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Southern Region

Final Environmental Impact Statement for the Revised Land and Resource Management Plan

Cherokee National Forest

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Abstract

The Forest Service proposes to revise the Land and Resource Management Plan (1986) for the Cherokee National Forest. The proposal updates the management goals, objectives, standards, and monitoring requirements for the ten-year planning period beginning when the revised LMP is approved. Revised management direction is developed for all of the lands resources on the Cherokee National Forest and is coordinated with that of the National Forests in Alabama, Chattahoochee-Oconee National Forests, Jefferson National Forest in Virginia, and the Sumter National Forest in South Carolina.

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CHAPTER 1: PURPOSE AND NEED

INTRODUCTION

The USDA Forest Service (USDA FS) has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into five chapters:

CHAPTER 1. PURPOSE AND NEED FOR ACTION: This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the USDA FS informed the public of the proposal and how the public responded.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES: This chapter describes the environmental effects of implementing the proposed action and other alternatives.

CHAPTER 4. PREPARERS: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.

Chapter 5. DISTRIBUTION LIST: This is a list of individuals and organizations that have been sent a copy of the EIS and Revised Land and Resource Management Plan.

Appendixes: The appendixes provide more detailed information to support the analyses presented in the EIS.

INDEX: The index provides page numbers by document topic. Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Forest Supervisors office.

The national forests in the southern Appalachian area have applied several efforts to begin their revisions. The main objective was to do the analysis leading to a proposal to change forest management direction. A key part of that analysis, for significant portions of each of the forests, has been the Southern Appalachian Assessment

(SAA). On February 24, 1995, a Notice of Intent (NOI) was placed in the Federal Register (Vol. 60, No. 37) that identified the relationships between the SAA and the forest plan revisions of the National Forests in Alabama, Chattahoochee-Oconee National Forests, Cherokee National Forest, Jefferson National Forest, and Sumter National Forest. Since then, preparation of an Analysis of the Management Situation (AMS) for each forest has included updating resource inventories, defining the current situation, estimating supply capabilities and resource demands, evaluating the results of monitoring, determining the "need for change" (36 CFR 219.19(e)(5)), reviewing previous public comments, and participating in public meetings or other outreach.

Proposed Action

The purpose of this proposed action is to revise the 1986 Cherokee Land and Resource Management Plan (1986 LMP). The revised LMP guides all natural resource management activities on the Cherokee National Forest (CNF) to meet the objective of federal law, regulations, and policy. The proposed action would also affect a wide range of socioeconomic factors as they relate to natural resources. The existing LMP for the CNF was approved April 1, 1986. As of September 30, 2002, there are 27 amendments to the existing LMP. Revision of the LMP is now needed to satisfy legal requirements and to address new information about the forest and forest uses.

The regulations implementing the National Forest Management Act (NFMA) instruct the Regional Forester to make periodic revisions to the LMP and to provide the basis for any revision. The instructions to revise forest plans and the basis for revision, are found in Code of Federal Regulations (CFR) 36 CFR 219.10(g).

The Environmental Impact Statement (EIS) describes the analysis of several alternatives for revising the LMP of the CNF and discloses the environmental effects of the alternatives. The EIS is guided by the implementing regulations of the National Environmental Policy Act (NEPA) found in the Council of Environmental Quality (CEQ) Regulations, Title 40, CFR 1500. The companion document to the EIS is the Revised Land and Resource Management Plan (LMP)—a detailed presentation of the selected alternative.

The following section describes the need to change the 1986 LMP and presents the basis for the proposed changes within the context of the regulatory requirements.

Need to Change Forest Plans

The need to revise these plans is driven by the changing conditions identified in the SAA and in individual forest assessments, as well as the changing public values associated with the national forest. These conditions and values make it appropriate that all of these southern Appalachian LMP revisions be done simultaneously. The Forest and Rangeland Renewable Resources Planning Act (RPA), as amended by the NFMA of 1976, requires that each national forest be managed under a LMP. The purpose of a LMP is to provide an integrated framework for analyzing and approving future site-specific projects and programs. Regulations require that LMPs be revised

on a 10-to-15-year cycle, or sooner if conditions or the areas covered by the plan change significantly.

Southern Appalachian Assessment

In the southern Appalachian area, various reports have been completed which provide information with regards to ecological analysis and management recommendations. One report is the SAA.

Information from the previous analyses along with the individual national forests efforts to update their Analysis of the Management Situation (AMS), was used by the national forests to determine what decisions should be reanalyzed or changed in LMP revision. The main objective of the AMS has been to do the analysis leading to a proposal to change forest management direction. A key part of that analysis, for significant portions of each of the forests, is the SAA.

The SAA includes National Forest System (NFS) lands and private lands in the George Washington and Jefferson, Nantahala and Pisgah, Cherokee, and Chattahoochee National Forests; and parts of the Sumter and Talladega National Forests. The SAA also involves the National Park Service lands in the Great Smoky Mountains National Park (GSMNP), Shenandoah National Park, and Blue Ridge Parkway.

The SAA facilitated an interagency approach to assessing conditions in the southern Appalachian area. The SAA is organized around four themes: (1) Terrestrial Resources (including Forest Health and Plant and Animal Resources), (2) Aquatic Resources, (3) Atmospheric Resources, and (4) Social/Cultural/Economic Resources (which includes the Human Dimension, Roadless Areas and Wilderness, Recreation, and Timber Supply and Demand). The SAA is culminated in a final summary report and four technical reports, which are now available to the public. The SAA was prepared by the USDA FS (the Southern Region of the NFS and the Southern Forest Experiment Station) in cooperation with the other Federal and State agencies that are members of Southern Appalachian Man and the Biosphere (SAMAB) Cooperative.

The SAA supports the revision of the LMP by describing how the lands, resources, people, and management of the national forests interrelate within the larger context of the southern Appalachian area. The SAA, however, is not a “decision document,” and it did not involve the National Environmental Policy Act (NEPA) process. As broad-scale issues were identified at the subregional level (southern Appalachian Mountain area) in the SAA, the individual national forest’s role in resolving these broad-scale issues becomes a part of the “need for change” at the forest level. Public involvement has been important throughout both of these processes. Continuing public involvement leading to formulation of alternatives for the LMP revision was conducted through the “scoping” period that followed the issuance on August 1, 1996, of the Notice of Intent (NOI).

Analysis of the Management Situation

The Analysis of the Management Situation for the CNF determined the need for revision based on results of monitoring, other policy and direction since 1986, the mandated five year review ((36 CFR 219.10(g)), the current condition of the resources, and supply and demand factors. This analysis also determined the ability of the planning area covered by the LMP to supply goods and services in response to

society's demands and provided a basis for formulating a broad range of reasonable alternatives.

A summary of the major findings that reflect the need for revision of the LMP follows:

The LMP needs to provide managers with the flexibility to determine and implement an appropriate suppression strategy ranging from prompt suppression to allowing fire to function in its natural ecological role.

The LMP needs to address the role that the forest would play in wildland/urban interface fires.

The LMP needs to develop qualitative and quantitative measures of recreation experiences in terms of economic values.

The LMP needs to supply an adequate spectrum of recreation settings and opportunities.

The LMP needs to provide for implementation of a comprehensive program for inventory of cultural resources not only qualitatively but also quantitatively.

The LMP needs to clarify the direction of the soils program for riparian areas. Specifically, the interpretation of watercourse protection strip guides and the activities that are permitted within the watercourse protection strip.

The LMP needs active management in various ecological communities utilizing appropriate silvicultural techniques to achieve forest health objectives while responding to commodity and other resource needs.

The LMP needs to validate the integration of landscape data, stream and riparian habitat, instream biological integrity, water chemistry and stream classification into a system that can be used to assess overall watershed and stream health.

The LMP needs an inventory of roads that are located in riparian areas. Once identified water quality problems associated with the roads can be evaluated and possible mitigation work determined.

Forest Plan Decisions

National Forest System resource allocation and management decisions are made in two stages. The first stage is the LMP level decisions, which allocates lands and resources to various uses or conditions by establishing management areas and management prescriptions for the land and resources within the plan area. The second stage is approval of project level decisions.

Land and Resource Management Plans do not compel the agency to undertake any site-specific projects; rather, they establish overall goals and objectives (or desired resource conditions) that the individual national forest strives to meet. Land and Resource Management Plans also establish limitations on what actions would be authorized, and what conditions would be met, during project level decision.

The primary decisions made in a LMP include:

Establishment of the forestwide multiple-use goals and objectives (36 CFR 219.11(b)).

Establishment of forestwide management requirements (36 CFR 219.13 to 219.27).

Establishment of multiple-use prescriptions and associated standards for each management area (36 CFR 219.11(c)).

Determination of land that is suitable for timber production (16 U.S.C. 1604(k) and 36 CFR 219.14).

Establishment of allowable sale quantity for timber within a time frame specified in the plan (36 CFR 219.16).

Establishment of monitoring and evaluation requirements (36 CFR 219.11(d)).

Recommendation of roadless areas as potential wilderness areas (36 CFR 219.17).

Where applicable, designate lands administratively available for oil and gas leasing; and when appropriate, authorize the Bureau of Land Management (BLM) to offer specific lands for leasing (36 CFR 228.102 (d) and (e)).

The authorization of site-specific activities within a plan area occurs through project decision making, which is the implementation stage of forest planning. Project level decision requires compliance with NEPA procedures and a determination that the project is consistent with the LMP.

Supporting Environmental Impact Statements

The following Environmental Impact Statements contain environmental analyses that are not repeated in this EIS, but provide supporting documentation for some of the forest plan decisions.

Final Environmental Impact Statement for the Gypsy Moth Management in the United States: A Cooperative Approach (USDA, Forest Service and APHIS, Washington, DC, November 1995)

Final Environmental Impact Statement for the Suppression of the Southern Pine Beetle (USDA Forest Service, Southern Region, February 1987)

Final Environmental Impact Statement for Vegetation Management in the Appalachian Mountains (USDA Forest Service, Southern Region, July, 1989)

Final Environmental Impact Statement for Forest Service Roadless Area Conservation (USDA Forest Service, Washington Office, November 2000)

Forest Profile

The CNF is the largest wildlife management area and single largest tract of public land in Tennessee. It is the only national forest in Tennessee. The only other USDA

FS unit in the state is *Land Between the Lakes National Recreation Area* located on the Tennessee/Kentucky border. The CNF covers approximately 640,000 acres and is located in ten east Tennessee counties along the border with North Carolina. In addition, the GSMNP divides the CNF creating a north and south end respectively (Figure 1).

The Tennessee valley and surrounding southern Appalachian mountains have and continue to experience considerable growth in recent years. For the most part communities within the CNF proclamation boundary are small and rural in nature. Major cities adjacent to the CNF include: Johnson City, Elizabethton, Bristol, Kingsport, Newport, Greeneville, Knoxville, Athens, Cleveland, and Chattanooga. The CNF is within a day's drive of approximately 20 million people. Interstate highways 81 and 75 run parallel to the CNF's western boundary from Virginia to Georgia. Interstate Highway 40 enters the CNF east of Newport, TN from North Carolina. Numerous state highways traverse the CNF at various locations.

The CNF ranges in elevation from approximately 1,500 feet to over 5,000 feet. Forest canopy composition is pine and hardwood mix, with over 70 species of trees represented. The climate throughout the CNF is typical of the southern Appalachians with four distinct seasons. No one season is particularly harsh. Average rainfall is approximately 60-65 inches.

The CNF is divided into four ranger districts: Ocoee-Hiwassee Ranger District and Tellico Ranger District located south of GSMNP, and Nolichucky-Unaka Ranger District and Watauga Ranger District located north of GSMNP. Each unit consists of approximately 160,000 acres.

Approximately 90 developed recreation sites and more than 600 miles of trails are scattered throughout the CNF. Approximately 150 miles of the A.T. passes through the north end of the CNF. There are 66, 389 acres of Congressionally-designated wilderness in 11 individual areas, and 85, 195 acres of SAA-inventoried Roadless Areas (CNF portions). The CNF is home to 500 miles of cold-water streams, 72 species of trees, 43 species of mammals, 55 species of amphibians and reptiles, 55 fish species, and at least 156 species of insects. Popular recreation activities include hiking, camping, driving for pleasure, whitewater boating, mountain biking, hunting and fishing. The CNF provides all or part of the source water area for several community water systems. It also contains a portion of the Conasauga River watershed that is one of fifteen community based large scale watershed initiatives, that exist nation-wide. This initiative is designed to demonstrate innovative ways to improve watershed, forest, range, water, and habitat conditions at a river-basin scale.

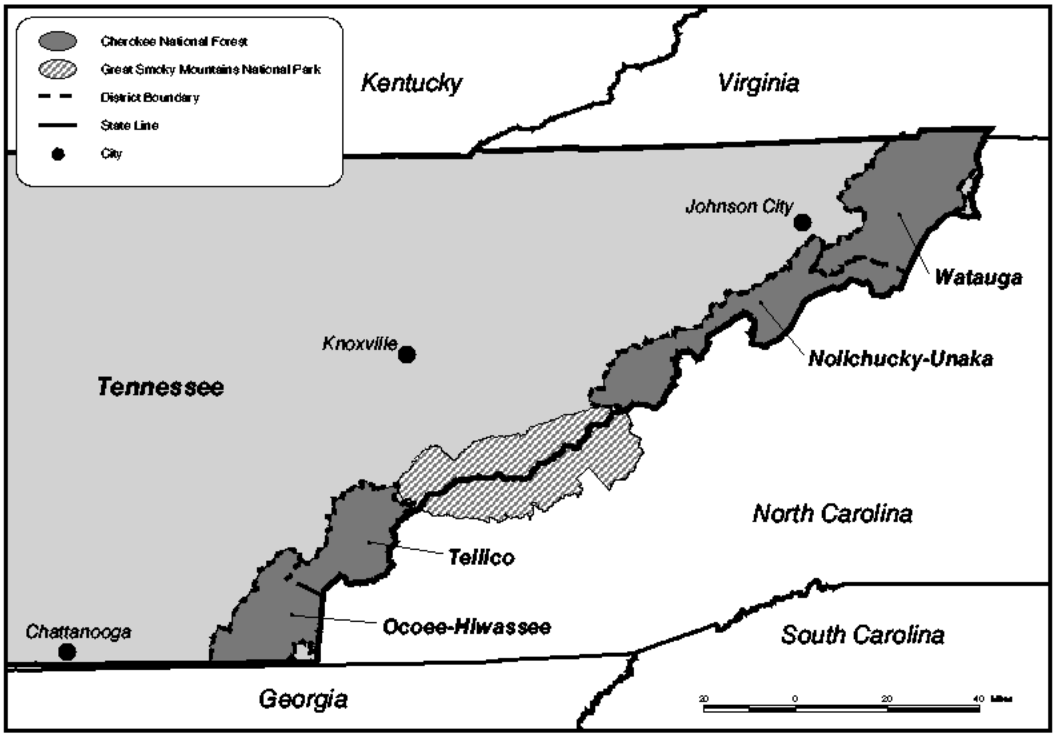


Figure 1- 1. Cherokee National Forest vicinity map with Ranger Districts.

Public Involvement

Five National Forests in the Southern Appalachians, including the Cherokee, worked concurrently to revise their current Forest Land & Resource Management Plans (LMP). The five national forests took a consistent approach to revising their plans. The overall process was the same for each national forest and public participation activities were conducted in close coordination and similar approach. The public was included throughout the process. The national forests developed Alternative I, often referred to as a "rolling alternative." Alternative I continued to incorporate public comments throughout the process. Regularly scheduled planning team meetings were open to the public throughout the process until the release of the Draft Revised Pan & EIS.

In October 1995 the Cherokee National Forest began notifying the public through a LMP newsletter that it would begin revising its LMP in early 1996. This newsletter was sent to the Forest mailing list consisting of approximately 4,200 individuals, groups, agencies and organizations.

The newsletter, correspondence, news releases, meetings, and personal contacts have been utilized to keep the public informed and to provide them with a variety of opportunities to be involved with the revision process. All of the CNF planning team meetings were open to the public. The public had the opportunity to interact with the team on a regular basis.

One of the first steps in the revision process was to analyze the current management situation to determine the need for change in forest management. On February 22, 1996 a public meeting was conducted in Alcoa to provide the public the opportunity to discuss the AMS and the need for change. A total of 45 people attended this meeting. Written comments were solicited and accepted.

Notice of Intent:

The Notice of Intent (NOI) to begin the revision process and formal public comment period (scoping) was published in the Federal Register on August 2, 1996. Through the Federal Register, the Forest mailing list and widespread media coverage a series of public meetings was announced. These meetings were conducted in October 1996 to provide information about the revision process and to solicit public comment.

Initial Scoping Efforts:

In order to provide the public with information about the scooping process and how to provide comment two meetings were conducted in each of the following cities: Elizabethton, Greeneville, Alcoa, Tellico Plains, Ducktown Cleveland, and Nashville. A total of 130 people attended these sessions.

The formal public comment period was August 2 – December 2, 1996. Written public comments were received and logged in at the Forest Supervisor's Office in Cleveland during this period. A total of 1,224 cards and letters of input were received.

It was extremely important that all public comments received during the NOI scoping be carefully reviewed and analyzed. The public response analysis is defined in the FSM1626.05 as "the objective and systematic description of the content, nature, and extent of public comments transformed into data that can be summarized and compared."

Issue Development:

A public content analysis team consisting of Forest specialists and technicians from various resource disciplines was assembled to read every comment and identity issues and concerns submitted during the initial scooping public comment period. The primary issues identified were used to help develop and address various management alternatives. The Southern Region Office worked with the five southern Appalachian national forests to develop a standard set of 12 common issues.

Alternative Development:

Initially the five southern Appalachian national forests developed four themes for resource management and direction. Along with the description of the current management situation these themes became the focal point for alternatives to be analyzed.

In October and November 1999 three series of meetings were conducted in Etowah, Unicoi, Greeneville, Tellico Plains and Benton. The first series of meetings informed the public of the status of the LMP revision process and presented Altenative I. The second series of meetings consisted of facilitated

group sessions. Each group identified items of concern and presented possible improvements to Alternative I. The final series of meetings was held to "fine-tune" the management alternative. A total of approximately 1,000 people attended these meetings.

In concert with the Regional Office and the other Appalachian national forests involved with revising their LMP's two workshops were conducted in Knoxville on August 22, 2002. The intent was to provide the public with an update of the status of the revision process, provide an update of Alternative I, provide an opportunity for the public to meet with the planning team, and to document "red flag" issues in the process. A total of 81 people attended the workshops.

The planning team reviewed the comments documented at the meetings and presented them to the Forest Leadership Team for consideration. It was determined that no issues or red flag issues were identified that had not already been addressed.

Release of the Draft Revised Plan & EIS:

The formal public comment period for the Draft Revised Plan & EIS began on March 22, 2003 after The Notice of Availability was published in the Federal Register on March 21. The public comment period was March 22 – July 3, 2003.

Copies of the Draft Revised Plan & EIS or the summary documents were mailed to approximately 3,500 people on the CNF mailing list. In addition, the documents were posted to a web site, placed in numerous public libraries, and were available upon request at all CNF offices.

Public meetings (two at each location) were conducted on April 14, 2003 in Cleveland, TN and on April 15, 2003 in Gray, TN (Johnson City area) to provide general information and to explain information in the draft EIS and draft Revised LMP. The intent was to help reviewers understand how to use and understand the contents of the documents. More than 100 people attended these meetings.

Approximately one month prior to the end of the public comment period a news release was issued as a reminder with information re: the comment period ending date, and information re: how to provide comment. In addition, a notice with similar information was mailed to the CNF mailing list.

Content Analysis:

An agency public content analysis enterprise team (CAET) based in Salt Lake City, Utah was used to receive and identify issues and concerns for the five southern Appalachian national forests involved with revising their draft LMPs & EIS's. Approximately 12,000 written comments were received for the five national forests.

Summary reports of comments received were provided to each national during the public comment period. At the end of the comment period a final report of all comments received was provided to each national forest. The Southern Region Office and the five southern Appalachian national forests worked together to determine which issues were national forest specific and which ones were multi-

forest in nature. The need to be consistent in responding to issues was a high priority. Each comment was grouped with similar comments/issues and addressed in the Final Environmental Impact Statement.

PRELIMINARY ISSUES

Issues submitted by the public, as well as from within the USDA FS, guided the need to change current management strategies. The preliminary issue list, which follows, is the result of nine years of public response to the implementation of the 1986 plan:

1. Biodiversity (includes fragmentation; old growth; forest type conversion; riparian areas; management indicator species (MIS); threatened, endangered, and sensitive species; and unique natural communities).
2. Below cost sales (includes efficiency of timber sale program; rural development; suitability; and allowable sale quantity).
3. Forest access (includes system roads; non-motorized trails; and fees).
4. All-terrain vehicles.
5. Roadless area management.
6. Special area management (includes wilderness; rivers; important scenic and recreational areas; fisheries; and black bear).
7. Aesthetics (includes user expectations).
8. Vegetation manipulation.
9. Resource sustainability (includes ecosystem management; extirpated species; soil productivity; water quality; vegetation management; herbicides; and air).
10. Minerals.
11. Forest health.
12. Adequacy of revision (includes implementation and monitoring).
13. Mix of goods and services (includes developed recreation; dispersed recreation; wildlife; and land ownership).

In addition to the preliminary issues, the need for change was identified through an AMS. A detailed account of the public involvement process is in Appendix A, "Summary of Public Involvement."

Collectively, public comments expressed in letters and appeals and preliminary issues, the Chief's directives, and concerns of USDA FS professionals are contained in the 12 southern Appalachian national forests issues. These issues guide the direction of the LMP and are a collaboration of efforts from the public, state and federal agencies, and national forests.

SIGNIFICANT ISSUES

The following issues are common to the National Forests in Alabama, Chattahoochee-Oconee National Forests, Cherokee National Forest, Jefferson National Forest, and Sumter National Forest.

The issues and planning questions are summarized in the following questions, which were used to develop alternatives for the LMP revision process.

1. **Terrestrial Plants and Animals and Their Associated Habitats**. How should the national forests retain or restore a diverse mix of terrestrial plant and animal habitat conditions, while meeting public demands for a variety of wildlife values and uses?
2. **Threatened, Endangered, and Sensitive/Locally Rare Species.** What levels of management are needed to protect and recover the populations of federally listed threatened, endangered and proposed species? What level of management is needed for USDA FS sensitive and locally rare species?
3. **Old Growth.** The issue surrounding old growth has several facets, including: (1) How much old growth is desired? (2) Where should old growth occur? (3) How should old growth be managed?
4. **Riparian Area Management, Water Quality and Aquatic Habitats.** What are the desired riparian ecosystem conditions within national forests, and how will they be identified, maintained and/or restored? What management direction is needed to help ensure that the hydrologic conditions needed for the beneficial uses of water yielded by and flowing through National Forest System lands are attained? What management is needed for the maintenance, enhancement, or restoration of aquatic habitats?
5. **Wood Products.** The issue surrounding the sustained yield production of wood products from national forests has several facets, including: What are the appropriate objectives for wood product management? Where should removal of wood products occur, given that this production is part of a set of multiple use objectives, and considering cost effectiveness? What should be the level of outputs of wood products? What management activities associated with the production of wood product are appropriate?
6. **Aesthetics/Scenery Management.** The issue surrounding the management of the visual quality has two facets: What are the appropriate landscape character goals for the national forests? What should be the scenic integrity objectives for the national forests?
7. **Recreation Opportunities/Experiences.** How should the increased demand for recreational opportunities and experiences be addressed on the national forests while protecting forest resources? This includes considering a full range of opportunities for developed and dispersed recreation activities (including such things as nature study, hunting and fishing activities, and trail uses).
8. **Roadless Areas and Wilderness Management.** Should any of the roadless areas on National Forest System lands be recommended for wilderness designation? For any roadless areas not recommended for wilderness, how should they be managed? How should areas that are recommended for wilderness designation be managed? How should the patterns and intensity of use, fire, and insects and disease be managed in the existing wilderness areas?

9. **Forest Health.** What conditions are needed to maintain forest capacity to function in a sustainable manner as expected or desired? Of particular concern are the impacts of exotic or nonnative species, and the presence of ecological conditions with a higher level of insect and disease susceptibility.
10. **Special Areas and Rare Communities.** What special areas should be designated, and how should they be managed? How should rare communities, such as those identified in the SAA, be managed?
11. **Wild and Scenic Rivers.** Which rivers are suitable for designation into the National Wild and Scenic Rivers System, and how should rivers that are eligible, but not suitable, be managed?
12. **Access and Road Management.** How do we balance the rights of citizens to access their national forests with our responsibilities to protect and manage the soil and water resources, wildlife populations and habitat, aesthetics, forest health, and desired vegetative conditions?

Planning Process

Forest planning occurs within the overall framework provided by implementing the regulations of NFMA and NEPA. National, regional, and forest planning form an integrated three-level process. This process requires a continuous flow of information and management direction among three USDA, FS administrative levels. Information from forest planning flows upward to the national level for use in the RPA program where, in turn, information flows back to the forest level. In this structure, regional planning is the principal process for conveying information between forest and national levels.

Planning actions required by the NFMA and used in this planning process are:

1. Identification of issues, concerns, and opportunities
2. Development of planning criteria
3. Inventory of resources and data collection
4. Analysis of the Management Situation
5. Formulation of alternatives
6. Estimation of effects of alternatives
7. Evaluation of alternatives
8. Recommendation of preferred alternative
9. Approval and implementation
10. Monitoring and evaluation

The results of planning steps 1-8 are described in this document. Refer to Appendix A and Appendix B, “Analysis Process,” for more detail on the results of these steps.

This document will be used in future environmental analyses through tiering. *Tiering* means that environmental analyses and documents prepared for projects arising from the LMP will refer to the Final Environmental Impact Statement (FEIS) and LMP.

DRAFT EIS

A draft EIS was released in February, 2003. More than 3000 copies were distributed for review. The review period closed in July, 2003. Comments on the draft were received and organized by the USDA, Forest Service, Content Analysis Enterprise Team in Salt Lake City, Utah. Analysis and response to comments was provided by the CNF planning interdisciplinary team. The responses are found in Appendix H of the EIS. An open house was held in Johnson City and Cleveland Tennessee during the review period tp provide additional access for the publc to the interdisciplinary team members and CNF personnel.

PLANNING PROCESS RECORDS

The forest's Interdisciplinary Team (IDT) is responsible for developing the revised LMP. Efforts were made to provide detailed explanations of each step of the revision in the form of process (or planning) records. This EIS contains summaries of the process records and includes references to the parent records. Process records are on file in the Forest Supervisor's Office. To review these records, contact:

Forest Supervisor's Office
PO Box 2010
Cleveland, TN 37320
Telephone: 423-476-9700

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter summarizes and compares the alternatives that were developed as potential management strategies for the CNF. It explains the alternative development process, provides reasons why some of these alternatives were later eliminated from detailed study, describes the alternatives that are considered in detail, and lastly compares how the alternatives respond to the significant issues identified in Chapter 1.

CONSISTENCY ACROSS FORESTS/STATE LINES

In an effort to have a consistent approach to the development of revised forest plans across the southern Appalachian national forests, various teams were assembled and actions taken. In addition to the individual forest IDTs, the following teams comprised of individuals from the five forests worked on coordinating, developing and analyzing the forest plan alternatives:

The Steering Team is comprised of the Forest Supervisors of the five national forests and the Director of Planning. They provided oversight and direction to the overall planning effort.

The SAP (Southern Appalachian Planners) Team included the Forest Planners from the five national forests and the Regional Planners. This group held numerous meetings, most of which were open to the public, to develop and implement a coordinated approach to developing and analyzing the alternatives.

The FWRBE (Fisheries, Wildlife, Range, Botany, and Ecology) Team was comprised of various specialists (wildlife, fisheries, etc.) from the forests and the region. This team developed a consistent approach to addressing those issues relating to terrestrial and aquatic species and their habitats including threatened, endangered, and sensitive species (TES); species of viability concern; and rare communities. Most of these meetings were also open to the public.

The SARRWAG (Southern Appalachian Recreation, Rivers, Wilderness Advisory Group) included recreation specialists from the forests and the region and developed a consistent approach to addressing recreation-related issues, evaluating roadless areas, managing Wilderness areas, studying Wild and Scenic Rivers, and where applicable – the management of the A.T.

The Riparian Team, comprised of hydrologists, soil scientists, and aquatic biologists, worked on developing a consistent approach to addressing water- and riparian-related issues.

In addition to the team efforts described above, some specific actions were taken to achieve a consistent approach to the planning process. They included:

All the forests working on the same schedule/timeline, starting with the issuance of a Notice of Intent to revise the forest plans for the five forests (on August 2, 1996), continuing on through the publication of this Environmental Impact Statement, and eventually will include the publication of the Final Environmental Impact Statement.

Developing a common set of significant issues, which are described in Chapter 1.

Developing a common set of Management Prescriptions. A team of representatives from the five forests and the regional office held a series of meetings, some of which were open to the public, to develop a common set of "generic" management prescriptions. First, different "categories" of prescriptions were identified and then "emphasis" statements were developed to address the various issues. Descriptions of the "desired conditions" that would result from implementing the management prescriptions were then developed. Later, the Forest IDTs took these "generic" descriptions of the management prescriptions and "localized" them to meet local conditions. The Management Prescriptions used on the CNF are listed in Table 2-1.

A coordinated approach to developing the alternatives, which is described below.

ALTERNATIVE DEVELOPMENT

The alternative development process consisted of four different phases. The process involved a coordinated effort of the staffs of the five national forests of the southern Appalachian area, with frequent meetings that were open to the public.

Phase I identified different ways the significant issues could be addressed.

Phase II developed four alternative themes using the information developed in Phase I. These alternative themes were the "starting points" for developing alternatives. The four themes were:

Produce high levels of goods and services compatible with local economies and communities.

Priority is given to restoring natural resources and processes.

Nature operates in conjunction with minimal human intervention.

Provide vigorously growing trees, commercial wood products and a variety of wildlife habitats in a generally naturally-appearing setting.

Phase III involved mapping the four alternative themes and "Current Direction". The Phase III maps showed the land allocations, with each allocation consisting of a management emphasis, desired condition, and applicable management direction.

The objectives of Phase IV of the alternative development process were to analyze the four alternative themes to determine whether modifications were needed, whether other alternatives needed to be developed, and whether there were any areas of consensus. Public participation in both Phases III and IV was extensive and critically important to the overall process of developing alternatives. A description of public meetings and public involvement activities is available in Appendix A.

Based on input from all five southern Appalachian national forests and the public on the five forests, changes were made and additional alternatives were developed to address a variety of issues and to provide a spectrum of alternatives to analyze and consider. The original four alternative themes (with some modifications) became Alternatives A-D, the Current Direction (No-Action) Alternative became Alternative F, and three new alternatives (Alternatives E, G and H) were developed.

Later, it was decided to develop a ninth alternative (Alternative I). A set of "design criteria" was developed for this alternative which incorporated those parts of Alternatives A-H where there appeared to be some general agreement from our publics. Also, as a part of the design of Alternative I, it was meant to "roll" through different iterations of coordinating efforts with our publics. As a result of this development strategy, this alternative was often referred to as the "Rolling Alternative".

CONSISTENCY WITH RENEWABLE RESOURCE PLANNING ACT

National Forest Management Act regulations at 36 CFR 219.12(f)(6) require the LMPs to respond to and incorporate the Renewable Resource Planning Act (RPA) Program objectives. The last RPA Program was developed in 1995. Currently the Forest Service Strategic Plan (2000 Revision) provides broad overarching national guidance for forest planning and national objectives for the agency as required by the Government Performance and Results Act. All of the alternatives in this EIS incorporate these broad strategic objectives.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

As was described above, there were originally nine different alternatives. However, as the planning process proceeded, it was determined that two of the alternatives that were developed did not need to be further evaluated in greater detail. Descriptions of those two alternatives and the reasons they were not studied further are explained below.

Alternative C

Alternative C would emphasize resource management with minimal human intervention to the natural resources. Management would be for the protection of resources, for meeting legal requirements, and for maintaining current recreation opportunities.

Potential old-growth areas would, within a few decades, come to represent the majority of the forest as a result of minimal management activity. There would be no regular, periodic harvest of green timber; therefore, no "suitable" forest land. The landscape character would change, moving toward high scenic integrity. Emphasis

would be on dispersed and non-motorized recreation opportunities. No new developed recreation facilities would be constructed.

All inventoried roadless areas would be recommended for wilderness designation. Risk of loss of critical habitat for threatened and endangered species, danger to forest visitors, risk of damage to private property through Forest Service inaction, or introduction of an exotic pest would be considered unhealthy forest conditions requiring human intervention. Human intervention would also be used to maintain or increase existing rare communities. The majority of the eligible wild and scenic rivers would be recommended for inclusion to the National Wild and Scenic Rivers System. Roads not needed for legal requirements and other resource needs would be closed or obliterated.

Reasons Alternative C Eliminated From Detailed Study

The management prescriptions applicable to this alternative were allocated and mapped, and preliminary estimates of the impacts of this alternative were made. After considering this preliminary information, it was determined that Alternative C did not need to be further evaluated in detail in this EIS. The reasons are: 1) From further analyses it was determined that this alternative, as originally envisioned, would not meet all the legal requirements of the National Forest Management Act of 1976 (NFMA), the Multiple-Use Sustained-Yield Act of 1960 (MUSYA) and the Endangered Species Act of 1973 (ESA); 2) Alternative C only addresses some, but not all, of the forest planning issues that have been identified by the public; 3) Other alternatives considered in detail provide for relatively low levels of management activities; and 4) Alternative C is similar to the "Minimum Level Benchmark" discussed in Appendix B.

The 219 regulations specify that the planning team should "formulate a broad range of reasonable alternatives according to NEPA procedures" (36 CFR 219.12(f)). With respect to meeting NEPA procedures, the alternatives developed need to respond to the "purpose and need". The "purpose and need" of revising the LMP is to address the changing conditions that were identified in the Southern Appalachian Assessment, the CNF Analysis of the Management Situation, and the changing public values as represented by the 12 common issues. Alternative C, with its emphasis on "minimal human intervention" would not address all these issues, and would not meet the "purpose and need" as required by NEPA.

Another expression of the "purpose and need" of the LMP is in the NFMA regulations where it states that the "resulting plans shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long term net public benefits in an environmentally sound manner" (36 CFR 219.1). The Multiple-Use Sustained Yield Act states that the Secretary of Agriculture should "develop and administer the renewable surface resources of the national forests for multiple use and sustained yield of the several products and services obtained there from" (Section 2). Again, with its focus on "minimal human intervention", Alternative C is not an alternative that would provide "for multiple use and sustained yield of goods and services".

Additionally, the requirement to "maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 CFR 219.19) would not be met. When this alternative was originally developed, it was thought that relatively few acres would need to be "actively managed" in order to meet this requirement. However, after more analysis was conducted on the habitat needs of various species, it was determined that there are a number of species that depend on ecological communities that can only be maintained by frequent levels of disturbance. As is explained in Chapter 3 of this EIS, a significant level of management is needed (at least over the next 10 to 50 years) to restore and maintain these disturbance-dependant communities. A certain amount of "human intervention" is needed to get these communities into the desired conditions of composition and structure, so that in the future, natural disturbances along with appropriate prescribed fire levels could maintain these communities. However, the levels of management activities that would be needed over the next 10 to 50 years to create these conditions would be inconsistent with the overall goal of Alternative C to have "minimal human intervention".

To further illustrate the need for a certain level of active management, Chapter 4 of the Southern Forest Resource Assessment (Effects of Forest Management on Terrestrial Ecosystems) states:

- "The exact nature and condition of these forests and disturbance regimes are unknown, but the presence of large grazing herbivores and fire-adapted forest communities suggests that much of this forest land was relatively open and subject to regular disturbances" (p. 92).
- "Today there are more forested acres in the South than in the early 1900s. These forests, however, are greatly altered from forests encountered by European settlers. … The common theme for the last 10,000 years is that forests were managed to meet human needs, including those of Native Americans" (p. 93).
- "We should recognize, however, that removal of all human disturbances will have profound effects on the region's biota" (p. 93).
- "To avoid regional population declines and species losses, land managers must have the flexibility to promote active management. This region's biota does not thrive in a static system, and intentional neglect does nothing but promote additional extinctions and endangerment to species at risk… This flexibility should not extend to the other extreme of promoting intensive forestry for wildlife conservation, but it does suggest that some level of active management will be necessary to maintain many still extant but imperiled species, including many found on present or set-aside lands" (p. 93).

With respect to the agency's "Healthy Forests Initiative", a management emphasis of the agency is to change the situation where forests, overloaded with fuels, are vulnerable to severe wildland fires. Minimizing "human intervention" would increase susceptibility of the forest to insect and disease outbreaks, which would create increased fuel-loading problems, and increase the risks to other resources and to

adjacent private lands. Alternative C would not address these problems and areas of concern.

Apart from the low levels of human intervention, the other aspects of this alternative such as large acreages in old-growth or late–successional conditions, maintaining roadless area characteristics, and providing for an emphasis on dispersed recreation activities, etc., are similarly represented in Alternatives E and G.

While Alternative C would address some of the issues, there are other management issues that have been raised by the public that this alternative does not address. In addition to the forest health and wildlife habitat management concerns expressed above, Alternative C does not address the issue that there are demands for various forest products such as high-quality sawtimber, which are of limited supply from private lands, but are available from National Forest lands.

Lastly, the Minimum Level Benchmark is "the minimum level of management which would be needed to maintain and protect the unit as part of the National Forest System together with associated costs and benefits" (36 CFR 219.12(e)(1)(i)). This is essentially the same management emphasis as Alternative C and a further description of this level of management can be found in Appendix B.

As a result of all these factors, it was determined that further study of this alternative was not needed.

Alternative H

Alternative H would provide for active resource management to achieve multiple-use objectives with all lands classified as unsuitable for timber production. There would be some timber harvest, but not under a sustainable harvest schedule as is done on suitable forest land. The resource management activities would focus on providing a wide diversity of wildlife habitats. Small human-made openings would be made to mimic natural gap openings. Emphasis would be on forest interior species habitats and these areas would be managed for high to very high scenic integrity.

Old-growth allocation and management would be primarily on lands already withdrawn from the suitable timber base. Restoration of degraded watersheds would be emphasized to improve aquatic habitats and water quality. Highways and roads in the forests, trail and river corridors, and recreation-use areas would have forest stands with few, if any, broken views to support enhancements in tourism and local, rural economies. Recreation areas and opportunities would be increased throughout a variety of settings.

Inventoried roadless areas adjacent to existing wilderness would be recommended for wilderness designation. Exotic pests and/or undesirable species would be controlled. All wild and scenic rivers would be recommended for inclusion into the National Wild and Scenic Rivers System (WS&R) if they do not conflict with other resources. Eligible wild and scenic rivers not recommended for inclusion into the WS&R would be allocated to a management prescription that protects these rivers and manages them similarly to congressionally designated rivers. Public access (travelways, use corridors, waterways, and trails including off-highway vehicles) would be increased in high-use areas and/or improved to provide for more opportunities for recreation.

Reasons Alternative H Eliminated From Detailed Study

When the management prescriptions applicable to this alternative were allocated and mapped, there ended up being virtually no difference between this alternative and Alternative G. The allocations were essentially the same, and therefore, the environmental effects would be essentially the same. The only significant difference between Alternative G and Alternative H was that in Alternative G, the majority of those acres being managed through silvicultural harvesting methods were classified as acres "suitable for timber production", while in Alternative H, those same acres and same management activities would be classified as "unsuited for timber production". The timber harvesting levels planned for in Alternative H are close to the levels of harvesting planned for in Alternative G. Since the main difference is primarily an administrative classification change, and there would be no differences in the overall outputs and environmental effects, it was decided that this alternative did not need to be considered further in detail in this EIS.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative A

Emphasize goods and services to local economies.

Manage timber for sustained yield of high quality sawtimber.

Manage wildlife for public demand game and non-game species.

Enhance developed and dispersed recreation opportunities.

Enhance high-quality scenery.

Increase public access to the forest enhance recreation opportunities.

Increase watershed restoration to improve fisheries.

Withdraw old growth lands from the suitable land base.

Manage vegetation actively to reduce the risk of insects and diseases.

Alternative A would emphasize production of goods and services beneficial to local economies and communities. Local communities include any community that benefits economically from forest visitors and forest products. Timber management would provide sustained yield of wood products with emphasis on high-quality sawtimber and public-demand species including game and other species. Developed and dispersed recreation opportunities and high-quality scenery would be provided in a variety of settings both natural and managed. These would include both commercial recreation and increased public access.

Restoration opportunities in watersheds would be emphasized to improve aquatic habitats and water quality. Old growth allocation and management would be primarily on lands already withdrawn (in current LMP) from the suitable timber base. Highways and roads in the forests, trail and river corridors, and recreation-use areas would have forest stands with few, if any, broken views to support enhancements in tourism and local, rural economies. Southern Appalachian Assessment inventoried

roadless areas adjacent to or in close proximity to wilderness areas that are high-use areas also would be recommended for wilderness designation. Vegetation would be actively managed to reach and maintain a condition of low risk of insect and disease problems, especially in those areas where timber production would be the emphasis, or vegetation management would be permitted. Public access (travelways, use corridors, waterways, and trails including off-highway vehicles) would be increased in high-use areas and/or improved to provide for more recreation opportunities.

This alternative responds to the President's Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

Alternative B

Biologically driven to emphasize restoring the natural resources and processes.

Emphasize creating and maintaining wildlife habitats.

Mimic natural process in a natural landscape pattern.

Create large and small openings.

Variety of recreation opportunities available if compatible with restoration.

Manage timber to enhance wildlife.

Emphasize old growth with goal to create pre-settlement conditions.

Emphasize riparian ecosystems.

Enhance scenic qualities over time (may be short-term impacts).

Roadless areas with high value wildlife needs are not recommended to wilderness.

The role of insects and disease in ecosystem would be accepted except in epidemic conditions. Exotic pest would be controlled where feasible.

Generally, amount of long-term permanent access would be reduced. Access in the short-term, may increase as needed to achieve management goals.

Alternative B would be biologically driven, emphasize restoring the natural resources and processes, and creating and maintaining wildlife habitats. Emphasis would be on restoration of vegetation to potential natural vegetation (plant associations) based on the ecological potential and capability of the land and providing a mix of the wildlife habitats for game and non-game species. Restoration activities would occur in areas where technology is available to implement. When possible, natural processes would be mimicked in a natural landscape pattern. Restoration activities would produce both large and small openings. Long-term restoration goals would be established for areas where technology is not currently available or for areas where

restoration activities cannot be implemented or completed within the life of the revised LMP. A variety of recreation settings would occur in areas compatible with restoration activities and in areas non-restoration areas. Management for wood products would only occur in concert with restoration and creating wildlife habitats. Timber sales would become a by-product of restoration management and wildlife habitats.

The long-term goal would be to provide old-growth conditions by old-growth community types within the ecological province or section similar to that existing before large-scale, extensive pioneer settlement and land uses. Riparian ecosystems would be managed to maintain water quality and aquatic ecosystems and to restore proper functioning condition to degraded areas. Timber production would be a result of management activities to restore and maintain specific impaired or degraded resources, natural processes, communities, and wildlife habitats. In some areas of the forests, scenic resources would move gradually toward high to very high scenic integrity. Restoration of areas would result in short-term, low to moderate scenic integrity but with a long-term goal of high scenic integrity. A wide variety of recreation opportunities would be provided. Roadless areas with identified restoration needs or wildlife habitat needs in conflict with wilderness designation would not be recommended for wilderness; other roadless areas could be recommended for wilderness study. The role of native insects and disease would be accepted, except that epidemics would be suppressed to reduce large-scale catastrophic tree mortality. Exotics such as beech scale, gypsy moth, hemlock woolly adelgid, Japanese privet, and kudzu would be controlled where feasible. Any restoration needs would be made compatible with W&SR classification and its outstandingly remarkable values. Access to degraded resources, areas in need of restoration, or areas where wildlife habitat needs occur could be temporarily provided to maintain or restore desirable ecological conditions. Access would be reduced as needed to restore and protect aquatic systems, soils, and plant/animal communities.

This alternative responds to the President's Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

Alternative D

All suitable lands available for sustained yield management.

Major forest types have a specific target "rotation" age. Harvest ensures that forest types are harvested and replaced with a new forest.

Forest management ensures approximate equal areas in each age class.

Age classes are distributed across the forest in 15-40 acre blocks.

Production of wood products and a variety of aquatic and wildlife habitats is emphasized.

Provide developed and dispersed recreation opportunities.

Provide old growth forest on unsuitable lands.

Maintain and increase forest access to facilitate alternative goal.

Alternative D would be to reach and maintain a balanced age class. All suitable lands would be available for sustained-yield management. On suitable lands, each of the major forest groups pine, mixed, and hardwood would have a specific target “rotation age” or age at which it would be harvested and replaced with a new forest.

There would be an approximately equal number of acres within each 10-year age class up to that rotation age. This “balance of age classes” would occur on lands identified as suitable and would be distributed in 15- to 40-acre blocks throughout the lands being managed for sustained-yield timber production. Pine, mixed, and hardwood forests older than the rotation age also would occur on large blocks of land already withdrawn from sustained-yield timber production. Production of both commercial wood products and a variety of aquatics/wildlife habitats would be emphasized. Developed and dispersed recreation opportunities would be provided in a variety of settings both natural and managed. Water quality and riparian areas would be protected through BMPs, streamside management zones, and standards and restored if needed. Streamside management zones would be included in the suitable timber base, with minimum widths based on applicable regulations.

Large- and medium-sized blocks of old growth would be provided only on unsuitable land. Small blocks would occur scattered throughout the suitable lands on steep slopes, streamside management zones, or similar areas. The forests would appear highly variable in tree sizes and openings in the canopy would be seen from roadways and vista points. Potential for roaded natural experiences would increase as access roads for timber harvest are built or improved. The semi-primitive experiences would be primarily on unsuited lands. Only those roadless areas that are already withdrawn from sustained-yield timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service would be recommended as wilderness. Insects, diseases, and exotic plant and animal species on suitable lands would be actively controlled and prevented where feasible. Some of the eligible wild and scenic rivers would be recommended for inclusion to the WS&R. Access would be developed, maintained, and used as needed to meet the goal of balanced age classes, wildlife habitats, and production of timber products.

This alternative responds to the President’s Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

Alternative E

Resource management designed to attract recreation users.

Maintain a forest canopy over most forested areas.

Maintain large blocks of the forest in roadless condition to provide remote, backcountry recreation.

Increase a variety of developed and dispersed recreation opportunities.

Increase the opportunity for Off-highway vehicle (OHV) use.

Maintain a variety of wildlife habitats across the landscape.

Focus timber management on production of high quality large diameter trees.

A natural setting and concentrated facilities would be provided that could attract a variety of recreation users. Resource management activities would be concentrated in certain locations and supports recreation use and visual quality. Most areas would maintain a forested canopy. Large blocks of the forest would be maintained in a roadless condition to provide remote, backcountry recreation. Dispersed and developed recreation areas and opportunities would be increased. A variety of recreation experiences would occur including concentrated use and OHV use. A variety of different wildlife habitats would be maintained in blocks across the landscape. Habitat for early successional species would be maintained in a manner that would be unnoticeable to most forest visitors. A substantial amount of the forest would be allocated to providing old growth for biological and aesthetic settings in large, medium, and small patches.

Riparian ecosystems and streamside management zones would be designated, through allocation or standards, to provide water-quality protection and improvement. The overall long-term timber product objective would be large-diameter and high-quality sawtimber for species capable of reaching that objective. Highways and roads in the forests, trail and river corridors, view sheds, and recreation-use areas would have forest stands with few, if any, broken views to support enhancements in tourism and local, rural economies. Many insect and disease impacts would be tolerated as part of a functioning natural ecosystem. Most wild and scenic rivers would be recommended for adding to the WS&R, with primary emphasis on protecting the resources. Public access (travelways, use corridors, waterways, trails including OHV) would be increased in high-use areas and/or improved to provide for more recreation opportunities.

This alternative responds to the President's Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

Alternative F

No Action Alternative - Current Management

Provide for threatened, endangered, and sensitive species management

Provide a variety of developed and dispersed recreation opportunies

Maintain a variety of wildlife habitats across the landscape

Riparian area management would continue with emphasis from standards

Emphasize high quality sawtimber

Maintaining a closed canopy would not be required

Roadless Areas and Wilderness Areas would folllow guidance of new roads policy

Protect existing rare communities

Protect all outstandingly remarkable values for eligible rivers

Number of open roads would remain essentially as is now.

Alternative F would continue with current management. Timber managmenet would provide high quality sawtimber. Developed and dispersed recreaiton opportunities would be provided in a variety of settings. Roadless and wilderness areas would follow guidance of new roads policy. The number of open roads would remain under current management standards. All outstandingly remarkable values for eligible rivers recommended for designation under WSR would be protected. A variety of wildlife habitats would be maintained across the landscape. Protection of rare communities would continue. Species management and protection for threatened, endangered, and sensitive species management would continue. Riparian area management would continue with emphasis from standards.

Alternative G

Link large undisturbed areas together with corridors.

Provide threatened and endangered (T&E) species management, species reintroduction and watershed restoration

Emphasize forest interior species habitat as well as a wide variety of other native plants and animals, particularly late successional species.

Emphasize nature oriented non-motorized recreation opportunities.

Recommend roadless areas for wilderness.

Emphasize high quality timber production outside the sensitive species habitat, movement corridors and large undisturbed areas.

Accept without intervention the effects of native insects and disease.

Use fire to restore natural ecosystem processes.

Redude the road network.

Maintain roadless areas as un-fragmented habitat.

Alternative G would emphasize linking together through land allocations movement corridors and large undisturbed areas, T&E species, species reintroduction, and watershed restoration. National Forest System lands would provide habitat for forest interior species and a wide diversity of native plants and animals, particularly late-successional species. Habitats on private lands would be considered. Backcountry, late-successional wildlife species, and nature-oriented nonmotorized recreation opportunities would be emphasized. Most roadless areas would be recommended

for wilderness. Old growth restoration areas around clusters of existing old growth and mature forests with old growth characteristics would provide natural old growth dynamics across the landscape of the Southern Appalachians. High-quality timber would be produced in long rotations in areas outside forest interior species habitat, movement corridors, and large undisturbed areas and would be accessed from existing roads. Effects of native insects and diseases would be accepted. Emphasis would be on establishing a naturally resilient forest that would avoid large outbreaks of forest pests. Fire would be used to restore natural ecosystem processes. Road network mileage would be reduced through closure and obliteration of roads not needed for ecosystem stewardship or restoration.

Emphasis would be on inventory, monitoring, conservation, and recovery of proposed, threatened, endangered, sensitive (PETS), and locally rare species. Riparian areas would be maintained as old growth for habitat and connectivity. Riparian area protection and restoration would be emphasized through watershed assessments and establishment of riparian corridors and reference watersheds. Naturally evolving and naturally appearing landscapes would be pre-dominant. Recreation would take place within a context set by habitat needs and ecosystem function.

Semi-primitive, wildlife, and nature-oriented recreation opportunities would be emphasized. Developed facilities would occur where they do not detract from ecosystem function and landscape connectivity. Roadless areas would be maintained as un-fragmented wildlife habitat, landscape linkages, old growth restoration areas, wilderness designation or proposed wilderness that would maintain their un-fragmented habitat and ecosystem function. Exotic pests would be controlled by means that least impact ecosystem function and un-fragmented habitat across the landscape. Eligible rivers that have outstanding botanical, ecological, fish, aquatic, or wildlife values would be recommended for inclusion to the WS&R.

This alternative responds to the President's Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

Alternative I (Selected Alternative)

Emphasize ecosystem restoration and maintenance.

Emphasize watershed restoration.

Maintain and restore riparian areas.

Emphasize sustainability of diverse ecosystems.

Promote and maintain a variety of old growth communities.

Prioritize maintenance of forest health.

Provide high quality nature-based recreation opportunities.

Emphasize non-motorized settings with natural appearing landscapes.

Reduce road system.

Alternative I was developed with extensive public input to address the Forest Service's Natural Resource Agenda (Watershed Health, Recreation, Sustainable Forest Ecosystem Management, and Forest Roads) and the Regional Forester's Emphasis Areas (watershed health/water quality, habitat for wide-ranging species, T&E recovery plan, old growth, semi-primitive/remote recreation opportunities, roadless areas, and lands suitable for timber production).

This alternative emphasizes the restoration and maintenance of forest ecosystems to provide high-quality water and diverse, resilient, self-reproducing aquatic populations. Riparian areas would be managed to retain, restore and/or enhance the inherent ecological processes and functions of the associated aquatic, riparian, and upland components within riparian corridors.

Also emphasized would be the sustainability of diverse ecosystems that support viable plant, wildlife and fish populations including habitats for those species needing large contiguous forested landscapes. There would be a variety of old growth communities to meet biological and social needs. Forest health would be a priority to ensure a forest that is resistant to large-scale, catastrophic plant mortality from insects or disease, especially from non-native organisms.

This alternative would provide high quality, nature-based recreation opportunities, emphasizing non-motorized settings with natural appearing landscapes and those that are not widely available on non-Federal lands. Inventoried roadless areas, outstandingly remarkable river values, and high scenic areas, including scenic views at a range of distances, would be protected.

The USDA FS road system would be managed at the minimum level needed to implement this alternative and achieve the management objectives of the alternative.

This alternative responds to the President's Healthy Forests Initiative by allowing for the management of forest vegetation and fuels, thus decreasing fuel-loading problems, the risks to other resources and to adjacent private lands and the potential for severe wildland fires. Prescribed fire will be utilized to reduce fuel-loading and to maintain fire dependant communities.

CHANGES TO ALTERNATIVE I

Alternative I is referred to as the "Rolling Alternative." Alternative I was conceived with the intent to change in response to public comment and management concerns. It was presented at a number of public open houses and briefings with the intent of uncovering additional opportunities to address needs and concerns. Alternative I as presented in the draft EIS has been modified or "rolled" again as a result of public input and management concerns expressed during the draft review period.

The proposed wilderness boundary involving the Big Laurel Branch Addition roadless area was modified in order to provide continued access to an existing powerline right of way. The change involved approximately 700 acres being shifted from proposed wilderness to either the A.T. prescription or remote backcountry prescription.

Adjustments were made to the proposed wild river corridor on the Conasauga River. A section of the river is proposed for “wild” status and section for “scenic.”

Objectives were added to the alternative concerning restoration of spruce-fir forest type restoration (100 acres) and high elevation early successional habitat (1000 acres).

Streamside filter zones replace streamside management zones. SFZs are a band around streams, lakes and other water bodies where significant disturbance is avoided.

The analysis presented in this EIS represents the latest land allocation and forestwide desired condition, goals, objectives and standards for Alternative I.

COMPARISON OF ALTERNATIVES

This section compares the management alternatives from several different perspectives. The acreage allocated to each management prescription for each alternative is shown. The issued identified in Chapter 1 are discussed in detail, and the impact of each alternative on the issue is summarized. Table 2-1 provides a description of the management prescriptions. Table 2-2 shows the CNF acres that would be allocated to each management prescription for each alternative. The acreage of existing designated Wilderness (Prescription 1.A) does not vary between the alternatives contrary to the figures in Table 2-2. Prescription allocations were mapped for each alternative using GIS applications. Acreage discrepancies reflect a margin of error created by the digital representation of conceptually based alternatives. Alternative F represents Wilderness acres prior to the designation of some existing Wildernesses.

Table 2-1. Management prescriptions with respective titles used in mapping each of the alternatives

Rx	Management Prescription Title
0	Custodial Management
1.A.	Designated Wildernesses/Wilderness Study Areas
1.B.	Recommended Wilderness Study Areas
2.B.1	Wild Rivers
2.B.2	Scenic Rivers
2.B.3	Recreational Rivers
4.A	Appalachian Trail Corridor
4.B.2	Proposed Research Natural Areas
4.E.1	Cultural/Heritage Areas
4.F.	Scenic Areas
5.A	Administrative Sites
5.B.	Designated Communication/Electronic Sites
6.A.	Natural Process
6.B	Areas Managed to Restore/Maintain Old-Growth Characteristics
6.C	Old-Growth Areas Managed with a Mix of Natural Processes and Restoration Activities
6.E.	Core Areas of Old-Growth Surrounded by Areas Under Uneven-Aged

Table 2-1. Management prescriptions with respective titles used in mapping each of the alternatives	
Rx	Management Prescription Title
	Management
7.A	Scenic Byway Corridors
7.B	Scenic Corridors and Sensitive Viewsheds
7.C	OHV Use Areas
7.D.	Concentrated Recreation Zones
7.E.1	Dispersed Recreation Areas
7.E.2	Dispersed Recreation Areas with Vegetation Management
8.A.1	Mid- to Late-Successional Forest Habitats
8.A.2	Area-Sensitive, Mid- to Late Successional Forest Habitats
8.B	Mix of Successional Habitats –Early Successional Habitat Emphasis
8.C	Black Bear Habitat Management
8.E.1	Ruffed Grouse Management
9.A.1	Source Water Protection Watersheds
9.A.2	Reference Watersheds
9.A.3	Watershed Restoration Areas
9.A.4	Aquatic Habitat Areas
9.B.1	General High-Elevation Forest Habitats
9.B.2	High-Elevation Balds
9.C	Restoration and Maintenance of Oak Forests: Maintain Existing Oak and Oak-Pine Mixed Stands
9.C.1	Dry and Xeric Oak and Oak-Pine Forests
9.E.	Maintenance and Restoration of Pine and Pine-Oak Forests
9.F.	Rare Communities
9.H	Management, Maintenance, and Restoration of Plant Associations to their Ecological Potential
10.A	Sustained-Yield Timber Management
10.B	High-Quality Forest Products
12.A	Remote Backcountry Recreation—Few Open Roads
12.B	Remote Backcountry Recreation--Nonmotorized

Table 2-2. Comparison of Alternatives by Prescriptions							
	Units: Acres						
Prescription	Alt-A	Alt-B	Alt-D	Alt-E	Alt-F	Alt-G	Alt-I
1.A	67,750	67,837	67,755	68,109	34,928	68,262	66,661
1.B	27,972	1,290		49,881	33,743	73,667	20,265
2.A.3					32,416		
2.B.1		1,253	1,253	1,253		1,253	1,110
2.B.2	1,253		51				757
2.B.3							2,579
4.A	35,574	38,137	36,458	33,425	24,078	30,747	36,076
4.B.2	608	566	575	397		397	
4.D					1,629		

Table 2-2. Comparison of Alternatives by Prescriptions							
	Units: Acres						
Prescription	Alt-A	Alt-B	Alt-D	Alt-E	Alt-F	Alt-G	Alt-I
4.E.1				290	467		1,085
4.F	11,127	17,257	9,341	17,662	11,984	17,579	20,946
4.I	4,843			4,799		4,892	
4.K	4,331	4,468	4,468	4,468		4,468	4,601
5.A	1,427	1,427	1,427	1,427		1,427	1,524
5.B	377	377	377	377		377	604
6.A	10,991	50,367	*	15,798	*	19,015	*
6.B	*	*	*	6,518	*	6,518	*
6.C	2,094	*	*	*	*	*	*
6.E	7,891	*	*	6,097	*	6,097	*
7.A	37,080	6,652	35,424	40,932		58,458	17,536
7.B		1,896	11,045	14,209		223	41,441
7.C	3,472			3,472			11,139
7.D	2,019	2,652	2,019	5,515	3,256	1,845	2,043
7.E.1				184,299		11,692	
7.E.2	84,721		20,850	484		484	97,021
8.A.1					28,6284	68,091	28,999
8.A.2	19,309		9,212				
8.B		18,010					56,517
8.C	56,135	43,776	117,073	48,367		51,400	94,948
8.E.1	2,615	2,608		3,029	79,950		
9.A.1	23,858	23,858					
9.A.2	18,118	18,081					
9.A.3	86,755	154,577		34,457			
9.A.4	23,517	23,545	7,967			8,184	
9.B.1		1,114	286				
9.B.2		1,403	1,323		1,074	48	
9.C		484					
9.C.1						58,281	
9.C.2		6,189					
9.E		16,697					
9.F	9,843	9,856	9,848	9,840		6,995	6,591
9.H	26,063	125,378					72,669
10.A	45,534		273,200		98,488		
10.B			29,779				
12.A	7,841			45,525		116,859	15,714
12.B	16,656			39,166	31,545	22,486	38,652
Total	639,774	639,755	639,731	639,796	639,847	639,745	639,958
* No allocation to old-growth management prescriptions							

Comparison Of Alternatives By Issue

This section compares how the alternatives address the issues identified in Chapter 1.

Issue 1 - Terrestrial Plants and Animals and Their Associated Habitats

In addressing this issue, management activities would strive to accomplish:

Maintain or increase habitats for those species needing large, contiguous forested landscapes, and where the management of NFS lands can make a difference in their populations and viability.

Provide habitat conditions necessary to maintain viable populations of all species native to the planning area, and to support desirable levels of selected species (e.g., species with special habitat needs, locally rare species, species commonly trapped/hunted, or species of special interest).

Table 2-3 shows the comparison of Issue 1 by alternative. This table shows/describes projected successional stages for selected levels of all acres for Mesic Deciduous communities, high elevations, and acres with early successional habitat objectives, greater than four percent.This table shows that Alternatives D and F would provide most early successional habitat for both short and long-term implementation, including high-elevation early successional habitat; as well as highest proportion of mesic deciduous forest allocated to young age classes. Alternatives E and G would provide most mid- and late-successional habitat for both short-term and long-term. Alternatives E and G would provide most forest interior habitat with low early successional habitat objectives; Alternatives D and F would provide least. Alternatives B and F would provide highest acreage allowing new wildlife opening development; Alternatives D and G would be most restrictive on opening development. No clear trends for MIS populations are apparent across alternatives.

Table 2-3. Issue 1 - Terrestrial Plants and Animals and Their Associated Habitats

Alternative/Units of Comparison	A	B	D	E	F	G	I
Successional Forest Habitats	Percent of Forested Acres						
Early Successional Habitat – 1st Decade	3	3	5	<1	5	1	3
Early Successional Habitat – 5th Decade	4	4	6	<1	8	2	5
Mid-, Late-, Old-Successional Habitat –1st Decade	83	83	81	86	81	84	83
Mid-, Late-, Old-Successional Habitat –5th Decade	85	84	76	97	73	91	83
Late- to Old Successional Habitat – 1st Decade	46	46	43	48	44	47	46
Late- to Old Successional Hbitat –	70	69	57	82	54	77	67

Table 2-3. Issue 1 - Terrestrial Plants and Animals and Their Associated Habitats							
Alternative/Units of Comparison	A	B	D	E	F	G	I
5th Decade							
	Acres						
Acres Maintained in high-elevation early-successional habitat	4,870	5,905	12,575	1,412	12,516	1,977	5,682
Mid-, Late-, and Old-Successional Mesic Deciduous* Forests in a Landscape with great than 70% cover and with Early Sucessoinal Habitat Objectives of 4-10%	139,881	173,478	92,825	218,169	75,891	186,681	121,841
	Percent of Forested Acres						
Proportion of Mid-, Late- and Old Mesic Deciduous* Forests Allocated to Mgt. Prescriptions with an Early-Sucessional Habitat Objective of greater than 4%	28	29	63	10	68	23	50
Permanent Openings, Old Fields and Balds	Percent of Total Acres						
Acres in Mgt. Pres. Allowing New Permanent Openings	60	70	32	53	62	41	56
MIS – Community Indicators	Trends**						
Pine warbler 1st Decade	=	=	++	=	++	=	+
Pine warbler 5th Decade	=	=	++	=	++	=	++
Acadian flycatcher 1st Decade	+	+	+	+	+	+	+
Acadian flycatcher 5th Decade	++	++	++	++	+	++	++
Scarlet tanager 1st Decade	=	=	=	=	=	=	=
Scarlet tanager 5th Decade	+	+	-	+	-	+	+
Hooded warbler 1st Decade	+	+	-	+	-	+	-
Hooded warbler 5th Decade	++	++	--	++	--	++	-
Pileated woodpecker 1st Decade	+	+	-	+	-	+	+
Pileated woodpecker 5th Decade	+	+	-	++	-	++	+
Praire warbler 1st Decade	=	=	+	-	+	-	=
Praire warbler 5th Decade	=	=	+	-	++	-	=

Table 2-3. Issue 1 - Terrestrial Plants and Animals and Their Associated Habitats							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Chestnut-sided warbler 1st Decade	=	=	+	-	+	-	=
Chestnut-sided warbler 5th Decade	=	=	++	-	++	-	=
*Includes CISC Forest Types 13, 41, 46, 50, 51, 53-56, 58, 61-65, 68, 69, 72, 75 **Population trend expressed as expected change from current levels: "++" relatively large increase; "+" increase; "=" little to no change; "-" decrease; "—"relatively large decrease							

Issue 2 - Threatened, Endangered, and Sensitive/Locally Rare Species

In addressing this issue, management activities would strive to accomplish:

Conserve and recover threatened, endangered, and sensitive species and their habitats.

Table 2-4 shows the comparison of Issue 2 by alternative. This table shows that Alternatives D and F would result in highest number of species/ habitat relationships at risk, and Alternatives B and A would result in lowest number of species/ habitat relationships at risk. Numbers do not reflect the ability to mitigate these effects through management. The number of species relative to the number of watersheds for aquatic species does not vary by alternative. For a thorough comparison see the Terrestrial Viability Section an Aquatic Viability Section in Chapter 3.

Table 2-4. Issue 2 – Threatened, Endangered, and Sensitive/Locally Rare Species							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Total Terrestrial Species Status Categories	Number of Species/Habitat Relationships						
Species/Habitat Relationships Rated as Very High Risk	156	139	175	158	231	158	139
Species/Habitat Relationships Rated as High Risk	172	179	225	173	166	173	210
Species/Habitat Relationships Rated as Moderately High Risk	221	223	205	219	209	219	219
Total	549	541	605	550	606	550	568

Issue 3 - Old Growth

In addressing this issue, management activities would strive to accomplish:

A variety of large, medium, and small old growth patches will be managed (through restoration, protection, or maintenance activities) to meet biological and social needs. These patches could include stands of either "existing old growth" or "future old growth".

For biological needs there are no known species or species groups identified as being obligate to old-growth forest communities. However, old-growth forest communities may serve as optimal habitat for some species associates. Much is still not known about species associated with old growth. To provide for these unknowns, the argument to provide

representative old-growth forest communities in order to maintain all components of the system has merit. The approach of providing a representation of different old-growth forest communities will help to address overall biological diversity goals and to provide a biological safety net.

For social needs old-growth provides for recreation opportunities, research and science, education, and cultural and spiritual values.

Table 2-5 shows the comparison of Issue 3 by alternative. This table shows/describes acres of allocated old growth and future old growth by alternative. Future old growth includes all lands in old growth compatible management prescriptions, riparian area and unsuitable lands within suitable management prescriptions. Some of the lands included in the future old growth category will need to be examined to determine if they are appropriate for management as old growth. The amount of existing old growth on the CNF is not known at this time, but is anticipated to be low.

Table 2-5. Issue 3 – Old Growth

Alternative/Units of Comparison	A	B	D	E	F	G	I
Old Growth	Acres in Thousands						
Acres of Existing Old Growth Protected	0	0	0	0	N/A	0	0
Acres of Allocated Old Growth (Rx 6's)	21	50	0	28	N/A	32	0
Total Acres Future Old Growth	385	373	320	528	N/A	467	359

Issue 4 - Riparian Area Management, Water Quality, and Aquatic Habitats

In addressing this issue, management activities would strive to accomplish:

Watersheds are managed (and where necessary restored) to provide resilient and stable conditions to ensure the quality and quantity of water necessary to protect ecological functions and support intended beneficial water uses.

Riparian ecosystems, wetlands and aquatic systems are managed (and where necessary restored) to protect and maintain their soil, water, vegetation, fish and wildlife associated resources.

Table 2-6 shows the comparison of Issue 4 by alternative. This table shows the average percent increase in sediment over the existing condition that would result from Forest Service management activities for each alternative in period 1. Alternative D would result in the largest percent increase (0.63%) while Alternative G would result in the smallest (0.30%). The table also indicates the number of forest acres allocated to watershed restoration prescriptions (9.A's) by alternative.

Table 2-6. Issue 4 – Riparian Area Management, Water Quality, and Aquatic Habitats							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Soil and Water	Percent Increase						
Average Percent Increase in Sediment Yields from FS Activities over Existing Levels for Period 1 (Across 24 Watersheds)	0.5	0.44	0.63	0.2	0.4	0.3	0.48
Acres in Watershed Restoration Prescriptons	Acres in Thousands						
Acres Allocated to Mgt. Pres. 9.A's	152	220	8.0	34.5	0	8.2	0

Issue 5 – Wood Products

In addressing this issue, management activities would strive to accomplish:

Where forest management activities are needed and appropriate to achieve the desired composition, structure, and function of forest ecosystems; a result of such activities will also be to provide a sustainable supply of wood products for local needs.

Provide supplies of those wood products where the Forest Service is in a unique position to make an impact on meeting the demand for those products.

Table 2-7 shows the comparison of Issue 5 by alternative. This table shows acres suitable for timber production, Allowable Sale Quantity (ASQ), and projected sale quantities for first and fifth decades.

Table 2-7. Issue 5 – Wood Products							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Timber Management	Acres						
Land Classified as Suitable for Timber Production	395,527	400,125	496,583	157,565	464,722	249,522	420,047*
	MCF / MMBF						
Allowable Sale Quantity (First Decade)	36,113	38,969	67,767	8,143	71,096	19,500	39,968
Timber Sale Program Quantity (Total First Decade	36,113/ 199	38,969/ 214	67,767/ 384	8,143/ 45	71,096/ 391	19,500/ 107	39,968/ 220
Timber Sale Program Quantity (Total Fifth Decade)	64,383/ 354	66,225/ 364	111,341/ 612	14,583/ 80	127,028/ 699	37,757/ 208	81,491/ 448
*suitable with early successional objectives is 278,849 acres							

Issue 6 - Aesthetics/Scenery Management

In addressing this issue, management activities would strive to accomplish:

Protect and enhance the scenic and aesthetic values of the NFS lands in the Southern Appalachians.

The national forests will be managed to provide a variety of Landscape Character Themes with the predominant themes being Natural Appearing, Natural Evolving, and variations of these themes.

Table 2-8 shows the comparison of Issue 6 by alternative. This table shows the range of Scenic Integrity Objectives (SIOs) and compares percentages across alternatives. SIOs are assigned by Management Prescription and define the different levels of acceptable alteration to the forest's scenery. In contrast to Alternative F, all other alternatives would potentially increase the number of acres assigned with SIO's of Very High, High, and Moderate. Scenic and aesthetic values are given the most protection and enhancement potential in Alternative G, with an emphasis on Wilderness, Wilderness study areas, remote backcountry recreation and old growth. Negative impacts to scenery from road construction vegetation management, insect and disease control, special use utility rights-of-way (ROW) and other activities would be the greatest in Alternative F. Alternative F also includes an SIO of Very Low on 36 percent of the total forest acreage.

Existing designated Wilderness is classified with an SIO of Very High and is considered naturally evolving. This acreage remains the same across all alternatives. The majority of forest acres are considered natural appearing; however, with a greater amount of acreage allocated to Wilderness study areas in Alternatives G, E, A, and I there could be a shift from natural appearing to natural evolving on approximately 14 percent to 23 percent of the forest.

Table 2-8. Issue 6 – Aesthetics/Scenery Management

Alternative/Units of Comparison	A	B	D	E	F	G	I
Scenic Integrity Objectives	Percent of Total Forest Acres						
Very High	23	23	13	30	11	32	24
High	25	21	27	27	14	37	23
Moderate	41	39	31	40	13	17	34
Low	9	16	28	< 1	26	13	19
Very Low					36		

Note: In each alternative, approximately 1 to 3% of the total forest acres currently has no assigned SIO; these lands include uninventoried land acquisitions: recent A.T. acquisitions, tract on Starr Mountain, etc.

Issue 7 - Recreation Opportunities/Experiences

In addressing this issue, management activities would strive to accomplish:

Provide a spectrum of high quality, nature-based recreation settings and opportunities which are not widely available on non-Federal lands.

Strive to meet the following recreation needs within the capabilities of the land:

Hiking, biking, and equestrian trail systems, especially in non-motorized settings with high quality landscapes. (Provide separate-use trails where necessary to reduce user conflicts or to improve the quality of recreation experiences.)

Designated OHV routes (which will occur primarily in RN1 settings).

The high priority improvements, expansions, or additions of facilities providing developed recreation opportunities.

Hunting, fishing, and non-consumptive wildlife opportunities.

Improved interpretive opportunities or other special recreation needs locally identified.

The national forests will manage areas to provide for the "backcountry" (semi-primitive/remote) recreation experiences that are not available on other land ownerships.

Although the opportunities for outdoor recreation are extensive and the public demand for these opportunities is seemingly endless, the CNF capability to meet these demands is neither static nor endless. Visitor preferences can shift over time, and both changing financial limitations and environmental impacts must be considered. In order to maximize value to the public with the limited resources available, the CNF will focus on providing those recreation opportunities which are unique or of exceptional long-term value in a manner that focuses on maximizing visitor satisfaction within financial and environmental limitations.

A goal is to provide a spectrum of high quality nature-based recreation settings and opportunities that reflect the unique or exceptional resources of the CNF and the interests of the recreating public on an environmentally sound and financially sustainable basis. Adapt management of recreation facilities and opportunities as needed to shift limited resources to those opportunities.

Table 2-9 shows the comparison of Issue 7 by alternative. This table shows the alternative distributions of the Recreation Opportunity Spectrum (ROS) across the CNF. Total acreage of prescription areas that emphasize recreation is also compared as well as estimated changes in the supply of developed recreation, motorized and non-motorized trails. Trends in animal species are relative to big and small game hunting opportunities.

Table 2-9. Issue 7 – Recreation Opportunities/Experiences

Issue/Units of Comparison	A	B	D	E	F	G	I
Recreation Opportunity Spectrum	Acres in Thousands						
Primitive (Rx's 1.A, 1.B, & 2.A.1)	95	68	67	117	67	140	87
Semi-Primitive Non-Motorized	68	93	75	73	75	53	70
Roaded Natural 2	189	198	190	195	167	237	195
Roaded Natural 1	288	281	308	255	230	210	288
Rural/Urban	<1	<1	<1	<1	<1	<1	<1
Recreation Management Allocations	Acres in Thousands						
Acres with a Recreation Emphasis (Rx 7's)	127	113	69	249	4	73	169
Acres with a Backcountry Recreation Emphasis (Rx 12"s)	25	0	0	85	31	140	54
Developed/Dispersed Recreation	Percent Increase (Range)						
Estimated Increase in Capacity	6-25	0-5	0-5	6-25	0-5	0-5	6-25

Table 2-9. Issue 7 – Recreation Opportunities/Experiences							
Issue/Units of Comparison	A	B	D	E	F	G	I
of Developed Recreation Areas							
Estimated Increase in Non-Motorized Trails	6-25	0-5	0-5	>26	0-5	6-25	6-25
Off-Highway Vehicle Roads and Trails	Acres in Thousands						
Acres of Off-Highway Vehicle Use Areas (Rx 7.C)	3	0	0	3	<1	0	11
	Percent Increase (Range)						
Estimated Change in Motorized Roads and Trails	11-50	Decrease	11-50	11-50	0-10	decrease	11-50

Alternative G secures the greatest combined acreage of Primitive (P) and Semi-Primitive Non-Motorized (SPNM) recreation settings on the forest. To some extent, all alternatives convert a portion of the existing supply of Roaded Natural (RN1) to more primitive or remote ROS settings. Alternatives E, A and I provide the most similar distributions of ROS classes across the forest, but there are thematic differences between these alternatives. Alternative A is primarily focused on recreation development linked to commercial opportunities, so facility improvements would accommodate popular activities that generate money for local economics. Alternatives E and I would maintain and provide facilities and settings that accommodate a broader range of developed and dispersed recreation activities. Alternatives B and D would place the least emphasis on recreation in comparison to the other alternatives.

Issue 8 - Roadless Areas and Wilderness Management

In addressing this issue, management activities would strive to accomplish:

> Wilderness, roadless and other unroaded areas are managed to provide their full range of social and ecological benefits.

Table 2-10 and Table 2-11 show the comparison of Issue 8 by alternative. These tables show how inventoried Roadless Area acreage is allocated by management prescriptions to Wilderness study areas or other prescriptions in which Roadless character is maintained. The acreage of existing Congressionally-designated Wilderness remains the same across all the alternatives. Inventoried Roadless Areas currently total approximately 85,195 acres in CNF. (This figure does not include an additional 2,366 contiguous acres in four Roadless Areas crossing boundaries into Jefferson and Pisgah National Forests, nor does it include acreage in the Pisgah NF portion of Bald Mountain Roadless Area that will be evaluated in a separate planning period.) The acres of inventoried Roadless Areas recommended for Wilderness Study are shown by alternative in Table 2-11 and are described by name across alternatives. A separate acreage figure that represents inventoried Roadless Areas assigned by alternative to management prescriptions where Roadless character is maintained (other than in Rx 1.B) is shown also in Table 2-10. The acreage total for Alternative F is the total of Management Area 14 acreage deferred from timber harvest and road construction, based on Amendment 6 of the 1986 LMP. Combining both WSA recommendations and other areas in which the Roadless character is

maintained, the total acreage is greatest in Alternative G, I, and E, and lowest in Alternative D.

Table 2-10. Issue 8 – Roadless Areas and Wilderness Management							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Wilderness/Roadless	Acres in Thousands						
Acres of Existing Wilderness	66.4	66.4	66.4	66.4	66.4	66.4	66.4
Recommended for Designation as WSAs	27.7	1.4	0	49.2	0	73.1	19.4
Roadless Character Maintained	30.7	45.8	13.6	30.2	46.6	11.7	62.7*
* With Roadbuilding direction included in Rx 4.F for Management Areas 8, 12, 15.							

Table 2-11 - Issue 8 – Roadless Areas Recommended for WSAs	
Alt	Roadless Areas Recommended for Designation as Wilderness Study Areas
A	Big Laurel Branch Addition, Joyce Kilmer-Slickrock Addition, and portions of Bald Mountain, Bald River Gorge Addition, Big Frog Addition, Little Frog Addition NE, Sampson Mountain Addition, Upper Bald River
B	Joyce Kilmer-Slickrock Addition
D	No areas recommended for WSAs
E	Bald Mountain, Bald River Gorge Addition, Big Frog Addition, Big Laurel Branch Addition, Devil's Backbone, Joyce Kilmer-Slickrock Addition, Little Frog Addition NE, Little Frog Addition NW, Sampson Mountain Addition, Slide Hollow, Upper Bald River, and a portion of Flint Mill Gap
F	No areas recommended for WSAs
G	Bald River Gorge Addition, Beaverdam Creek, Big Frog Addition, Big Laurel Branch Addition, Brushy Ridge, Devil's Backbone, Joyce Kilmer-Slickrock Addition, Little Frog Addition NE, Little Frog Addition NW, London Bridge Branch, Sampson Mountain Addition, Slide Hollow, Stone Mountain, Sycamore Creek, Upper Bald River, and portions of Bald Mountain, Flint Mill Gap, and Rogers Ridge
I	Big Frog Addition, Joyce Kilmer-Slickrock Addition, Little Frog Addition NE, Little Frog Addition NW, Sampson Mountain Addition, Upper Bald River and a portion of Big Laurel Branch Addition

Issue 9 - Forest Health

In addressing this issue, management activities would strive to accomplish:

Forest ecosystems are managed, either through restoration or maintenance, to provide the desired composition (species mix), structure (age class distribution), function (resulting benefits), and productivity over time.

Management activities will reduce the impacts from exotic or non-native invasive species.

Table 2-12 shows the comparison of Issue 9 by alternative. This table shows of the management prescription on risk of damage by the associated forest health community.

Table 2-12. Issue 9 – Forest Health							
Issue/Units of Comparison	A	B	D	E	F	G	I
Forest Health Concerns	Ranking						
Gypsy Moth	stable	stable	reduced	increased	reduced	increased	stable
Southern Pine Beetle	stable	stable	reduced	increased	reduced	increased	stable
Oak Decline	stable	stable	reduced	increased	reduced	increased	stable
Beech Bark Disease	none	none	none	none	none	none	none
Littleleaf Disease	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-native Invasive Plants	Moderate increase	Moderate increase	High increase	Low increase	High increase	Low increase	Moderate increase
Storm Damage	none	none	none	none	none	none	none
Dogwood Anthracnose	Moderate reduction	Moderate reduction	reduced	Low reduction	reduced	Low reduction	Moderate reduction
Prescribed Fire	Acres						
Estimated Acres Prescribed Burned (Total)	16,000	16,000	16,000	10,000	16,000	16,000	20,000
Restoration	Acres						
Acres with a Restoration Emphasis (Rx's 9.C, 9.D, 9.E, 9.G, 9.H)	17,377	114,935	0	0	0	46,093	56,737

Issue 10 - Special Areas and Rare Communities

In addressing this issue, management activities would strive to accomplish:

Protect or restore the rare communities found on NFS lands.

Those areas with special geological, paleontological, botanical, zoological, cultural, or heritage characteristics will be managed (or where feasible restored) to protect those characteristics.

Table 2-13 shows the comparison of Issue 10 by alternative. This table shows rare communities will be protected across all alternatives expect for Alternative F. The potential acres treated vary based upon how permissive the prescription allocations are to those activities under each alternative. For Special Areas, this table shows the number of acres allocated to management prescriptions specific to the A.T., cultural and heritage areas, designated scenic areas, and Roan Mountain. The acreage total

for Alternative F was based on acreage form 1986 Forest Plan for Management Area 4 (national trails), Management Area 9 (Roan Mountain), Management Area 10 (balds), and Management Area 11 (cultural areas), as well as current scenic area acreage. The number of acres where these Special Areas are managed to protect their unique characteristics is greatest in Alternatives I, E, B, and G, and lowest in Alternatives D and F. Botanical and zoological areas are addressed as Rare Communities.

Table 2-13. Issue 10 – Special Areas and Rare Communities							
Issue/Units of Comparison	A	B	D	E	F	G	I
Special Areas	Acres in Thousands						
Acres Allocated to Special Areas (RX 4's)	57	61	51	61	48	59	62
Rare Communities							
Rare Communities Managed According to the Rare Community Mgt. Pres. (9.F)	Yes	Yes	Yes	Yes	No	Yes	Yes
	Potential Acres Treated per Year						
Xeric pine and oak forest restored per year to open woodlands, savannahs, grasslands	485	485	600	520	600	485	570
Average annual acres of table mountain pine forest to be restored	40	45	50	40	55	45	50

Issue 11 - Wild and Scenic Rivers

In addressing this issue, management activities would strive to accomplish:

> Wild, Scenic and Recreation Rivers which are designated by Congress, recommended for designation, or are eligible for designation, will be managed to protect their outstandingly remarkable values.

Table 2-14 show the comparison of Issue 11 by alternative. This table shows the miles of rivers currently eligible for Wild and Scenic designation and the protection of their outstandingly remarkable values across alternatives.

Table 2-14. Issue 11 – Wild and Scenic Rivers							
Alternatives/Units of Comparison	A	B	D	E	F	G	I
Wild and Scenic Rivers	Miles						
Miles of Rivers Currently Designated	0	0	0	0	0	0	0
Miles of Rivers Eligible	40.6	40.6	40.6	40.6	40.6	40.6	40.6
Miles of Rivers Managed to Protect their Outstanding Remarkable Values (ORVs)	40.6	40.6	40.6	40.6	40.6	40.6	40.6
Miles of Rivers Recommended for W&SR Designation	1.3	1.3	1.3	1.3	1.3	1.3	1.3

In Table 2-14, the miles of rivers eligible for Wild and Scenic designation only represent river miles located on the CNF. Under all alternatives, management emphasis for the eligible rivers and their corridors is focused on protection and enhancement of the values for which they were established, without limiting other uses that do not substantially interfere with public use and enjoyment of those values. The free flowing condition and outstandingly remarkable values (ORV's)

determined for the eligible rivers would be protected under all alternatives regardless of recommendations from future suitability studies. Miles of rivers recommended for Wild and Scenic designation include 1.3 river miles of the Nolichucky River, which was recommended to Congress in 1991.

Issue 12 - Access and Road (Travelway) Management

In addressing this issue, management activities would strive to accomplish:

Provide a transportation system that supplies and improves access for all forest road users within the capabilities of the land.

Accelerate the pace of decommissioning unneeded roads (classified and unclassified).

Provide better quality access by upgrading highly used forest roads; and any roads that are needed but are adversely affecting surrounding resource values and conditions.

Table 2-15 shows the comparison of Issue 12 by alternative. This table compares acres of land allocated to the four FWRBE road options.

Table 2-15. Issue 12 – Access and Road Management							
Alternative/Units of Comparison	A	B	D	E	F	G	I
Transportation System	Acres in Thousands						
Construction and Reconstruction Prohibited	113	70	69	158	100	165	127
Density of Open Roads and Motorized Trails Should Decrease Over Time	181	174	149	136	0	219	122
Density of Open Roads and Motorized Trails Should Remain Near Existing Levels	337	390	420	334	444	254	378
Density of Open Roads and Motorized Trails May Increase Over Time	8	5	2	12	82	2	13

Chapter 3: Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and ecnomic environments of the project area and the effects of implementing each alternative on that environment. This chapter presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2, Alternative Development.

Physical Elements

The physical environment is the non-living portion of the environment upon which the living organisms depend—air, soil, water, geology, and climate. This section begins with a description of the ecological classification of the CNF. Ecological classification is a system which classifies land and water at various scales through integrating information about climate, geology, landform, soils, water, and vegetation. This classification is a tool to provide a more ecological and scientific basis in land and resource management planning.

Ecological classification is useful for:

Evaluating the inherent capability of land and water resources.

Predicting changes occurring over time.

Evaluating effects of management.

Allocating land to management areas.

Selecting appropriate management indicators.

Discussing and analyzing ecosystems and biodiversity at multiple scales.

DESCRIPTION OF ECOLOGICAL UNITS

The National Hierarchical Framework of Ecological Units is a classification and mapping system for dividing the Earth into progressively smaller areas of increasingly similar ecology. Ecological units are mapped based on patterns of climate, soils, air quality, hydrology, geology, landform and topography, potential natural communities and natural disturbances.

These various components take on greater or lesser importance as the mapping scale changes. Conditions dominant at broad scales such as climate and geology are continually related to conditions more important at finer scales such as biologic communities and soil characteristics. Refer to the CNF web site

(www.southernregion.fs.fed.us/cherokee) for more information on Land Type Associations (LTA's) that are located on the forest.

The CNF generally lies within the Hot Continental Division of the Humid Temperate domain. Within this division, all but westernmost fringe of the south end of the CNF is in the Central Blue Ridge Mountain Section of the Central Appalachian Broadleaf Forest - Coniferous Forest – Meadow Province. The westernmost fringe of the south end of the CNF is located in the Sandstone hills Subsection of the Central Ridge and Valley Section, Eastern Broadleaf Forest Province.

The south end of the CNF includes the Ocoee/Hiwasse and Tellico Ranger Districts and is underlain by metamorphic rocks and by highly deformed sedimentary rocks. These rock units range in age from Pre-Cambrian to Cambrian. Rocks on the CNF have been greatly altered by periods of metamorphism and tectonism.

Deposits of metamorphosed slate, graywacke shale, sandstone and conglomerate make up the Ocoee series of Pre-Cambrian age. These Pre-Cambrian meta-sedimentary rocks form most of the Great Smoky Mountains and large parts on the south end of the CNF. Rocks of the Ocoee series have been complexly folded and faulted internally and have been metamorphosed to varying degrees by heat and pressure. The Ocoee series is extensive on the south end, where it can be divided into the Walden Creek Group and Great Smoky Group. A intervening belt of ranges form a transitional zone between the Blue Ridge and the Valley and Ridge provinces. It is a belt in which the linear structural pattern of the Valley and Ridge is predominant, but it is underlain by formations that are more characteristic of the Blue Ridge. The formations are part of the Conasauga and Chilhowee Groups. Rock Units consists of conglomerate, arkoses, shale, siltstone and quartzite.

On the north end of the CNF, most of the Nolichucky/Unaka Ranger District falls in the Central Blue Ridge Mountains Subsection. However, a portion of district and most of the Watauga Ranger District falls within the Southern Blue Ridge Mountain Subsection of Blue Ridge Mountain Section of the Central Appalachian Broadleaf Forest - Coniferous Forest-Blue Ridge Mountain Section.

Northern Ridge and Valley Section (Ridge and Valley Subsections)

The Ridge and Valley sections are in the Watauga Ranger District and are characterized by long belts of parallel mountains and valleys, the landforms being closely related to the lithology and structure of the bedrock.

The ridges consist of shale, siltstone and sandstone with the occasional rock outcroppings. The lower flanks and valleys are composed of deposits of limestone, dolomitic limestone and shale. Plunging folds, anticlines and synclines unite otherwise parallel ridges. Agriculture and urban areas dominate the valleys, while forestry is the primary use on the oak-hickory covered ridges. These Appalachian oak-hickory and oak-pine forests were strongly influenced by fire prior to the 18th century.

Blue Ridge Mountains Section (Northern and Southern Blue Ridge Subsections)

The Blue Ridge Mountains Section is the oldest on the CNF. These tectonic uplifted mountain ranges are composed of Proterozoic-Paleozoic igneous and metamorphic rock, forming many high gradient, deeply incised streams. These crystalline rocks are part of the Eastern overthrust belt which overlays the sedimentary rocks of the Valley and Ridge Sections. Extensive areas of metamorphosed sedimentary rocks occur on the western flank. Deeply weathered bedrock, called saprolite, occurs in some areas of the Blue Ridge. Mesic oak forests predominate, but large pockets of northern hardwoods and spruce-fir can also be found at the highest elevations. Ice, wind and fire are major natural disturbances throughout this section.

1.0 SOILS

1.1 Affected Environment

Soil is a non- living system that represents a finite resource. It develops slowly from various parent materials and is modified by time, climate, macro- and micro-organisms, vegetation and topography. Soils are complex mixtures of minerals, organic compounds and living organisms. The distinct surface geology and topography of each Ecological Section are important factors in the formation of soils on the forest.

The distinct surface geology and surface topography of each section are important in the soil formation process on the forest. The majority of the forest lies in the Blue Ridge Mountains Province and the remainder either in the Central Ridge and Valley Subsection on the Northern Ridge and Subsection on the westernmost edge of the forest.

Soils in the planning area developed under a temperature range of 4^{o}F to 74^{o}F, a rainfall range from 48 inches to 54 inches and a variety of forest vegetation. There a few areas at very high elevations that exceeds 70 inch rainfall. They formed in sandstone, phyllite, and shale parent materials that dominate the mountainous relief. Minor soil areas developed from other kinds of rocks, including limestone, granite, quartzite, gneiss, conglomerate, schist, and slate.

Due to the great difference in slope, the kind of parent material, and the length of time the material has been in place, there are some differences among the soils. In general, soils are moderately acid to strongly acid, although some drains are slightly acid to medium acid. To large extent the soils of the forest are low in fertility and organic matter. However, a fairly large acreage of soils that is over high grade limestone are in coves has a relatively high and moderate to high organic matter.

The majority of the forest is located within this section. They consists mainly of rugged mountainous terrain with narrow valleys and ridge tops, some narrow flood plains and steep side slopes. The soils are developed from sandstone, phyllite, shale, limestone, granite, quartzite, gneiss, conglomerate, schist and slate. They are dry to droughty and range in texture from to clay. These soils generally have moderate fertility for brose, mass and forage production; and moderate to low productivity for pine production; and low productivity for hardwood production. The primary

conditions that effect most management activities are soil erosion potential and steepness of slope.

Meta-sedimentary subsection

The majority of the Ocoee/Hiwassee and Tellico Ranger Districts are located within this section. The area is characterized by parallel low gently sloping valleys are generally dry and range in texture from loam to clay. This area similar to the Blue Ridge Province in productivity and soil erosion on steep slopes is still the main management concern. The remainder of the Districts are located in the Central Ridge and Valley Section.

The majority Nolichucky/Unaka Ranger Districts are located with this section. The Watauga District is located partly in the Southern Blue Ridge and Northern Ridge and Valley Section.

The slope range of soils on the forest is nearly level to very steep and the degree of erosion ranges from none to slightly eroded. The land varies in productivity from exceptionally good in the coves to very poor on the shallow rocky soils of the steep, south facing slopes.

GEOLOGY

The geologic setting is the foundation for a variety of ecologic elements. Geologic materials and geologic processes control or influence a host of ecological factors, such as slope aspect; slope steepness; the areal extent of landforms and associated vegetation; the distribution and composition of soil parent material; the structure and composition of vegetation; the physical character of wetlands, riparian area and stream substrates; the quantity and quality of stream water and ground water; and the natural disturbance regime.

Surface geologic processes are an important part of the natural disturbance regime in the CNF. These processes include: the erosion, transport and deposition of sediment; mass wasting or landsliding; flooding; changes in stream channels; groundwater flow; the formation of caves, sinkholes and other karst features. These processes have been part of the natural disturbance regime in the mountains for the past several hundred thousand years and affect the CNF in varying degrees every year.

The interaction of the surface geologic processes with the different geologic formations and geologic structures produced different landforms. The forest, within the Appalachian Highlands physiographic region, is subdivided into physiographic or geomorphic provinces based on landform, rock types and geologic structure.

Ridge and Valley Geomorphic Province

The Ridge and Valley Geomorphic Province, which is a long belt of parallel mountain ridges and valleys. The forest's ridges and valleys are long, linear landforms, trending in a northeast direction across westernmost Virginia.

Geologic forces squeezed the originally flat-lying sedimentary layers and folded them into a series of arches (anticlines) and troughs (synclines). Erosion of these folds over

millions of years has produced a distinctive repeating landscape of ridges and valleys. Most of the CNF in this Province is located on strike ridges.

A strike ridge is a linear, asymmetric ridge formed by the differential erosion of inclined Bed rock layers. One flank of the strike ridge is a steep slope cutting across several Bed rock layers (antidip or scarp slope). In contrast, the other side of the ridge is a less steep slope conforming to the slope of the underlying bedrock layer (dip slope).

Resistant sandstone or conglomerate forms the top of strike ridges and much of the dip. Slopes In contrast, the lower flanks of the ridges are underlain by shale, and in some places, carbonate bedrock (limestone and dolomite). The valleys are also underlain by shale and carbonate bedrock. In some limestone areas, caves, sinkholes, and other karst features have developed.

Blue Ridge Mountains Geomorphic Province

The southern portion of the CNF is underlain by metamorphic rocks and by highly deformed sedimentary rocks. These rock units range in age from Pre-Cambrian to Cambrian. Rocks on the CNF have been greatly altered by periods of metamorphism and tectonism.

Deposits of metamorphosed slate, graywacke shale, sandstone and conglomerate make up the Ocoee series of Pre-Cambrian age. These Pre-Cambrian meta-sedimentary rocks form most of the Great Smoky Mountains and large parts on the south end of the CNF. Rocks of the Ocoee series have been complexly folded and faulted internally and have been metamorphosed to varying degrees by heat and pressure. The Ocoee series is extensive on the south end, where it can be divided into the Walden Creek Group and Great Smoky Group. An intervening belt of ranges from a transitional zone between the Blue Ridge and the Valley and Ridge provinces. It is a belt in which the linear structural pattern of the Valley and Ridge is predominant, but it is underlain by formations that are more characteristic of the Blue Ridge. The formations are part of the Conasauga and Chilhowee Groups. Rock Units consists of conglomerate, arkoses, shale, siltstone and quartzite.

The eastern portion of the CNF is located in the Blue Ridge Geomorphic Province, in which the northeast-trending Blue Ridge Mountains rise above the eastern border of the Ridge and Valley Geomorphic Province. Granite and other igneous rocks dominate the upper slopes of the Blue Ridge Mountains. Quartzites, sandstones, limestone and shales are found on many of the western slopes.

However, most of the CNF in this Province is located not on this incised plateau terrain, but rather on strike or monoclinal ridges (Pine Mountain, Stone Mountain and Powell Mountain), more characteristic of the Ridge and Valley Province.

In general, the CNF has not developed interpretive sites and interpretive brochures for geologic resources. Except for a small portion of the Upper Ocoee River. As a result, the public is generally unaware of these geologic resources.

Geologic Hazards

A geologic hazard is a natural event or condition which involves geologic processes that harm or interfere with human activity. Mass movement, earthquakes, flooding and development of Karts features are examples of geologic hazards.

It should be noted that numerous rock units of the Ocoee Series contain disseminated iron sulfides, notably pyrite. Pyrite in various percentages have been cited on the south and southeast end of the Ocoee/Hiwasseee Ranger District and the north, northeast and southeast end of the Tellico Ranger District.

Also, on the north end of the forest in the Watauga Ranger District some small pockets in the extreme northeast corner can be found.

1.2 Direct/Indirect Effects

Geologic hazards associated with these units involve chemical weathering of the sulfur bearing minerals upon exposure to the atmosphere and weathering process. Upon weathering, sulfuric acid and ferric sulfate are produced, which may enter the aquatic ecosystem, causing considerable increase in stream acidity. Almost every formation within the Great Smokey Group contains observable sulfide minerals. Generally, the dark colored slates and schists, which are variably distributed throughout the group, carry significant amounts of sulfides.

The primary management activities that could affect the soil resource (refer to the Watershed Section for more information on Soil Resources (Erosion and Sedimentation)):

Timber Harvest

Site Preparation and Timber Stand Improvement

Effects of Fire Management

Effects of Recreation Management and Use

Effects of Transportation System Management

Minerals Management

Compaction

Soil compaction is dependent upon soil texture, soil structure, soil moisture, ground cover, rock content and the type of activity. Soils are most susceptible to compaction when moisture content is high. Fine textured soils without rock fragments are more at risk. Research has shown that biomass production (a measure of soil productivity) is reduced on compacted soils in the early stages of site recovery. Rutting, increased runoff, erosion and reduced root/plant growth can occur on severely compacted soils. Large areas of the forest have surface soil characteristics that reduce their susceptibility to compaction. Low clay content and high rock content of the surface soil layers help reduce impacts to soil productivity from compaction. If topsoil removal occurs, generally compaction is more likely, since the subsoil layers of many soils on the forest have higher clay content and have less rockiness. However, if

topsoil removal has occurred, then soil productivity has already been reduced on the area. Compaction is considered a short term (less than 100 years) effect on soil productivity, since research has shown even severely compacted soils may recover in ten to sixty years where mitigation measures of tilling and reestablishing vegetation have been used. Depth of compaction does not usually exceed six inches with the kinds of equipment being used on the forest. Actions that can produce soil compaction associated with EIS alternatives are skid trail (unbladed access routes) use, dispersed recreation use, timber harvesting, and trail use.

Land Use Change

If a soil on the forest has the ability to produce biomass, it then has soil productivity. If this same soil, for example, is converted to a parking lot, building site, paved road or into some other use that prevents it from producing biomass, then it has lost some or all of its productivity for some time, probably a long time (greater than 100 years). Land use change is considered a long-term impact to soil productivity.

Displacement (Topsoil Removal)

Topsoil removal is considered a long-term effect to soil productivity because it involves the loss of the most fertile part of the soil. The organic layer and the A-horizon beneath it are where most of the feeder roots are located for plants and where many of the macronutrients needed for soil organisms to grow are found. Many of the forest's soils are formed in sandstones and shales that are naturally low in nutrients used by plants. Many are also acidic (low in soil pH). This means the upper layers of soil, where most of the organic material and microorganisms are found, are very important in maintaining the soil's productivity. Many years are needed for the soil to recover its original productivity when the upper layers are removed. Soil formation typically occurs at a rate of one inch per 200-1000 years and depends on many local environmental factors.

However, areas where topsoil is disposed will be enriched with this added soil material and organic matter. Productivity on these topsoil disposal areas will be improved by increasing soil depth, rooting depth, moisture holding capacity and organic matter. Actions which can produce topsoil removal associated with LMP alternatives are temporary and skid road construction, log landing construction, developed recreation use, new trail construction and relocation, fire dozer line construction, special use development and wildlife opening establishment.

Soil Improvement

The forest works to improve soil conditions and reduce soil movement on about 40-50 acres per year. An inventory of areas on the forest needing treatment to reduce soil movement, reduce compaction and increase vegetative cover is updated annually. Special emphasis is given to riparian areas to help reduce sediment delivery to stream channels, floodplains and wetlands. Some watersheds may be targeted for this work to tie in with large-scale watershed partnerships, special concerns with species habitats and public water sources. The effects of soil improvement will be considered a long-term positive effect on soil productivity and an improvement of existing soil conditions. Soil improvement work will help these

treated soils toward recovery of their inherent soil productivity. Actions which would be considered soil improvement associated with EIS alternatives would include slope stabilization, erosion control structures and vegetation, road and trail closure, illegal traffic use areas treated for compaction and erosion.

Prescribed Fire Use

Prescribed burning impacts soils two ways. One way the fire itself burns up portions of the soil's organic layer, an important part of soil productivity. Hotter fires with large fuel loads will burn up more of the organic matter than cooler fires. A few soils on the forest, with thin organic layers, can lose their entire organic layer when a fire burns hot. Typically, these would be shallow, rocky soils at or near ridge tops on steep slopes. In most cases, on this forest, the effects of fire on the soil are a short-term effect. Organic layers are replenished by leaf fall and native vegetation takes advantage of a temporary increase in available nutrients, and an existing root system to recover over.

Erosion/Soil Movement

An indirect effect of removing a soil's vegetative cover and its organic layer to create bare mineral soil is erosion, meaning soil movement. An undisturbed soil with soil layers intact and growing biomass is not very susceptible to erosion. When soils are disturbed in some way to expose bare mineral soil (A-horizon and lower), then soils on slopes become susceptible to raindrop impact, displacement and overland flow with water. These forces can cause soil to move down slope, sometimes into stream channels, where it then becomes sediment and is incorporated into the bed load of the stream channel. Exposed slopes with low clay soils and soils without many rock fragments are most susceptible to soil movement.

Erosion is considered here as soil movement and not soil loss. Soil material may or may not move from a site or to a stream channel. Many factors influence soil movement and when soil moves, it is deposited somewhere. Depositional areas may benefit from the addition of this eroded soil. Gully erosion is the extreme case of soil movement and would be considered a long-term effect to soil productivity.

Vegetation Removal/Nutrient Cycling

When vegetation is removed from a site, a portion of the potential organic matter and its available nutrients to the soil is removed with it and the resulting condition of a reduced canopy (shade) can have an effect on soil temperature, soil moisture and nutrient cycling. This situation will normally occur with a timber harvest. The bole of the tree is removed from the site and the forest canopy opens up to allow more sunlight and moisture to reach the soil surface. Other parts of the tree will remain onsite to recycle into the soil system over time. Loss of trees will reduce evapotransporation and increase soil moisture. Loss of canopy will increase soil temperature in the topsoil. These conditions will increase soil organic matter decomposition and increase available nutrients on the treated area. Much of this increase in plant available nutrients will be taken up by the stump sprouting of hardwood trees and the by the root systems of the remaining vegetation on the treated area. Some nutrients may be leached from the site and reach local streams.

This leaching effect is short term and literature has shown that removal of the tree main stem alone will not reduce long-term soil productivity. These short-term losses are made up by leaf fall, atmospheric additions and weathering of parent material. Any increased leaching of nutrients from the soil would be very short term (less than 5 years). Long-term productivity can be reduced with whole tree harvesting on short rotations, which is not prescribed for the CNF.

1.3 Cumulative Effects

There would be no known cumulative effects to soils.

2.0 WATERSHED

2.1 Affected Environment

Several large rivers flow through the CNF. The following table displays the major river basins that encompass the CNF.

Table 3-1. Hydrologic unit watersheds (8-digit sub basin) encompassing the CNF

Hydrologic Unit Code Number	River Basin Subbasin	Area of Subbasin (acres)	Portion of Subbasin that is Cherokee National Forest (%)
03	South Atlantic-Gulf Watersheds		
03150101	Conasauga	224,000	6.5%
06	Tennessee River Watersheds		
06020003	Ocoee	408,960	17.5%
06020002	Hiwassee	1,728,000	5.3%
06010204	Little Tennessee	1,681,280	7.2%
06010106	Pigeon	440,960	2.3%
06010105	French Broad	1,203,840	4.9%
06010108	Nolichucky	1,123,840	8.1%
06010103	Watauga	556,160	19.3%
06010102	South Fork Holston	1,310,720	5.5%
Note: A very small portion of the Cherokee National Forest is located within the Ohio River Basin, Upper New River Subbasin (05050001).			

Table 3-2 indicates the acreage of national forest lands located within each of the 5th level watersheds. Some of the watersheds include acreage from national forests located in more than one state. For example, the Hiwassee River 5th level watershed includes NFS lands in Georgia, North Carolina and Tennessee.

Table 3-2. Acreage of NFS land within 5th level watersheds

5th Level Watershed	Watershed Code	National Forest Acreage
Big Laurel Creek	06010102010	99,008

Table 3-2. Acreage of NFS land within 5th level watersheds

5th Level Watershed	Watershed Code	National Forest Acreage
Conasauga River	03150101010	61,878
South Holston Lake	06010102030	34,778
Roan Creek	06010103010	11,627
Watauga River	06010103020	16,768
Elk River	06010103030	8,971
Doe River	06010103040	36,303
Stone Creek	06010103050	24,267
Lower Watauga River	06010103060	12,659
French Broad River	06010105070	40,560
Big Creek	06010105080	21,991
Pigeon River	06010106010	10,348
North Carolina Streams	06010108010	27,756
North Indian Creek	06010108030	43,167
South Indian Creek	06010108031	16,698
Camp Creek	06010108050	19,672
Nolichucky River	06010108060	6,645
Little Tennessee River	06010204020	55,856
Tellico River	06010204040	73,836
Hiwassee River	06020002030	118,201
Conasauga Creek	06020002040	10,458
Lower Ocoee River	06020003020	61,098
Upper Ocoee River	06020003040	29,252

Note: A very small portion of the Upper New River 5th level watershed (0505000101) is located in Tennessee.

Climate

The CNF can be characterized as having a humid, continental climate with hot, humid summers and cool winters. Weather can be highly variable across the forest and throughout the year. The average annual temperature is 55°F. January is usually the coldest month with an average temperature of 34°F, while July is usually the hottest month with an average temperature of 76°F.

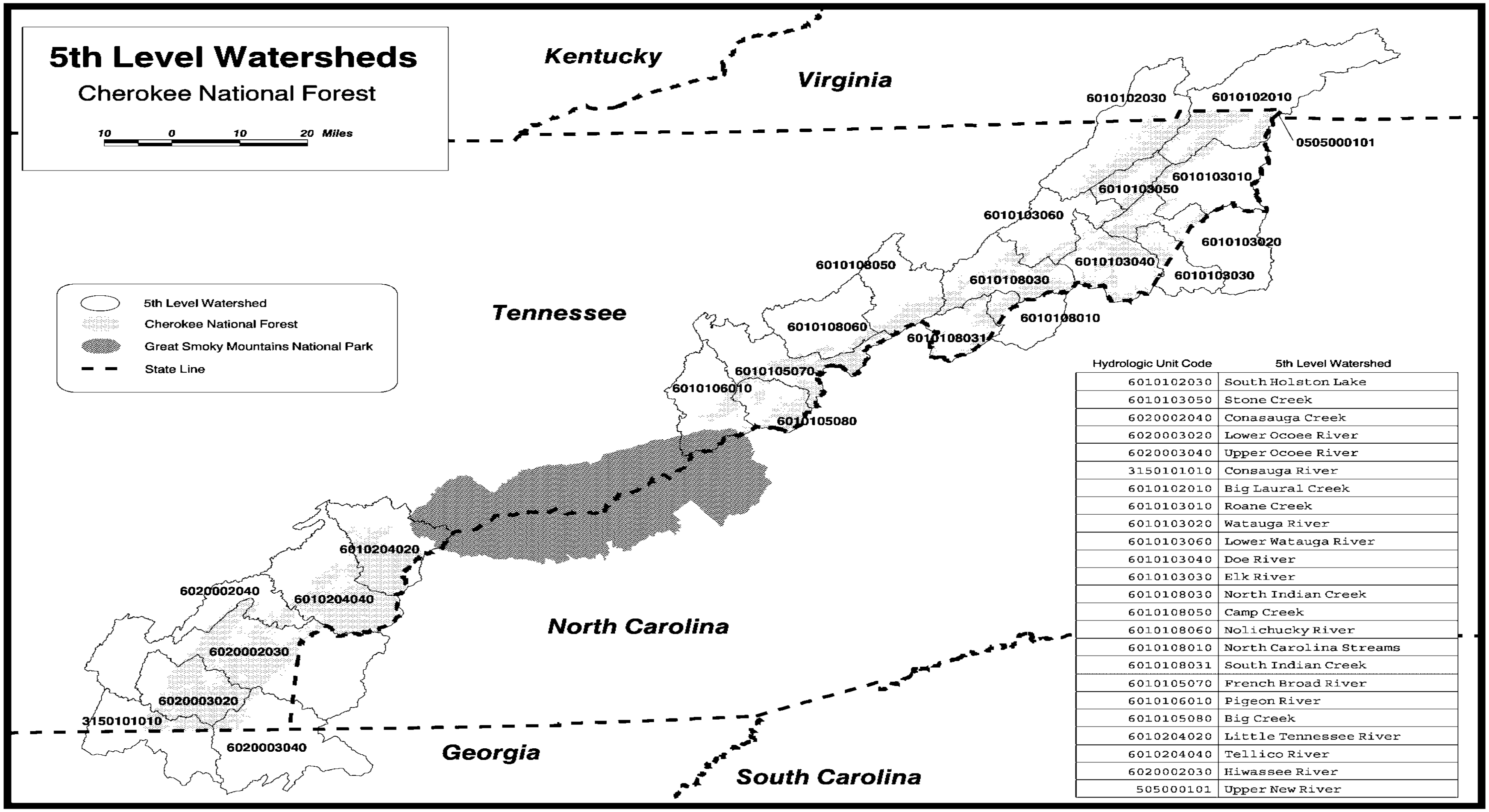
Average precipitation in the project area is about 50 inches annually, which is distributed fairly evenly throughout the year. Average annual precipitation varies from 40 inches at lower elevations to over 75 inches at higher elevations. July is usually the wettest month with an average of 5.5 inches of precipitation, while October is usually the driest with an average of 2.7 inches of precipitation.

The length of the growing season varies from 150 days per year on the north end of the CNF to over 200 days per year on the south end of the CNF.

Climate related events such as micro-wind-bursts, tornadoes, ice/snow storms, floods and lightening caused fires can result in disturbance to the CNF at various spatial scales. Most often, however, they affect relatively small areas.

Surface Water Yield

The larger subbasins identified in Table 3-1 have been further subdivided into watersheds. Twenty-four of these “fifth level watersheds” (Figure 3-1) contain CNF ownership. These lands typically are in the mountainous headwaters of the watersheds. As such, national forest streams are usually high-gradient, high energy systems. An estimated 6,500 miles of perennial and intermittent stream exist on the forest, producing an average annual runoff of about 31 inches. This equates to an average, annual, surface water yield of 1.6 million-acre feet. This surface water yield results from the interaction of several processes and conditions. Weather, vegetation, land use, and soils and geomorphology are the primary determinants of water yield. For example, current forest water yield is affected by an epidemic of southern pine beetle (SPB) tree mortality. Thousands of acres of pine have been killed during a three-year epidemic. In some cases, almost pure pine stands were killed, while in others, pine in mixed hardwood-pine stands has been killed. This epidemic has undoubtedly resulted in increased water yield potential in areas of the forest that have been severely impacted, especially those areas where pine was the majority of the overstory. Despite the potential for water yield increase due to pine mortality, the forest has also been in a moderate drought over the past several years. The drought has resulted in abnormally low flow conditions on the forest throughout the past couple of years.



Hydrologic Unit Code	5th Level Watershed
6010102030	South Holston Lake
6010103050	Stone Creek
6020002040	Conasauga Creek
6020003020	Lower Ocoee River
6020003040	Upper Ocoee River
3150101010	Consauga River
6010102010	Big Laural Creek
6010103010	Roane Creek
6010103020	Watauga River
6010103060	Lower Watauga River
6010103040	Doe River
6010103030	Elk River
6010108030	North Indian Creek
6010108050	Camp Creek
6010108060	Nolichucky River
6010108010	North Carolina Streams
6010108031	South Indian Creek
6010105070	French Broad River
6010106010	Pigeon River
6010105080	Big Creek
6010204020	Little Tennessee River
6010204040	Tellico River
6020002030	Hiwassee River
505000101	Upper New River

Figure 3-1. Fifth level watershed within the CNF

Ground Water

Ground water resources vary with each of the two ecological regions represented on the CNF. The vast majority of the CNF is located in the Blue Ridge Mountains Ecoregion. Ground water in this ecoregion typically occurs in small, localized reservoirs rather than in large aquifers. Ground water is mainly found in fractures and joints in crystalline rock and in alluvial deposits found along larger streams. The expected yield of wells from this region varies from three to 25 gallons per minute. The western edge of a portion of the CNF is located within the Central Appalachian Ridges and Valleys Ecoregion. Limestone and other carbonate rocks produce cavernous and karst features within some areas of this ecoregion. Where these exist, large quantities of high quality water can be found. The geology of much of this ecoregion consists of sandstones and shales, which are poor producers of ground water. The expected yield of wells from this ecoregion varies from five to 200 gallons per minute depending upon the geology.

Floods and Droughts

Flooding is a natural phenomenon that occurs periodically on the CNF where steep topography and high precipitation rates can produce rapid runoff. Small watersheds on the forest can produce extreme flood peaks that approach 1000-cubic feet per second (cfs) per square mile of watershed. Larger watersheds, (5th level or larger) can produce maximum flood peaks that approach 100 cfs per square mile. Most often, flooding occurs during the winter and early spring months when soils are saturated and heavy rains provide immediate runoff to stream systems. Localized flooding can also occur during summer months, when intense thunderstorms can result in several inches of rain in a short period of time. Considerable economic damage and even the loss of life can occur in flooded areas when human development has encroached onto floodplain areas. Most development on the forest is limited to roads and recreation facilities. These types of facilities have been severely damaged by floods in the past. Some flood control is provided on major rivers such as the Ocoee, Hiwassee, Little Tennessee, Watauga and South Fork Holston by the presence of TVA dams and reservoirs.

Low flows typically occur during the late summer and fall when precipitation is low and soil moisture is utilized by growing vegetation. Base flow and low flow is primarily sustained by the release of ground water. Low flow discharges are typically less than 1.0 cfs per square mile of drainage area, and are often in the range of 0.1 cfs to 0.3 cfs per square mile of drainage area. Variations in low flow stream condition result from differences in geology, soils and topography within the watershed.

Water Quality

Water quality in streams and reservoirs is typically very good when the source area is NFS lands. These water bodies generally meet or exceed all water quality criteria established by the state of Tennessee for their use classification. Reaches of some streams may not meet specific criteria such as pH due to natural or human-caused exposure of acid bearing rock (Anakeesta, for example), and due to acid deposition that is particularly acute in high elevation streams.

Several of the large rivers flowing through the CNF are listed on the Tennessee 303d list of impaired streams as “partially supporting” or “not supporting” water quality criteria for its designated use(s). In addition, several impaired streams are located in 5th level watersheds that contain national forest ownership. The impaired segments of these streams are located on private ownership downstream from national forest lands, or are in subwatersheds that contain no national forest ownership. Table 3-3 summarizes pertinent information related to the 303d status of these rivers:

Table 3-3. 303d Listed Rivers within CNF

River	Use Support	Cause	Source
Ocoee	Not Supporting	Siltation Metals Flow Alteration	Resource Extraction, Contaminated Sediments, Upstream Impoundment
Hiwassee	Partial Supporting	Flow Alteration	Upstream Impoundment
Pigeon	Not Supporting	Dioxins	Sources Outside State Contaminated Sediments
Nolichucky	Partial Supporting	Pathogens, Siltation	Sources Outside State Agriculture
Doe	Partially Supporting	Habitat Alteration	Channelization
North Indian Creek	Partially Supporting	Siltation	Urban Runoff, Storm Sewers
Scioto Creek	Partially Supporting	Siltation	Land Development
Martins Creek	Partially Supporting	Habitat Alteration	Urban Runoff, Storm Sewers
Roan Creek	Partially Supporting	Siltation	Municipal Point Source, Pasture
Trail Fork & Gulf Fork Big Creek	Partially Supporting	Pathogens	Septic Tanks
Ballplay Creek	Partially Supporting	Nitrates, Pathogens	Pasture

Water quality concerns can result from natural events such as floods and landslides, land uses associated with private lands and national forest management activities. Sediment is the primary water quality concern related to national forest management activities. Access systems are acknowledged as being the primary source of accelerated erosion and sediment to national forest streams, although timber harvest, prescribe burning and developed and dispersed recreation activities and uses can also result in non-point source pollution.

A sediment model (Clingenpeel, 2002) has been utilized to estimate existing sediment yields within the 5th level watersheds that contain NFS ownership. Table 3-4 displays the estimated, current sediment yield within these watersheds from

private and NFS ownerships, and sediment resulting from roads within the watersheds.

Table 3-4. 5th Level Watershed			
Watershed	Sediment Yield (tons/year)		
	Pvt.	NFS	Roads*
Upper New River	14,127	8	
Big Laurel Creek	60,107	879	8,680
Conasauga River	24,954	215	3,968
South Holston Lake	50,092	1,233	8,645
Roan Creek	25,274	375	4,690
Watauga River	24,931	705	7,385
Elk River	9,579	338	2,763
Doe River	14,146	1,301	4,020
Stony Creek	9,207	1,050	1,100
Lower Watauga River	69,950	586	9,183
French Broad River	22,394	1,163	4,204
Big Creek	2,981	699	1,761
Pigeon River	25,402	448	5,598
North Carolina Streams	7,328	724	1,735
North Indian Creek	25,803	1,767	4,512
South Indian Creek	4,668	511	1,379
Camp Creek	55,856	751	4,507
Nolichucky River	68,180	179	5,480
Little Tennessee River	3,044	1,295	3,038
Tellico River	13,837	1,591	7,013
Hiwassee River	30,805	1,148	13,300
Conasauga Creek	20,457	276	3,962
Lower Ocoee River	10,450	1,292	3,993
Upper Ocoee River	36,991	190	10,405
* Roads data base used did not allow distinction between NFS and private roads. Sediment is cumulative total.			

Watershed Assessment

A general assessment of watershed condition and vulnerability was completed on the forest in Fiscal Year (FY) 2000. This “rapid characterization” process comparatively rated and ranked each of the 24 fifth level watersheds that occur on the forest in terms of their condition and vulnerability. The rating considered public and private lands within the watersheds. In general, the watersheds that ranked poorest in condition (Lower Watauga River, South Fork Holston Lake and Nolichucky River) have a low percentage of national forest, a relatively high percentage of urban/agricultural land use, and a high number of point sources of pollution. The watersheds that ranked best in overall watershed condition (Conasauga River, Tellico River, Big Creek, North Carolina Streams) have a high percentage of forest land, few point sources of

pollution and relatively little hydrologic modification. The watersheds that ranked highest in vulnerability to impact (North Indian Creek, Little Tennessee River, Pigeon River) were those that have a high number of Proposed, Endangered, Threatened, and Sensitive (PETS) species, endemic species, impaired waters, source waters or a combination of these.

Water Uses

Water originating on and flowing through the forest provides for many uses. The vast majority of this is instream, non-consumptive use, especially recreational activities such as fishing, paddling sports and scenic viewing. The water also provides habitat for a wide variety of aquatic dependant species. Instream flow needs to support these uses and habitats have not been quantified. Water withdrawal for out-of-stream use has not been an issue on the forest, however, with the exception of historic and present-day withdrawal of water from the Ocoee and Hiwassee Rivers for power generation. These withdrawals partially dewater a significant section of these rivers before the water is returned to the channel.

An estimated 123 million gallons of consumptive water use occurs on the forest each year for administrative needs or to supply the needs associated with special uses (i.e. spring-boxes/transmission lines) administered by the forest. In addition, thirteen source water areas providing domestic water supply have been inventoried on the CNF. These source water areas contain a large percentage of NFS lands. National forest system lands are also located within the watersheds of several rivers (Ocoee, Hiwassee, Tellico, Little Tennessee, French Broad, Nolichucky, South Fork Holston, Watauga, Doe) that are classified for domestic water supply by the state of Tennessee. The quantity of consumptive withdrawal is estimated to be less than one percent of the forest's annual surface water yield.

Existing Impoundments, Transmission Facilities, Wells, and other Man-Made Developments

The CNF contains several large TVA impoundments, as well as, several small recreation reservoirs (Table 3-5). Other reservoirs are within the CNF proclamation boundary, but these are surrounded by private ownership. The acreage shown in Table 3-5 is based on the normal maximum pool.

Table 3-5. Existing Impoundments with Adjacent CNF Lands

Impoundment	Surface Area (Acres)
Ocoee # 3	480
Ocoee # 1 (Parksville Lake)	1,900
Watauga	6,430
South Holston	7,580
Wilbur	72
Indian Boundary	97
McKamy	7

Special use permits have been issued for eighteen water transmission pipelines on the CNF. Most of these have been issued to municipal utility companies to transport water to urban areas and rural communities. Several have also been issued to individuals for their domestic water supply needs. Water transmission pipelines are also in use at NFS administrative and recreation sites and at a fish hatchery site on the Tellico River to supply the needs for these facilities.

TVA withdraws water from the Ocoee and Hiwassee Rivers for power generation needs. The Ocoee River is partially dewatered from river mile 29.2 to 19.7 by a hydroelectric tunnel and a wooden flume. The Hiwassee River is partially dewatered from river mile 66.0 to 53.6 by a hydroelectric tunnel.

Special use permits have been issued for seventy-two wells and springboxes on the CNF. Most of these have been issued to individuals for single family domestic water supply needs. Several have also been issued to water development associations to supply water to rural communities. Wells are also in use at recreation sites to supply the needs for these facilities.

2.2 Direct/Indirect Effects

Watershed condition and the water resource would potentially be affected by a variety of forest management activities and uses. Activities that disturb the land surface, decrease forest canopy or otherwise alter land surface cover would potentially affect water yield (quantity and timing) and potentially degrade water quality. Soil particles detached and transported (erosion) from disturbed sites would potentially reach streams as sediment affecting aquatic systems and water quality. The risk of adverse water quality impacts increases as the distance between a ground disturbing activity and a stream or other water body decreases.

Those activities and uses that have the highest potential to affect watershed condition, and water quality and quantity on the CNF include prescribe fire, wildland fire along with suppression activities, timber harvest, silvicultural treatments, dispersed and developed recreation, and road maintenance, reconstruction and construction. The existing system of forest roads and trails is considered the greatest source of non-point source pollution to forest streams and other water bodies. Best management practices associated with these activities and uses are designed to reduce, to the extent possible, the amount of erosion that takes place from disturbed sites, and minimize soil movement from disturbed sites to aquatic systems.

Water Quality Effects from Management Activities and Forest Uses

Geologic Erosion

Even in minimally disturbed, forested watersheds geologic (herinafter referred to as baseline) erosion takes place. Erosion rates on the order of 0.05 to 0.3 tons per acre per year and sediment rates of 0.01 to 0.10 tons per acre per year have been observed and documented (Patric, 1994). Very little of this erosion takes place on the hillside except for occasional debris/soil avalanches. The major source of sediment is from within the channel due to fluctuating stream-flows, especially from

major storm-flows that result in channel scour, bank erosion and sediment transport and deposition. Table 3-6 and Table 3-7 compare potential land use-related (Forest Service), accelerated sediment yields with the baseline erosion and sediment yields that takes place even in pristine, forested watersheds.

Timber Harvest

The act of cutting trees has very little direct effect on soil erosion and sediment production (Ursic and Douglas, 1978). In so far as water yields would potentially be temporarily increased due to tree harvest; however, sediment yields into forest streams would be indirectly affected. Forest soils remain wetter after tree harvest, and more soil moisture would be available to stream channels. For this reason, intermittent drains would potentially be somewhat wetter during the growing season and perennial channel systems would potentially expand slightly upslope into hollows that would be usually dry before cutting takes place. This effect would be temporary usually lasting no more than two or three years before returning to a pre-cut condition.

Possible water quality effects from timber harvest primarily result from soil disturbance caused by removing trees from the woods. Each alternative would lead to ground disturbance and increased soil loss and sediment yields from three main sources--skid trails, constructed temporary and/or permanent roads, and log landings. While subject to many variables, an estimate of approximately ten percent of a given area harvested by conventional equipment (chainsaws/rubber tired skidders) would be impacted by skid trails, access roads and log landings. Table 3-6 displays the estimated sediment yield that would potentially result from the implementation of timber harvest treatments along with associated road construction for each alternative and 10-year planning period. The sediment estimates also include predicted yields associated with prescribe burning.

Table 3-6. Estimated Average Annual Sediment Yield (Tons) by Alternative and 10-Year Period Due to Timber Harvest and Prescribe Burning Treatments

Alternative	Planning Period 1	Planning Period 2	Planning Period 3	Planning Period 4	Planning Period 5
A	2,228	2,646	2,437	2,528	2,841
B	1,861	2,329	2,576	2,558	2,493
D	2,775	3,741	3,605	3,886	3,612
E	843	850	816	932	1,060
F	1,751	1,856	1,668	1,789	1,856
G	1,243	1,575	1,366	1,587	1,727
I	2,097	2,836	2,551	2,947	3,041

To put these yields into a frame of reference, the annual tons of sediment per alternative could potentially be distributed across the forest to determine the accelerated sediment yield on an annual per acre basis. Using the highest estimated annual sediment yield of 3,886 tons per year (Alternative D, Planning Period 4) the annual increase in sediment yield would be about 0.006 tons per acre, or about 12 pounds per acre. In reality, sediment yield would not be proportioned across the entire forest, but would be more appropriately examined on a watershed scale. Table

3-7 displays estimated percent increases in sediment yield above a baseline condition that would occur in each 5th level watershed from the implementation of each alternative (CNF activities only). Table 3-8 displays estimated percent increases in sediment yield above the current (existing) condition that would occur in each 5th level watershed from the implementation of each alternative (CNF activities only). Planning Periods 1 and 5 are shown in the tables as percent increases in sediment yield tend to increase slightly through time, generally reaching their highest levels in period five.

Table 3-7. Estimated Percent Increases in Sediment Yield Above a Baseline Condition Due to Land Uses on NFS Lands Within Each 5th Level Watershed by Alternative

Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Period 1								
Upper New	05050001010	0.05	0.05	0.1	0.02	0.04	0.02	0.04
Big Laurel	06010102010	4.0	3.5	4.5	1.4	3.6	1.7	3.4
Conasauga River	03150101010	3.1	2.7	3.0	1.7	2.9	2.8	2.9
South Holston	06010102030	2.8	2.7	4.4	1.0	3.0	2.2	3.0
Roan	06010103010	2.1	1.6	2.5	0.6	1.4	0.9	1.7
Watauga	06010103020	1.8	1.2	2.4	0.9	1.5	1.2	1.8
Elk	06010103030	2.1	2.7	3.0	1.2	2.0	1.7	2.0
Doe	06010103040	6.1	5.3	7.4	3.7	6.0	4.1	5.9
Stone	06010103050	9.0	7.2	14.0	3.1	8.1	5.7	8.2
Lower Watauga	06010103060	2.6	2.8	4.7	1.0	1.8	1.6	2.7
French Broad	06010105070	8.0	6.0	10.0	2.9	6.6	3.6	7.0
Big Creek	06010105080	7.8	8.9	12.6	2.3	7.2	7.1	8.0
Pigeon	06010106010	1.4	1.2	2.7	0.5	1.0	0.8	1.4
North Carolina	06010108010	1.1	1.3	1.9	0.6	1.1	0.4	1.6
North Indian	06010108030	8.5	7.1	11.6	3.7	5.8	3.6	7.9
South Indian	06010108031	2.3	1.9	3.7	1.5	2.5	1.9	3.1
Camp	06010108050	2.7	1.8	3.9	1.2	2.2	1.6	2.5
Nolichucky	06010108060	2.0	1.6	2.7	0.6	1.9	0.7	1.8
Little Tennessee	06010204020	6.1	4.6	6.1	2.8	3.8	2.6	5.6
Tellico	06010204040	10.5	7.7	10.5	2.8	7.0	4.2	9.6
Hiwassee	06020002030	9.2	6.9	11.3	2.2	6.4	4.8	8.3
Conasauga Ck.	06020002040	5.4	3.7	6.2	1.0	2.7	2.2	5.2
Lower Ocoee	06020003020	14.3	13.7	15.7	7.1	12.2	10.2	13.5
Upper Ocoee	06020003040	1.7	1.7	1.7	0.9	1.6	1.1	1.7
Period 5								
Upper New	05050001010	0.06	0.09	0.1	0.02	0.05	0.03	0.05
Big Laurel	06010102010	4.6	4.3	6.3	1.4	3.8	2.0	4.9

Table 3-7. Estimated Percent Increases in Sediment Yield Above a Baseline Condition Due to Land Uses on NFS Lands Within Each 5th Level Watershed by Alternative

Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Conasauga River	03150101010	5.0	2.9	4.5	3.4	3.0	4.5	4.6
South Holston	06010102030	4.2	4.0	5.9	1.1	3.1	3.4	4.5
Roan	06010103010	2.3	2.1	3.4	0.6	1.6	1.2	2.4
Watauga	06010103020	2.2	1.6	3.1	1.0	1.6	1.5	2.5
Elk	06010103030	2.8	4.4	4.4	1.5	2.2	2.3	2.8
Doe	06010103040	7.9	8.0	9.6	4.6	6.2	5.5	8.5
Stone	06010103050	10.9	9.3	17.4	3.1	8.5	7.3	11.4
Lower Watauga	06010103060	3.1	4.4	5.8	1.1	2.0	2.0	4.0
French Broad	06010105070	9.7	6.6	13.2	3.6	6.9	5.0	10.9
Big Creek	06010105080	12.5	13.9	15.6	2.3	7.5	11.6	12.6
Pigeon	06010106010	1.7	1.5	3.3	0.6	1.0	1.1	2.1
North Carolina	06010108010	1.2	1.5	2.7	0.6	1.3	0.5	2.2
North Indian	06010108030	9.7	8.6	14.7	4.9	6.2	4.5	12.0
South Indian	06010108031	3.4	2.5	4.8	1.9	2.6	2.9	4.5
Camp	06010108050	3.0	2.2	5.1	1.4	2.3	1.8	3.3
Nolichucky	06010108060	2.2	2.4	3.4	0.6	2.0	0.8	2.8
Little Tennessee	06010204020	6.8	5.4	8.2	4.5	4.1	3.1	8.1
Tellico	06010204040	12.5	10.1	13.6	3.0	7.4	5.3	12.1
Hiwassee	06020002030	12.5	9.8	14.4	2.3	6.7	7.4	12.2
Conasauga Ck.	06020002040	7.2	6.1	7.7	1.0	3.0	3.2	6.6
Lower Ocoee	06020003020	19.9	18.7	20.8	10.1	12.8	15.0	20.8
Upper Ocoee	06020003040	2.0	2.1	2.2	1.1	1.7	1.3	2.5

Predicted sediment yield increases above a baseline condition due to actions on NFS lands range from 0.05 percent to 20.8 percent. These increases are low considering the very low erosion/sediment rates associated with a baseline condition with no human influence. The increases would be in addition, however, to the percent increases resulting from the current condition in each watershed, as shown in Table 3-8.

Using the highest estimated annual sediment yield increase of 20.8 percent above natural or 343 tons (Lower Ocoee Watershed, Alternatives D and I) the estimated annual increase in sediment yield would be about 0.004 tons per acre or about eight pounds per acre in this watershed.

Table 3-8. Estimated Percent Increase in Sediment Yield Above the Current Condition Due to Land Uses on NFS Lands Within Each 5th Level Watershed								
Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Period 1								
Upper New	05050001010	0.0*	0.0	0.0	0.0	0.0	0.0	0.0
Big Laurel	06010102010	0.2	0.1	0.2	0.1	0.1	0.1	0.1
Conasauga River	03150101010	0.2	0.2	0.2	0.1	0.2	0.2	0.2
South Holston	06010102030	0.1	0.1	0.2	0.0	0.1	0.1	0.1
Roan	06010103010	0.1	0.1	0.2	0.0	0.1	0.1	0.1
Watauga	06010103020	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Elk	06010103030	0.2	0.3	0.3	0.1	0.2	0.2	0.2
Doe	06010103040	0.6	0.5	0.7	0.3	0.6	0.4	0.5
Stone	06010103050	0.8	0.7	1.3	0.3	0.8	0.5	0.8
Lower Watauga	06010103060	0.1	0.1	0.1	0.0	0.0	0.0	0.1
French Broad	06010105070	0.5	0.4	0.7	0.2	0.5	0.2	0.5
Big Creek	06010105080	1.7	1.9	2.7	0.5	1.6	1.6	1.7
Pigeon	06010106010	0.1	0.1	0.2	0.0	0.1	0.1	0.1
North Carolina	06010108010	0.2	0.2	0.3	0.1	0.2	0.1	0.3
North Indian	06010108030	0.5	0.4	0.7	0.2	0.3	0.2	0.5
South Indian	06010108031	0.6	0.5	0.9	0.4	0.6	0.5	0.7
Camp	06010108050	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Nolichucky	06010108060	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Little Tennessee	06010204020	2.2	1.7	2.2	1.0	1.4	1.0	2.0
Tellico	06010204040	1.2	0.9	1.2	0.3	0.8	0.5	1.1
Hiwassee	06020002030	0.7	0.5	0.8	0.2	0.5	0.3	0.6
Conasauga Ck.	06020002040	0.3	0.2	0.3	0.1	0.2	0.1	0.3
Lower Ocoee	06020003020	1.5	1.5	1.6	0.8	1.3	1.1	1.4
Upper Ocoee	06020003040	0.1	0.1	0.1	0.0	0.1	0.0	0.1
Period 5								
Upper New	05050001010	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Big Laurel	06010102010	0.2	0.2	0.2	0.2	0.1	0.1	0.2
Conasauga River	03150101010	0.3	0.2	0.3	0.2	0.2	0.3	0.3
South Holston	06010102030	0.2	0.2	0.3	0.2	0.1	0.2	0.2
Roan	06010103010	0.2	0.1	0.2	0.2	0.1	0.1	0.2
Watauga	06010103020	0.2	0.1	0.2	0.2	0.1	0.1	0.2
Elk	06010103030	0.3	0.4	0.4	0.4	0.2	0.2	0.3
Doe	06010103040	0.7	0.7	0.9	0.7	0.6	0.5	0.8
Stone	06010103050	1.0	0.9	1.6	1.4	0.8	0.7	1.1
Lower Watauga	06010103060	0.1	0.1	0.1	0.1	0.0	0.0	0.1

Table 3-8. Estimated Percent Increase in Sediment Yield Above the Current Condition Due to Land Uses on NFS Lands Within Each 5th Level Watershed

Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
French Broad	06010105070	0.7	0.5	0.9	0.8	0.5	0.3	0.8
Big Creek	06010105080	2.7	3.0	3.4	2.9	1.6	2.5	2.7
Pigeon	06010106010	0.1	0.1	0.2	0.2	0.1	0.1	0.1
North Carolina	06010108010	0.2	0.3	0.4	0.3	0.2	0.1	0.4
North Indian	06010108030	0.6	0.5	0.9	0.7	0.4	0.3	0.7
South Indian	06010108031	0.8	0.6	1.2	0.9	0.6	0.7	1.1
Camp	06010108050	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Nolichucky	06010108060	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Little Tennessee	06010204020	2.4	1.9	2.9	2.2	1.5	1.1	2.9
Tellico	06010204040	1.5	1.2	1.6	1.2	0.9	0.6	1.4
Hiwassee	06020002030	0.9	0.7	1.0	0.8	0.5	0.5	0.9
Conasauga Ck.	06020002040	0.4	0.3	0.4	0.4	0.2	0.2	0.4
Lower Ocoee	06020003020	2.1	2.0	2.2	1.7	1.4	1.6	2.2
Upper Ocoee	06020003040	0.1	0.1	0.1	0.1	0.1	0.0	0.1

*Indicates less than 0.05 percent

Table 3-8 indicates that there would be very little change in predicted sediment rates that result from CNF management activities compared to the existing condition in each of the 5th level watersheds.

Table 3-7 and Table 3-8 examine percent increases in sediment yield resulting from management alternatives at a large watershed scale. At this level of detail, the contributions of NFS lands to the overall quality of water is difficult to discern. In the case of watersheds such as the Lower Watauga, Nolichucky River and Upper Ocoee River, the sources contributing to degradation of water quality are external from NFS lands. There is little that management of the national forest can contribute to improving the quality of water flowing into the national forest. In other cases such as the Conasauga River, the headwaters are in NFS ownership and water quality provided downstream is very good (meets state and federal water quality criteria). The effects of NFS system management to individual streams would be best determined at a project level (smaller watershed scale) where specific management practices are evaluated for impacts to water quality.

Erosion that results from timber harvest activity would be greatly modified through time in that disturbance would be temporary and generally a single pulse over a long period of time. Any given area to be disturbed by a harvest would likely be cut and site prepared within a year's time. After this, the given area would unlikely be disturbed (barring natural disturbance) for at least 50 to 60 years. With proper mitigation applied, effects from timber harvest on soil loss, sediment yield and compaction would return to precutting conditions within two to five years.

Forestwide and riparian prescription management standards have been designed to mitigate the amount and duration of compaction, erosion and sediment delivery that would potentially occur from timber harvest and other management activities. Research and effectiveness monitoring have proven the value of properly applied mitigation (BMP) in greatly reducing compaction, erosion and sediment yield potential (Patric, 1994 and Curtis, Pelren, George, Adams, and Layzer, 1990). All alternatives considered would incorporate mitigation that would be designed to:

Restore vegetation and litter cover on logging roads, skidder trails, and log landings as soon as practicable.

Minimize land disturbance by building the fewest skid trails, logging roads and log landings feasible.

Use broad-based dips or waterbars on all access ways and firelines on non-level slopes to disperse water.

Locate all access as far as practicable from streams.

Maintain as much unbroken forest floor as possible between exposed mineral soil and streams through the use of riparian corridors and filter strips.

Disking or ripping deeply compacted soils that result from management activities to restore soil productivity and assist in controlling runoff and erosion.

Potential sediment yields displayed in Table 3-6, Table 3-7, and Table 3-8 would not completely reflect the mitigation that would be associated with timber harvest and other management activity. This mitigation would actually prevent much of the potential yield displayed in Table 3-6, Table 3-7, and Table 3-8 from reaching streams or other water bodies.

In addition to soil loss and sediment yield, each alternative would potentially result in soil compaction. Where compaction would be severe and unmitigated, soil productivity would be reduced due to loss of soil structure. Compaction would be most likely to occur on those areas where heavy equipment operates repeatedly especially when soils are wet. Areas subject to compaction include bladed skid trails, temporary roads and log landings.

Timber harvest results in an increase in solar energy reaching the forest floor. The increased litter and soil temperature results in an increase in chemical and biological activity that causes an increased rate of organic matter breakdown. Since partial harvest or clearcutting leaves fewer plants (especially trees) on an area to uptake nutrients and more nutrients would potentially be available due to increased organic matter decomposition, nutrients would be potentially free to move off site. Nutrients would potentially be dissolved in precipitation and infiltrate into underlying mineral soil. Subsequent drainage through the soil would potentially carry some of these nutrients to nearby streams. The result would be an increase in nutrient levels such as nitrogen, calcium and magnesium in stream water. The duration of this possible effect would be short-lived--less than five years. After this time period, sprouts,

seedlings and other vegetative growth reestablish shade to the cut area and effectively tie up available nutrients.

Long term measurements of chemical changes in water quality at Coweeta Hydrologic Lab found that nutrient losses observed in commercial logging were small, and would not adversely impact the sustainability of growth in the successional forest (Swank, et al, 2001). These findings also support other studies that concluded hardwood ecosystems in the southern Appalachians are highly resistant and highly resilient to changes in biogeochemical cycles associated with forest harvesting activities (Swank, et al 2001).

Management standards associated with the riparian prescription would prevent increases in solar insolation from directly reaching streams. Research studies indicate that maintaining streamside vegetation would be a key to maintaining stream temperatures at existing levels (Stednick, 1999).

Site Preparation and Timber Stand Improvement

Generally, site preparation and timber stand improvement treatments used on the forest result in little or no soil disturbance. Hand tools (chainsaws) and herbicides would be used for these treatments. An exception to this would be firelines associated with the use of fire for site preparation.

Each alternative would use herbicides for site preparation and timber stand improvement. Where used, herbicides would normally be applied only to individual trees that would be treated to accomplish the stand improvement or site preparation objective. Herbicide use would involve low toxicity chemicals that would be applied infrequently (once or twice in a period of 80 or more years). The method of application would minimize herbicide residue movement into surface waters, although (depending upon the method of application) short duration residue concentrations of 0.5 to 1.0 ppm would potentially occur during stormflow (Neary, 1988). On-site degradation processes and in-stream dilution and degradation would result in quick dissipation of any herbicide residue that might reach surface waters (Neary, 1988). Short-term water quality effects would be minimal, and long-term water quality would not be adversely affected (Neary, 1988). Forestwide standards and riparian corridor prescription standards would apply to all alternatives, and would limit application of herbicides in proximity to surface waters.

Effects of Fire Management

Each alternative proposes prescribe burning for fuel reduction, ecosystem restoration and site preparation. The effects of prescribed fire on water quality vary, depending on fire severity, type and amount of vegetation, ambient temperature, antecedent soil moisture, terrain and other factors (Van Lear, 1989). Published scientific studies have concluded that understory, prescribed burns implemented under managed or controlled conditions have negligible effect on the physical, chemical and biological properties of soils and soil productivity (Patric, 1994; Richter, Ralston, and Harms, 1982; Van Lear, Thomas and Waldrop, 1989; Swift, et al, 2001). Furthermore, there is little evidence that sedimentation or water yield increases significantly in streams from forested lands burned under conditions specified in a prescribed burning plan

designed to meet wildlife, recreation, watershed, vegetation management, or ecological objectives. Understory burning would consume only a small amount of the duff (organic layer) and would expose very little mineral soil. Most of the organic layer and fine root layer would be left in place.

As fire severity increases, a higher percentage of the litter, duff and larger fuels on the forest floor would be consumed, resulting in possible degradation of mineral soil quality. This in turn would affect soil biota, structure, organic matter and fertility, potentially triggering accelerated erosion and loss of soil nutrients. Suspended solids, sediments and dissolved salts in streamflow would increase nutrient enrichment. Very hot, stand replacement burns would result in these effects.

Ground disturbance created by firelines, particularly those constructed by bulldozers, could result in erosion and sedimentation to streams. Forestwide management standards would be designed to reduce these effects by minimizing the connectivity of firelines to streams, and completing erosion control on firelines, as necessary, to minimize erosion.

Alternatives A, B, D, F, and G propose a prescribe burning objective of 16,000 acres per year. Burning would be completed for fuel reduction and ecosystem restoration. Alternative E proposes an objective of 10,000 acres per year, and Alternative I proposes a burning objective of 20,000 acres per year.

It is estimated that about three percent of all acres subject to prescribed fire would be severely burned (personal observation). Severe burning implies all organic matter on the soil surface and within the upper ½ inch of the mineral soil would be consumed, and soil structure and or color visibly altered. These conditions would affect the hydrologic condition and productive potential of the severely burned area in the short term. Therefore, projections would be that prescribed fire would potentially adversely impact soils the least in Alternative E (300 acres), followed by Alternatives A, B, D, F, and G (480 acres), with Alternatives I having the greatest potential impact related to fire (600 acres). These severely burned acres would normally be small patches distributed throughout the burn area, essentially mimicking natural fire occurrence.

Effects of Recreation Management and Use

Water plays an important role in many aspects of recreation on the forest. Lakes and streams would be a magnet to people who visit the forest. The need and desire for recreational users to be near water would create varying degrees of impact to the resource.

Most of the developed and dispersed recreation sites on the forest would potentially be located near streams and lakes. Likewise, many wilderness visitors travel to and camp near streams. This type of concentrated use would result in damaged vegetation, and compaction and erosion within riparian zones and along stream banks. Water pollution from human waste, dishwashing, trash accumulation and horse use would be a potential effect where people congregate. Generally, these effects would be localized and would be reduced by using strategies to avoid riparian

areas whenever possible, using appropriate mitigation measures and educating forest visitors about ways to protect soil and water resources.

Off-road vehicle trails and their use result in soil compaction, displacement, erosion and sedimentation. The magnitude of this problem varies by alternative depending upon the mileage of off-road vehicle trails provided. Acres designated for off-highway vehicle use by alternative provides an indication of potential OHV use. Alternaitve I has the most acres designated as OHV areas followed by Alternative A and E. All alternatives would limit off-road vehicle use to designated roads and trails. The use of proper location, layout, and construction techniques would reduce the impacts associated with off-road vehicle trails and their use. For example, the avoidance of soils with high erosion hazard, minimizing stream crossings, and proper drainage of trails reduces potential soil and water effects.

Hiking, horse and bicycle trails result in varying degrees of compaction, erosion and sedimentation depending upon their location, design and amount of use. As with off-road vehicle trails, proper location, layout, and construction techniques would potentially reduce the impacts associated with these types of trails and their use.

Overall, recreation use of the forest would be expected to increase for all alternatives. This could result in an increased affect to soil and water resources. Effects to the soil and water resources would not be expected to vary significantly by any alternative, except Alternative A and E. These alternatives would emphasize providing increased recreation opportunities, and would be expected to have more recreation-related effects to the soil and water resources compared to the other alternatives.

Effects of Transportation System Management

Watershed effects related to roads are generally categorized as geomorphic, hydrologic and those related to site productivity.

Geomorphic Effects - Roads are considered the most common source of accelerated erosion and sediment on CNF lands. Road-generated sediment would be produced from the erosion of cut and fill slopes, ditches, and the road surface, and from stream crossings and mass erosion processes (debris slides). Raw ditchlines and roadbeds would be a continuing source of sediment, usually because of lack of maintenance, inadequate maintenance for the amount of use, excessive ditchline disturbance, or poorly timed maintenance relative to storm patterns (Swift, 1984). Unpaved roads paralleling and crossing streams would be a continuing source of sediment to some forest streams.

Mass failure of road segments has occurred on the forest after large rainfall events. Typical causes of mass road failure have included location (road encroachment into floodplain) and inadequate culvert sizes to pass water associated with a given flood event. Future, extreme precipitation events could result in road-related mass failure.

The occurrence and magnitude of road-related debris slides varies by climate, geology, road age, construction practices and storm history. Several studies in the eastern United States of America (U.S.A.) have shown that landslides were driven

more by storm magnitude and geology than by land use. A threshold amount of five inches of rain per day and metasedimentary geology has been shown to be associated with large debris slides in the Appalachians (Eschner and Patric, 1982). Road drainage could cause small slides in road fills; nevertheless, some major landslides originate in undisturbed forest land (Neary and others, 1986; Neary and Swift, 1987).

The accelerated erosion and sediment associated with permanent, open roads would be reduced by effective mitigation, but would not be eliminated. Proper maintenance, the use of vegetative measures and surfacing materials for soild stability, and proper drainage of roads would be the key to reducing erosion and sediment.

Hydrologic Effects: Roads have three primary effects on water: intercept rainfall directly on the road surface, cutbanks and surbsurface water moving down the hillslope; concentrate flow, either on the surface or in an adjacent ditch or channel; and divert or reroute water from pathways that it would otherwise take if the road were not present (Gucinski, Furniss, Ziemer, Brookes, 2000). By intercepting surface and subsurface flow, and diverting it into ditches and channels, road systems effectively increase the density of streams in the landscape. As a result, the amount of time required for water to reach stream channels and the timing of peakflows would be altered. Generally, the higher the density of roads within a watershed, the quicker the runoff is received by the stream network, and peak flows increase.

Productivity Effects – Roads affect site productivity by removing and displacing topsoil, altering soil properties, and accelerating erosion. The number of acres of existing, permanent roads on the forest is estimated to be considerably less than one percent of the total forest acreage. As a result, productivity effects related to roads are quite small.

The effects described for roads would vary somewhat by alternative depending on the number of miles of new road that would need to be constructed to support management activities and forest visitor use. Road mileage resulting from new construction would be expected to increase very little, since roads needed for management and forest visitor use would be essentially in place. Road effects would also vary by alternative to the extent that road decommissioning would take place; although road decommissioning is expected to vary only slightly by alternative.

Minerals Management

Very little mineral activity occurs and would be expected to occur on the CNF. The level of activity would not be expected to change by alternative.

Common variety rock would be collected in very small amounts on the forest for landscaping purposes. Very little effect to the water resource results from this activity.

A very localized activity that occurs on the forest is suction dredging for gold: currently known to occur in only one or two streams on the forest. Dredging would be done more for recreational than commercial purposes. While the effects associated

with this activity are not well documented, possible effects relate more to aquatic biology than water quality. Where dredging would potentially be done, smaller channel substrate particles would potentially be moved from one location to another within the stream. A temporary increase in suspended sediment levels would be likely in close proximity to the dredging activity. Channel morphology would be affected locally by changing bed material particle size, modifying channel topography and possible disturbance of streambanks (Harvey, Lisle, Vallier, Fredley, 1995). Other than any streambank disturbance, these morphological changes would normally be short-lived as high flows tend to reestablish the pre-dredging condition.

Water Quantity Effects from Timber Harvest and Other Activities

The CNF is the source of water for domestic and commercial use, as well as, recreation use and stream flows necessary to maintain healthy aquatic and riparian resources. Forest management activities or natural disturbance that reduces live tree basal area, or disturbances such as roads would potentially affect water yield.

Changes in water yield would occur in response to timber harvest, road and skid trail development and silvicultural activities such as mechanical slash-down or herbicide treatment of vegetation. These activities would increase water yield by decreasing the interception of precipitation by trees and transpiration loss of soil water. Research indicates that achieving a measurable increase in stream flow requires at least a 20 percent decrease in basal area (Patric, 1994). As basal area reduction increases to 100 percent, greater increases in stream flow take place. Any basal area left on harvested areas would reduce the water yield increase. In all of the alternatives, most vegetation manipulation would be done with partial basal area removal cuts (shelterwood).

Stream flow increases do not last long in the southeastern U.S.A due to the rapid regeneration of dense new stands on cut areas. Although increased yields would be possible from five to ten years or even longer after harvest, almost all of the increase would be over after five years for clearcuts and within one to three years when less than 50 percent basal area would be removed. In terms of the timing of yield increases, almost all of the increased stream flow takes place during the growing season (and often during periods of stream low flow). This is due to the fact that soil moisture is usually deficit during this time of the year and any increase in soil moisture due to a decrease in evapo-transpiration would move through the soil and augment stream flow. In the vegetative dormant season when little evapo-transpiration occurs, soils would normally be saturated anyway. The increased growing season yields diminish yearly as increased vegetative growth and resultant evapo-transpiration return the water balance to pre-cut conditions.

Timber harvest would potentially increase storm flows (quick flows) and slightly affect the timing of the storm hydrograph in relation to the amount of basal area removed, the number of acres of a given watershed involved, and the amount of ground disturbance (including roads) present after harvest. Research at Coweeta Hydrologic Lab indicates that timber harvest, with carefully located and designed roads, produce only small and acceptable (about 15%) increases in mean storm flow volumes and peak flow rates. Increased stream flows and storm flows would not necessarily be a

negative effect since these almost always occur during the growing season when stream flow would potentially be at or near base flow.

The highest water yield increase would be expected from the implementation of Alternative D, followed by Alternatives I, B, A, G, F and E. Variation in water yield increase, by alternative, would be due to the amount and type of timber harvest associated with each alternative. Water yield would be extremely variable, however, in relation to time of year, intensity and duration of storms, antecedent moisture conditions, and the timing and concentration of contributing flows. Water yield increases would often go undetected, especially in relation to larger downstream flows. Local flows would be detectable depending upon the percentage of a watershed harvested, and the location of harvest units within the watershed. These effects would be analyzed on a site-specific basis. Based on local knowledge and field observation, stream channels within the forest are usually stable and capable of handling the small increases in flow that would be associated with each alternative without causing channel erosion.

Water Use

Water supplies in the southern Appalachians are abundant in the form of year-round rainfall, surface water flowing through streams and groundwater (SAA, 1996). With expanding development and urbanization, there is expected to be an increasing demand on water supplies. The SAA (1996) indicates, however, that water usage in the domestic, industrial and agricultural categories actually declined by 19.6 percent between 1985 and 1990. This was primarily due to a decrease of 26.6 percent in industrial use.

In recognition of the changing status of water demand in the south, the Tennessee enacted Chapter Number 854 of Public Acts, 2000 (Public Acts) that regulates certain water withdrawals from streams and aquifers in Tennessee. This act requires public water suppliers to obtain an Inter-Basin Transfer Permit to transfer water out of a major river basin in Tennessee. The Publics Act applies to surface and some groundwater supplies.

Table 3-9 displays the water use in counties that contain CNF ownership within them. This information was developed in the SAA completed in 1996.

Table 3-9. Water Use of Counties That Contain CNF Ownership (million gallons per day)

County	Commercial	Domestic	Industrial	Agriculture	Total
Carter	0.81	5.53	20.73	0.11	27.18
Cocke	0.91	2.18	0.74	0.35	4.18
Greene	3.31	3.18	0.82	1.11	8.42
Johnson	0.17	1.0	0.47	0.13	1.77
McMinn	0.63	2.13	73.47	0.86	77.09
Monroe	0.57	2.29	0.32	0.36	3.54
Polk	0.15	1.59	29.04	0.15	30.93
Sullivan	1.47	4.52	450.72	0.44	457.15
Unicoi	0.23	1.55	0.35	0.14	2.27

The estimated consumptive withdrawal of water from sources on the CNF would be about 0.34 million gallons per day. Water supply vastly exceeds this use.

Relatively small water yield increases would be expected from the alternatives considered. Any increases in summer low flow, if detectable, would be a benefit to local water users and instream uses. The actions in any of the alternatives would not have an effect on local water supply or aquatic biota.

2.3 Cumulative Effects

To evaluate watershed cumulative effects associated with management alternatives on the CNF, a frame of reference in terms of time and space was needed. For LMP planning, 5th level watersheds are considered the appropriate landscape scale for analysis. While the LMP would have an implementation period of ten to 15 years, the appropriate time scale for cumulative watershed effects analysis is considered to be five 10-year periods (50 years).

Sediment is an appropriate measure to determine the effects of management activities on water quality and respective associated beneficial uses on forested lands (Coats and Miller, 1981). Sediment is the primary factor that would potentially reduce the quality of water derived from forested lands. Sediment increases could adversely affect fish productivity and diversity (Alexander and Hansen, 1986), degrade drinking water and affect recreational values. Other cumulative effects that could result from forest management activities such as changes in water yield and nutrient fluxes in streams are considered to be minor and not an appropriate indicator of cumulative effects at the LMP level.

To evaluate cumulative effect, estimated sediment yields were evaluated for 24 fifth level watersheds. These watersheds range in size from 37,657 to 300,301 acres (modified USGS 5th level hydrologic units). The average watershed size used in this analysis is approximately 113,631 acres.

Table 3-10 displays the percent increase in sediment yield over baseline conditions. Table 3-11 displays the predicted percent increase in sediment yield over the current or existing condition due to activities occurring on Forest Service and private lands within each watershed. Planning periods 1 and 5 are shown in the Tables, as percent increases in sediment yield tend to increase slightly through time, generally reaching their highest levels in period five.

Table 3-10. Estimated Percent Increases in Sediment Yield Above Baseline Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed

Watershed	Hydrologic Unit Code	Current Above Natural	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Period 1									
Upper New	05050001010	1,316	60	60	60	60	60	60	60
Big Laurel	06010102010	2,695	41	40	41	38	40	38	40
Conasauga River	03150101010	1,579	41	40	41	39	40	40	40

Table 3-10. Estimated Percent Increases in Sediment Yield Above Baseline Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed									
Watershed	Hydrologic Unit Code	Current Above Natural	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
South Holston	06010102030	2,182	24	24	26	22	24	24	24
Roan	06010103010	1,598	46	45	46	44	45	45	45
Watauga	06010103020	1,441	46	45	46	45	46	45	46
Elk	06010103030	1,017	48	48	48	47	48	47	47
Doe	06010103040	1,088	37	36	38	34	37	35	37
Stone	06010103050	1,072	23	21	28	17	22	20	22
Lower Watauga	06010103060	4,836	28	28	30	27	27	27	28
French Broad	06010105070	1,464	25	23	27	20	24	21	24
Big Creek	06010105080	461	42	44	47	37	42	42	43
Pigeon	06010106010	1,526	36	36	37	35	35	35	36
North Carolina	06010108010	561	40	40	40	39	40	39	40
North Indian	06010108030	1,698	26	24	29	21	23	21	25
South Indian	06010108031	412	36	35	37	35	36	36	37
Camp	06010108050	3,312	13	12	14	12	13	12	13
Nolichucky	06010108060	4,789	21	21	22	20	21	20	21
Little Tennessee	06010204020	277	29	27	29	26	27	26	28
Tellico	06010204040	861	28	26	28	21	25	22	28
Hiwassee	06020002030	1,402	45	42	47	37	42	40	44
Conasauga Ck.	06020002040	1,845	36	34	36	31	33	32	35
Lower Ocoee	06020003020	953	24	23	25	16	22	20	23
Upper Ocoee	06020003040	3,014	83	83	83	82	83	82	83
Period 5									
Upper New	05050001010	1,316	60	60	60	60	60	60	60
Big Laurel	06010102010	2,695	41	41	43	38	40	39	41
Conasauga River	03150101010	1,579	42	40	42	41	41	42	42
South Holston	06010102030	2,182	26	25	27	22	24	25	26
Roan	06010103010	1,598	46	46	47	44	45	45	46
Watauga	06010103020	1,441	46	46	47	45	46	46	47
Elk	06010103030	1,017	48	50	50	47	48	48	48
Doe	06010103040	1,088	39	39	40	35	37	36	39
Stone	06010103050	1,072	25	23	31	17	22	21	25
Lower Watauga	06010103060	4,836	29	30	31	27	28	28	30

Table 3-10. Estimated Percent Increases in Sediment Yield Above Baseline Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed

Watershed	Hydrologic Unit Code	Current Above Natural	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
French Broad	06010105070	1,464	27	24	31	21	24	22	28
Big Creek	06010105080	461	47	49	50	37	42	46	47
Pigeon	06010106010	1,526	36	36	38	35	35	35	36
North Carolina	06010108010	561	40	40	41	39	40	39	41
North Indian	06010108030	1,698	27	26	32	22	24	22	29
South Indian	06010108031	412	37	36	38	35	36	36	38
Camp	06010108050	3,312	14	13	16	12	13	12	14
Nolichucky	06010108060	4,789	21	22	22	20	21	20	22
Little Tennessee	06010204020	277	30	28	31	27	27	26	31
Tellico	06010204040	861	30	28	31	21	25	23	30
Hiwassee	06020002030	1,402	48	45	50	38	42	43	47
Conasauga Ck.	06020002040	1,845	37	36	38	31	33	33	37
Lower Ocoee	06020003020	953	29	28	30	19	22	24	30
Upper Ocoee	06020003040	3,014	83	83	83	82	83	82	83

Table 3-11. Estimated Percent Increases in Sediment Yield Above Current Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed

Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Period 1								
Upper New	05050001010	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Big Laurel	06010102010	1.5	1.5	1.5	1.4	1.5	1.4	1.5
Conasauga River	03150101010	2.6	2.6	2.6	2.5	2.6	2.6	2.6
South Holston	06010102030	1.1	1.1	1.2	1.0	1.1	1.1	1.1
Roan	06010103010	2.9	2.8	2.9	2.8	2.8	2.8	2.8
Watauga	06010103020	3.2	3.2	3.2	3.1	3.2	3.2	3.2
Elk	06010103030	4.7	4.7	4.8	4.6	4.7	4.6	4.7
Doe	06010103040	3.4	3.3	3.5	3.2	3.4	3.2	3.4
Stone	06010103050	2.1	2.0	2.6	1.6	2.1	1.8	2.1
Lower Watauga	06010103060	0.6	0.6	0.6	0.6	0.6	0.6	0.6
French Broad	06010105070	1.7	1.6	1.9	1.4	1.6	1.4	1.7
Big Creek	06010105080	9.2	9.5	10.3	8.0	9.1	9.1	9.3
Pigeon	06010106010	2.3	2.3	2.4	2.3	2.3	2.3	2.3
North	06010108010	7.0	7.1	7.2	7.0	7.1	6.9	7.1

Table 3-11. Estimated Percent Increases in Sediment Yield Above Current Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed								
Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Carolina								
North Indian	06010108030	1.5	1.4	1.7	1.2	1.4	1.2	1.5
South Indian	06010108031	8.7	8.6	9.1	8.5	8.8	8.6	8.9
Camp	06010108050	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Nolichucky	06010108060	0.4	0.4	0.5	0.4	0.4	0.4	0.4
Little Tennessee	06010204020	10.5	9.9	10.5	9.3	9.6	9.2	10.3
Tellico	06010204040	3.3	3.0	3.3	2.4	2.9	2.6	3.2
Hiwassee	06020002030	3.2	3.0	3.3	2.7	3.0	2.9	3.1
Conasauga Ck.	06020002040	1.9	1.8	2.0	1.7	1.8	1.8	1.9
Lower Ocoee	06020003020	2.5	2.4	2.6	1.7	2.3	2.1	2.4
Upper Ocoee	06020003040	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Period 5								
Upper New	05050001010	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Big Laurel	06010102010	1.5	1.5	1.6	1.4	1.5	1.4	1.5
Conasauga River	03150101010	2.7	2.6	2.7	2.6	2.6	2.7	2.7
South Holston	06010102030	1.2	1.2	1.3	1.0	1.2	1.1	1.2
Roan	06010103010	2.9	2.9	3.0	2.8	2.8	2.8	2.9
Watauga	06010103020	3.2	3.2	3.3	3.1	3.2	3.2	3.2
Elk	06010103030	4.8	4.9	4.9	4.6	4.7	4.7	4.8
Doe	06010103040	3.6	3.6	3.7	3.2	3.4	3.3	3.6
Stone	06010103050	2.3	2.2	2.9	1.6	2.1	2.0	2.4
Lower Watauga	06010103060	0.6	0.6	0.7	0.6	0.6	0.6	0.6
French Broad	06010105070	1.9	1.6	2.1	1.4	1.7	1.5	1.9
Big Creek	06010105080	10.3	10.6	10.9	8.0	9.2	10.1	10.3
Pigeon	06010106010	2.4	2.4	2.5	2.3	2.3	2.3	2.4
North Carolina	06010108010	7.1	7.1	7.3	7.0	7.1	6.9	7.2
North Indian	06010108030	1.6	1.5	1.9	1.3	1.4	1.3	1.7
South Indian	06010108031	9.0	8.8	9.3	8.6	8.8	8.9	9.2
Camp	06010108050	0.4	0.4	0.5	0.4	0.4	0.4	0.4
Nolichucky	06010108060	0.4	0.5	0.5	0.4	0.4	0.4	0.5
Little Tennessee	06010204020	10.7	10.2	11.2	9.9	9.7	9.4	11.2
Tellico	06010204040	3.5	3.3	3.7	2.4	2.9	2.7	3.5
Hiwassee	06020002030	3.4	3.2	3.6	2.7	3.0	3.0	3.4
Conasauga Ck.	06020002040	2.0	2.0	2.1	1.7	1.8	1.8	2.0
Lower Ocoee	06020003020	3.1	2.9	3.2	2.0	2.3	2.6	3.2

Table 3-11. Estimated Percent Increases in Sediment Yield Above Current Condition Due to Land Uses on Public and Private Lands Within Each 5th Level Watershed								
Watershed	Hydrologic Unit Code	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Upper Ocoee	06020003040	2.8	2.8	2.8	2.7	2.7	2.7	2.8

Watershed Health Index

A watershed health index was developed as a measure of the condition of each 5th level watershed with respect to current and future sediment load increases (Clingenpeel, 2002). The health index relates sediment loads in watersheds to the relative abundace of locally adopted aquatic species (See Aquatic Habitats, page 196). The reference point for the index is the estimated current, average annual sediment yield in 5th level watersheds expressed as a percent above a baseline condition (Table 3-10). Table 3-10 also displays future estimates of sediment yield expressed as a percent increase above baseline condition for each alternative. The current and future estimates include sediment yields from private and public lands.

Watersheds whose current sediment condition have the highest percent increases above a baseline condition generally contain a small percentage of NFS ownership and contain a large amount of urban, agricultural and other non forest land uses on private land. The Nolichucky, Upper Ocoee and Lower Watauga watersheds are examples of this condition. Forest Service activities would potentially result in minor sediment yield increases as determined by comparison of Table 3-7 and Table 3-8 with Table 3-10 and Table 3-11. With implementation of the Riparian Prescription (which is imbedded in all prescriptions and Forestwide direction, cumulative effects to water quality from land disturbing activities would be insignificant in all alternatives).

3.0 Riparian, Wetlands, and Floodplains

3.1 Affected Environment

Riparian areas include the water body, and the transition area between aquatic systems and upland terrestrial systems. All wetlands (including beaver ponds), as well as margins of varying widths along streams, rivers, lakes, ponds, and reservoirs, are contained within the riparian area. The 100-year floodplain associated with streams and rivers is often within or analogous to the riparian area.

An estimated 6,500 miles of perennial and intermittent streams exist on CNF lands. In addition, there are approximately 16,000 acres of lakes and reservoirs. The riparian corridor associated with streams, lakes and other water bodies is estimated to be about 126,000 acres. Riparian corridor acreage is not necessarily the same as actual riparian area acreage. The riparian corridor is a fixed width area for management purposes. True riparian area acreage on the forest is believed to be somewhat less than the acreage associated with riparian corridors, but this assumption has not been validated. Most first order streams on the forest are ephemeral, while second order streams are generally intermittent. Third order and higher streams are generally perennial. Stream orders are based on the Strahler method of categorization by ordering all streams on 1:24,000 topographic maps

from the watershed divide to valley bottom. Streams are generally located in steep, narrow mountain valleys with relatively narrow floodplains. Most streams are small, high gradient, riffle/pool systems. Forest streams comprise the headwater areas of several large rivers that originate or flow through the forest. These include the Conasauga, Ocoee, Hiwassee, Tellico, Little Tennessee, Pigeon, French Broad, Nolichucky, Watauga and South Fork Holston Rivers.

Extensive wetland areas do not exist on the forest. Approximately 290 acres of wetland have been inventoried. Not included in this total, are riverine and palustrine wetland areas that are associated with river and stream beds, and palustrine and lacustrine areas associated with lake and reservoir beds. The presence of additional wetland areas in riparian zones along rivers and streams and associated with springs and seeps is likely.

Prior to becoming lands of the CNF, many cove sites and most of the larger floodplain areas associated with streams and rivers were logged, farmed, and grazed. Tramlines for logging and early access roads were often built in riparian areas due to the relative ease of construction at these locations. Besides the obvious changes to riparian vegetation that resulted from these actions, other possible effects included compaction of riparian soils, accelerated erosion/sediment delivery to streams and rivers, and channel instability.

As lands were acquired and became part of the CNF, a new forest began to mature in riparian, as well as, upland areas. Today, riparian areas are generally in a mid to late successional stage of forest development. Most disturbances in these areas are the result of access roads, trails, and dispersed and developed recreation area development. Natural disturbance also results from floods, wind, ice, and insect and disease damage. The elimination of American by the chestnut blight (Endothia parasitica) from the forest landscape in the early 20th century has affected the quality of woody debris provided to streams. The size and resistance of the tree to rot provided long lasting woody debris and stability to stream systems. Future input of woody debris to streams could potentially be affected by forest pests such as hemlock woolly adelgid (HWA) and gypsy moth (GM). Southern pine beetle has recently affected thousands of acres of southern yellow pine and white pine, some of which, is located in riparian areas.

Healthy and properly functioning riparian areas, wetlands, and floodplains are physically and biologically diverse and highly productive environments. These land-water interfaces are generally very dynamic and support complex associations of plant and animal communities. Riparian areas maintain or improve water quality, moderate impacts of flooding, and provide continuous ground water recharge areas. The areas are also attractive for their diverse scenery and recreation potential.

A proper functioning condition assessment has not been completed on forest riparian areas. Most of the areas are believed to be functioning at or near their proper capability and potential. Where roads and concentrated recreation (dispersed and developed) exist in riparian areas, proper functioning condition could be at-risk or non-functioning. Sufficient quantities of large woody debris, for example, may be

absent in some streams due to these facilities and/or past land use practices and natural disturbance.

3.2 Direct/Indirect Effects

Under all alternatives, riparian corridors would be managed under the riparian prescription. The prescription defines these corridors by setting minimum widths of 100 feet on either side of perennial streams and 50 feet on either side of intermittent streams, but also indicates that the corridors would be expanded to include all of the true riparian area. A 100 foot corridor width for perennial streams is generally recognized in the literature as an appropriate zone to maintain proper riparian function and protection. The management goal for riparian corridors would be to maintain or enhance the structural and functional integrity of riparian areas and associated aquatic and upland systems.

To provide for riparian integrity, management standards would be included in the riparian prescription. Management standards would include provisions to provide desirable levels of woody debris, and control impacts from vegetation management, recreational uses, mineral development, and fireline construction. Vegetation management would be limited to that needed to maintain or improve riparian function. Zones around channeled ephemeral streams would also be recognized as special areas, with standards designed to ensure protection of channels and their function as part of the riparian network.

Fire Management

Prescribed fire would potentially occur within riparian corridors, most often as low intensity backing fires. Because of low intensity, the fires would not be expected to substantially alter riparian conditions. Firelines needed in riparian corridors would normally be built with hand tools. The use of mechanized equipment would be minimized. Forestwide and riparian prescription direction required for all alternatives would minimize fire-related effects in riparian areas.

Vegetation Management

Minimal vegetation management is expected to occur in riparian areas. Implementation of the riparian prescription under all alternatives is expected to increase the acreage of riparian area that is in late-successional forest. Increases in older forests would result in increases in abundance of snags and downed wood and large woody debris input to streams.

Any timber harvest or other vegetative management treatments that occurs in riparian areas would be guided by forestwide and riparian prescription direction. Significant ground disturbance would not result from any vegetative treatments that would be completed. As a result, soil productivity and water quality would be minimally affected by any vegetative management actions that would occur in riparian areas.

Transportation System Management

The need for new road construction would be minimal for any alternative. Any road construction that would potentially be required in riparian areas would be limited to crossings that enter and leave the areas in as close to a perpendicular manner as possible. Encroachment by new roads along stream channels and in floodplains would be minimal. Very little effect to riparian, floodplain and wetland areas would result from new road construction.

Each alternative would examine opportunities to improve, relocate or decommission roads located in riparian areas, as appropriate and feasible. Improvement would focus on reducing sediment delivery to streams and addressing any aquatic organism passage concerns. To the extent these activities would be needed and completed, the proper functioning condition of riparian areas would be improved.

Recreation Management

Most of the existing developed recreation and dispersed camping sites on the forest are located in or near riparian areas. This type of concentrated human use results in damaged vegetation, soil erosion and compaction including damage to stream banks and minor channel alterations (rock dams). Sediment delivery to nearby aquatic systems would potentially be an effect as would water pollution from human or animal waste, dishwashing, and trash accumulation. Generally, the effects would be localized and would be reduced by using strategies to avoid riparian areas whenever possible, using appropriate mitigation measures and educating forest visitors about ways to protect soil and water resources.

Any new trail or recreation facility development and use would potentially result in localized effects to riparian areas such as vegetation removal, soil compaction and erosion. Forestwide and riparian prescription direction limits new recreation facility and trail development in these areas, however, and requires mitigation to minimize these effects.

Effects to the riparian resource are not expected to vary significantly by any alternative. Alternative A and E emphasize providing increased recreation opportunities, and could potentially result in more trail and facility development in these areas. Opportunities to improve existing developed and dispersed recreation facilities to achieve a proper riparian functioning condition would be examined and implemented as necessary and possible.

3.3 Cumulative Effects

Cumulatively, networks of riparian corridors across the national forest landscape are fragmented by mixed ownerships and land use conversion on private land. This condition would be expected to persist across all alternatives. On NFS lands, riparian areas would move toward a late successional or mature forest condition. Table 3-12 indicates the percentage of riparian area within each 5th level watershed that is in a forested condition. Table 3-12 displays a coarse indication of the relative health of riparian areas at the watershed scale.

Table 3-12. Percent Forested Riparian Area (1990) by 5th Level Watershed

5th Level Watershed Name	Percent Forested Riparian
Upper New River	79.5
Big Laurel	72.8
Conasauga River	81.3
South Holston River	55.9
Roan Creek	77.8
Watauga River	75.8
Elk River	88.0
Doe River	89.5
Stone Creek	86.4
Lower Watauga River	70.8
French Broad River	75.2
Big Creek	95.2
Pigeon River	81.9
North Carolina Streams	92.6
North Indian Creek	75.8
South Indian Creek	96.3
Camp Creek	56.6
Nolichucky River	55.0
Little Tennessee River	81.0
Tellico River	84.3
Hiwassee River	78.3
Conasauga Creek	70.9
Lower Ocoee River	81.5
Upper Ocoee River	86.5

On NFS lands, riparian areas would be close to 100 percent forested with the exception of roads and recreation developments. Expected trends for riparian areas on NFS land—moving toward mature forest—would contribute to sustaining healthy riparian condition on the landscape.

4.0 Air Resources

4.1 Affected Environment

The CNF contains portions of two Class I Wildernesses; the Cohutta Wilderness and Joyce Kilmer-Slickrock Wilderness. These wildernesses are afforded special protection under the Clean Air Act (CAA). The CAA requires federal land managers to identify Air Quality Related Values (AQRV), or resources important to the areas that might be affected by air pollution. For Cohutta and Joyce Kilmer-Slickrock Wilderness these include visibility, water quality and vegetation. The GSMNP (administered by the Department of Interior) is another Class I area located between the south and north end districts of the CNF. The term AQRV will apply to any resources within the national forest boundary that might be affected by air pollution. A more detailed

explination of air quality and the impacts to the AQRV can be found in Appendix G, Air Resource.

Through a series of legislative and regulatory requirements, federal land management agencies have the unique responsibility to not only protect the air, land, and water resources under their respective authorities from degradation associated with the impacts of air pollution emitted outside the borders of NFS lands (CAA, 1990), but to protect those same resources from the impacts of air pollutants produced within those borders (CAA, 1990, Organic Act, 1977, Wilderness Act, 1997). Activities from within the forest such as prescribed burning, road construction/maintenance, recreational use, and timber harvesting all have an impact on the air quality of the forest. It is the responsibility of federal land managers to minimize the impact of these activities on the forest's AQRV, as well as the forest's contribution to air pollution. It is important for federal land managers to understand the impacts of pollution sources from activities within the national forest, and to be familiar with the impacts from pollution sources outside the national forest boundary.

The CNF is found in an area of the U.S.A with an increasing population and with an increasing demand for the combustion of fossil fuels to produce energy for electricity and transportation (SAMI, 2002). The forest is within a day's drive of a large percentage of the United State's population. Within 120 miles there are 36 urban areas and numerous towns near the CNF. Four major cities, Nashville, Birmingham, Atlanta, and Charlotte are among the urban areas about 120 miles from the forest.

The urban areas are where the largest number of vehicle miles is traveled, where many coal-fired power plants are located near to supply electricity, and where industrial facilities (such as the Tennessee Eastman Company near Kingsport, Tennessee) are located to manufacture goods (Figure 3-2). Within 120 miles of the forest, about 35 percent of the nitrogen oxide emissions are released from coal-fired power plants (especially during hot summer days when electricity is needed to cool homes and businesses) and about 34 percent of the nitrogen oxides released come from highway vehicles. Nitrogen oxides are an important contributor to the formation of ground-level ozone on hot sunny days (Chameides and Cowling, 1995). Current ozone concentrations near the forest are at levels that exceed the new ozone National Ambient Air Quality Standards (NAAQS), which means ozone levels on many areas of the forest are most likely to be unhealthy for people (Figure 3-3). Also, ozone exposures are likely to be causing growth reductions to sensitive species on the forest, and may be causing the ozone sensitive species to be less abundant in the forest (SAMI, 2002). Currently, there are laws rules and regulations in place that will reduce nitrogen oxide emissions by 60 percent in 2040 (in comparison to 1990 emission) within 120 miles of the forest (Figure 3-4). The reductions in nitrogen oxides are most likely to reduce the highest concentrations of ozone, which may result in ozone having only minimal effects on growth by the year 2040. Further nitrogen oxide reductions are also anticipated as State and local air pollution control agencies seek ways to attain the new ozone standard in urban areas like Johnson City, Kingsport, and Bristol; Chattanooga; and Knoxville. The further reductions in

nitrogen oxides will have a large benefit for the health of people visiting or living within the forest, as well as the vegetation.

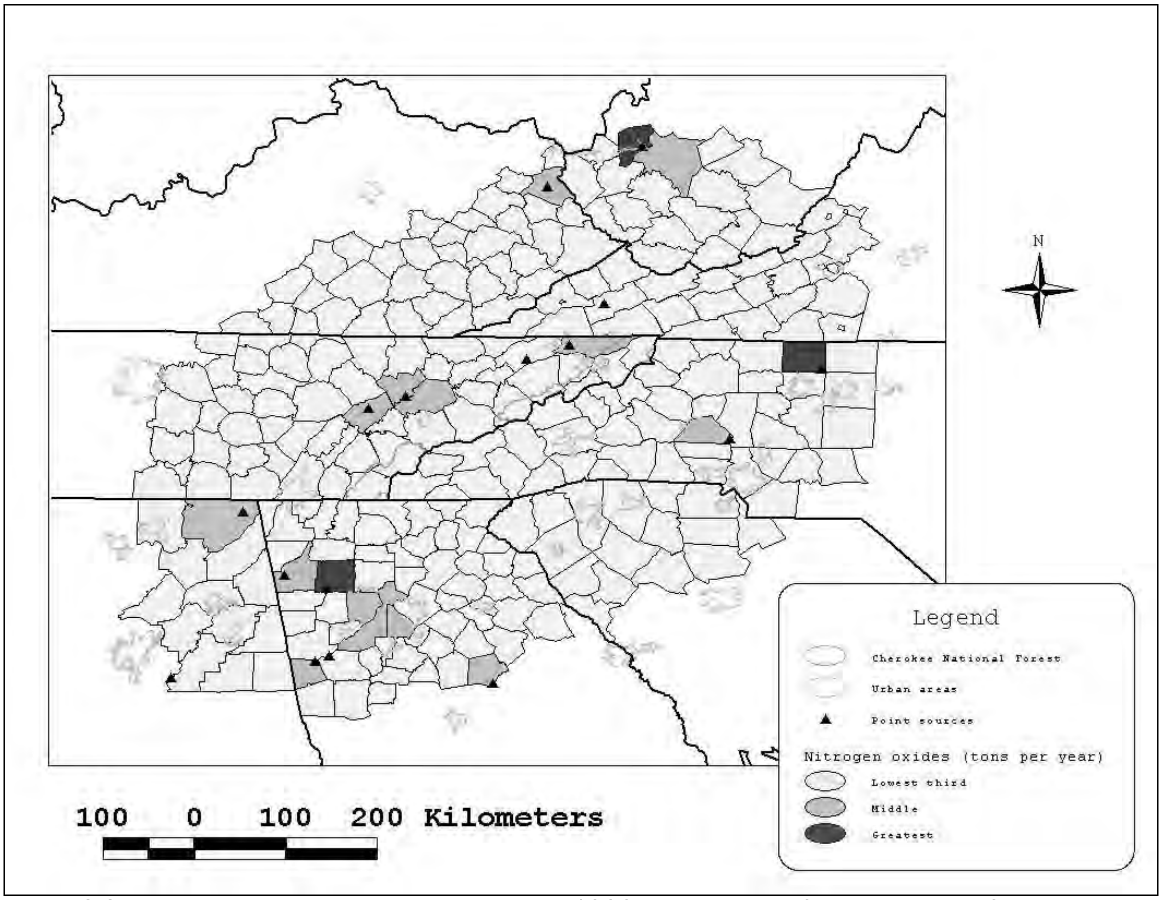


Figure 3-2. Total nitrogen oxide emission (tons) in 1990 and location of point sources of nitrogen oxides greater than or equal to 10,000 tons per year (SAMI, 2002).

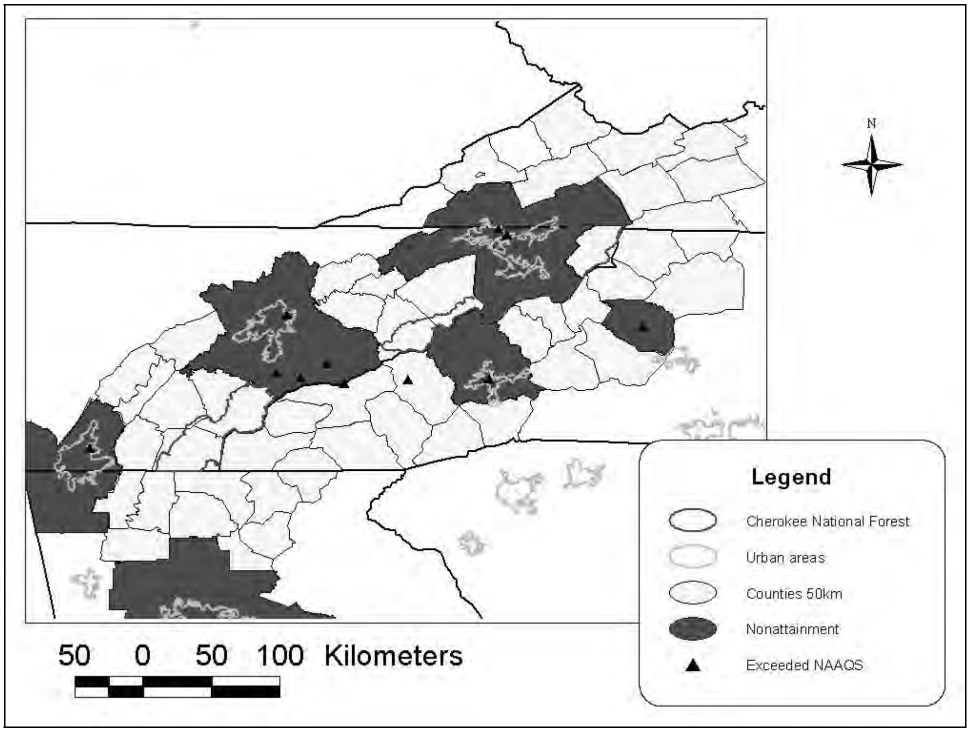


Figure 3-3. Area that could possibly be designated nonattainment for the 8-hour ozone standard based upon using 1998 through 2000 data.

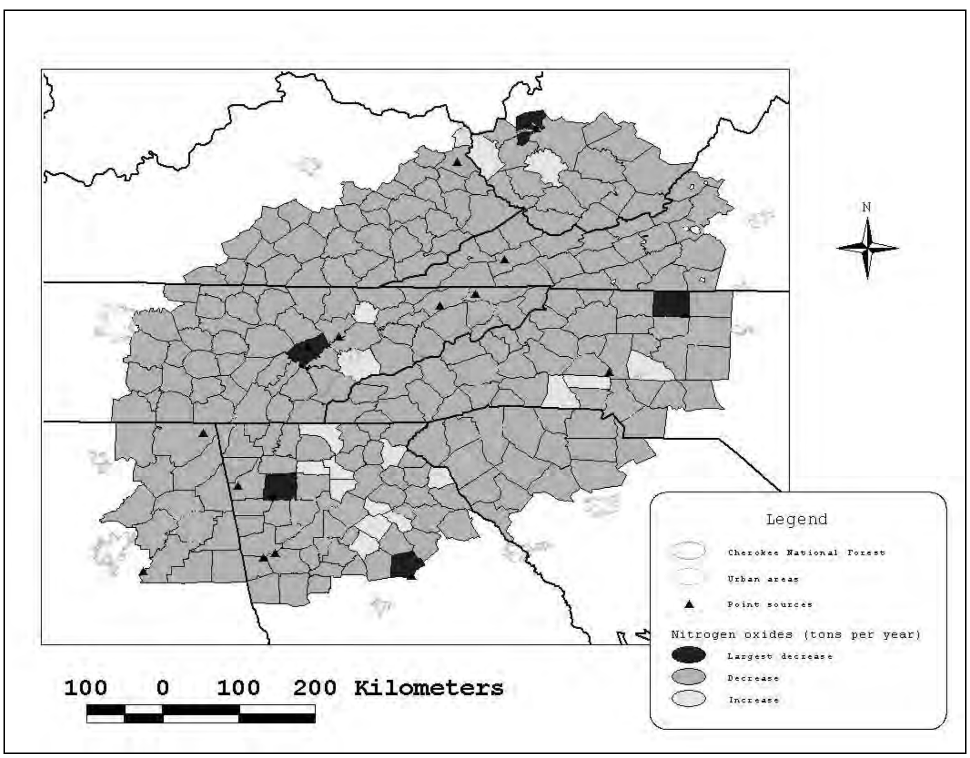


Figure 3-4. Changes in total nitrogen oxide emission (tons) in 2040 and location of point sources of nitrogen oxides greater than or equal to 10,000 tons in 1990 (SAMI, 2002).

Acid compounds in clouds, fog, rain, and haze (dry deposition) are having an adverse impact to visibility, and the ability of the soils and streams to buffer acid inputs (called acid neutralizing capacity, or ANC). Sulfur compounds, or sulfates, are the primary secondary compound causing these impacts and originally began as sulfur dioxide emissions. Seventy-eight percent of the sulfur dioxide emissions within 120 miles of the forest are released from coal-fired power plants. The power plants in Georgia and Alabama are most likely to be influencing the acidity and sulfate concentration in the rainfall on the south end Districts; while TVA is most likely to have the greatest contribution to sulfates in rainfall on the north end districts (SAMI, 2002). Sulfur dioxide emissions are expected to decrease by 61 percent, or more, from sources within 120 miles of the forest by the year 2040. However, continued decreases in stream ANC is expected for many high elevation headwater streams (Figure 3-5) because the soils have been retaining sulfates for many decades. As the sulfates are released into soil water solution then an equivalent amount of base cations, such as calcium, will be removed from the soils. Eventually the stream's ANC may fall below a value of 50 microequivalents per liter, a value which may indicate potential adverse impacts to the aquatic biota.

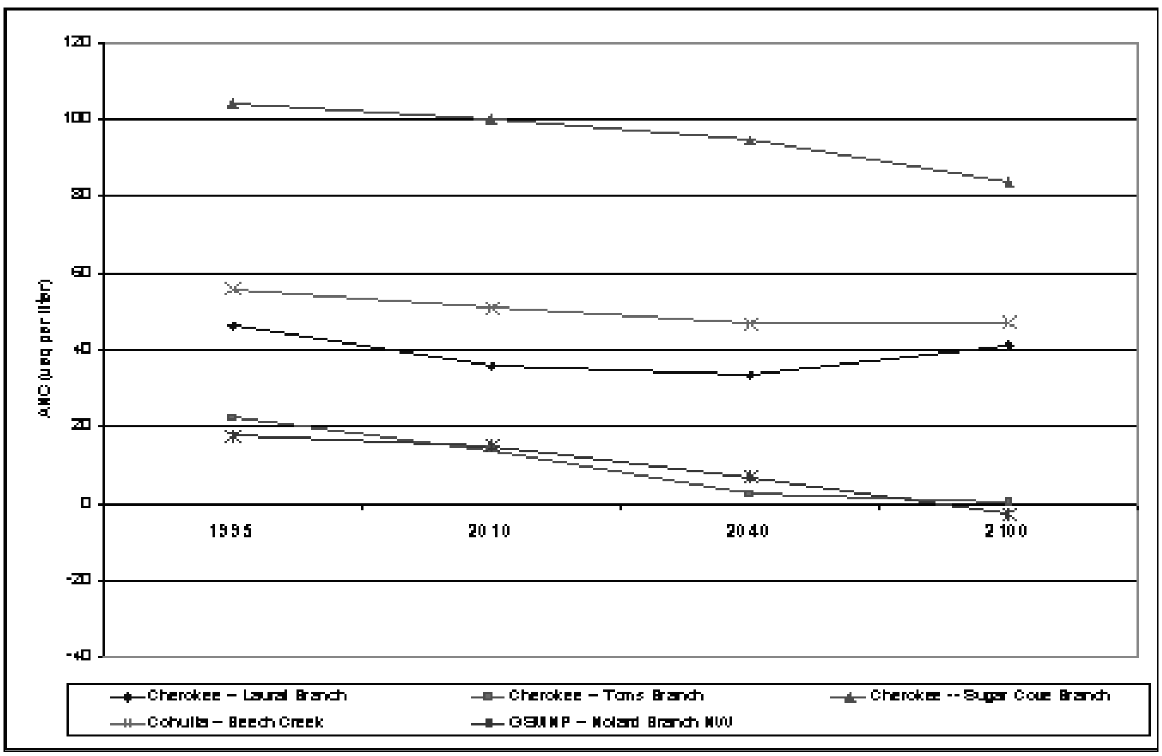


Figure 3-5. Predicted trend acid neutralizing capacity (ANC) with implementation of current laws, rules, and regulations (SAMI, 2002).

The regional haze and reduced visibility observed in the mountains is caused mostly by air pollution, primarily sulfates that originated from coal-fired power plants. The beautiful mountain scenery is one of the main reasons tourists visit the CNF and other areas in Appalachia (Appalachian Regional Commission, 1970). During the last four decades, the eastern U.S.A has seen a significant, regional reduction in visibility (IMPROVE, 2001). The estimated natural background visibility for the

eastern U.S.A is 93±28 miles (NAAP, 1991). However, there has been a significant reduction in how far a person can see distant views, as well as how clearly a person can see the mountains. Secondary fine particles ($PM_{2.5}$) are primarily responsible for the visibility impairment. Secondary fine particles are formed when combustion gases are chemically transformed into particles. In the eastern U.S.A it is sulfate particles (transformed sulfur dioxide) from coal-fired power plants that comprise most of the measured fine particle mass (IMPROVE, 2001).

On the days (with a relative humidity of 80 percent) classified as having the lowest fine particle mass (3.9ug/m3) the estimated visibility is 60 miles, but on the highest mass (20.65ug/m3) days the visibility is reduced significantly to 16 miles (Figure 3-6). Relative humidity levels play an important role in determining visibility, certain air pollutants (e.g. sulfate molecules) physically grow in size with increasing relative humidity. The days with the poorest visibility are most likely to occur starting in May and continue through September (Air Resource Specialists, 1995) during the time when most people are visiting the forest. Throughout the year, people are most likely to see a uniform haze – like a white or gray veil – obscure the beautiful mountains (Air Resource Specialists, 1995). Sulfates are the most important fine particles contributing to visibility impairment. On the low mass days they comprise 53 percent of the total mass while on the highest mass days the sulfates are 68 percent of the total. Seventy-eight percent of the sulfur dioxide emissions within 120 miles of the forest are released from coal-fired power plants. On hot-sunny days when there is an atmospheric stagnation then it is the TVA emissions of sulfur dioxide that are most likely to be causing most of the visibility impairment on the forest (SAMI, 2002). Organics (released primarily from vegetation as volatile organic compounds) are the second most important fine particles measured and if organics were to most abundant then there would be a bluish cast to the mountains – hence the name Blue Ridge Mountains.

Figure 3-6. Visual representation at Joyce Kilmer-Slickrock Wilderness using the 1988 through 1995 IMPROVE data. The image on the left shows visibility on a low fine particle mass day (90 miles), while the image on the right shows a high fine particle mass day (16 miles). Relative humidity was set at 80 percent when using the WinHaze model.

Sulfur dioxide is expected to decrease by at least 61 percent by the year 2040 in the counties within 120 miles of the CNF. Further reductions by coal-fired power plants in North Carolina (especially if the facility in Asheville puts on controls) and the TVA are likely to contribute to further reductions then what Southern Appalachian Mountains Inititatives (SAMI) (2002) estimated for the year 2040. SAMI did estimate what visibility may be like between the 1991 through 1995 average and the year 2040. For Joyce Kilmer-Slickrock Wilderness the annual average visibility was estimated to be 23.4 miles, but with the current laws, rules and regulations in place the average is expected to improve to 28.5 miles. Summertime visibility is worst with an average of 13.8 miles. The SAMI (2002) estimates for summertime visibility are expected to improve by the year 2040 to 21.1 miles. Similar patterns are also expected for Cohutta Wilderness. The annual average visibility estimate based upon the SAMI (2002) analysis is 19.5 miles and it is predicted to improve to 24.5 miles by the year 2040. Summertime visibility at Cohutta Wilderness was estimated to be 15.7 miles and visibility is expected to improve to 24.3 miles.

The fine particles that cause visibility impairment are also of concern because high concentration can be unhealthy for people since they are primarily associated with the aggravation of respiratory conditions, such as asthma. Fine particles are closely associated with increased hospital admissions and emergency room visits for heart and lung disease, increased respiratory disease and symptoms such as asthma, decreased lung function, and even premature death. Sensitive groups are at greater risk and include the elderly; individuals with cardiopulmonary disease, such as

asthma; and children. For this reason, fine particle levels are monitored, and the Environmental Protection Agency (EPA) has established NAAQS for fine particles, also called $PM_{2.5}$. Table 3-13 presents results for monitors near the CNF and these results indicates the annual average $PM_{2.5}$ is the NAAQS most likely to be violated in the future. The 24-hour average (please note the maximum values are presented and not the 98th percentile) NAAQS is unlikely to be exceeded when the data from the closest monitoring sites to the forest are averaged for three years. The fine particles measured in the atmosphere area combination of both primary (such as released from prescribed fires) and secondary (such as the transformation of sulfur dioxide to sulfates) fine particles. Near urban areas the types of compounds comprising most of the fine particles are likely to be sulfates and organics that are released from vegetation and vehicles.

Table 3-13. Monitoring results for particulate matter 2.5 microns ($PM_{2.5}$) and smaller in size for the year 1999 through 2001*.

Location (County)	1999 Maximum 24-hour (ug/m^3)	1999 Annual Average (ug/m^3)	2000 Maximum 24-hour (ug/m^3)	2000 Annual Average (ug/m^3)	2001 Maximum 24-hour (ug/m^3)	2001 Annual Average (ug/m^3)
Blount	41.3	17.42	25.3	13.49	No data	No data
Blount	No data	No data	48.7	18.14	40.9	15.14
Knox	38.2	19.49	52.3	18.59	45.1	17.14
Knox	72.7	21.82	69.6	20.61	46.7	18.42
Knox	29.0	17.26	52.9	17.92	86.5	18.51
McMinn	No data	No data	50.4	18.87	43.1	16.81
Sullivan	53.2	18.2	56.2	17.55	45.1	16.66

* The National Ambient Air Quality Standard is violated if the average of 3-years of annual means is 15 ug/m^3 or greater (multiple community oriented monitors can be averaged together), or the 3-year average of the 24-hour concentration for the 98th percentile (using the maximum population oriented monitor in an area) is the 65 ug/m^3 or greater.

The Johnson City-Kingsport-Bristol metropolitan statistical area (Sullivan County) includes a large portion of the north end districts and there is a high likelihood this area will be designated as nonattainment for the fine particle (and ozone) NAAQS. The EPA will have the decision if any other portions of the forest will also be designated as nonattainment for fine particles or ozone. It is of particular importance for fire managers to mitigate prescribed fire emissions, to the greatest extent practical, during those days characterized by existing or predicted high ambient air pollution. The $PM_{2.5}$ standard may require fire managers to be even more vigilant to protect the health and welfare of citizens on and off forest lands from the effects of particulate matter emissions associated with prescribed fire.

Once an area is designated nonattainment, a State Implementation Plan is developed in attempt to bring the area back into attainment of the standard. This usually involves placing controls on various sources that contribute to the pollutant of concern in order to lessen or minimize their emissions. The forest will need to interact with the Tennessee Department of the Environment and Conservation - Air

Pollution Control Division to ensure that Forest prescribed fire emissions (and perhaps other Forest activities) are considered in the State Implementation Plan development, since 70 percent of the emissions from prescribed fires are fine particles, and nitrogen oxides and volatile organic compounds are also released.

4.2 Direct/Indirect/Cumulative Effects

Land management and recreational activities conducted on the forest would potentially contribute to air quality degradation in combination with other air pollution emissions in the region. Most of the emission activities (such as highway vehicle use) from Forest Service activities are already accounted for in emissions inventories. However, the single most important Forest Service management activity that would deviate from the emissions inventory would be for prescribed fires. Therefore, this analysis will be limited to evaluating how county level total emissions of fine particles would change with the alternatives.

The Southern Appalachian Mountain Initiatives database was used to estimate primary fine particulate matter ($PM_{2.5}$) emissions (SAMI, 2002) for the nine counties that intersect the forest. Total fine particulate matter emissions in the year 1990 were estimated to be 11,928.5 tons and by the year 2040 the emissions would potentially be predicted to increase to 14,334.4 tons. The agriculture and forestry sector was estimated to have 907.3 tons of fine particles in 1990 and 1,607.9 tons by the year 2040. It should be noted that it can not be determined how much of the agriculture and forestry total would potentially be from Forest Service prescribed fires.

Table 3-14 lists the estimated emissions of fine particulates for each of the Alternatives and the emissions would potentially be directly related to the number of acres to receive prescribe fire treatment each year. Alternatives F (current), A, B, D, E, and G would potentially be all below the 1990 totals obtained from the SAMI database, while Alternative I (as well as the other alternatives) would potentially be below the 2040 levels predicted by SAMI. Most likely though, the SAMI emission inventory for fine particulates emissions has not anticipated all of the emissions for any of the Forest Service alternatives. Therefore, it is critical for the forest to work with the Tennessee Department of Environmental Control – Air Pollution Control Division and others to include Forest Service emissions in future emissions inventories.

Table 3-14. Estimated fine particulate emissions for each of the Alternatives using EPA emission factors (U. S. EPA, 1996).

Alternative	Acres	Fuel Consumed (tons per acre)	$PM_{2.5}$ (pounds per ton of fuel consumed)	$PM_{2.5}$ Emissions (tons)
A	16,000	4	28	896
B	16,000	4	28	896
D	16,000	4	28	896
E	16,000	4	28	896
G	10,000	4	28	560
I	20,000	4	28	1,120

Table 3-14. Estimated fine particulate emissions for each of the Alternatives using EPA emission factors (U. S. EPA, 1996).				
Alternative	Acres	Fuel Consumed (tons per acre)	$PM_{2.5}$ (pounds per ton of fuel consumed)	$PM_{2.5}$ Emissions (tons)
F-current	16,000	4	28	896

Sulfates are the primary fine particles measured at remote monitoring sites near the Class I areas (SAMI, 2002). Currently, the emissions from prescribed fires would not be expected to be a large contributor to the total fine particulate matter mass and consequently to exceeding the fine particle National Ambient Air Quality Standard (NAAQS). However, the forest would be expected to follow conformity determination rules and disclose any prescribe fire activities in nonattainment areas. Most likely, this would include any prescribe burn projects in the following counties: Sullivan, Charter, Washington, and Unicoi.

5.0 MINERALS

5.1 Affected Environment

The U.S.A holds title to approximately 89 percent of the minerals beneath the CNF. The 11 percent the forest doesn't own are identified as Reserved or Outstanding mineral rights. Reserved minerals rights are property rights that were established at the time the Forest Service acquired the surface estate when the mineral estate was severed from the surface estate. Outstanding mineral rights are property rights that were established and separated from the surface estate prior to the Forest Service's acquisition of the surface estate. The Bureau of Land Management (BLM) manages the mineral estate where the U.S.A holds title and the Forest Service administers the surface estate. There are no mineral activities occurring on the CNF.

There are 639,755 acres on the CNF. The Federal mineral ownership is 568,005. This acreage falls within five categories for mineral leasing purposes. The first category consists of lands that are not available for lease. These lands have either been withdrawn from mineral entry administratively, by law or the forest has determined that a prescription goal cannot be accomplished if the lands were open to mineral entry. 5.6 percent of the forest falls within this category. The second category allows only oil and gas leasing only with a No Surface Occupancy (NSO) stipulation. 3.7 percent of the forest falls within this category. The third category allows solid minerals leasing with a NSO stipulation. 5.5 percent of the forest falls within this category. The fourth category allows mineral leasing with a NSO or a Controlled Surface Use (CSU) stipulation. 7.1 percent of the forest currently falls within this category. The final category allows leasing with standard lease stipulations. A majority of the lands on the forest, 78.1 percent, fall within this category. The above listed information identified as Alternative F and is located in the following table (Table 3-15):

Table 3-15. Percentage of CNF Affected by Each Alternative					
Alternative	No Leasing	Oil & Gas Leasing with NSO	Leasing Allowed with NSO	Leasing Allowed with NSO/CSU	Leasing Allowed with Standard Stipulations
A	11.1	5.6	11.0	40.0	32.3
B	11.2	5.9	6.9	49.1	26.9
D	11.2	5.7	0.1	30.7	52.4
E	11.2	5.2	7.9	36.0	39.7
F	5.6	3.7	5.5	7.1	78.1
G	11.2	4.8	11.6	30.5	41.9
I	11.1	5.6	3.5	35.4	44.4

5.2 Direct/Indirect Effects

The determination of effects for each alternative would be measured by the percentage of the forest available for Federal leasing under each alternative.

Alternative A: Under this alternative 11.1 percent of the forest would potentially not be available for lease, 5.6 percent would potentially only be available for oil and gas leasing with a NSO stipulation, 11.0 percent would potentially be available for solid mineral leasing with a NSO stipulation, 40.0 percent would potentially be available for lease with NSO and/or CSU lease stipulations and 32.3 percent of the forest would potentially be open for leasing with standard lease stipulations.

Alternative B: With this alternative 11.2 percent of the CNF would potentially be withdrawn from leasing, 5.9 percent of the forest is available for oil and gas leasing with a NSO stipulation, 6.9 percent of the forest would potentially be available for solid mineral leasing with a NSO stipulation, 49.1 percent of the forest would be available for leasing with either a NSO or a CSU lease stipulation, and 26.9 percent of the forest would potentially be available for leasing with standard lease stipulations.

Alternative D: In this alternative 11.2 percent of the CNF will not be available for lease, 5.7 percent of the CNF would be available only for oil and gas leasing with a NSO stipulation, 0.1 percent of the CNF would be available for solid mineral leasing with a NSO stipulation, 30.7 percent would be available for lease with either a NSO or CSU stipulation, and 52.4 percent of the CNF would be available for lease with standard lease stipulations.

Alternative E: With this alternative 11.2 percent of the forest would potentially not be available for lease, 5.2 percent of the forest would potentially be available only for oil and gas leasing with a NSO stipulation, 7.9 percent would potentially be available for solid mineral leasing with a NSO stipulation, 36.0 percent would potentially be available for lease with either a NSO or a CSU stipulation and 39.7 percent of the forest would potentially be available for lease with standard lease stipulations.

Alternative G: Under this alternative 11.2 percent of the forest would not be available for lease, 4.8 percent of the forest would only be available for oil and gas leasing with a NSO lease stipulation, 11.6 percent would be available for solid mineral leasing with a NSO lease stipulation, 30.5 percent would be available for lease with either a NSO or a CSU lease stipulation and 41.9 percent of the forest would be available for lease with standard lease stipulations.

Alternative I: In this stipulation 11.1 percent of the forest would not be available for lease, 5.6 percent would only be available for oil and gas leasing with a NSO lease stipulation, 3.5 percent would only be available for solid mineral leasing with a NSO lease stipulation, 35.4 percent would be available for leasing with either a NSO or CSU lease stipulation and 44.4 percent of the forest would be available for lease with standard lease stipulations.

5.3 Cumulative Effects

Potential cumulative effects disclosure would not be determined due to the uncertain nature of mineral exploration and development. An area under lease may or may not contain marketable minerals. Any lease issued would potentially not have 100 percent surface disturbance.

BIOLOGICAL ELEMENTS

Introduction – Historical Perspective

The forests and plant and animal communities of the southern Appalachian region are widely known as being some of the most rich and diverse systems outside of tropical areas (Laerm et al. 1999 in Ford et al. 1999; USDA Forest Service 2001). This high level of diversity abounds despite the intensive land use and abuse of the early to mid 1900's that left much of the region de-forested and barren (Shands 1991). Thus, the high diversity found in the southern Appalachians today is a testimonial to the resilience of these systems. The following sections that describe the effects of EIS alternatives on plant and animal communities are described primarily based on current conditions. This introductory section provides some historical context that may be used as a reference point when comparing expected future habitat outcomes and in describing effects to viability of associated species.

While much of the region had been completely logged over by the turn of the century, various tracts of land remained with standing virgin timber (Shands 1991). Early inventories of forests in the southern Appalachian region conducted by government surveyors provide valuable insights into the historical condition and distribution of southern Appalachian forest communities (Ashe 1911, 1913, 1922; Ayres and Ashe 1905; Foster and Ashe 1908; Greeley and Ashe 1907; Pinchot and Ashe 1897). Table 3-16 provides a brief summary of the major forest tree species and their position on the landscape based upon inventories conducted primarily by U.S. Forest Service Examiner W.W. Ashe, during the period 1897 to 1922.

Table 3-16. Historic Data For Major Forest Tree Species for the Southern Appalachians.

Common Name	Scientific Name	Description (after Ayers and Ashe, 1905)
Chestnut	*Castanea dentata*	The chestnut is a large tree which attains a height of 120 feet and a diameter of 7 feet. It is common on nearly all soils above 2,000 feet. It regenerates well from both shoots and seeds and has a greater growth rate than any other tree in the region.
White Oak	*Quercus alba*	White oak reaches a height of 120 feet and a diameter of 5 feet. It is common below an elevation of 4,500 feet, especially on rocky soils. It seeds abundantly and reproduction is good.
Chestnut Oak	*Quercus prinus*	Chestnut oak reaches a height of 90 feet and a diameter of 40 inches. It is common on dry, sandy slopes where it seeds in abundance.
Northern Red Oak	*Quercus rubra*	Northern red oak is the largest oak in the southern Appalachians, frequently reaching a height of 130 feet and a diameter of more than 5 feet. It is common above 1,500 feet elevation but attains it’s greatest size in protected coves where it grows with chestnut, basswood, birch, and yellow poplar. Red oak is a tree that seeds frequently and has good reproduction.
Scarlet Oak	*Quercus coccinea*	Scarlet oak reaches a height of 100 feet and a diameter of 30 inches. It is very common on dry soils below 4,000’ elevation.
Black Oak	*Quercus velutina*	Black oak reaches a height of 100 feet and a diameter of 30 inches. It is frequent on good soils on well drained slopes below 2,500 feet elevation. It is a tree with good reproduction.
Southern Red Oak	*Quercus falcata*	Southern red oak reaches a height of 80 feet and a diameter of 30 inches. It is common below an elevation of 2,000 feet where it occurs on dry soils with shortleaf pine. Southern red oak grows rapidly and seeds abundantly every few years.

Table 3-16. Historic Data For Major Forest Tree Species for the Southern Appalachians.

Common Name	Scientific Name	Description (after Ayers and Ashe, 1905)
White Pine	*Pinus strobus*	White pine typically reaches a height of 160 feet and a diameter of 40 inches. It can form nearly pure stands on sandy or gravelly soils on northwest slopes between 1,700 and 4,000 feet elevation. This species has rapid growth and reproduces freely.
Shortleaf Pine	*Pinus echinata*	Shortleaf pine reaches a height of 100 feet and a diameter of 36 inches. It is found on well-drained soils below 2,000 feet elevation. It seeds freely and reproduces abundantly in full sunlight.
Pitch Pine	*Pinus rigida*	Pitch pine reaches a height of 90 feet and a diameter of 28 inches. It is associated with shortleaf pine though it is more abundant than that species at higher elevations.
Table Mountain Pine	*Pinus pungens*	Table Mountain pine is a medium sized tree reaching a height of 70 feet and a diameter of 24 inches. It occurs on dry, rocky ridges between 1,500 and 3,000 feet.
Virginia Pine	*Pinus virginiana*	Virginia pine (also refered to as scrub pine) is a short-lived, slender tree that seldom reaches more than 80 feet in height and 18 inches in diameter. It is common below an elevation of 2,000 feet where it propagates freely and grows rapidly. It is most common in abandoned fields and fencerows.
Hemlock	*Tsuga canadensis*	Hemlock is one of the largest trees in the eastern U.S.A often attaining a height of over 140 feet and a diameter of 5 feet. It is common along streams and on north facing slopes above an elevation 1,500 feet. It seeds frequently but reproduction is poor.
White Ash	*Fraxinus americana*	White ash often attains heights of 130 feet and a diameter of 40 inches.
Black Gum	*Nyssa sylvatica*	Black gum can reach 110 feet in height and 36 inches in diameter. It is common along streams at low elevations and on dry slopes at higher elevations.

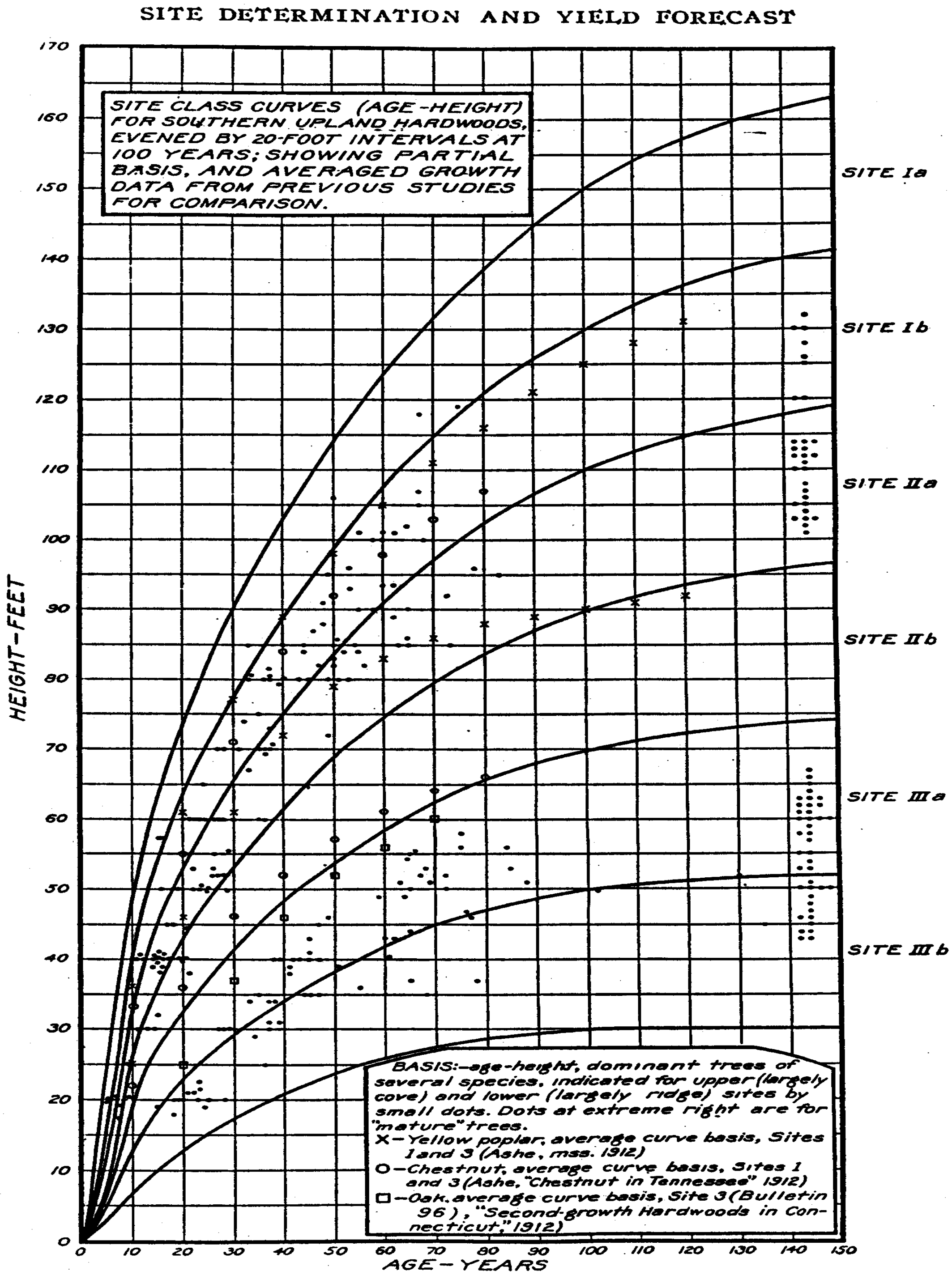
Table 3-16. Historic Data For Major Forest Tree Species for the Southern Appalachians.		
Common Name	Scientific Name	Description (after Ayers and Ashe, 1905)
Basswood	*Tilia heterophylla*	Basswood reaches 120 feet in height and 48 inches in diameter. It is common along streams and in protected coves.
Buckeye	*Aesculus flava*	Buckeye reaches a height of 120 feet and a diameter of 48 inches. It is common in coves, especially above elevations of 3,000 feet.
Red Maple	*Acer rubrum*	Red maple often attains a height of 110 feet and a diameter of 36 inches. It is common on moist soils and represents most of the young growth in culled forests.
Sugar Maple	*Acer saccharum*	Sugar maple reaches a height of 120 feet and a diameter of 40 inches. It typically occurs above 2,000 feet elevation on cold, moist sites.
Black Cherry	*Prunus serotina*	The best individuals of Black Cherry have generally been removed, however, on moist sites it still reaches heights of 100 feet and a diameter of 36 inches.
Hickories	*Carya* spp.	Several specoes of hickory are found in the souther Appalachians. These species occupy a variety of sites from moist to dry and typically reach heights of 110 feet and diameters of 36 inches.
Sweet Birch	*Betula lenta*	Sweet birch reaches a height of 90 feet and a diameter of 36 inches. It is typically found along cold mountain streams and on north facing slopes.
Yellow Birch	*Betula allgheniensis*	Yellow birch reaches a height of 80 feet and a diameter of 36 inches. It is common on north facing slopes at higher elevations.
Beech	*Fagus americana*	Beech reaches a height of 100 feet and a diameter of 30 inches. It reaches it's greatest size on moist sites, coves, and along streams. It also forms stunted groves on cold slopes at higher elevations.

Land acquisition files of the USDA Forest Service provide detailed inventories of individual forested tracts and often include detailed site mapping showing the distribution of forest types on the landscape. Site mapping, with corresponding forest descriptions, for most (if not all) of the lands that now comprise the CNF are part of land acquisition records (USDA 1912 -). Four categories of sites were used in the early type mapping done by the U.S. Forest Service: "Cove", "Lower Slope", "Upper Slope", and "Ridge" (Frothingham 1921). The "site" is the sum of the

ecological (edaphic, topographic, climatic) factors at a given location (Ashe 1922). The forest "type" that corresponds to a given site on the maps is provided in the records as a description of the major forest species present at that location. The canopy species and size of trees that make up a forest "type" are directly related to the conditions at the "site" (Ashe 1922), thus differing quality (size) trees of the same species may be expressed in the various forest types depending upon the site at which they occur (Figure 3-I). In addition to describing forested communities, land acquisition files may provide insightful data on the distribution of rare communities. Site mapping for the Roan Mountain area depicts historical boundaries of balds and spruce-fir forests, both of which have declined significantly since the time of acquisition.

Affected environment sections presented below describe existing habitat conditions within major forested communities found on the CNF. Existing habitat conditions within these forests today are far different from those found in the pre-settlement forests that supported trees with the characteristics described in Table 3-16. Objectives in the LMP geared at restoring major forest communities are designed to begin to restore habitat structure, composition, and distribution to a desired condition thought to be needed to maintain viability of associated species. However, there is no surrogate today for a chestnut tree, which, on a good site, could reach a diameter of seven feet and height of 120 feet tall, nor the associated habitat conditions found in forests that support such trees. Recognizing that the forests have undergone such significant change is important in describing effects to species viability. Section 15.0 of this chapter (Terrestrial Species Viability) outlines the process that was used to analyze effects on species viability and makes reference to pre-settlement conditions as a benchmark to compare expected habitat outcomes. It is recognized that significant ecological changes (loss of the American chestnut from eastern forests due to chestnut blight (Endothia parasitica), and reduction of large tree structure, etc.) cannot be replaced in the short-term, rather, future habitat outcomes are put into the context of how well they approximate such conditions.

Figure 3-7. Growth Curves for Southern Appalachian Site Types Showing the Difference Between the Highest Quality (Cove – Site 1a) and Lowest Quality (Ridge - Site IIIb) sites (Frothingham 1921).



6.0 MAJOR FOREST COMMUNITIES

The following sections describe existing condition and potential effects by alternative to Major Forest Communities on the CNF.

6.1 Mesic Deciduous Forests

6.1.1 Affected Environment

Mesic deciduous forests covered in this section include northern hardwood, mixed mesophytic, and bottomland hardwood community types, as well as the dry-mesic oak forest communities with most ambient moisture (USDA Forest Service 1997 and Table 6-1). These forest types are characterized by relatively low levels of disturbance, and from a habitat perspective, their primary value is providing habitat for a variety of species dependent on mid- and late-successional forest stages.

Abundance

Oak forests are the dominant forest cover type in the SAA Area, comprising over one-third of the land area (SAMAB 1996:23). However, in contrast to this analysis, that figure includes both mesic and xeric oak forests. Other mesic deciduous forest communities such as northern hardwood, mixed mesophytic hardwood, and bottomland hardwood forests are less common, comprising 1.6 percent , 8.4 percent and 1.2 percent of the land area of the SAA area.

The current acreage of mesic deciduous forests for the CNF is shown in Table 3-17. Figure 3-8 and Figure 3-9 show the current distribution of mesic deciduous forests.

Mesic deciduous forests are abundant and well distributed, comprising 44 percent of the CNF. The best, most clustered distributions are found at the higher elevations of the Tellico Ranger District and Big Frog Mountain, followed by Big Bald, Unaka, Roan, Pond and Holston Mountains and Rogers Ridge (Figure 3-8 and Figure 3-9). Poorest distributions are found on the pine-dominated Starr and Chilhowee Mountains.

Table 3-17. Current acreage (and percent) of mesic deciduous forest by successional class, the percent of total mesic deciduous forest acreage in mid-late-old successional stages, and the percent of total forest acres in mid-late-old successional mesic deciduous forests for the CNF, 2002.

Early Successional	9,965 (4%)
Sapling/Pole	22,139 (8%)
Mid- Successional	103,214 (36%)
Late-Old Successional	147,770 (52%)
Total	283,088
Total acres of mid-late-old successional mesic deciduous forests	250,984
% of total mesic deciduous forest acres in mid-late-old successional stages	89%
% of total forested acres in mid-late-old successional mesic deciduous forests	39%

CISC data, 20 December 2002. Includes CISC Forest Types 13 (Loblolly Pine-Hardwood), 41 (Cove Hardwoods-White Pine-Hemlock), 46 (Bottomland Hardwood-Yellow Pine), 50 (Yellow Poplar), 51 (Post Oak-Black Oak), 53 (White Oak-Red Oak-Hickory), 54 (White Oak), 55 (Northern Red Oak), 56 (Yellow Poplar-White Oak-Red Oak), 58 (Sweet Gum-Yellow Poplar), 72 (River Birch-Sycamore), 81 (Sugar Maple-Beech-Yellow Birch).

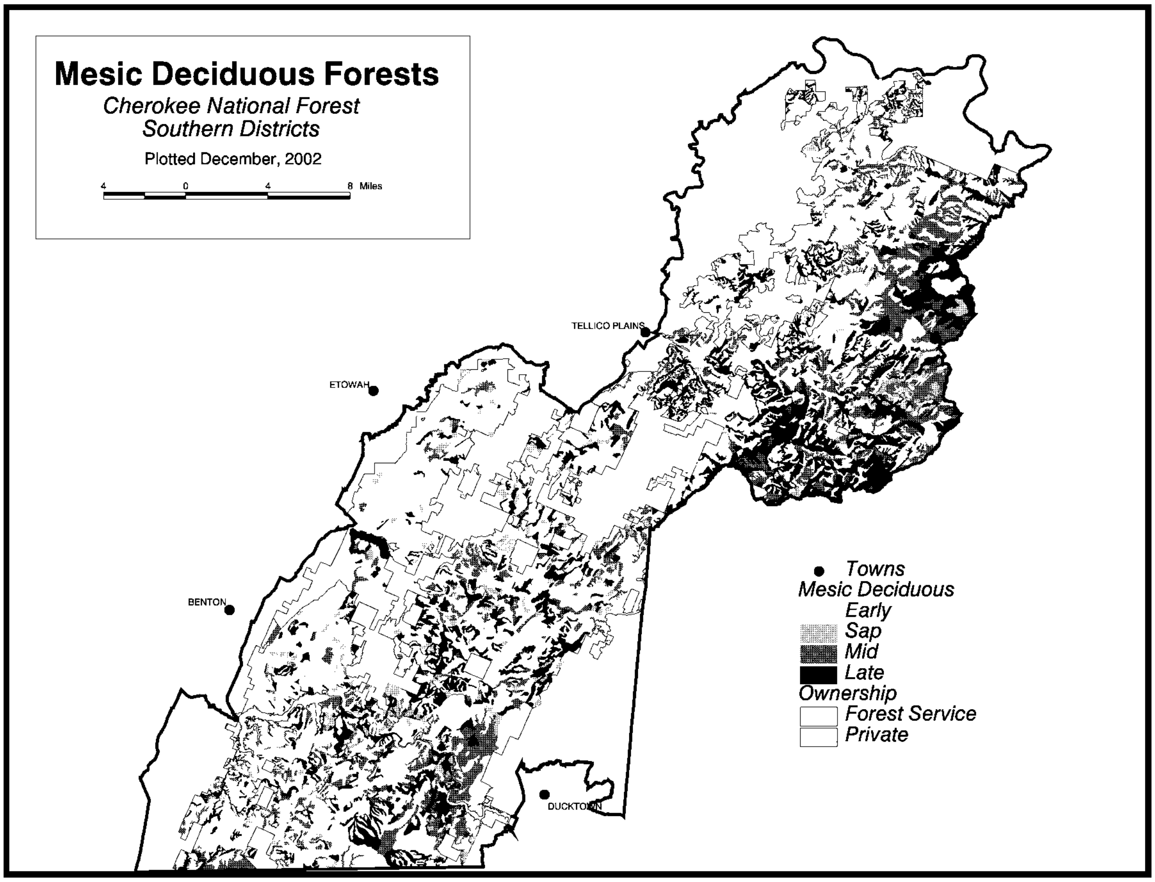


Figure 3-8. Current distribution of mesic deciduous forests, south end CNF, 2002

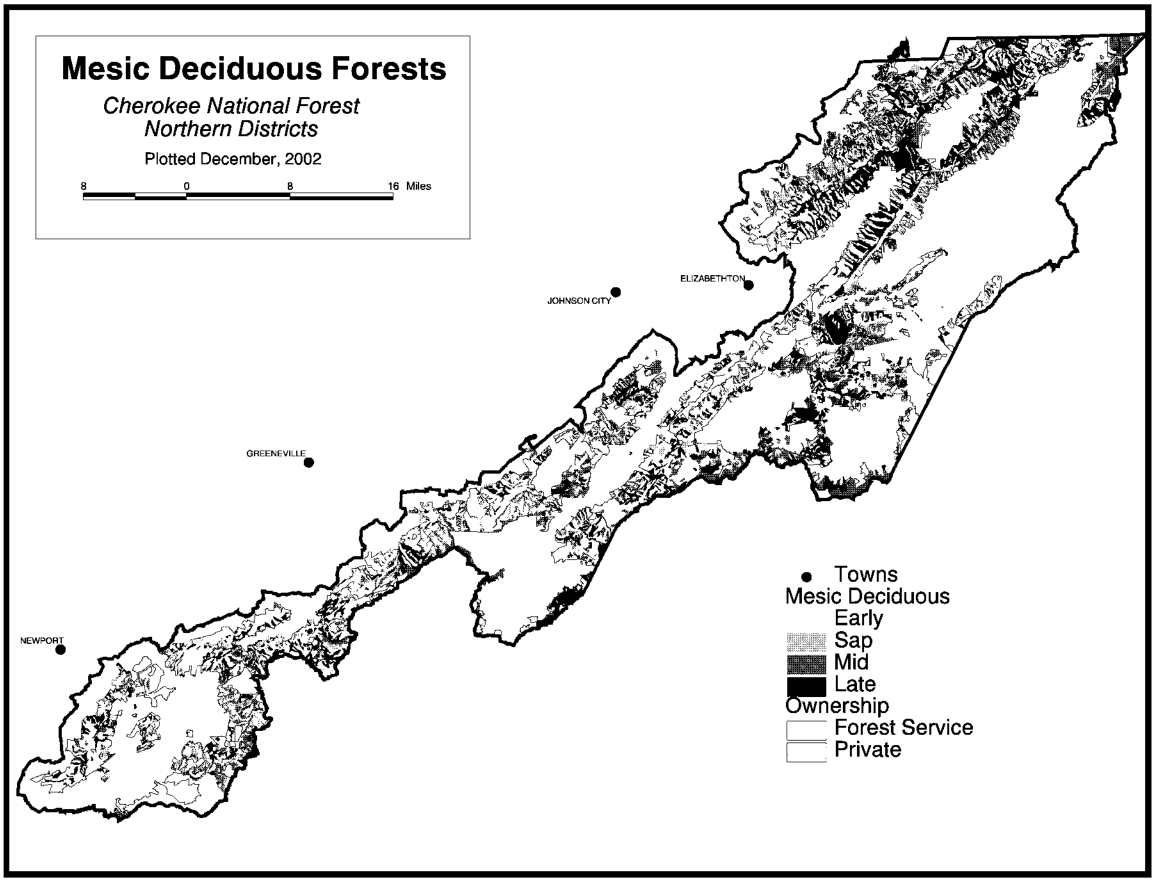


Figure 3-9. Current distribution of mesic deciduous forests, north end CNF, 2002.

Age Class Distribution and Forest Structure

For the SAA Area, the majority of the mesic deciduous forests are currently in mid-late successional age classes. Across all ownerships, approximately 75-80 percent of northern hardwoods, oak-hickory, and river floodplain forests are in mid- and late-successional stages (SAMAB 1996: 165). There are approximately 3.5 million acres of deciduous forest on NFS within the SAA area (SAMAB 1996:168). Of these acres, two percent are in early-successional forest, six percent are in the sapling/pole forest, 45 percent are in mid-successional forest and 46 percent are in late-successional forest.

A key management issue for this community is maintenance of a high proportion of this type in older conditions to provide habitat for associated species. There are over 200 species of viability concern species that are broadly associated with mature mesic deciduous forests of the southern Appalachian region, and others that are more specifically associated with such forests at high elevations (Table L, Appendix E). This assemblage supports a high number of viability concern species compared with other broad ecological community forest groups (ie, pine and pine-oak, oak and oak-pine).

The current age class distribution of mesic deciduous forests for the CNF is shown in Table 3-17. About 89 percent of these forest communities are in mid-late-old successional stages. These forest types make up 39 percent of the total CNF acres.

A number of bird species, including the cerulean warbler (*Dendroica cerulea*) favor mature, mesic hardwood forests with a diverse and well-developed canopy structure including canopy gaps and associated midstory and understory structural diversity. (Ramey 1996; Buehler and Nicholson 1998; Rodewald and Smith 1998; Nutt 1998). Species of potential viability concern associated with canopy gaps and structurally diverse understories in mesic deciduous forests are identified in Table L, Appendix E. This structural diversity may be characteristic of the decadent, patchy conditions found in old growth forests, to which these species have presumably adapted. While a growing portion of the landscape in the southern Appalachians consists of large hardwoods, most sites have very simple canopy structures (Runkle 1985). This lack of structure is likely the result of previous even-aged timber management, resulting in forest stands of approximately equally-aged trees with low mortality and few canopy gaps. Most of these mid- and late-successional forests have not yet begun to develop the canopy gaps characteristic of old growth forests. It may be many centuries before such structure develops through natural succession.

Intermediate treatments such as thinning can be used to improve forest structure in mid-successional mesic deciduous forests. Canopy gaps created by these treatments would stimulate the development of the desired midstory and understory structure. Single-tree selection or small group selection (generally less than 0.75 acre group maximum size), implemented at relatively low intensities, achieves very similar desired conditions. For some late successional and older mesic forests, several old growth structural characteristics such as canopy gaps, multi-layered canopy, and abundance of dead and down wood may be present, and treatments to achieve this objective would not be needed.

Management Indicators

Several management indicators have been identified for assessing effects to mesic deciduous communities. These include both MIS and key habitat variables.

The hooded warbler (*Wilsonia citrina*) is a neotropical migrant that is fairly common to common throughout the southeastern U.S.A during the breeding season (Hamel 1992). It is found in moist deciduous forests with fairly dense understories, where it breeds and feeds (Hamel 1992; DeGraaf et al. 1991). It has been identified as a MIS for mid-late mesic deciduous forests with canopy gaps and structurally diverse understories. The hooded warbler is common in appropriate habitat on the CNF.

The cerulean warbler was previously considered as a MIS due to the association of breeding territories with canopy gaps within southern Appalachian forests. The warbler is a high-priority neotropical migrant that breeds in the eastern US and Canada (DeGraaf et al. 1991, Rosenberg et al. 2000). Breeding Bird Survey results indicate that it experienced an average annual decline of 4.2 percent per year from 1966-2000 (Sauer et al. 2000). In 1991 it was listed as a Category 2 (C2) candidate for listing under the ESA and was petitioned for listing as threatened in 2000. It is currently undergoing status review by the US Fish and Wildlife Service (USFWS).

The cerulean warbler is also extremely rare on the CNF and is known from less than ten sites within the Bald River and upper Citico Creek drainages of the Tellico Ranger District. It is identified in the Forest Service National Strategic Plan as an emphasis species and will be monitored on the CNF, but not as a MIS. It is not an effective MIS because of its extreme rarity on the CNF and is not effectively monitored using standardized point count protocols. Consequently, trend analysis is not feasible. Its populations would primarily be evaluated based on presence or absence in targeted habitat types or in response to experimental habitat treatments. Monitoring for this species will focus more on verifying occurrence location data rather than determining population response to management activities.

The hooded warbler is more appropriate as an MIS for the CNF because it is more common and widely distributed than the cerulean warbler. Management opportunities exist to increase the structural diversity of closed canopied habitats in this type to favor species, such as the hooded warbler, that optimize their abundance in forests with canopy gaps and patches of dense understory. This species is also deemed appropriate for helping to indicate the availability of mid- and late-successional mesic deciduous habitats and the efficacy of management intended to favor its habitat.

Key habitat variables identified for this community are total acres of mid- and -late successional and old growth mesic deciduous forests, and total acres treated to create canopy gaps.

6.1.2 Direct/Indirect Effects

Abundance and Age Class Distribution

The amount of regeneration treatments would potentially affect the future quantity and distribution of mid-late-old successional mesic deciduous forests. The future age class distribution of mesic deciduous forests would vary among alternatives due to the differences in management intensity and emphasis. Table 3-18 shows the proportion of existing mid-late-old successional deciduous forest by successional stage option for the CNFs (see section on Early Successional Forests for a more detailed description of successional stage options). Those acres allocated to successional stage Options 1 and 2 would emphasize mid-late-old successional forests as compared to Options 3 and 4, which would emphasize moderate and high quantities of early-successional forest.

Table 3-18. Proportion of current mid-late-old successional mesic deciduous forest in each successional stage option by alternative

Alternative	Successional Stage Option [1]			
	1	2	3	4
Alternative A	46	26	22	6
Alternative B	40	32	26	3
Alternative D	34	3	23	40
Alternative E	87	3	9	1
Alternative F	31	0	48	20
Alternative G	76	1	23	0
Alternative I	50	0	43	7

[1] –Successional Stage Options:
1- No objective for creating early-successional forest; areas are expected to provide mid-late-old successional forest habitat.
2 – Areas with predominance of mid-late-old successional forests, but up to 4% in early-successional forest.
3 – Areas with mid-late-old successional forests common, but 4-10% in early-successional forest.
4 - Areas with emphasis on early-successional forests, with 10-17% in early-successional forest

Currently, 89 percent of the CNF's mesic deciduous forests are in older (mid-late-old) age classes (Table 3-17). These older forests would be allocated to prescriptions that would maintain their existing landscape predominance (successional stage option 1 or 2) in all alternatives except F and D (Table 3-18). For alternative I, about half would be allocated to older successional options, and half to younger successional stage options, but overall abundance may remain stable due to maturation of forest allocated to options 1 and 2.

Forest Structure

With the exception of mesic oak forests, these forests are not benefited by presence of fire and many associated species are fire intolerant. Forestwide objectives and standards have been established to minimize the acreage of these forests prescribed burned and to reduce the impacts of prescribed fire in these communities when included as part of landscape-level burn units. In addition, a CNF standard ensures that a minimum of 75 percent of the northern hardwood, mixed mesophytic and river floodplain forest types would be maintained in mid-late successional stages, and that 50 percent of each of those types be maintained in late successional or old growth conditions.

Management of existing mid- and late-successional mesic deciduous forests to create desired structural habitat conditions would be implemented on an experimental, small-scale basis. A plan objective was established to cooperate with

USFWS to increase structural habitat diversity in up to five percent of closed-canopied mid- and late-successional mesic deciduous forest, including old growth restoration areas, by retaining large trees and creating small canopy gaps suitable for cerulean warbler and associated species. Canopy gap treatments that enhance structural diversity in mid-successional mesic hardwoods could benefit cerulean warbler, hooded warbler, and other species associated with these habitat conditions. The cerulean warbler responds to changes in canopy structure resulting from canopy gaps. However, breeding densities would be expected to remain low under all alternatives due to the position of the forest within its range (Hamel 1992:275). In the long term, alternatives that provide the highest levels of late-successional and old growth mesic deciduous forests (Alternatives A, B, E, and G) would most likely support the largest populations of this species.

Management Indicators

Hooded warblers are more common than cerulean warblers, and respond to the understory growth that ultimately results from canopy gaps. Its highest population densities are expected in these situations. Average breeding densities reported by Hamel (1990:C-8) are 16.0 pairs per 100 acres. Populations are expected to be highest under alternatives that provide for more creation of canopy gaps and older decadent forests. Since a specific acreage objective for canopy gap generation was not developed, a quantitative comparison across alternatives is not possible. Table 3-19 is based on the relatively high proportions (68%, 63%, and 50%, respectively) of mesic deciduous forests allocated to successional stage options 3 and 4 in Alternatives F, D and I (Table 3-18). Alternatives A, B, E and G would provide the highest acreage of older forests where canopy gap habitat for hooded warbler would be expected to develop.

Table 3-19. Expected population trend[1] of the hooded warbler on the CNF under EIS alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	+	+	-	+	-	+	=
50 years	++	++	- -	++	- -	++	=

[1] Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

6.1.3 Cumulative Effects

Mature mesic hardwood forests were widespread historically. Species composition, diversity and structure of today's forests does not approximate historic conditions due to loss of the American chestnut by the chestnut blight, previous unregulated cutting and burning, and reduction of large diameter trees (Ayres and Ashe 1905). Increases in distribution of mature forests and restoration towards historic conditions are expected under all alternatives except Alternatives D and F. This is based on a comparison of current conditions (52% of mesic hardwoods currently in late and old successional age classes and 89 percent in mid-late-old successional age classes;

Table 3-17) with proposed conditions in Table 3-18 demonstrating that Alternatives F and D would allocate 68 percent and 63 percent (respectively) to successional stage options 3 and 4. For Alternative I, although 50 percent of these forests are allocated to options 3 and 4, the total acreage of late and old successional habitats would remain stable and likely increase during the 10- and 50- year planning horizons due to the "recruitment" or maturation of mid-successional forests. The future distribution of mature mesic forests is expected to be common (Table 3-75 Section 15.1, Terrestrial Viablity). Distibution is expected to be fair for all alternatives except for Alternatives D, F, and I, for which distribution would be poor compared to historic conditions (Table 3-74, Section 15.1, Terrestrial Viability).

Mature mesic hardwood forests were likely the predominant condition at high elevations. Species composition, diversity and structure of these forests today does not approximate historic conditions due to predominance of mid-successional age class structure (Section 8.1, Successional Forested Habitats, northern hardwoods). Distribution will likely continue to approach historic conditions under all alternatives except for Alternatives D and F, which would put these forest types under regulation and for which distribution would be expected to be poor compared to historic conditions (Table 3-75, Section 15.1, Terrestrial Viability). For other alternatives mid-late successional forests would be the predominant matrix condition at high elevations. Abundance would be expected to be occasional for all alternatives (Table 3-74, Section 15.1, Terrestrial Viability).

Oak decline and gypsy moth are expected to primarily effect xeric oak-dominated forests, and will not likely have significant effect on this mesic hardwood group. The effects of dogwood anthracnose, butternut canker, beech bark disease and hemlock woolly adelgid are discussed in the Forest Health section.

Large patches of late successional and old growth mixed mesophytic and northern hardwood forests are very uncommon within the southern Appalachian region due to prior land uses. About five percent of the total acreage of these two ecological communities falls within these age classes, and they comprise only one percent of the Southern Blue Ridge physiographic province (SAMAB 1996). More than two-thirds of all northern hardwood acreage in the region is located on non-industrial private lands, where only five percent is classed as late successional. About one fourth is found on public land, where 30 percent is late successional. Within the Blue Ridge, about 80 percent is mid-successional. As concluded above, the current age class structure of the northern hardwoods group and the mixed mesophytic group does not resemble historic conditions (Ayres and Ashe 1905).

Implementation of all alternatives would increase amounts of mature mesic deciduous forests, primarily on those acres allocated to successional stage options 1 and 2 (Table 3-18). However, the regional distribution of these forests with a desired structure that approximates historic conditions is expected to remain relatively rare due to predominance of younger age classes on private lands. Restoration of old growth mesic deciduous forests is therefore an opportunity best achieved on public lands.

6.2 Spruce-Fir Forests

6.2.1 Affected Environment

This forest is dominated by red spruce (*Picea rubens*) and Fraser fir (*Abies fraseri*). Red spruce begins to occur in stands with northern hardwoods (yellow birch, *Betula lutea*: beech, *Fagus grandifolia;* maple spp. *Acer*; etc.) at elevations around 4,500 feet. It becomes more dominant with increasing elevation, and may be the dominant species between 5,000 and 5,500 feet. Dominance of Fraser fir also increases with elevation. It occurs as low as 4,500 feet in Virginia, and may outcompete the red spruce to form pure stands above 6,000 feet. The northern limit of Fraser fir is Mount Rogers in Virginia. Common shrub associates of red spruce-Fraser fir are *Rhododendron catawbiense*, *Vaccinium erythrocarpum* and *V. constablaei, Rubus canadensis,* and *Viburnum alnifolium.* The herb layer commonly includes *Oxalis montana, Dryopteris campyloptera, Aster divaricatus, Clintonia borealis, Solidago glomerata, Carex pennsylvanica* and *Maianthemum canadense,* as well as a variety of other species. The pure fir forest has many of the same species in the understory, although total species diversity is typically somewhat lower. Both of these communities are characterized by relatively high moisture levels, short growing seasons, acidic soils with low levels of nutrients, and are often subject to strong winds and other extreme weather conditions.

Spruce-fir forests are low disturbance systems, with most of the area under forest canopy. Adverse affects caused by air pollution, the non-native balsam woolly adelgid, and the SPB have cause significant mortality of overstory trees in many areas, making quality examples of this community very rare and threatening persistence of many associated species. Further discussion of these threats is found under the Forest Health section.

There are a number of species with viability concerns associated with the spruce-fir type (Table L, Appendix E). These forests support species found nowhere else in the world. Some examples are Fraser fir, the rock gnome lichen *(Gymnoderma lineare)*, and the spruce-fir moss spider (*Microhexura montivaga)*. Fraser fir only occurs naturally in a few isolated islands in western Virginia and North Carolina, and in eastern Tennessee (D. Beck In: Burns & Honkala 1990). The rock gnome lichen is only known from the Great Smoky Mountains (Hale 1979). The spruce-fir moss spider is one of only two known species in the genus *Microhexura,* and is apparently endemic to the southern Appalachian spruce-fir zone. The forests also provide key habitat for both the Carolina and Virginia northern flying squirrels, *Glaucomys sabrinus coloratus and G.s. fuscus,* respectively. Isolated populations of several birds--the northern saw-whet owl *(Aegolius acadicus),* the black-capped chickadee *(Parus atricapillus)*, the red crossbill *(Loxia curvirostra)* and possibly the olive-sided flycatcher (*Contopus borealis*)--occur at these high elevations and are uncommon or rare elsewhere in the southeast.

Within the Southern Appalachians, the southern extent of this habitat association coincides approximately with the state lines where Tennessee, North Carolina and Georgia come together. The northern extent of the association is roughly coincident with the northern boundary of the Monongahela National Forest. These forests are

confined to the highest peaks of Virginia, Tennessee, and North Carolina. They provide a cool, moist habitat similar to the boreal forests found at more northern latitudes. Woodward & Hoffman (in Terwilliger 1991) postulate that Fraser fir speciated from balsam fir *(Abies balsamea)* during the Pleistocene when the climate warmed and populations were isolated on southern mountain tops.

There are about 85,000 acres of spruce-fir forest in the region (SAMAB 1996:168-169). Of this total, 11,700 acres are on national forests. These stands occur on the George Washington, Jefferson, and CNFs, and the National Forests in North Carolina. Of the remainder, 62,700 acres are in other public ownership (mostly National Park Service), and 10,600 acres are in private or corporate ownership. Most of the public land (including 39% of the NFS land) is in late successional stage (81 yrs. +) forests. At the time of the SAA (1996), four percent of the NFS acres were in the sapling/pole (11-40 yrs.) stage and 57 percent were in the mid-successional (41-80 yrs.) stage. All of the private holdings are in either the sapling/pole stage or the mid-successional stage.

There are currently 642 acres of spruce-fir forest remaining on the CNF (Table 3-20) comprising 0.1 percent of total forested acres. Spruce-fir forest is located at Roan Mountain and Unaka Mountain.

Table 3-20. Acres of spruce-fir forests by successional stage and percent of total forested acres, October 2002

Successional Stage	Acres
Early Successional	29
Sapling/Pole	79
Mid- Successional	511
Late-Successional (includes Old Growth)	23
Total	642

It is possible that the spruce-fir type originally extended from Unaka Mountain east to Roan Mountain along the North Carolina-Tennessee border. Spruce-fir forest occupied over 800-900 acres at Roan Mountain (Tennessee), but has declined to a current figure of 476 acres. The area formerly supported at least 700,000 spruce and fir trees of “Christmas tree size” (Mead 1939), which were sold to markets throughout the region. All of the remaining Fraser fir forest and 75 percent of the CNF’s remaining fir and spruce-fir type is located at Roan Mountain. At least 2-4 acres of red spruce at Roan Mountain have been lost to SPB infestations of 2000-2002. Approximately eight acres were infested with the beetle, but the most vigorous trees survived (Duerr 2002).

Historic distribution of red spruce was also more extensive at Unaka Mountain than current conditions indicate, totalling at least 291 acres in 1921 for one acquisition tract alone (Hedges 1921). These spruce stands were densely stocked at over 20 thousand board feet per acre. Virtually all of the original red spruce was destroyed by logging followed by a catastrophic fire (Red Fork Fire) which impacted 6,806 acres in 1925. The current stand at Unaka Mountain is 166 acres of red spruce, some of which was planted in 1934-1935, and re-planted in 1943. One small remaining

stand contains red spruce trees over 180 years of age, and may be one of few remaining "old growth" stands of its type in the Southern Appalachians. This old growth stand was 164 acres in size in 1921 (Hedges 1921). Small numbers of red spruce at Unaka Mountain were killed by a SPB infestation in 2001-2002, but loss is apparently not widespread at this time (Myers 2002).

Total acres of spruce/fir forests will be used as management indicators to assess effects to this community. Because little management activity would occur in this type, no MIS were chosen to reflect effects of management on this community.

6.2.2 Direct and Indirect Effects

Historic loss of this forest type occurred early in the 20th century due to unregulated logging and burning, and unregulated commercial sale of Christmas trees throughout a regional market (Mead 1939). Currently, potential negative impacts to this community include recreational activity that may inhibit regeneration because of soil compaction, physical damage to young trees, and the commitment of some potential tree growing sites to recreational facilities. Recreation and facility development at Roan Mountain, along with dispersed camping use along the A.T. and day use recreation at Roan Mountain, will require monitoring. In addition, Fraser fir cone collection is decreasing the in-ground seed bank and thereby decreasing potential seedling recruitment.

In response to these threats, forestwide standards have been incorporated into all alternatives to help maintain this type. They include measures that prohibit collection of Fraser fir seeds and cones, require that all silvicultural treatments conducted in spruce-fir forests be designed to maintain or restore the type, and to the extent practical, contribute to control of threats from insects and disease.

Management under Prescription 9.F (Rare Communities) would benefit this forest type. Generally, management in these areas would consist of activities that protect or enhance spruce-fir forests, and conform with the recovery plans for listed species. Restoration activities for spruce-fir forests may include planting trees, removing selected trees, and use of herbicides. Activities needed to control insects and diseases are not clearly known at this time. Such activities would be proposed and anlayzed as site-specific projects.

Because these forests would be managed to optimize their natural distribution, abundance, and condition in all plan alternatives, potential effects through plan implementation to these vegetative communities should be positive. Because provisions for maintenance of spruce-fir are similar across all alternatives, the magnitude of these positive effects would be similar for all alternatives.

6.2.3 Cumulative Effects

Populations of Fraser fir are in decline range-wide because of several threats. The SPB and balsam woolly adelgid are killing mature spruce and fir, respectively. Airborne heavy metal pollution and acid precipitation may be contributing to the decline of both the fir and the spruce and inhibiting regeneration of both species, as well as contaminating understory plants and the soil. Because only 14,700 acres of

spruce/fir forest out of a total of 85,000 is privately owned, the perpetuation of this forest type is primarily a federal responsibility. Restoration and maintenance activities on national forest and expected protection and management on the national parks should have positive benefits to the type; however, continued decline in quality of these communities is likely due to impacts from the adelgid and air pollution. Therefore, despite national forest management efforts, it is likely that quality examples of this community will continue to decline on the forest and within the Southern Appalachian region. Future distribution of this community type is expected to be rare, and future abundance expected to be poor, for all alternatives (Table 3-74 and Table 3-75, Terrestrial Viability Section 15.1).

6.3 Eastern Hemlock and White Pine Forests

6.3.1 Affected Environment

Eastern hemlock and white pine forests are broadly defined to include those forested communities that are either dominated or co-dominated by eastern hemlock (*Tsuga canadensis*) or eastern white pine (*Pinus strobus*) in the canopy. These forest types are the predominant components of the Conifer-Northern Hardwood community type described in the regional old-growth guidance (USDA Forest Service 1997). For the purposes of this analysis, forests with a significant component of eastern hemlock are classified as hemlock forests, even where white pine may be dominant (CISC types 4, 5, 8). White pine forests include all other forests where white pine is dominant (CISC types 3, 9, 10). This division puts priority on the presence of hemlock as a key habitat component.

Eastern hemlock forests typically occur on acidic soils and often have a dense shrub layer composed of ericaceous species. These communities are typically low in herbaceous diversity, but may support rich bryophyte communities. White pine forests occupy similar sites but also may occur on dryer locations, particularly in areas where fire has been suppressed. White pine forests have also been artificially created as timber plantations.

The combination of a largely evergreen canopy and a dense midstory in naturally occurring hemlock and white pine forests provide for a variety of benefits, including shading and cooling of riparian systems, thermal cover for wildlife, and nesting and foraging habitat for several species of neotropical migrant birds dependent upon the layered canopy structure and understory thickets (Rhea and Watson 1994). There is some evidence that hemlock-white pine forests provide necessary habitat components for the long-term conservation of red crossbills (Dickson 2001). Eastern hemlock forests may also be important refugia for species typically adapted to higher elevations. Dickson (2000) states that red-breasted nuthatches, winter wrens, and golden-crowned kinglets are found in late successional hemlock forests down to elevations of 2,000 feet, and several species of rare bryophytes that are known to occur primarily within the spruce/fir zone are also found at lower elevations in humid gorges often under a canopy that includes eastern hemlock (Hicks 1992).

In 1996, the SAA (SAMAB 1996) estimated that there were 617,687 acres of “White Pine-Hemlock Forests” across all land ownerships in the southern Appalachians

representing 2.5 percent of the total land base. This figure represents data collected from FIA, Continuous Inventory of Stand Condition (CISC), and LANDSAT imagery. The current amount and distribution of mature eastern hemlock forests is threatened by the recent emergence of the hemlock woolly adelgid in the southern Appalachians. First identified in the eastern U.S.A near Richmond, VA in the early 1950's, this exotic pest has recently spread into the southern Appalachians and threatens to spread throughout the range causing mortality within five years after initial infestation (SAMAB 1996).

The current distribution of eastern hemlock forests is shown in and Figure 3-11.

Figure 3-10. Distribution of eastern hemlock forests on the southern districts of the CNF.

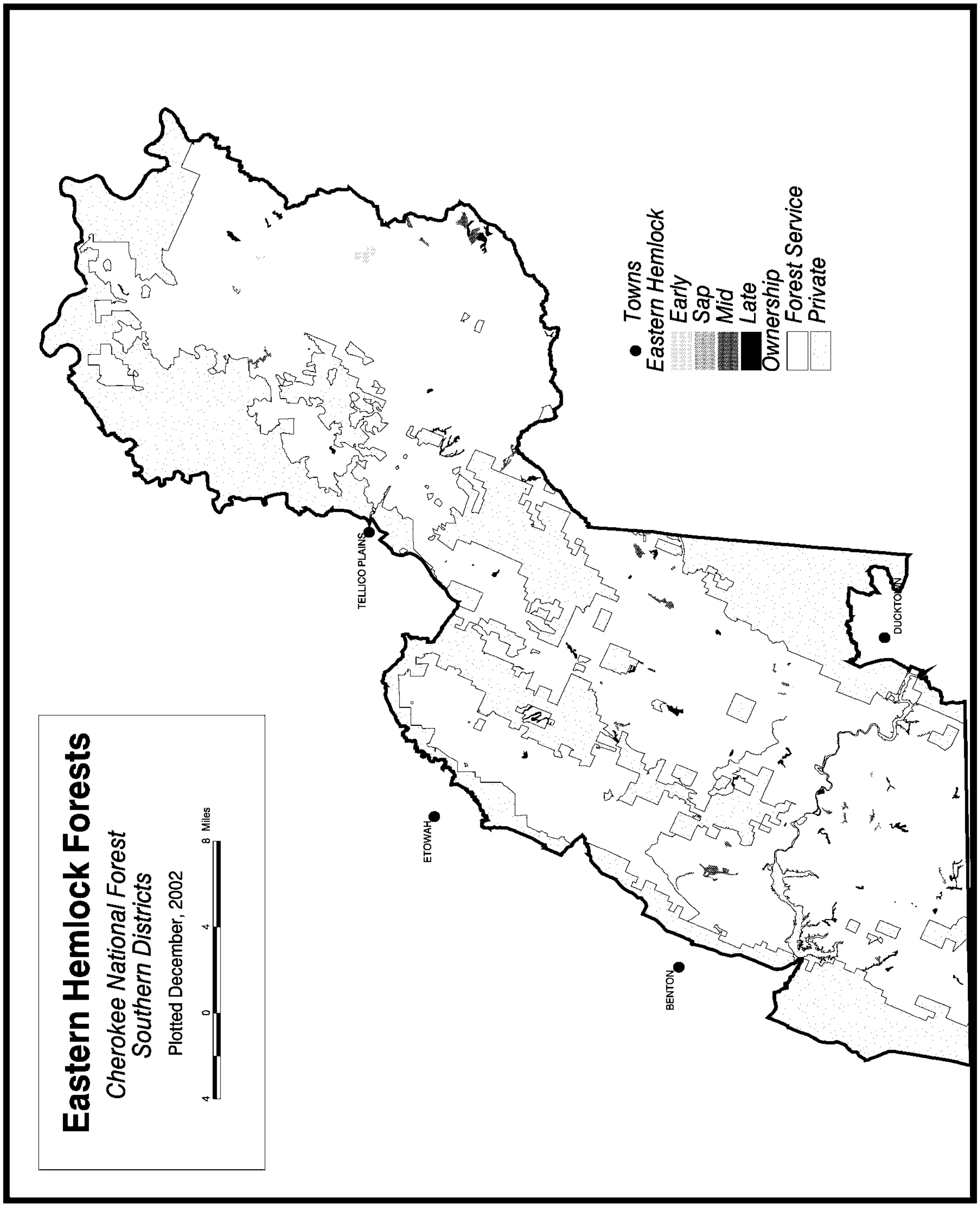


Figure 3-11. Distribution of eastern hemlock forests on the northern districts of the CNF.

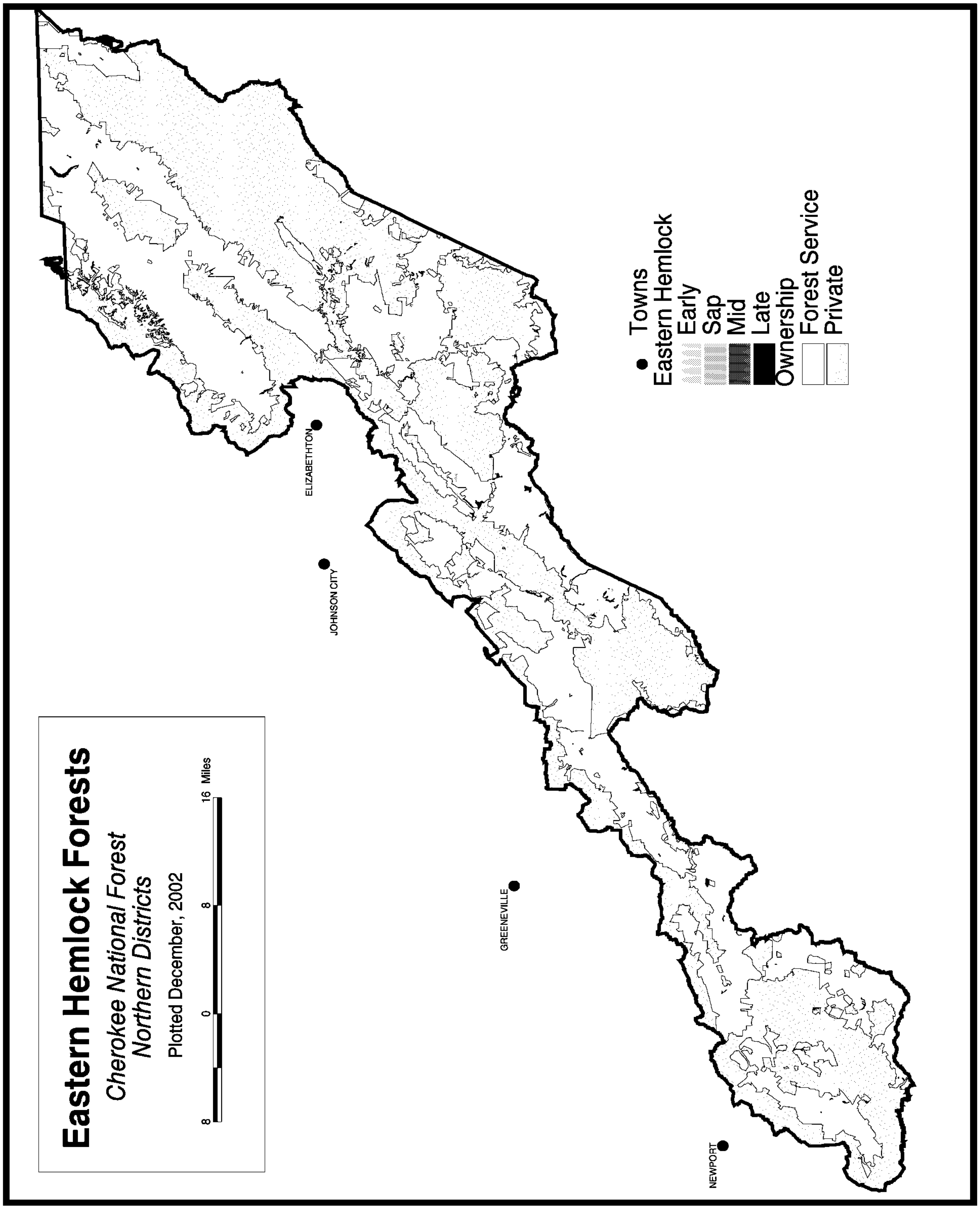


Table 3-21 displays the acres of eastern hemlock and white pine forests by successional stage for the CNF.

Table 3-21 Acres of eastern hemlock and white pine forests by successional stage and percent of total forested acres, 2002	
	Acres
Eastern Hemlock	
Early Successional	315
Sapling/Pole	131
Mid- Successional	1,989
Late-Successional (includes old growth)	4,558
Total	6,993
Percent of forested Acres	1%
White Pine	
Early Successional	2,076
Sapling/Pole	15,411
Mid- Successional	15,182
Late-Successional (includes old growth)	12,456
Total	45,125
Percent of forested Acres	7%

On the CNF, eastern hemlock forests are found primarily in association with north facing coves and slopes and riparian systems. Years of fire suppression have allowed individual hemlocks and white pine to creep upslope onto more xeric slopes and ridges where they would not likely exist under a natural fire regime. There are currently approximately 45,125 acres of white pine forest types on the CNF, 6,664 acres of which originated as plantations.

Management Indicators

Two key habitat variables are selected as management indicators to monitor the condition of eastern hemlock and white pine forests. The number of acres of hemlock forests infested with hemlock woolly adelgid and the number of acres of white pine plantations restored to diverse native communities will be tracked annually. The selection and monitoring of MIS may be an appropriate tool when a clear correlation between a specific management activity and the population trend of the species is known. Because the main factor that may cause a decline in hemlock forests and associated species is the hemlock woolly adelgid rather than management, it is not meaningful to select MIS for this community type.

6.3.2 Direct and Indirect Effects

Abundance

The amount and distribution of white pine forests has increased over its natural abundance through the establishment of plantations and a process of upland encroachment that is a result of years of fire suppression. White pine plantations are often closed canopy stands with little botanical diversity. The LMP includes objectives to restore these plantations back to diverse native communities

appropriate to the site. Expected levels of such restoration vary across alternatives as shown inTable 3-22.

Table 3-22. Expected acres of existing white pine plantations to be restored to diverse native communities by alternative, 2002	
	Acres
Existing White Pine Plantations	6,664
Acres Restored Alternative A	4,250
Acres Restored Alternative B	4,250
Acres Restored Alternative D	5,500
Acres Restored Alternative E	2,000
Acres Restored Alternative F	5,500
Acres Restored Alternative G	3,000
Acres Restored Alternative I	5,000

With a renewed emphasis of introducing fire onto the landscape in areas where natural fire may have played a role in shaping historic vegetative patterns, it is likely that white pine distributions will shrink from areas where it has been able to become established in the absence of fire. Table 3-23 shows the proportion of white pine plantations by vegetation management level by alternative. In general, the use of prescribed fire will be consistent with the vegetation management level, though it is also possible to have low to moderate prescribed fire use in areas where vegetation management is low to none.

Table 3-23. Percent of Existing White Pine Plantations in Each Vegetation Management Level by Alternative

Alternative	Vegetation Management Level			
	None	Low	Medium	High
Alternative A	4	35	40	21
Alternative B	6	26	31	37
Alternative D	0	10	25	65
Alternative E	3	76	20	1
Alternative F	0	7	64	29
Alternative G	4	54	25	17
Alternative I	0	12	54	34

These figures show that the greatest opportunity for management activities that would restore native diversity within existing white pine plantations occurs under Alternatives F, D, and I. Good but more moderate opportunities are available under alternatives B, A, and G, with the lowest opportunities present under Alternative E.

Eastern hemlock forests are naturally limited in distribution, occurring primarily in association with north facing coves and slopes and riparian systems. Under all alternatives except F (current Plan) forestwide standards are included that defer existing hemlock forests from regeneration cutting during this plan period and that maintain the hemlock component where it occurs as patches within other forest types. These provisions are included in the action alternatives in an effort to maintain mature hemlock forests in the face of threats to this type from the hemlock woolly

adelgid. As a result of these provisions, no changes to the distribution and abundance of eastern hemlock forest are anticipated as a direct or indirect effect of national forest management. However, long-term effects from the hemlock woolly adelgid may be large (see cumulative effects).

Condition

Objectives to restore white pine plantations to more diverse natural communities would benefit species dependant upon multi-layered canopies with an evergreen component. Because hemlock forests would not be subject to regeneration cutting this planning period, hemlock forests would move into older age classes with Plan implementation, increasing abundance of mature forests of this type under all alternatives. Activities within hemlock stands would be limited under all alternatives and would promote mature forests with the desired multi-layered canopy condition that is needed by many species of wildlife.

Because hemlock and white pine forests would be managed to optimize their natural distribution, abundance, and condition in all plan alternatives, potential effects through plan implementation to these vegetative communities should be positive. There are thirty-three species of plants and animals with viability concerns that are associated with mature hemlock forests across the southern Appalachian area (Table 3-73, Terrestrial viability section). Thirteen of these species are of concern on the CNF (Table 3-79, Terrestrial viability section and Table L, Appendix E). The positive direct and indirect effects to hemlock and white pine forest communities should contribute to the viability of these associated species under all alternatives Because provisions for maintenance of hemlock are similar across all alternatives, the magnitude of these positive effects would be similar for all alternatives.

6.3.3 Cumulative Effects

A thirty-nine percent increase in the acreage of white pine-hemlock forests has been documented across both public and private ownerships in the southern Appalachians since the mid 1970's (SAMAB 1996). This is largely attributable to an increase in managed stands of white pine (plantations) and upland encroachment of both white pine and hemlock into areas where it would not occur under a natural fire regime. The use of prescribed fire in the restoration of upland habitats will likely shrink these communities back to a more natural distribution on the landscape over time. Despite Plan protection and restoration objectives, the current amount and distribution of mature eastern hemlock forests is threatened by the recent emergence of the hemlock woolly adelgid in the southern Appalachians. The fact that this community type is naturally limited in distribution, coupled with the impending threats from the hemlock woolly adelgid which will imapct the species regardless of land ownership, leaves the long-term maintenance of historical distribution and abundance of this community type in question. Future distribution and abundance of this community type compared to historic levels would be poor (see Table 3-74 and Table 3-75, Terrestrial viability section). The fate of associated viability concern species will be dependent upon their ability to adapt to changing environmental conditions associated with the decline of hemlock from within these communities. Species that utilize hemlock forests in addition to other vegetative

community types will be more likely to persist than species that are obligates to the hemlock forest community.

6.4.0 Oak and Oak-Pine Forests

6.4.1 Affected Environment

Oak dominated forests covered under this section include dry to mesic oak and oak-pine forests. Dry-mesic oak forests vary greatly in their species composition due to its wide distribution. The major species include chestnut oak (*Quercus montana*), northern red oak (*Q. rubra*), black oak (*Q. velutina*), white oak (*Q. alba*), and scarlet oak (*Q. coccinea*) (USDA Forest Service 1997:60, and Table 6-1). The dry to mesic oak-pine forests considered here are oak-dominated forests containing a significant pine component. Predominant pine species include white pine (*Pinus strobus*), shortleaf pine (*P. echinata*), Virginia pine (*P. virginiana*), and loblolly pine (*P. taeda*). These dry to mesic types are distinguished from oak and oak-pine woodlands and savannas, which are targeted at xeric oak, oak-pine, and pine-oak types. These xeric types are covered under the section on Oak, Mixed, and Pine Woodlands, Savannas, and Grasslands.

Abundance

In the southern U.S.A, acres of oak-hickory and oak-pine forests have increased over the last 50 years (USDA Forest Service 2001: 49). Oak and oak-pine forests are common throughout the South, comprising over half of the timberland of the region as a whole (USDA Forest Service 2001: 91-92). Oak-hickory forests are the dominant forest type in the Southern Appalachian Ecoregion.

The current acreage of oak forests for the CNF is shown in Table 3-24.

Oak forests are abundant on the CNF, comprising 36 percent of the CNF acreage (Figure 3-12 and Figure 3-13). These forests are very well distributed within the northern portion of the CNF. Oak forests are less evenly distributed on the southern CNF, especially along the pine-dominated lower elevations including Starr Mountain and the lower Citico Creek drainage; and in the highest elevations, where mesic deciduous forest types predominate.

Table 3-24. Current acreage (and percent) of oak[1] forest by successional class, the percent of total oak forest acreage in mid- and late-successional stages, and the percent of total forest acres in mid- to late-successional oak forests, 2002.

Early Successional	6,147 (3%)
Sapling/Pole	12,716 (5%)
Mid- Successional	79,501 (34%)
Late-Successional (including Old Growth)	133,632 (58%)
Total	231,995
Total acres of M-L Succ. Oak	213,133
% of total oak acres in mid- and late-successional oak forests	92%

Table 3-24. Current acreage (and percent) of oak[1] forest by successional class, the percent of total oak forest acreage in mid- and late-successional stages, and the percent of total forest acres in mid- to late-successional oak forests, 2002.	
% of total forested acres in mid- and late-successional oak forests	33%
[1] - Based on 20 December 2002 CISC data for Forest Types 44 (Southern Red Oak-Yellow Pine), 45 (Chestnut Oak-Scarlet Oak-Yellow Pine), 47 (White Oak-Black Oak-Hickory-Yellow Pine), 48 (Northern Red Oak-Hickory-Yellow Pine), 51 (Post Oak-Black Oak), 52 (Chestnut Oak), 53 (White Oak-Red Oak-Hickory), 54 (White Oak), 55 (Northern Red Oak), 59 (Scarlet Oak), 60 (Chestnut Oak-Scarlet Oak).	

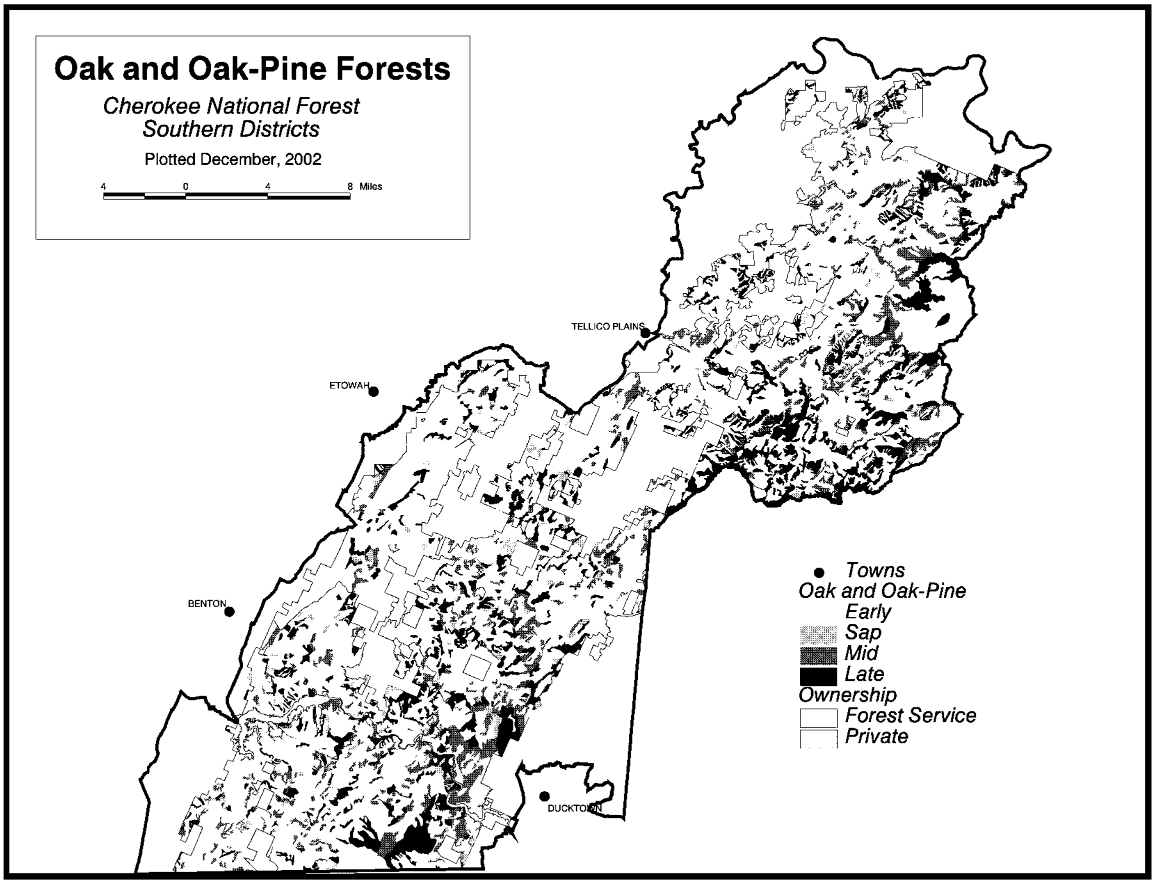


Figure 3-12. Current Distribution of Oak and Oak-pine forests, South end CNF, 2002.

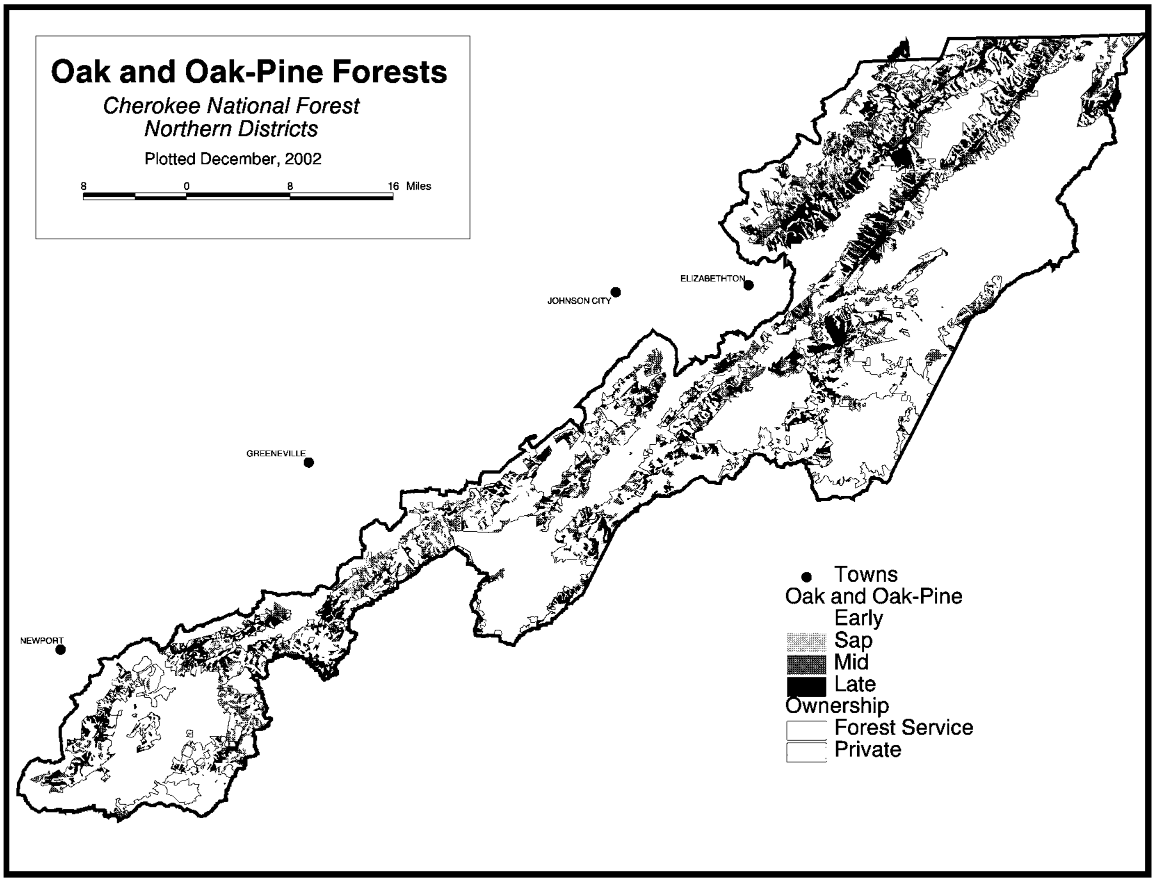


Figure 3-13. Current Distribution of Oak and Oak-pine forests, North End, 2002.

Future abundance will primarily depend on the management of existing oak stands to maintain oak dominance. Additional opportunities exist to restore oak forests to 9,000 acres now occupied by pine plantations.

Age Class Distribution and Forest Structure

Across the southern U.S.A, about 50 percent of the upland hardwood forests (predominantly oak-hickory) and 30 percent of the natural oak-pine forests are in mid- and late-successional stages (41+ year-of-age) (USDA Forest Service 2001: 69-70). However, only about one percent of the planted oak-pine forests are in mid- and late-successional stages. For the SAA Area, approximately 75 percent of oak-hickory forests are in mid and late successional stages (SAMAB 1996: 165). For the CNF, 92 percent of this community type is currently within these age classes (Table 3-24); over half of these forests are in late successional or old growth condition, with another third in the mid-successional stage.

SAMAB 1996 (pp. 165, 168-169) summarizes the age class distribution of oak-hickory and oak-pine forests across the SAA area by a variety of land ownerships. The vast majority of older oak forests are located on publicly-owned lands (Table 3-25). The age class structure of the CNF's oak forests is comparable to other public lands, with slightly younger forests present.

Table 3-25. Successional stage distributions (in %) for oak and oak-pine forests across several ownerships in the SAA Area.

Successional Stage	CNF	All Public Lands	All Private Lands	All Ownerships
Early Successional	3%	2%	8%	6%
Sapling/Pole	5%	8%	28%	23%
Mid- Successional	34%	41%	54%	51%
Late-Successional (includes old growth)	58%	49%	10%	20%

NFS data is derived from the December 2002 CISC Database. Data for other ownerships is derived from FIA and LANDSAT data.

The structural condition of these oak forests is a key factor in the maintenance of these communities. Brose et al. (2001) describe an emerging hypothesis that periodic, low-intensity surface fires were crucial to the perpetuation of mixed oak forests for millennia. Research indicates that oak forests may not perpetuate themselves without some level of disturbance, especially on mesic sites (Loftis 1991). Treatments such as shelterwood harvest combined with prescribed burning (Brose et al. 1999) or basal area reduction from below using herbicides (Loftis 1991) have been shown to create conditions that promote adequate oak regeneration. Oak dominance can be maintained by retention of suitable oak densities in regeneration treatments and implementation of moderate fire return intervals.

Treatments such as moderate thinning and prescribed burning also can be used to create the desired habitat conditions in closed canopy oak forests. There are a number of viability concern species that are associated with open canopy condition and moderate levels of prescribed burning in dry to mesic oak forests (See Woodland and Savannah habitat element in Table L, Appendix E).

Mast Production

Mid- and late-successional oak forests provide an important source of hard mast and dens. Acorns are a critical fall and winter food for numerous wildlife species (Martin et al. 1951). The availability of acorns have been shown to strongly influence population dynamics of species such as black bear (Pelton 1989), squirrels (Nixon et al. 1975), white-tailed deer (Wentworth et al. 1992) and white-footed mice (Wolff 1996). The large diameter hollow trees and snags found in these older oak forests also are an important source of dens for black bears (Carlock et al. 1983). Hard mast production is an important habitat feature for several wildlife species in demand for sport hunting, including white-tailed deer, wild turkey, gray squirrel, and black bear. The only mast dependent viability concern species on the CNF are the Southern Appalachian eastern woodrat *(Neotoma floridana haematoreia)* and the Allegheny woodrat (*Neotoma magister*).

Management Indicators

Several management indicators have been identified for assessing effects to oak and oak-pine forest communities. These indicators include both MIS and key habitat variables. Because of their wide distribution across moisture gradients, mid- and late-successional oak and oak-pine forests support a wide variety of species. Hooded warblers, selected as MIS for mid- and late-successional mesic deciduous forests adequately represent the mesic oak forest communities. This species is expected to respond positively to management actions (including thinning and moderate frequency burning) that are designed to stimulate advanced oak regeneration and perpetuation of the forest type on these mesic sites. Drier oak forests support a slightly different mix of species due to their more open condition. To represent this upland oak community, the scarlet tanager is selected as an MIS. This species is most abundant in upland mature deciduous forest (Hamel 1992).

Four key variables for tracking management effects on this community type are selected. To indicate the level of management activity directed at maintaining this forest type, acres of the type burned annually and acres thinned annually are projected. Restoration efforts are tracked by the annual acreage of oak and oak-pine forest restored to appropriate sites currently occupied by other forest types, as well as total acres and age-class distribution. Because older oak forests are an important source of oak mast and dens, total acres of mid- and late-successional oak and oak-pine forests are also projected.

6.4.2 Direct and Indirect Effects

Abundance

The future abundance of oak and oak-pine forests is primarily related to the maintenance of stand conditions that ensure oak dominance, and to the restoration of oaks or oak-pine forests on appropriate sites currently occupied by pine plantations or other hardwood species such as gum and maple. Opportunity for these activities is similar across all alternatives, and slightly higher for Alternatives F, D, and I (Table 3-26).

Table 3-26. Expected Activity Levels related to the maintenance and restoration of oak forests by Alternative.

Activity	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Average annual acres of oak or oak-pine forests to be restored	750	800	900	800	1,000	800	900
Average annual acres of oak and oak-pine forests to be burned	4,420	4,680	5,200	4,680	5,720	4,680	5,200

The ability to meet these activity levels, to manage these forests to ensure adequate oak regeneration, and to provide habitat conditions for species associated with relatively open canopy condition and moderate levels of prescribed burning will vary

among alternatives due to the differences in management intensity and emphasis. To compare the potential level of maintenance and restoration activities among alternatives, the current distribution of oak forest was compared with the prescription allocations by alternative. Prescriptions were rated as to the management opportunity (none, low, medium, and high) they provide for the levels of thinning and burning desirable for oak management. The proportion of the existing oak forests in each management opportunity level is shown in Table 3-27.

Table 3-27. Proportion of Oak and Oak-Pine Forest in Management Opportunity Level by Alternative

Alternative	Management Opportunity Level [1]			
	None	Low	Moderate	High
Alternative A	5	41	26	28
Alternative B	13	30	28	29
Alternative D	2	21	8	69
Alternative E	6	29	56	9
Alternative F	0	16	13	71
Alternative G	6	34	35	25
Alternative I	1	22	24	53

Management Opportunity Level: (Veg Mtg -Rx Fire)
None: None-None
Low: None-Low, None-Medium, Low-Low
Mod: Low-Medium, Low-High, Medium-Medium
High: Medium-High, High-High

For the CNF, all alternatives would provide opportunities to manage existing oak forests to ensure adequate oak regeneration and create desired stand conditions on a majority of forest acres. Opportunities for management would be greatest in Alternative F, followed by D and I Table 3-27). With plan implementation, oak forests would continue to be abundant and well distributed across the CNF under all alternatives.

Age Class Distribution and Forest Structure

Future age class distribution will vary slightly among alternatives due to the differences in management intensity and emphasis (Table 3-26 and Table 3-27). Alternatives F, followed by D and I, would provide lesser amounts of mid-late successional oak forest habitat. However, the quantity of this habitat is expected to be abundant and well distributed in all.

Mast Production

Acorn production is greatest in mid and late successional oak forests. The expected quantity of mid- and late successional oak forest habitats and the availability of oak mast will vary only slightly among alternatives. The quantity of mid- and late-successional oak forests and consequently acorn availability is expected to increase under all alternatives during the planning period with the possible exception of Alternatives D and F, due to the emphasis on high levels of management targeting older oaks (Table 3-27). Quantity of oak forest habitats will vary only slightly among

alternatives but will be abundant, well-distributed, and sufficient to maintain viability of oak mast dependent species in all alternatives.

Management Indicators

High levels of management activity directed at maintaining this forest type would occur most often in Alternatives F and D (Table 3-27). Acres of the type to be burned annually and acres to be restored to oak and oak-pine forests would be very similar across all alternatives (Table 3-26). Acres to be thinned annually, as well as total acres of oak/oak-pine and future age-class distributions are not specifically projected. Because older oak forests are an important source of oak mast and dens, total acres of mid- and late-successional oak and oak-pine forests are projected. Levels of oak mast are expected to remain fair for all alternatives except for Alternatives D and F, for which mast levels are expected to be poor compared to historic conditions (Table 3-74 and Table 3-75, Section 15.1, Terrestrial Viability).

Because relatively few acres of oak would be restored during the first decade of plan implementation (Table 3-26), no changes in levels of scarlet tanager populations would be expected (Table 3-28). Since Alternatives F and D would likely result in high activity levels targeting mid- and late-successional oak forests (Table 3-27), population levels may decline during a fifty-year period.

Table 3-28. Expected population trend[1] of scarlet tanager on CNF under EIS alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	=	=	=	=	=	=	=
50 years	+	+	-	+	-	+	+

[1] Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

6.4.3 Cumulative Effects

Oak and oak-pine forests are common on the CNF as well as on adjacent nonindustrial private and other public lands, and to a lesser extent, forest industry lands. Management opportunities permitted in most alternatives would ensure continued oak dominance on NFS lands. However, the majority of these oak forests are on nonindustrial private lands. These lands are the least likely to receive active forest management and therefore the loss of oak dominance is likely to be more problematic in these areas.

Insects and diseases such as gypsy moth and oak decline also are expected to have an overall negative effect on oak forests in the future (SAMAB 1996: 103-108, 114-117). Several gypsy moth infestations have been detected in the CNF's northeastern counties, and spread of the infestation is expected to expand throughout the CNF by 2020. Many of the older xeric oak forests are experiencing oak decline. The greatest impact of oak decline will be immediately behind the advancing front of gypsy moth due to repeated severe defoliations. As existing oak stands grow older, susceptibility

will increase. Although oaks will not be eliminated from effected areas, oak abundance and diversity will be reduced. On both NFS and private lands, the future of oak forests will largely depend on management activity such as thinning and burning that encourage oak reproduction to offset the impacts of these insects and diseases. Further discussion of these threats is found under the Forest Health section (Section 16.0).

American chestnut mast was historically dominant within the southern Appalachians. Oak and hickory mast has replaced it at reduced levels. Levels are expected to remain reduced, especially due to additional impacts from gypsy moth infestations. The future distribution of mast is expected to be fair for all alternatives except for D and F, for which distribution is expected to be poor. Abundance is expected to be common for all alternatives (Table 3-74 and Table 3-75, Section 15.1, Terrestrial Viability).

Mature oak forest habitat was widespread historically, but often as a subcomponent of chestnut forests. Oak has replaced chestnut and increased in distribution, but it is threatened by approaching gypsy moth infestation and oak decline, which may reduce future distribution. Alternatives that emphasize older forests and lower oak species diversity will likely lose more to gypsy moth; those alternatives that emphasize balanced age-classes will lose older forests to younger age classes. Therefore, the result is a similar distribution and abundance under all alternatives, with less than good distribution. Management effects differ due to general intention to maintain, increase, or reduce acreage of mature oak forest. However, future distribution is expected to be fair for all alternatives, and abundance is expected to be common for all alternatives (Table 3-74 and Table 3-75,, Section 15.1, Terrestrial Viability).

6.5.0 Pine and Pine-Oak Forests

6.5.1 Affected Environment

Pine dominated forests covered in this section include all "Southern Yellow Pine" (SAMAB 1996: 163) forest types with various admixtures of hardwood species occurring as minor components. These forests occur on a variety of landforms at a wide range of elevations. Historically, in the Blue Ridge Physiographic Province, these communities occupied areas that were subject to natural fire regimes and typically occurred on ridges and slopes with southern exposures (NatureServe 2002). However, due to a combination of previous land use, fire exclusion, and intensive forestry (plantations), many pine species have expanded beyond their natural range and today, pine-dominated communities can be found on virtually all landforms and aspects.

<u>Abundance</u>

During the last 50 years across the southeastern U.S.A, pine plantations have increased in importance, expanding from one percent of the total pine forest acres to 48 percent of those acres (USDA Forest Service 2001: 1). At the same time, the 20-year trend reported for the SAA area (SAMAB 1996: 27) shows a downward trend of 16 percent for southern yellow pine forests. These two facts together suggest that

natural yellow pine forests have declined significantly and represent an opportunity for large-scale restoration of this community type.

The current acreage of southern yellow pine types on the CNF is displayed in Table 3-29.

Table 3-29. Current acreage of Southern Yellow Pine forest types for the CNF	
Community Type	Acres
Loblolly Pine (CISC 31)	1,167
Loblolly Pine – Oak Forests (CISC 13)	186
Pitch Pine (CISC 38)	14,853
Pitch Pine-Oak Forests (CISC 15)	14,512
Shortleaf Pine (CISC 32)	23,943
Shortleaf Pine - Oak forests (CISC 12)	6,094
Table-Mountain Pine (CISC 39)	6,920
Table-Mountain Pine – Hardwoods (CISC 20)	3,172
Virginia Pine (CISC 33)	51,106
Virginia Pine-Oak (CISC 16)	19,471
Total acres of Southern Yellow Pine Forests	141,424

The CNF has been experiencing a SPB epidemic since 1999 and currently 40,000-60,000 acres of southern yellow pine forests have been severely impacted. Many of the sites impacted were densely stocked stands of Virginia pine that had proliferated beyond their natural range due to fire suppression and land management practices of the past 70 years. Historical data suggests that large areas that have become occupied by even aged stands of Virginia pine would have naturally supported mixed stands of shortleaf and pitch pine with varying levels of hardwoods. These natural communities are maintained by low intensity fires originating on ridgetops and southern exposures (NatureServe 2002). With large-scale mortality in these communities due to pine beetle effects, the opportunity now exists to restore these sites to a more natural mixed pine hardwood community.

Age Class Distribution and Forest Structure

On the CNF, southern yellow pine forests are currently well distributed across the landscape (Figure 3-14 and Figure 3-15).

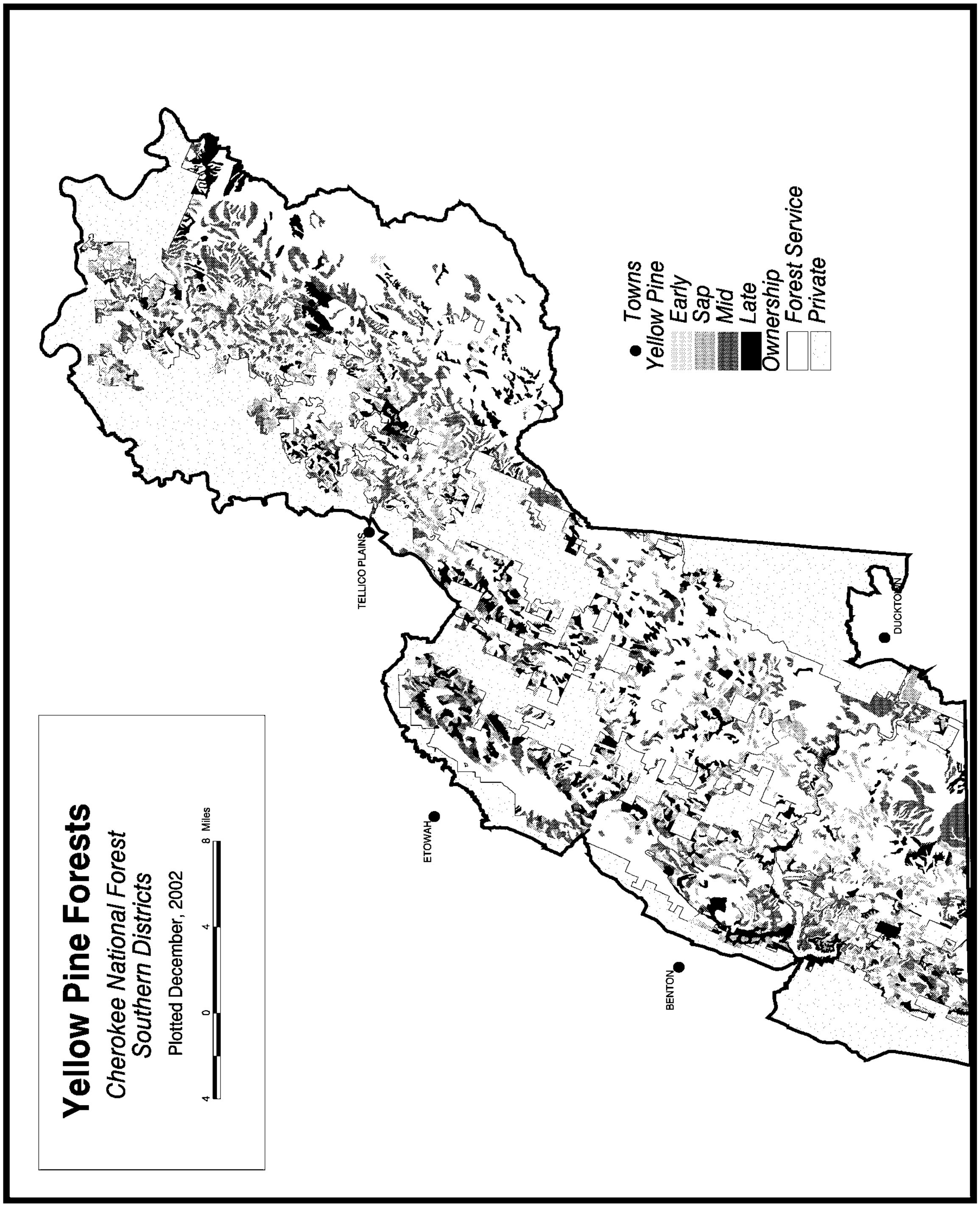


Figure 3-14. Distribution of yellow pine forests on southern districts of the CNF

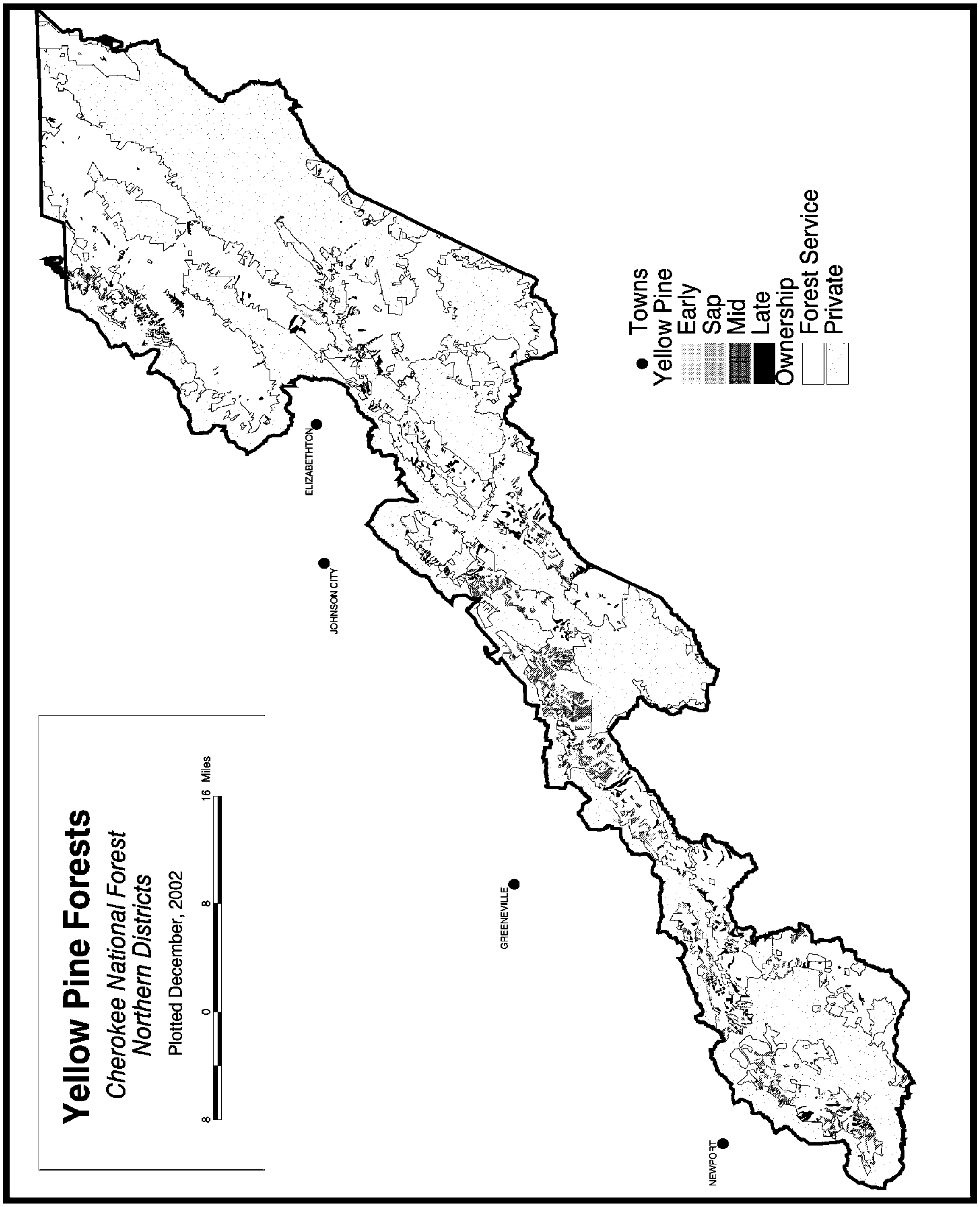


Figure 3-15. Distribution of yellow pine forests on the northern districts of the CNF

The SAA (SAMAB 1996: 165, 168-169) summarizes the age class distribution of southern yellow pine forests across the SAA area by a variety of land ownerships. Similar information is derived from queries of the CNF CISC database. Table 3-30 provides a summary of this information.

Table 3-30. Successional stage distributions (in %) for southern yellow pine forests across several ownerships in the SAA Area.

Successional Stage	Cherokee NF	All Public Lands	All Private Lands	All Ownerships
Early Successional	7	10	18	16
Sapling/Pole	22	9	19	18
Mid- Successional	43	32	59	55
Late-Successional (includes old growth)	28	49	4	11

NFS data is derived from the CISC Database. Data for other ownerships is derived from FIA and LANDSAT data

Nineteen species of viability concern are associated with southern Appalachian late-successional southern yellow pine forests (Table 3-73, Terrestrial Viability section), six of which are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E). While public lands support the majority of late-successional acres, the structure and composition of these forests has been altered due to years of fire suppression resulting in less than optimal habitat conditions. Fire intolerant species such as Virginia pine have proliferated while other pines (shortleaf, pitch, Table Mountain, longleaf) have seen dramatic declines (NatureServe 2002, Martin et al 1993). In the absence of fire, hardwoods, shrubs, and vines have replaced the open, grassy, herbaceous layer that is characteristic of frequently burned areas, and hardwoods have encroached into the midstory further affecting forest structure. This change in forest structure and resulting habitat condition has had a direct effect on species dependent upon these communities. Several bird and reptile species associated with southern pine forests are in decline (Dickson 2001) as various habitat components are lost. In addition to declines in species dependent upon specific habitat attributes, entire pine communities are in decline. Recent studies show that acreage of Table Mountain pine communities (considered a rare community in the southern Appalachians) has decreased due to fire suppression (Turrill and Buckner 1995) and that many remaining examples have substantial hardwood invasion.

Management Indicators

Several management indicators have been identified for assessing effects to pine and pine-oak forest communities. These indicators include both key habitat variables and MIS.

Key habitat variables to be monitored annually include the number of acres of pine forests burned, the number of acres of pine plantations restored to natural

communities, and the total number of acres of pine forests restored. These activities together indicate the level of effort directed at maintaining or restoring pine and pine oak communities. The pine warbler (*Dendroica pinus*) is selected as a MIS for mid and late-successional pine forests based upon its association with this community. It will be monoitored annually through standard survey protocols.

6.5.2 Direct and Indirect Effects

Abundance

The future distribution of pine and pine-oak forests on the CNF will vary among alternatives in relation to management objectives for the maintenance and restoration of these community types. Table 3-31 lists the expected activity levels related to maintenance and restoration of southern yellow pine forests by alternative.

Table 3-31. Expected activity levels related to the maintenance and restoration of southern yellow pine forests on the CNF

Activity	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Average annual acres of existing shortleaf pine, pitch pine, or table mountain pine forests to be restored.	850	850	1,050	900	1,050	850	1,000
Average annual acres of loblolly pine plantations to be restored to natural communities	30	30	30	30	30	30	30
Average annual acres of Virginia pine forests to be reduced through restoration of fire adapted pine or pine oak communities.	2,125	2,125	2,625	2,250	2,625	2,125	2,500
Average annual acres of pine and pine-oak forests burned to achieve a fire return interval of 4-12 years.	1,955	1,955	2,415	2,070	2,415	1,955	2,300
Specific acre objectives for Table Mountain pine forests are presented in Section 7.4.0 (p.139							

The ability to meet these activity levels under each alternative varies based upon differences in the emphasis and subsequent management intensity of each alternative. To compare the potential level of maintenance and restoration activities among alternatives, the current distribution of southern yellow pine forests was compared with the prescription allocations for each alternative. Prescriptions were rated as to the management opportunity they provide for varying levels of vegetation management and prescribed burning (none, low, medium, and high). The proportion of existing mid and late-successional southern yellow pine forests in each management opportunity level is shown in Table 3-32.

Table 3-32. Proportion of existing mid and late-successional southern yellow pine forests on the CNF in each management opportunity level by alternative.

Alternative	Management Opportunity Level [1]			
	None	Low	Moderate	High
Alternative A	1	27	30	42
Alternative B	5	22	37	36
Alternative D	1	16	12	71
Alternative E	2	18	70	10
Alternative F	0	13	11	76
Alternative G	2	20	38	40
Alternative I	1	15	15	69

Management Opportunity Levels: None: None-None

(Veg Mtg -Rx Fire):

Low: None-Low, None-Medium, Low-Low

Mod: Low-Medium, Medium-Medium, Low-High

High: Medium-High, High-High

Table 3-32 shows that all alternatives provide high levels of opportunity for management, the lowest being alternative A, with 72 percent of the acres within prescriptions that would allow at least moderate levels of management.

Age Class Distribution and Forest Structure

Future age class distributions and forest structure will vary among alternatives due to the differences in management intensity and emphasis as shown above in Table 3-32. The ability to use fire as a management tool will play a critical part in restoring natural species assemblages and forest structure within the southern yellow pine communities.

As shown in Table 3-32, opportunities exist to manipulate vegetation in southern yellow pine forests through prescribed fire and other vegetation management techniques under all alternatives. Projected activities should be sufficient to enhance existing habitat conditions within pine and pine-oak forests above their current levels. Longer rotation ages coupled with more frequent fire will enhance habitat attributes such as grassy understories and standing snags needed by several declining bird species (Dickson 2001). With 50 years of Plan implementation, it is expected that this habitat element will be relatively abundant and well distributed across the forest under all alternatives.

Differing age class distribution and structure by alternative will have varying effects on the MIS for this community type. Table 3-33 shows the expected population trends for pine warblers under the different alternatives.

Table 3-33. Expected population trend[1] of pine warblers on the CNF under forest plan revision alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.							
Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	=	=	++	=	++	=	+
50 years	=	=	++	=	++	=	++

[1] Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

Based upon opportunities for active management, alternatives D, F, and I present the best future scenario for these MIS.

6.5.3 Cumulative Effects

This community was likely a common component of the historical landscape, but has been greatly reduced in distribution by recent SPB infestations and over the long term by fire exclusion. Restoration of mature forests will still be in progress in 50 years at some level under all alternatives, but likely would remain below historical levels. Future distribution and abundance of this community type would be considered to be fair (See Table 3-74 and Table 3-75, Terrestrial Viability section) when compared to historic levels. Although restoration rates would vary among alternatives, general outcomes would be the same because even under aggressive restoration alternatives, it will take longer than 50 years to restore mature forests in desired conditions.

Pine and pine-oak forests are common on the CNF as well as on adjacent private and public lands. The distribution of age classes (Table 3-30) varies considerably based upon ownership patterns, with the majority of older pine forests occurring on public lands. Management opportunities under all alternatives will ensure continued persistence of these communities on NFS lands with a focus on maintenance and restoration of natural species assemblages. Public lands already provide a vital function in providing the bulk of mid- and late-successional southern yellow pine forests and as restoration proceeds within these communities on NFS lands, the importance of these habitats to species of regional viability concern will increase.

6.6 Woodlands, Savannas, and Grasslands

6.6.1 Affected Environment

Complexes of woodlands, savannas, and grasslands were once a frequent occurrence across portions of the southeastern landscape, primarily in the Piedmont and Coastal Plain provinces (Davis et al., 2002; NatureServe 2001). Smaller occurrences likely occurred in the southern Appalachians on xeric ridge-tops and south-facing slopes where they were maintained by frequent fire (SAMAB 1996; DeSelm and Murdock, 1993). Woodlands are open stands of trees, generally forming 25 to 60 percent canopy closure (Grossman et al. 1998:21) and may be of pine, hardwood (typically oak), or mixed composition. Savannas are usually defined

as having lower tree densities than woodlands; grasslands are mostly devoid of trees. All of these conditions typically occurred in mixed mosaics within a fire-maintained landscape. In all cases, a well-developed grassy or herbaceous understory is present.

Existing remnants of this habitat in both the southern Appalachians and Piedmont are limited primarily to roadsides and powerline rights-of-way (Davis et al., 2002) due to reductions in fire frequency across most landscapes. One hundred and thirty-seven species of viability concern are associated with this community in the southern Appalachian region (Table 3-73, Terrestrial Viability section). Of these, thirty-five species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

Because existing woodland, savanna, and grassland complexes are rare and not consistently tracked, the current acreage in such condition is not well documented. These communities would likely occur on landforms currently occupied by xeric pine and oak communities. The distribution and condition of xeric pine and oak forests are discussed above in sections 6.4 and 6.5.

Management indicators used to assess management effects to woodland, savanna, and grasslands are: 1) total acres of woodland, savanna, and grassland complexes restored and maintained in desired conditions, 2) annual acreage of xeric forest types thinned for the purpose of restoring desired tree densities, 3) annual acreage of prescribed burning in xeric forest types for the purpose of restoring or maintaining open conditions and diverse understories, and 4) changes in the relative frequency of plant species within prescribed fire monitoring plots (USDI National Park Service 2001).

6.6.2 Direct and Indirect Effects

Because of their rarity, existing remnants of grassland communities that support significant populations or assemblages of rare species would be managed under the Rare Community Prescription (9.F) under all alternatives except F (current Plan). Similarly, existing woodland conditions associated with glades and barrens also would be included under rare community provisions. The Rare Community Prescription provides priority to protection and maintenance of such sites under all alternatives except F, including regular prescribed burning (if necessary) to maintain desired species composition and vegetation structure. Therefore, these sites are expected to be sustained for the foreseeable future under all alternatives except F.

In an effort to restore some of the ecological role that these communities have historically played, the LMP includes objectives for restoring complexes of woodlands, savannas, and grasslands to fire-maintained landscapes. Desired conditions include heterogeneous canopy coverage averaging 25 to 60 percent, and dense grass and herbaceous ground layers. Scattered patches may be devoid of canopy to provide for interspersed savanna and grassland conditions. Restoration activities may include thinning of trees (generally to less than 60 $ft.^2$ of basal area per acre) and prescribed burning. Prescribed fire on relatively short rotations (1 to 3 years) typically would be used to maintain desired conditions, and may involve both dormant and growing season fires.

Acres of woodland, savanna, and grassland complex restored and maintained would vary by alternative (Table 3-34) as a result of differing management emphases and the opportunity for varying levels of vegetation management and prescribed burning afforded by the various prescription allocations.

Table 3-34. Expected annual acres of maintenance and restoration activities for woodland, savanna, and grasslands complexes on the CNF

Activity	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Acres of shortleaf/pitch pine forests thinned per year to maintain a target basal area of 60-80 square feet per acre.	85	85	105	90	105	85	100
Acres of xeric pine and oak forests restored per year to open woodlands, savannas, and grasslands.	485	485	600	520	600	485	570
Acres of open woodlands, savannas, and grasslands burned annually in an effort to maintain a fire return interval of 4-12 years.	2,210	2,210	2,730	2,340	2,730	2,210	2,600

Because good examples of this community have become rare or missing on today's landscape, abundance of this community type in the future will be directly related to the amount of restoration and maintenance activities accomplished. Alternatives D, F, and I are the most permissive to restoration activities based upon the allocation of prescriptions, yet alternative's B and I provide the most direction to restore through associated objectives and overall theme of the prescriptions.

Restoration and maintenance activities would provide habitat for species associated with these community types, including several species of viability concern. Populations of these species are expected to vary across alternatives based on the amount of habitat restored and maintained. Permanent plots will be sampled pre- and post burn to determine the relative frequency of plant species. Fire adapted species are expected to increase over time within these plots.

Restoration and maintenance activities may cause some short-term negative effects to individual species, by causing disturbance, mortality, or temporarily setting back plant and animal reproduction or growth. However, species associated with this community are relatively adapted to such disturbances, which are necessary to create and maintain optimal habitat conditions. In balance, these actions would result in long-term beneficial effects to associated species.

6.6.3 Cumulative Effects

Historically present on xeric sites due to presence of fire, these habitats are much reduced today. Restoration will improve their distribution, but not likely to historical levels under any alternative. Restoration and management activities on National

Forests would play a critical role in the conservation of this community within the landscapes containing NFS land. Natural woodland, savanna, and grassland habitats are currently rare, occurring on private ownerships primarily along mowed roadside and powerline rights-of-ways (Davis et.al., 2002). It is not expected that private landowners will restore or manage to maintain significant amounts of woodland, savanna, and grassland complexes; therefore, they would remain limited in abundance without national forest restoration efforts.

7.0 Rare Communities

Rare communities are assemblages of plants and animals that occupy a small portion of the landscape, but contribute significantly to plant and animal diversity. They generally are limited in number of occurrences, are small in size, and have relatively discrete boundaries. Rare communities, wherever they occur on the forest, will be managed to ensure their contribution to meeting goals for community diversity, endangered and threatened species recovery, and species viability. Objectives and standards in the LMP are designed to maintain, restore, and enhance rare communities so that they will exhibit the composition, structure, and function necessary to support vigorous populations of species characteristic of the community, including relevant federally-listed threatened and endangered species, and species at risk of losing viability. The following sections describe existing condition and potential effects to rare communities on the CNF by alternative.

7.1.0 Wetland Communities

7.1.1 Affected Environment

Rare wetland communities in the Southern Appalachians include bogs, fens, seeps, ponds, river gravel-cobble bars, and river scour areas as follows:

Bogs, fens, seeps, and ponds are characterized by 1) soils that are semi-permanently to permanently saturated as a result of groundwater seepage, perched water tables, rainfall, or beaver activity, but otherwise are generally nonalluvial, and 2) presence of wetland-associated species such as sphagnum, ferns, and sedges. Dominant vegetation may be herbs, shrubs, trees, or some complex of the three. Ponds in this group include limesink, karst, and depression ponds, which may hold areas of shallow open water for significant portions of the year. Also included are all impoundments and associated wetlands resulting from beaver activity. Artificial impoundments are not included, unless they support significant populations or associations of species at risk. The primary management need is that of protection from activities that could disrupt wetland hydrology or other community structures and functions. Some sites may require periodic vegetation management to maintain desired herbaceous and/or shrubby composition. Rare wetland communities include Mafic and Calcareous Fens, Sphagnum and Shrub Bogs, Swamp Forest-Bog Complex, Mountain Ponds, Seasonally Dry Sinkhole Ponds, and Beaver Pond and Wetland Complex as defined in the SAA (SAMAB 1996), and all Associations within the following ecological groups as defined by NatureServe (2001):

458-15 Appalachian Highlands Wooded Depression Ponds
458-20 Appalachian and Interior Highlands Limesink and Karst Wooded

	Ponds
470-10	Appalachian Highlands Forested Bogs
470-20	Appalachian Highlands Forested Acid Seeps
470-50	Appalachian Highlands Forested Fens and Calcareous Seeps
475-10	Appalachian Highlands Acid Herbaceous Seeps
475-20	Appalachian Highlands Alkaline Herbaceous Fens and Seeps
475-30	Appalachian and Interior Highlands Herbaceous Depression Ponds and Pondshores

Riverine rare communities are characterized by 1) sites adjacent to or within stream channels that are exposed to periodic flooding and scour, and 2) presence of significant populations or associations of species at risk. These communities may be found in both Appalachian and Piedmont regions. Primary management needs are protection from disturbance during development of road crossings, and maintenance of desirable in-stream flows. These communities include River Gravel-Cobble Bars as defined in the SAA (SAMAB 1996), and the rare Associations within the following ecological groups as defined by NatureServe (2001):

457-10	Appalachian Highlands Riverine Vegetation
457-30	Rocky Riverbeds
457-40	Appalachian Highlands Riverscour Vegetation

The SAA Terrestrial Report summarizes the approximate number of occurrences of some of these wetland communities on NFS lands in the southern Appalachians (SAMAB 1996: 190) as follows:

Beaver Ponds and Wetland Complex = 5
Mafic and Calcareous Fens = 5
Mountain Ponds = 14
River-Gravel/Cobble Bar = 15
Seasonally Dry Sinkhole Ponds = 9
Sphagnum and Shrub Bogs = 62
Swamp Forest - Bog Complex = 19

Three hundred and fifty-six species of viability concern are associated with the above communities in the southern Appalachian region (Table 3-73, Terrestrial Viability section), one hundred and seventeen of which are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

There are numerous occurrences of wetland communities on the CNF. The following named communities represent some of the more significant occurrences by type: Cumberland Forested Acid Seeps (Bullet Creek, Cutshall Bog, Yellow Creek); Swamp Forest-Bog Complex - typic type (Jones Branch Bog, Lindy Camp Bog, parts of Moffett-Laurel Botanical Area, Stony Creek Bog); Rich Montane Seep - Cove Type (parts of Moffett-Laurel Botanical Area); Sinkhole Wetlands (Grindstaff Karst/Sinks, Sharp/Gimlet Branch); Montane Sweetgum Alluvial Flat (Sheeds Creek); Northern white cedar fen (Pine Knob); Unclassified (Devil’s Kitchen Branch Bog, Allen Gap).

7.1.2 Direct and Indirect Effects

Ernst and Brown estimated that more than 50 percent of the nation's wetlands have been destroyed in the past 200 years (Ernst and Brown 1988). Wetlands have been ditched and drained for pastures, mined for peat (Ewel 1990), and filled for a variety of commercial activities. Loss of some wetlands can also be attributed to sedimentation, pollution, and plant succession due to fire suppression (USFWS 1991). Because wetlands are so vulnerable to destruction on private land, it is critical to maintain these communities where they occur on NFS land. Beaver activity has historically played an important role in creating open wetland habitats that are now rare on the landscape. Beaver wetlands are beneficial for many rare species such as monkey face orchid (Shea 1992), but may be detrimental to others such as bog turtle (Jensen, pers. commun). Beaver impoundments also may cause unacceptable impacts to facilities and other resources.

Wetland rare communities would be managed under all alternatives except F, under the 9.F Rare Community Prescription for protection, maintenance, and where possible, restoration. These wetlands generally fall within riparian corridors, so provisions of the Riparian Prescription also would apply. Standards under all alternatives except F provide for protection of hydrologic function of wetland rare communities, and prohibit fish stocking to maintain suitability for amphibian breeding. Beaver created wetlands would normally be treated as rare communities, but beaver populations and impoundments could be managed to avoid adverse impacts to public safety, facilities, private land resources, at-risk species, and other rare communities.

Because wetland rare communities would be protected and maintained in all alternatives except F, no adverse direct or indirect effects to these communities are expected in these alternatives. Restoration efforts and creation of new wetlands through beaver activity may result in increased occurrence of these communities to the benefit of associated species. However, analysis indicates that, under all alternatives, wetland rare communities would remain uncommon on the forest because of their naturally limited distribution.

7.1.3 Cumulative Effects

Because all alternatives (except F- current Plan) place priority on protection and maintenance of these communities, cumulative effects on NFS lands are expected to be positive However, a significant proportion of Southern Appalachian wetland rare communities are located on private lands (SAMAB 1996: 190) where protection may be poorly regulated. For these reasons, protection of these habitats on NFS land is important to maintaining viability of associated species within the region. Future distribution and abundance of wetland habitats is likely to be poor (see tables 3 and 4, terrestrial viability section) when compared to historic levels. Drainage of virtually all occurrences of wetlands during European settlement and subsequent farming has reduced the distribution of these habitats and while plan implementation may restore some occurrences over time, this would not approximate historical levels within 50 years.

7.2.0 Barrens, Glades, and Associated Woodlands

7.2.1 Affected Environment

These communities are characterized by thin soils and exposed parent material that result in localized complexes of bare soils and rock, herbaceous and/or shrubby vegetation, and thin, often stunted woods. During wet periods they may include scattered shallow pools or areas of seepage. Glades, barrens, and associated woodlands differ from rock outcrop communities by exhibiting soils and vegetative cover over the majority of the site, and differ from the more widespread woodland communities in that they occur on geologic substrates which are unique for the region, including limestone, dolomite, amphibolite, greenstone, mafic rock, serpentine, sandstone, or shale. Associated communities include Calcareous Woodlands and Glades, Mafic Woodlands and Glades, Serpentine Woodlands and Glades, and Shale Barrens as defined in the SAA (SAMAB 1996). At a minimum, this rare community complex includes rare associations within the following ecological groups as defined by NatureServe (2001a):

401-17	Appalachian Highlands Calcareous/Circumneutral Dry-Mesic Hardwood Forest
440-05	Appalachian Highlands Carbonate Glades and Barrens
440-06	Appalachian Sandstone Glades and Barrens
440-07	Appalachian Serpentine Woodlands
440-08	Appalachian Mafic Igneous/Metamorphic Glades and Barrens

These communities may be found in the Appalachian region but are primarily known from Piedmont and Ridge and Valley physiographic provinces. Shale and mafic woodlands are most widespread in distribution, and may be forested if fire has not played a role in their maintenance or restoration. In general, these communities have not been well inventoried. Occurrence data for these communities on the CNF is limited, partly through the natural rarity of the community type, and in part due to lack of inventory. The following communities have been mapped on the CNF to be included in the rare community (9.F) prescription:

Appalachian Sandstone Glades and Barrens
Little Toqua Creek
Red Knobs Post Oak – Virginia Pine Woodland
CEGL008406 Community Rank: G2?
Monroe County

Appalachian Shale Glades and Barrens
French broad Shale Slopes
Blue Ridge Calcareous Shale Slope Woodland (Grassy Type)
CEGL007720 Community Rank: G2?
Cocke county

Nolichucky Cliffs
Blue Ridge Calcareous Shale Slope Woodland (Grassy Type)
CEGL007720 Community Rank: G2?

Unicoi County

Wilbur Lake Cliffs
Blue Ridge Calcareous Shale Slope Woodland (Grassy Type)
CEGL007720 Community Rank: G2?
Carter County

Wilbur Lake Cliffs
Blue Ridge Acid Shale Forest
CEGL007539 Community Rank: G2?
Carter County

The SAA (1996) concluded that only 25 percent of the known occurrences for species associated with mafic and other calcareous habitats, occurred on NFS lands. There are one hundred and nineteen species of viability concern associated with rare glades, barrens, and woodlands in the Southern Appalachians (Table 3-73, Terrestrial Viability section), fifteen of which are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

7.2.2 Direct and Indirect Effects

Many rare communities of this type are likely to be overgrown or in need of some level of restoration. Slightly adverse short-term effects could occur as a result of active restoration activities, which may temporarily alter the timing of reproduction or growth, but will result in no long term adverse effects. Short-term direct effects to species associated with these communities are likely to be small and insignificant compared to the positive indirect benefits of habitat restoration activities, when needed. Since all rare communities will be managed under the rare community (9.F) prescription, and the standards associated with the rare community prescription will be applied, effects of national forest management on both the communities and associated species is expected to be positive across all alternatives except alternative F (1986 LMP) in the long-term.

Since community inventories will primarily be conducted in project areas, consistent with the standard specific to this prescription, alternatives with fewer anticipated projects may result in the discovery and consequent restoration of fewer rare communities. Although the glade and barren communities are geographically restricted in distribution, and require low intensity disturbance once they are restored, they will be managed or restored to maintain their characteristics based on Forestwide goals for rare communities which will be applied across all alternatives. The future distribution of glade, barren, and woodland rare communities on the CNF, will be limited in all alternatives based upon natural rarity of these communities.

7.2.3 Cumulative Effects

The cumulative effects on the quantity and distribution of these rare communities is predicted by considering opportunities to inventory and restore these communities across alternatives and across private and public ownerships. Our ability to protect and restore these communities on the national forest is limited by our knowledge regarding their occurrence and distribution on the landscape. If only 25 percent of

the known sites for this community type occur on NFS land, glades, barrens, and woodland rare communities are likely to be vulnerable to development, competition with successional vegetation, and possible extirpation. Given the emphasis on rare communities in this Forest Plan, our knowledge regarding their distribution on NFS land is likely to increase. This suggests that national forests will play a larger role than private land in the conservation of glade, savanna, and woodland rare communities in the future. The cumulative effects of plan implementation are likely to be positive, though more so in year 50 compared to year ten of plan implementation as a result of better inventories. Restoration activities (especially prescribed fire) will improve the distribution of these habitats after 50 years of implementation, however we cannot accurately gauge changes from historical distribution because many examples of this community type are likely obscured on the landscape. Future distribution and abundance of this community type would be fair (See Table 3-74 and Table 3-75, Terrestrial Viability section) when compared to historic levels, except under Alternative F, which may not explicitly recognize these communities for proactive restoration and maintenance.

7.3.0 Carolina Hemlock Forests

7.3.1 Affected Environment

Carolina Hemlock (*Tsuga caroliniana*) communities, in general, have a restricted range, occurring primarily in the Southern Blue Ridge, with scattered occurrences in the upper Piedmont and Ridge and Valley of North Carolina, Tennessee, South Carolina, and Virginia. Occurrences are typically small and restricted to rocky bluff habitats, but can be found on valley bottoms, gorge slopes, or other protected landforms. These rare forests are separated into three distinct subtypes that are included in one ecological group (401-20) as defined by NatureServe 2001.

The ecology of this forest community is poorly understood with some debate in the current literature regarding the role of fire. Much of the species composition would suggest a fire maintained community, yet monitoring studies in North Carolina have shown evidence of stand expansion both following fires and periods of fire exclusion (Schafale and Weakley 1990). Rentch et al. (2000) reported that Carolina hemlock at a site in Montgomery County, VA was long-lived, very tolerant of drought stress, and had reproduced episodically over the past 200 years. There is no mention of fire in that paper. Further description of the life history of Carolina hemlock can be found in Humphry (1989).

Published information on the known distribution of Carolina hemlock forests across the southern Appalachians includes five occurrences on national forests, one occurrence in national parks, and six occurrences under private ownership (SAMAB 1996). Three sites have been allocated to the rare community (9.F) prescription on the CNF, located at Cliff-Temple Ridge, Iron Mountain, and Wilbur Lake Cliffs. The fact that these communities are often small in size and that half of the known occurrences occur on private lands leaves this community type vulnerable throughout it’s range.

The current amount and distribution of Carolina hemlock forests is threatened throughout it's range by the recent emergence of the hemlock woolly adelgid in the southern Appalachians. First identified in the eastern U.S.A near Richmond, VA in the early 1950's, this exotic pest has recently spread into the southern Appalachians and threatens to spread throughout the range causing mortality within five years after initial infestation (SAMAB 1996).

7.3.2 Direct and Indirect Effects

Carolina hemlock forests are considered to be a rare community and are afforded protection in all plan alternatives (except alternative F – current plan) through the 9.F (rare community) prescription. Additionally, a forestwide standard is included in all LMP alternatives except F that will minimize impacts to Carolina hemlock during vegetation management activities in order to maintain future restoration opportunities. Through the combination of the rare community prescription and forestwide standard, Carolina hemlock forests will be optimally managed for protection, restoration, and/or maintenance. This habitat type will remain rare and poorly distributed on NFS lands however, due to it's naturally limited distribution. There are four species of plants with viability concerns that are associated with Carolina hemlock forests across the southern Appalachian ecoregion (Table 3-73, Terrestrial Viability section). Three of these species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E). Due to the rarity of the habitat, the viability of these associated species will remain at risk, though management strategies included under all alternatives except F will minimize this risk by maintaining existing sites and associated populations.

Despite protection afforded under Plan alternatives, the current amount and distribution of Carolina hemlock forests is threatened throughout it's range by the recent emergence of the hemlock woolly adelgid in the southern Appalachians. First identified in the eastern U.S.A near Richmond, VA in the early 1950's, this exotic pest has recently spread into the southern Appalachians and threatens to spread throughout the range causing mortality within five years after initial infestation (SAMAB 1996).

7.3.3 Cumulative Effects

The fact that these communities are often small in size and that half of the known occurrences occur on private lands also leaves this community type vulnerable throughout their range. This, coupled with the impending threats from the hemlock woolly adelgid which will impact the species regardless of land ownership, leaves the long-term persistence of this community type in question. After 50 years of Plan implementation the distribution and abundance of this community would be poor (see Table 3-74 and Table 3-75, Terrestrial Viability section).

7.4.0 Table Mountain Pine Forests

7.4.1 Affected Environment

This forest community is characterized by a dominant or significant component of Table Mountain pine (*Pinus pungens*) in the overstory often in combination with pitch

pine (*Pinus rigida*). This community type corresponds to Table Mountain pine/Pitch Pine Woodlands as defined in the SAA (SAMAB 1996:185-186), and all Associations within the following ecological group as defined by NatureServe (2001a):

401-80 Appalachian Highlands Pitch and Table Mountain pine Woodlands.

The Table Mountain pine community is globally rare (G3) and endemic to the southern Appalachian Mountains where it is maintained by periodic fire or extreme site conditions. Several sensitive and locally rare species may be found within this community type. Recent studies show that acreage of this community has decreased due to fire suppression (Turrill and Buckner 1995) and that many remaining examples have substantial hardwood invasion. Without periodic fire, this community will gradually succeed into forests dominated by *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating (NatureServe 2001). Previous studies have suggested that stand replacement fire was the primary mechanism for Table Mountain pine regeneration (USDA 1965, Zobel 1969, Sanders 1992), however, recent research suggests otherwise. Welch and Waldrop (2001) found that while fire is needed for regeneration of Table Mountain pine stands, the intensity may vary depending on site conditions. High intensity fire may reduce seedbed habitat quality by drying the site, reducing mycorrhizal fungi abundance, and may consume cones and kill seeds (Waldrop 2002). Additionally, dendrochronology studies indicate that ridgetop pine communities in the southern Appalachians are unevenly aged with trees ranging from 50 to 150 years old, and were historically created and maintained by multiple low-intensity fires rather than a single stand-replacement event (Waldrop 2002).

Table Mountain pine has a very limited distribution on the CNF. The CISC database currently contains 6,921 acres coded as Table Mountain pine and an additional 3,172 acres of Table Mountain pine-hardwood, which combined is just over one percent of the total forest acres. One of the largest Table Mountain pine stands is found at Horse Hitch Gap in Greene County. This 148 acre site consists mostly of steep, upper mountain slopes ranging from approximately 2,000 to 2,800 feet in elevation. The vegetation varies from nearly pure stands of Table Mountain pine to mixed communities that support a variety of pine and hardwood species. The area was proposed as a Research Natural Area in the 1970's but was never formally established. Additional Table Mountain pine stands are found at scattered locations on the CNF, noteably at Cliff-Temple Ridge (Unicoi Co.), Fagal-Birch Branch (Johnson Co.), Nolichucky Cliffs (Unicoi Co.), Whetstone Branch (Johnson Co.), and Wilbur Lake Cliffs (Carter Co.).

Ten species of viability concern are associated with Table Mountain pine forests in the southern Appalachian region (Table 3-73, Terrestrial Viability section). Three of these species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

7.4.2 Direct and Indirect Effects

Table Mountain pine forests are considered a rare community and are protected in all plan alternatives except F (current Plan) through the 9.F (rare community) prescription. Plan alternatives A, B, D, E, G, and I also include specific standards and

management direction to maintain and restore this community type on suitable sites. Where Table Mountain pine occurs as a minor component of the canopy, vegetation management will be designed to ensure it's regeneration in order to maintain future restoration opportunities. Primary management needs are maintenance and expansion of existing occurrences, using thinning and prescribed fire. Table 3-35 shows expected activity levels related to the maintenance and restoration of Table Mountain pine forests.

Table 3-35. Expected Activity Levels related to the maintenance and restoration of Table Mountain pine forests for the CNF by Alternative.

Activity	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Average annual acres of table mountain pine forests to be restored	40	45	50	40	55	45	50
Average annual acres of table mountain pine forests to be burned	130	145	175	130	175	130	160

The ability to meet these activity levels under each alternative varies based upon differences in the emphasis and subsequent management intensity of each alternative. To compare the potential level of maintenance and restoration activities among alternatives, the current distribution of Table Mountain pine forests was compared with the prescription allocations for each alternative. Prescriptions were rated as to the management opportunity they provide for varying levels of vegetation management and prescribed burning (none, low, medium, and high). The proportion of existing Table Mountain Pine Forests in each management opportunity level is shown in Table 3-36 and Table 3-37.

Table 3-36. Proportion of existing Table Mountain pine forests on the CNF in each management opportunity level by alternative.

Alternative	Management Opportunity Level [1]			
	None	Low	Moderate	High
Alternative A	3	46	48	3
Alternative B	19	19	52	10
Alternative D	3	15	1	82
Alternative E	4	44	33	19
Alternative F	0	15	44	41
Alternative G	4	34	28	34
Alternative I	2	26	22	50

[1]Management Opportunity Levels: (Veg Mtg -Rx Fire)
None: None-None
Low: None-Low, None-Medium, Low-Low
Mod: Low-Medium, Low-High,Medium-Medium
High: Medium-High, High-High

Table 3-37. Proportion of existing Table Mountain pine-oak forests on the CNF in each management opportunity level by alternative.				
Alternative	Management Opportunity Level [1]			
	None	Low	Moderate	High
Alternative A	12	57	22	9
Alternative B	20	39	33	8
Alternative D	3	34	2	61
Alternative E	3	61	33	3
Alternative F	0	30	24	46
Alternative G	3	56	36	5
Alternative I	2	34	47	17

[1]Management Opportunity Levels: (Veg Mtg -prescribed Fire)
None: None-None
Low: None-Low, None-Medium, Low-Low
Mod: Low-Medium, Low-High,Medium-Medium
High: Medium-High, High-High

For the CNF, alternatives F, D, and I provide the most opportunity for management, and all alternatives have at least 50 percent of the Table Mountain pine acres allocated to prescriptions that would allow at least moderate levels of management. The same is true for Table Mountain pine-oak forests, except only alternatives F, I, and D have greater than 50 percent of the acres allocated to prescriptions that would allow at least moderate levels of management. While all alternatives appear to allow sufficient management to maintain existing Table Mountain pine forests, only alternatives F, I, and D would provide sufficient flexibility to restore these communities where hardwood encroachment has occurred. However, because alternative F does not explicitly recognize this community type and afford it the protections and proposed restoration strategies that the other alternatives do, it is not anticipated that management activities will benefit this communty type under alternative F. While restoration and maintenance activities would benefit this community, Table Mountain pine forests will remain rare and poorly distributed on NFS lands due to their naturally limited distribution.

7.4.3 Cumulative Effects

Table Mountain pine has a limited distribution on the CNF and is concentrated in relatively small areas typically with small acreages. Little is known about the amount of Table Mountain pine forest on adjacent private lands, however, it is unlikely that such forests would be actively managed to restore or maintain this community type, and therefore existing Table Mountain pine stands on private lands are expected to decline over time due to hardwood encroachment and lack of pine regeneration. Although limited in acreage, the maintenance and restoration of this community on NFS lands remains critical to perpetuate this forest type.

Distribution of these forests should be improved with restoration and maintenance, but prevalence of fire at moderate elevations needed to maintain this community will probably still be less than that which occurred historically. The rare community prescription would result in the same level of protection and maintenance of existing

sites across alternatives, except for Alternative F, which could result in continuing decline of the type due to neglect. After 50 years of Plan implementation the distribution of this community type would range from good to poor (see Table 3-74 and Table 3-75, Terrestrial Viabilty section).

7.5.0 Basic Mesic Forests

7.5.1 Affected Environment

These communities are characterized by closed-canopy deciduous overstories and rich and diverse understories of calciphilic herbs, underlain by high-base geologic substrates. On moderate to high elevation sites, these communities are typically found in protected coves, and can be distinguished from more acidic mesic cove forests by the abundance of species such as white basswood (*Tilia americana*), yellow buckeye (*Aesculus flava*), black walnut (*Juglans nigra*), sweet white trillium (*Trillium simile*), black cohosh (*Cimicifuga racemosa*), blue cohosh (*Caulophyllum thalictroides*), sweet shrub (*Calycanthus floridus*), sweet cicely (*Ozmorhiza* spp.), doll's eyes (*Actaea racemosa*), maidenhair fern (*Adiantum pedatum*), and plantain-leaved sedge (*Carex plantaginea*). Good examples of moderate and high elevation basic mesic forests have a low incidence of white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), rhododendron (*Rhododendron* spp.), and Christmas fern (*Polystichum acrostichoides*).

On lower elevation sites, these communities are more typically found on north slopes, where dominant and characteristic overstory species are American beech (*Fagus grandifolia*) and northern red oak (*Quercus rubra*), with tulip poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), or white ash (*Fraxinus americana*), and pawpaw (*Asimina triloba*) in the midstory and shrub layers, and understories that include nodding trillium (*Trillium rugelii*), black cohosh (*Cimicifuga racemosa*), doll's eyes (*Actaea racemosa*), foam flower (*Tiarella cordifolia var. collina*), bloodroot (*Sanguinaria canadensis*), bellworts (*Uvularia sp.*) and trout lilies (*Erythronium spp.)*. Good examples of low elevation basic mesic forests have a low incidence of sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), and exotics such as Japanese honeysuckle (*Lonicera japonica*) or Chinese privet (*Lingustrum vulgare*).

This community includes the following Associations defined by NatureServe (2001a, 2001b):

CEGL007711	Southern Applachian Cove Forest (Rich Foothills Type),
CEGL007695	Southern Applachian Cove Forest (Rich Montane Type),

Identification of these communities is typically based on site-specific inventories. The following sites supporting basic mesic forests have been mapped for protection on the CNF: Fagal Branch, Griffith Branch, Whetstone Branch.

The SAA (SAMAB 1996:49) combined mesic and xeric mafic communities, and concluded that only 25 percent of the known occurrences for species associated with mafic and other calcareous habitats, occurred on NFS land. Forty-three species of viability concern are associated with basic mesic forests in the southern

Appalachian region (Table 3-73, Terrestrial Viability section), with the majority being vascular plants. Twenty-seven of these species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

7.5.2 Direct and Indirect Effects

All high quality basic mesic forest communities will be managed under the 9.F (rare community) prescription under all alternatives except Alternative F (current Plan). Under Alternative F these areas may be available for timber production and early seral wildlife habitat, reducing their distribution relative to other alternatives. Primary management needs are protection from undesirable disturbance. These communities are characterized by low intensity, low frequency disturbances, and are often most threatened by recreational use, since many are desirable for interpretive trails. Several standards for rare communities ensure their maintenance or restoration across the CNF. The 9.F prescription encourages the exclusion of basic mesic forests from prescribed burning blocks where this can be accomplished without large increases in fireline construction, and discourages direct firing unless necessary to secure control lines. Only low intensity fires are allowed. Alternative E, which emphasizes recreation, may present the greatest management challenge to protection of these communities and associated species. Additional rare communities standards are designed to reduce or eliminate adverse effects to rare communities caused by recreational use.

Since rare communities would be protected or restored across all alternatives, the effects of national forest management on these communities and associated species would be positive under all alternatives except F (current plan). However, under all alternatives this community will remain relatively rare on the forest because of its naturally limited distribution.

7.5.3 Cumulative Effects

The cumulative effect on the quantity and distribution of basic mesic forests is determined by considering trends in the status of these communities through time and across private and public ownerships. Even though people increasingly use the national forest for recreational or social needs, protection actions will have positive effects. However, based on regional conditions reported in SAMAB (1996:49) the CNF likely contains a relatively small proportion of known occurrences of this community type; examples of the type on private lands are unlikely to receive the same level of protection. It is expected that the cumulative effects of development, recreational use, timber harvest, and other activities on private lands will result in a decrease of good examples of these community types across the landscape, making national forest examples increasingly valuable to regional conservation. Future distribution and abundance of this community on NFS lands would be fair (see Table 3-74 and Table 3-75, Terrestrial Viability section) under all alternatives except Alternative F when compared to historic levels. Although virtually all of these sites have been logged in the past, with protection they are likely restorable to near historic distributions after 50 years of LMP implementation. Outcomes are the same across alternatives, except for Alternative F, which does not recognize this community for protection.

7.6.0 Beech Gap Forests

7.6.1 Affected Environment

This community is characterized by canopies dominated by American beech (*Fagus grandifolia*) on steep slopes near mountain gaps above 4,500 feet. Trees may be stunted, shrub layers are typically sparse, and herbaceous growth dense. This community is found in the Appalachian region. Primary management needs are protection from non-target management disturbance and recreational impacts. This community corresponds to Beech Gap Forest as defined in the SAA (SAMAB 1996:179), and the following Associations defined by NatureServe (2001a, 2001b):

CEGL006246 Southern Appalachian Beech Gap (North Slope Tall Herb Type)
CEGL006130 Southern Appalachian Beech Gap (South Slope Sedge Type)

Beech gap forests are considered as a distinctive subtype of the northern hardwood forest (Schafale and Weakley 1990). These forests have a very restricted range and typically occur as small acreages. As a result of exposure to severe climatic conditions (wind, snow, ice) the canopy trees typically have a distinctive stunted and gnarled appearance. There are no plants or animals known to be obligate associates of this community, though one species of viability concern in the southern Appalachian region is associated with this habitat type (Table 3-73 and Table 3-79, Terrestrial Viability section and Table L, Appendix E).

The SAA indicates that there are at least 12 known occurrences of this rare community in Virginia and North Carolina, with other occurrences possible in Tennessee (SAMAB 1996: 188). Of these, five are on national forests, three on national parks, and four on private lands (SAMAB 1996:190). Beech gap communities are not well inventoried on the CNF, though a few occurrences have been documented and are included in mapped rare community (9.F) allocations.

7.6.2 Direct and Indirect Effects

Beech gap forests would be managed under the Rare Community (9.F) Prescription under all alternatives except alternative F (current Plan). Because of the site-dependent ecological forces that have shaped existing beech gap forests, opportunities for increasing their extent are limited. Maintenance of existing sites would focus on protection from recreational impacts and management disturbances. Despite these protections, this community will remain rare and poorly distributed on NFS lands due to its naturally limited distribution. Threats to these forests include wild hogs and air pollution (TNC 1994, NatureServe 2001).

7.6.3 Cumulative Effects

This community is limited to topographic positions that make its potential distribution relatively stable over time. However, these communities were significantly modified (cleared and burned) during the early 20th century. Stands will need to reach about 140 years of age before old growth component is present again. Beech bark disease is expected to cause mortality at existing sites under all alternatives.

This community is limited in distribution and abundance across ownerships, with the majority of known sites in public ownership (SAMAB 1996: 190), making protection on public lands critical to its maintenance. All revision forests supporting this community recognize it as a rare community under provisions of the 9.F prescription, which would provide it optimal protection under all alternatives except alternative F. Protection of private land sites is not as certain. Regardless of national forest protections, this community would remain rare across the southern Appalachian region under all alternatives due to its naturally limited distribution. After 50 years of Plan implementation the distribution and abundance of this community would be fair (see Table 3-74 and Table 3-75, Terrestrial Viability section) under all alternatives when compered to historic conditions, except alternative F, which would be poor.

7.7.0 Rock Outcrops and Cliffs

7.7.1 Affected Environment

Rock outcrops and cliffs are defined here as rare communities and include the following types of communities as defined in the SAA (SAMAB 1996:179-186), and by NatureServe (2001).

Talus Slopes

This community is characterized by nonvegetated or sparsely vegetated accumulations of rock at 2,500 to 4,600 feet elevation. It is found in the Appalachian region and is distinguished from Forested Boulderfields by the lack of trees, and from rocky summits by its occurrence on side slopes as opposed to ridges and peaks. This community includes Talus Slopes as defined in the SAA (SAMAB 1996:186), and all Associations within the following ecological group as defined by NatureServe (2001):

430-10 Eastern Acid Talus

Forested Boulderfields

This community is characterized by rock fields, found at 3,500 to 5,300 feet elevation, that support a variable density of trees, typically dominated by yellow birch. It is distinguished from talus slopes by the presence of trees. It is found in the Appalachian region. This community includes Boulderfields as defined in the SAA (SAMAB 1996:179), and the following Associations as defined by NatureServe (2001a, 2001b):

CEGL004982	Southern Appalachian Hardwood Boulderfield Forest (Typic Type)
CEGL006124	Southern Applachian Boulderfield Forest (Currant and Rockcap Fern Type)

Cliffs and Bluffs

These communities are characterized by steep, rocky, sparsely-vegetated slopes, usually above streams or rivers. Cliff communities may be dry or wet, and include communities associated with waterfalls, such as spray cliffs and rock houses. These communities are found in the Appalachian region. This community includes Calcareous Cliffs, Mafic Cliffs, Sandstone Cliffs, and Spray Cliffs as defined in the SAA

(SAMAB 1996:179,182,183,185), and all Associations within the following ecological groups as defined by NatureServe (2001a):

430-40 Eastern Dry Acid Cliffs
430-45 Eastern Moist Acid Cliffs
430-50 Eastern Dry Alkaline Cliffs
430-55 Eastern Moist Alkaline Cliffs
430-60 Appalachain Highlands Northern White-Cedar Bluffs
430-65 Appalachian Highlands Rock Houses

Rock Outcrops

These communities are characterized by significant areas of exposed, usually smooth, exfoliating granite or related rocks, with scattered vegetation mats and abundant lichens. These communities are found in both the Appalachian and Piedmont regions. This community includes Granitic Dome and Granitic Flatrock as defined in the SAA (SAMAB 1996:180-181), and all Associations within the following ecological groups as defined by NatureServe (2001a):

435-10 Appalachian Highlands Granitic Domes
435-20 Appalachian Highlands Grantic Flatrock

Rocky Summits

This community is characterized by sparsely vegetated outcrops of fractured, irregular rock found above 4,000 feet elevation on peaks, ridges, and upper slopes. It is distiguished from rock outcrop communities by its fractured, irregular rock surface, and from talus slopes and cliff communities by its topographic position on or near summits. It differs from forested boulderfields in its general lack of forest cover. This community is found in the Appalachian region. This community includes High Elevation Rocky Summits as defined in the SAA (SAMAB 1996:182), and all Associations within the following ecological group as defined by NatureServe (2001a):

436-30 Appalachian Highlands Rocky Summits

The known distribution of rock outcrop and cliff communities (Table 3-38) described in the SAA (SAMAB 1996:188) is as follows:

Table 3-38. The Distribution of Rock Outcrop and Cliff Rare Communities By State For The Southern Appalachian Area (after SAMAB 1996:188)

Community Type	AL	GA	NC	SC	TN	VA
Talus Slopes	?	?	?	?	?	9
Forested Boulderfields	?	?	96	?	37	5
Calcareous Cliffs	2	?	3	?	2	41
Mafic Cliffs	?	?	4	?	?	3
Sandstone Cliffs	6	6	?	?	2	5
Spray Cliffs	?	?	40	4	?	?
Granitic Domes	?	?	53	18	?	?
Granitic Flatrock	5	?	?	?	?	?

Note: These data are based upon a 1996 query of State Natural Heritage databases and may not reflect actual distributions if individual states have not tracked these communities.

Two hundred and eighteen species of viability concern are associated with southern Appalachian rock outcrops and cliffs (Table 3-73, Terrestrial Viability section). Of these, sixty-eight species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

7.7.2 Direct and Indirect Effects

As stated above, rock outcrop and cliff communities are considered rare communities and will be managed optimally for protection, restoration, and/or maintenance through the 9.F (rare community) prescription. This direction is the same under all plan alternatives (except F – current Plan) thus the effects of national forest management on these communities and associated species is expected to be positive in all alternatives except F. A subset of these communities that are associated with riparian areas (spray cliffs, waterfalls, etc.) are also afforded protection by the riparian prescription under all plan alternatives. This habitat type will remain rare and poorly distributed on NFS lands, however, due to it's naturally limited distribution. Likewise, viability of associated species will remain at risk, though management strategies included under all alternatives except F will minimize this risk by maintaining existing sites and associated populations.

7.7.3 Cumulative Effects

Cumulatively, these communities are vulnerable to negative impacts on private lands, making national forest sites essential to maintain. Distribution of such sites has been and should continue to be relatively stable over time under all alternatives due to the stability of the factors that define them. Future condition of this habitat type should be good (see Table 3-74 and Table 3-75, Terrestrial Viability section) when compared to historic condition, except under Alternative F, which does not explicilty recognize these communities for protection.

7.8.0 High Elevation Balds and Meadows

7.8.1 Affected Environment

"Of all the non-forested plant communities in the southern Appalachians, the grassy balds are the most famous and their origins the most historically obscure" (Lindsay and Bratton 1979). The origin and continued existence of high elevation balds in the southern Appalachians has been, and continues to be, a hotly debated topic. Several authors have proposed that existing balds are simply the result of historic land use and their disappearance is nothing more than natural succession (Wells 1936, 1938, 1956; Gersmehl 1970; Lindsay and Bratton 1979; Sutter and White 1994), while others are proponents of natural origins with major ecological changes being the cause of their decline (Billings and Mark 1957; Mark 1958, Weigl and Knowles 1995). The answer most likely to be accurate combines both theories. Some balds support species of rare and northern disjunct plant species suggesting a long evolutionary history (Weigl and Knowles 1995) while others support a mix of common and non-native species and may be nothing more than historical fields.

Regardless of origin, two types of high elevation balds are found in the southern Appalachians; grassy balds and shrub (or heath) balds. Grassy balds are characterized by extensive areas dominated by herbaceous vegetation at high elevations (generally above 5,000 feet). They generally are found on ridgetops, domes, and gentle slopes. Shrub balds are typically found on steep exposed slopes and ridges at elevations ranging from 2,000 to 6,500 feet, and are characterized by dominance of ericaceous shrubs. This community includes Grassy Balds and Heath Balds as defined in the SAA (SAMAB 1996: 181-182), and all Associations within the following ecological groups as defined by NatureServe (2001a):

436-10 Appalachian Highlands Grassy Balds
436-20 Appalachian Highlands Shrub Balds

Conditions typically occurring on high elevation balds include strong wind, high rainfall, frequent fog and extremes of temperature and moisture. Species composition varies regarding topographic features, moisture, exposure, types of disturbances and land use history. The known distribution of grassy and heath bald communities is described in the SAA Terrestrial Technical Report (SAMAB 1996:188-190). This report indicates that approximately two-thirds of the occurrences of grassy balds and nearly one half of the occurrences of heath balds in the southern Appalachian area are located on NFS lands.

Twenty-nine balds and high elevation meadows are known to occur on the CNF. Table 3-39 lists these balds with a short description of existing conditions.

Table 3-39. Balds and High Elevation Meadows Known to Occur on the CNF

Name	Location	Existing Condition
Northern Portion of the CNF		
Beauty Spot	N36° 07.02' W82° 19.95'	Open areas with numerous exotic species present. Has been maintained with mowing and prescribed fire.

Table 3-39. Balds and High Elevation Meadows Known to Occur on the CNF		
Name	Location	Existing Condition
Beauty Spot Gap	N36º 07.55’ W82º 18.71’	Open area with numerous exotic species present. Some woody encroachment is taking place. Partially in Wilderness.
Big Bald	N35º 59.30’ W82º 29.30’	Predominantly open area with a mixture of exotic and native grasses. Areas of blackberry and hawthorn thickets are being controlled with annual mowing. Vehicle use is causing problems on portions of the area.
Big Butt	N36° 04.00’ W82° 37.50’	An open high elevation grassland also known as the Ball Ground. Consists of exotics and natives. Mowed on occasion by District. Road currently flood damaged. Some woody encroachment taking place. Need to restore access in order to maintain.
Bradley Gap	N36° 07.869’ W82° 01.600’	Open bald with a mix of native and exotic species. Managed with a grazing allotment administered by the Pisgah National Forest. Woody encroachment is occurring on perimeters. Most of this lies within North Carolina but portions may be on Cherokee National Forest lands.
Camp Creek Bald	N36° 01.40’ W82° 42.30’	Site of an old ski resort and development. Currently open and maintained. Mostly exotic grasses, but some natives present. Vehicle use has caused problems at site. Small grass dominated openings are scattered along the ridge and are surrounded by high elevation red oak forest.
Cold Springs Bald	N36° 03.50’ W82° 38.30’	An open bald mowed as a wildlife opening. Access road is currently flood damaged. Some woody encroachment is taking place. Mixture of exotics and natives. Need to restore road access in order to maintain.
Doll Flats	N36° 08.426’ W82° 00.710	Open fields. Portion recently acquired in North Carolina was grazed. Portions in Tennessee suffering from encroachment and ATV traffic. Vegetation is a mix of exotics and natives. Currently open, but encroachment is a problem. Currently talking with Pisgah National Forest to manage jointly with grazing.

Table 3-39. Balds and High Elevation Meadows Known to Occur on the CNF		
Name	Location	Existing Condition
Grassy Bald	N36° 06.201’ W82° 04.877’	Natural bald. Mostly native species, but some exotics present. Some ongoing maintenance, but woody encroachment is still occurring. Visitor use is resulting in trampling of vegetation.
Jane Bald	N36° 06.368’ W82° 05.40’	Natural bald. Mostly native species, but some exotics present. Periodically maintained by mowing, but encroachment is occurring and is a constant problem.
Lick Rock	N35° 59.00’ W82° 36.00’	Old farmstead consisting of a mixture of exotics and native grasses and shrubs. Working with ATC to keep open by burning. Need to work on exotics to improve site.
Little Hump Mountain	N36° 07.457’ W82° 01.753’	Open bald. Combination of natives and exotics. Managed with a grazing allotment administered by the Pisgah National Forest. Woody encroachment is occurring on perimeters.
Max Patch	N35° 47.40’ W82° 57.20’	Mostly open with scattered shrubby patches. Maintained by the Pisgah NF recently by fire. Combination of natives and exotics.
North East Little Rock Knob	N36° 09.19’ W82° 08.23’	Currently maintained as a wildlife opening by mowing. A mix of natives and exotic species.
Roger’s Ridge	N36° 35.316’ W81° 41.421’	Once one bald, now split in two, separated by northern hardwood/mesic oak forest. Composed of exotic and native grasses. Approximately 20 acres (25%) of open area was burned in 2001. Woody encroachment is a major factor here and the bald is very vulnerable to closure in the absence of active open-areas management.
Round Bald	N36° 06.397’ W82° 06.27’	Natural bald. Mostly native species, but some exotics present. Maintained via track mowing, weed eaters, brush mowers, and grazing in recent years. Woody encroachment is a constant problem.
Stamping Ground Ridge	N36° 08.30’ W82° 17.30’	A heath bald with encroaching trees. Exotic species are prevalent along trails. No current management. Partially in wilderness.
Street Gap	N35° 58.30’ W82° 32.25’	Recently acquired old Christmas tree farm. Burned in 2001 and planted with hardwoods. Plans are to keep a small opening along AT and allow rest to revert to forest. Numerous exotic species present.

Table 3-39. Balds and High Elevation Meadows Known to Occur on the CNF		
Name	Location	Existing Condition
Unaka Mountain Observation Site	N36° 08.00’ W82° 18.40’	A heath bald. Mostly native vegetation, but exotics occur along road and trail. No current management. Located partially in Wilderness.
Walnut Mountain	N35° 50.30’ W82° 56.50’	Historic farm fields and orchards that are succumbing to succession. Currently a mixture of small openings, orchards and young forest, with a mix of native and exotic species. Plans exist to re-open as part of the Wolf Creek Project.
Southern Portion of the CNF		
Beaverdam Bald		Small grassy area surrounded by hardwood forest. Currently a mixture of native and introduced grasses and forbs.
Buck Bald		Small grassy area surrounded by hardwood forest. Currently a mixture of native and introduced grasses and forbs.
Grassy Top		Bald remnant, now mostly forested with hardwood forest.
Haw Knob		Small grassy area surrounded by hardwood forest. Currently a mixture of native and introduced grasses and forbs.
Hazelnut Knob		Bald remnant, now mostly forested with hardwood forest.
Stratton Meadow		Bald remnant, now mostly forested with hardwood forest.
Little Bald		Small grassy area surrounded by hardwood forest. Currently a mixture of native and introduced grasses and forbs.
Little Haw Knob		Small grassy area surrounded by hardwood forest. Currently a mixture of native and introduced grasses and forbs.
Whigg Meadow		Grassy meadow dominated by a mixture of introduced and native grasses and forbs. Surrounded by high elevation hardwood forest.

Primary management needs for natural balds are protection from recreational impacts and maintenance of open condition with desired vegetation. Sixty-five species of viability concern are associated with southern Appalachian grassy and shrub bald communities (Table 3-73, Terrestrial Viability section). Of these, twenty-nine species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

7.8.2 Direct and Indirect Effects

Natural balds are considered a rare community and would be managed and protected under all alternatives through the 9.F (rare community) prescription. Balds determined to be anthropogenic in origin are best considered “historic landscapes” and may be managed to interpret those conditions. Regardless of origin, balds containing significant populations of rare elements will be protected as rare communities under all alternatives.

Information concerning the former distribution of grassy balds is available from historic records which could be used to ascertain desired future distribution. Distribution of shrub balds has been, and should continue to be, somewhat more stable over time than grassy balds due to the stability of the factors that create them, namely slope position and shallow soils. Catastopic fires that occurred after land clearing in the early 20th century has likely expanded and changed the composition of these balds. Expected outcomes for bald habitats are the same across alternatives, except for the benign neglect under Alternative F as opposed to focused attention under other alternatives as a result of the rare community prescription.

For those balds that fall within existing or recommended Wilderness (Prescriptions 1.A and 1.B), restoration activities could occur, but these allocations could limit the available methods and the degree of restoration activities. High elevation balds would be managed to maintain or restore bald characteristics including species composition, successional stages desired, and occurrences of threatened or endangered species. Bald restoration may involve thinning, mechanical treatments, herbicide release, grazing, and prescribed burning (Saunders 1980).

A conservation strategy for three high elevation balds (Roger’s Ridge, Whigg Meadow, and Camp Creek Bald) was completed in 2001 (Major 2001). Much of the information and methods presented in that document will be applicable to other balds in the region. Restoration and maintenance activities would benefit these communities and associated species of viability concern, however they will remain rare and poorly distributed on NFS lands due to their naturally limited distribution and constraints on the ability to manage as described above.

7.8.3 Cumulative Effects

Most high elevation habitat (> 4,000’ elevation) in the southern Appalachian region occurs on public lands placing the responsibility of restoration and maintenance of balds on public land managers. Similar restoration efforts for balds are occurring throughout the southern Appalachian region which should result in a long-term improvement of this habitat type in the future. Expected abundance and distribution of this habitat element after 50 years of plan implementation relative to historic conditions would be fair (see Table 3-74 and Table 3-75, Terrestrial Viability section).

7.9.0 Caves and Mines

7.9.1 Affected Environment

This community is characterized by natural and human-made openings in the ground that extend beyond the zone of light, creating sites buffered in relation to the outside

environment. Included are karst and sinkhole features and sinking streams that lead to subterranean environments. Surfaces of karstlands are directly linked to cave water systems and aquifers (Kastning and Kastning 1990).

The shape and location of entrances, along with the hydrology, configuration, size, elevation, and patterns of airflow influence the types of fauna found within caves and mines (SAMAB 1996: 180). Many bats are dependent on caves, both seasonally and year-round. Bats select roosts with temperatures appropriate to their metabolic processes (Tuttle and Stevenson 1977). An intermediate, unusable range of temperatures characterizes most caves, and bats use a very small number of caves with desirable conditions.

In the southern Appalachians, most caves are found in carbonate valleys of the Ridge and Valley and the Cumberland Plateau (SAMAB 1996: 180). The Blue Ridge contains fissure caves and a smaller number of solution caves found in limestone or dolomite collapsed valleys and windows. Because of their rarity and vulnerability, their protection is a key conservation need within this region (SAMAB 1996: 37). Sinkholes and karstlands are scattered throughout the planning area, and large examples are rare They are most common in the Northern and Central Ridge and Valley (Jefferson National Forest), as well as the Cumberland Plateau (Bankhead National Forest), with fewer occurrences known from the Blue Ridge (SAMAB, 1996: 189).

Abandoned mines have become key year-round resources for bats displaced from natural roosts, including caves and large hollow trees, by human disturbance (Tuttle and Taylor 1994). Abandoned mines may provide microclimates similar to those of caves. Mines are used for maternity sites, hibernation sites, migratory stopover sites, and temporary night roosts. Some bats rely heavily on use of mines range wide, and many bat species are believed to hibernate exclusively in old mines or caves (Tuttle and Taylor 1994).

The limited karst formations of the CNF are found along the extreme western edge of the forest (the eastern edge of the Ridge and Valley Province) (Barr 1961). Eight caves and over twenty mine portals are known to exist on the CNF. Barite or iron ore mine portals are known from all ranger districts but are concentrated on the Nolichucky-Unaka District.

7.9.2 Direct and Indirect Effects

Possible threats to national forest caves and mines are 1) direct disturbance from human visitation or improperly installed gates/closure devices, 2) management activities that indirectly result in alteration of temperature, humidity, surface water recharge or water quality, and 3) temporary decline in air quality due to prescribed burning (SAMAB 1996:90).

Provisions of the Rare Community Prescription (9.F) and forestwide direction apply to caves and mines that support cave-associated species and are the same across all alternatives. Direct disturbance from human visitation is regulated by a standard that requires use of proper closure devices for caves and mines supporting significant populations of bats. Camping and fire-building at cave and portal

entrances is prohibited. Non-essential public access routes within .25 miles of these sites will be closed during periods when bats are present. Consistent inclusion of this standard under all alternatives is expected to reduce frequency and degree of human intrusion, providing beneficial effects to associated species.

Management actions that may result in indirect alteration of temperature, humidity, surface water recharge or water quality within caves or mines include vegetation clearing and management, construction of roads, trails and other recreation developments, and other use of heavy equipment. Standards under all alternatives provide for undisturbed buffers around significant caves and mines and associated features to maintain clean water, vegetative cover and moist microclimatic conditions. Prohibited activities include vegetation cutting, recreation site development, and construction of roads, skid trails and log landings. Until caves, mines, and associated features have been surveyed for use by federally listed bats, these species are assumed to be present and habitat is maintained for them by applying standards for occupied sites. Implementation of the Riparian Prescription (Rx 11) will also contribute to high water quality and abundant aquatic macroinvertebrates in cave water systems and connected streams.

Identifying caves and mines as smoke sensitive targets and planning to avoid them when developing prescribed burn plans mitigates effects of prescribed burning. Until caves or mines have been surveyed for use by federally listed bats, these species are assumed to be present and habitat is maintained for them by applying standards for occupied sites.

For more discussion on other habitat elements for federally listed bats, see Section 11.0.

All caves and mines suitable for supporting characteristic fauna would be managed optimally for protection under all alternatives. Because of the priority put on protection of this community and associated species, effects of national forest management are expected to be positive under all alternatives except Alternative F, which does not provide the same explicit level of conservation and protection.

7.9.3 Cumulative Effects

Caves and other karst features are naturally rare elements. In addition, a significant proportion of Southern Appalachian caves (95%) are located on private lands (SAMAB 1996: 37, 49) where protection may be poorly regulated. For these reasons, effects of protection of these habitats on NFS land is important to maintaining viability of associated species within the region.

Overall distribution of these habitat features may have increased due to creation of mines, although many attributes of karst ecosystems (intact water systems and invertebrate, amphibian and fish fauna) may be lacking in mines. Generally, existing sites would be maintained through protection under all alternatives due to the riparian prescription (Prescription 11) and other legislation. Alternative F does not provide an explicit, similar level of protection that is provided in the other alternatives under the rare community prescription (Prescription 9.F). Overall viability of these systems is tied to private lands. Across all alternatives, the future distribution would

be expected to remain rare. Abundance would be expected to be fair for all alternatives except for Alternative F, for which abundance would be expected to be poor due to lack of explicit protection (Table 3-74 and Table 3-75, Terrestrial Viability, Section 15.1).

8.0 Successional Habitats

The following sections describe existing condition and potential effects by alternative to successional habitats on the CNF.

8.1 Successional Forested Habitats

8.1.1 Affected Environment

Forest age and related structure are key determining factors for presence, distribution, and abundance of a wide variety of wildlife. Some species depend on early-successional habitats, some depend on late-successional habitats, and others depend on a mix of both occurring within the landscape (Franklin 1988, Harris 1984, Hunter et al. 2001, Hunter 1988, Litvaitis 2001). These habitat conditions are also important as wintering and stopover habitats for migrating species (Kilgo 1999, Suthers 2000, Hunter et al. 2001). In order to support viability of diverse plant and animal populations and to support demand for game species, a variety of habitat types are needed within national forest landscapes.

This section deals only with successional forest conditions. Permanent openings such as open woodlands, savannas, grasslands, barrens and glades, balds, wildlife openings, old fields, pastures, and rights-of-way are covered elsewhere in this document. Mid- and late-successional/old growth conditions are covered only generally in this section; more detailed treatment of desired conditions for these successional stages can be found under individual forest community sections.

For analysis purposes, forest succession is divided into four stages: early, sapling/pole, mid, and late (Table 3-40; after SAMAB 1996:11, 284). Early-successional forest is defined as regenerating forest of zero to ten years of age for all forest community types. It is characterized by dominance of woody growth of regenerating trees and shrubs, often with a significant grass/forb component, and relatively low density or absent overstory. This condition is distinguished from most permanent opening habitats by dominance of relatively dense woody vegetation, as opposed to dominance of grasses and forbs. Such conditions may be created by even-aged and two-aged regeneration cutting, and by natural disturbance events, such as windstorms, severe wildfire, and some insect or disease outbreaks. Ages defining the remaining successional stages vary slightly by forest community type. Sapling/pole forest is characterized by canopy closure of dense tree regeneration, with tree diameters typically smaller than ten inches. Mid-successional forest begins to develop stratification of over-, mid-, and understory layers. Late-successional forests are usually greater than 80 years old. The old growth stage contains the largest trees and often has many well-developed canopy layers, scattered openings caused by tree mortality, and an abundance of dead and downed wood.

Table 3-40. Forest age (years) corresponding to successional stages for each forest community type coinciding with CNF SPECTRUM analysis.				
	Successional Stage			
Forest Community Type	Early	Sapling/Pole	Mid	Late
Northern Hardwood Forest	0-10	11-40	41-80	81+
Conifer-Northern Hardwood Forest	0-10	11-40	41-80	81+
Mixed Mesophytic Forest	0-10	11-40	41-80	81+
River Floodplain Hardwood Forest	0-10	11-20	21-60	61+
Dry-Mesic Oak Forest	0-10	11-40	41-80	81+
Dry and Xeric Oak Forest; Woodland and Savanna	0-10	11-40	41-80	81+
Xeric Pine & Pine-oak Forest & Woodland	0-10	11-40	41-80	81+
Dry and Dry-mesic Oak-pine Forest	0-10	11-40	41-80	81+
Montane Spruce-fir Forest	0-10	11-40	41-80	81+

Of particular importance as habitat are forest conditions that exist at both extremes of the forest successional continuum – early-successional and late successional/old growth forests. Table L, Appendix E identifies species of viability concern associated with early-successional forests, mixed successional forest landscapes, and late-successional/old growth forests of a variety of forest community types.

Early-successional forests are important because they are highly productive in terms of forage, diversity of food sources, insect production, nesting and escape cover, and soft mast. Early-successional forests have the shortest lifespan (10 years) of any of the forest successional stages, and are typically in short supply and declining on national forests in the Southern Appalachians (SAMAB 1996:28), and in the eastern U.S.A (Thompson 2001). Early-successional forests are also not distributed regularly or randomly across the landscape (Lorimer 2001). These habitats are essential or beneficial for some birds (ruffed grouse, chestnut-sided warbler, golden-winged warbler, prairie warbler, yellow-breasted chat, blue-winged warbler); beneficial to deer, turkey, and bear in the South; and sought by hunters, berry pickers, crafters, and herb gatherers for the opportunities they provide (Gobster 2001). Many species commonly associated with late-successional forest conditions also use early-successional forests periodically, or depend upon it during some portion of their life cycle (Hunter et al. 2001).

Sapling/pole stages are generally of least value to wildlife because closed canopies limit understory development, and trees are not yet large and old enough to begin producing mast or other wildlife benefits. However, this successional stage does provide value as dense cover for some species. Mid-successional forests begin to look and function like late-successional forests, and provide habitat for many species that use late-successional forests. For most of these species however, mid-successional forests provide lower quality habitat than do late-successional forests.

Like early-successional forests, late-successional forests provide habitats and food supplies for a suite of habitat specialists as well as habitat generalists. These habitats are important providers of high canopy nesting, roosting, and foraging habitat, suitable tree diameters for cavity development and excavation, and relatively large volumes of seed and hard mast. Although it takes many decades for late-successional forest conditions to develop, these habitats are more common and contiguous across the national forest and are dominant features in the SAA area (SAMAB 1996:28).

At the time of the SAA, NFS lands had three percent of forest habitats in the early-successional stage, while 89 percent was in the mid- and late-successional classes; 45 percent of this was late-successional forest (SAMAB 1996:168). Other public lands were similar to the national forest. Conversely, private industrial lands had 22 percent in early-successional forest and only four percent in late-successional forest; private non-industrial had eight percent in early-successional forest and nine percent in late-successional forest (SAMAB 1996:168-169). The 20-year trends (SAMAB 1996:28) show early-successional forest on national forests decreasing by four percent , with late-successional forest increasing by 34 percent. Trends for private forests are mixed, with increases in both early- and late-successional forest percentages. These results likely reflect the mixed objectives of private landowners, with some focusing on commodity production and others on amenity values. In general, on NFS lands forest conditions are weighted heavily toward total acres of older forests, while private forests are providing emphasis on young forests (Trani-Griep 1999).

Quality of forest successional habitats may also vary between private and NFS lands. Objectives on national forests to provide for wildlife habitat needs, recreational activities, SIOs, and water quality often result in greater vegetation structure retained in early-successional forests than in similar habitats on private lands. On private lands, intensive management for fiber production may simplify structure and composition, reducing habitat quality. Similarly, effort to restore and maintain desired ecological conditions and processes in mid- and late-successional forests also often enhances habitat quality over that found on private lands. For these reasons, conclusions regarding cumulative habitat availability from both private and NFS lands must be made with caution.

Hurricanes (Foster 1992), lightning frequency (Delcourt 1998), fire frequency (Whitney 1986), and pre-settlement cultural activities (Delcourt 1987) were probably the major sources of disturbance events that created early successional forests prior to European occupation. Less drastic perturbations such as mortality events from tornadoes, insect or disease outbreaks, or defoliation (passenger pigeon roosts) were

typically less extensive and cyclic but nonetheless provided a source of early-successional forest conditions. Natural disturbances, however, are unpredictable, episodic, and heterogeneous (Lorimer 2001); influential at a landscape scale; and are neither uniform nor random in distribution. Anthropogenic disturbances may have occurred more frequently in floodplains along major rivers and in "hunting grounds."

Overall, landscape patterns more consistently contain a component of young forests in places more "likely" to be susceptible to disturbances, i.e., south and west facing slopes, sandy or well drained soils, or in fire adapted plant communities. Fire suppression, intensive agriculture resulting in massive soil losses, land use changes, and urban sprawl have drastically altered the variables that would perpetuate a landscape with a significant component of early- successional forests. Many species associated with southeastern early successional forests (Table L, Appendix E) are in decline (Hunter et al. 2001), and management actions that perpetuate early-successional forest conditions would support their viability. Many of these same factors, especially land use conversion, have also reduced the distribution and abundance of quality late-successional forests across the larger landscape. Maintenance of these on public lands is equally important.

Table 3-41. Current acres and percentages of forested acreage by community type on the CNF in each successional stage by forest community type. Source: CNF GIS database, November 2002, sorted by Old Growth Community; Utilized in SPECTRUM modeling.

	Successional Stage			
Forest Community Type	Early	Sapling/Pole	Mid	Late
Northern Hardwood Forest	582 (3%)	1603 (9%)	9579 (51%)	6913 (37%)
Conifer-Northern Hardwood Forest (primarily White Pine)	1438 (4%)	13012 (40%)	10126 (31%)	7816 (25%)
Mixed Mesophytic Forest	4209 (3%)	13758 (9%)	60178 (40%)	72622 (48%)
River Floodplain Hardwood Forest	30 (2%)	0	398 (27%)	1072 (71%)
Dry-Mesic Oak Forest	4118 (3%)	10246 (8%)	40274 (32%)	71395 (57%)
Dry and Xeric Oak Forest; Woodland and Savanna	3621 (5%)	1589 (2%)	25858 (36%)	40958 (57%)
Xeric Pine & Pine-oak Forest & Woodland	2691 (2%)	20654 (18%)	57199 (50%)	33008 (30%)
Dry and Dry-mesic Oak-pine Forest	6273 (6%)	20988 (20%)	32616 (32%)	43802 (42%)
Montane Spruce-fir Forest	29 (5%)	79 (12%)	511 (79%)	23 (4%)

Generally, age classes at extreme ends of the spectrum are relatively rare for all community types (Table 3-41). Old growth (combined here with late successional age class) is essentially absent due to nearly complete land clearing prior to Forest Service land acquisition. Early successional habitats are relatively scarce due to a decline in management activity during the past decade. Overall, other age class distributions reflect relative availability of merchantable tree species over the past century. The majority of forest management activity during the past 50 years focused on white pine, followed by red and white oaks and shortleaf pine (see sapling/pole percentages). Prior to the 1950's, management emphasis focused on upland hardwoods, especially mixed mesophytic and northern hardwood forests, for harvest of species including red and white oaks, black cherry and associated cove species (see mid-late successional percentages). Age class structure of river floodplain forest and spruce-fir forest is probably reflective of the condition at the time of land acquisition. Forest structure of northern hardwoods and xeric pine/pine-oak forests is probably particularly poor due to dominance of the mid-successional age class.

Management Indicators

Indicators of conditions related to successional forest habitats are acreage or percent of forested acres on the national forest within three categories of forest successional stages: 1) early successional forest, 2) mid- and late-successional forest combined, and 3) late-successional/old growth forest alone. These three indicators are selected because they are most relevant to describing important habitat conditions. Early-successional forests are a key condition required by many species, and their level indicates near-future presence of sapling/pole successional stages as well. Because most species associated with late-successional conditions will also be found to some extent in mid-successional forests, the combined level of these successional stages provides an indication of the total base of habitat available for these species. However, because late-successional/old growth forest conditions will often provide better quality habitat for these species, a focus on levels of this stage alone is also meaningful.

The prairie warbler (*Dendroica discolor*) is selected as a MIS to represent early-successional forests. Because the mid- and late-successoinal forest habitats support more divergent communities depending on their composition, MIS for these habitats are identified and analyzed under the individual major forest community sections of this document.

Prairie warblers are shrubland nesting birds found in suitable habitats throughout the Southern Appalachians (Hamel 1992). Prairie warblers require dense forest regeneration or open shrubby conditions in a forested setting. Near optimal habitat conditions are characterized by regeneration, thinned area or patchy openings ten acres or more in size where woody plants average two to three meters in height, three to four cm dbh, and occur in stem densities around 3,000 stems/acre (Natureserve 2001). Populations respond favorably to conditions created three to ten years following forest regeneration in larger forest patches (Lancia 2000). Providing a sustained flow of regenerating forests is necessary to support

populations of prairie warbler. Populations of prairie warbler have been steadily declining in the eastern U.S.A (Trend -2.08, P value 0.0000; Sauer 2000).

8.1.2 Direct and Indirect Effects

To guide provision of forest successional habitats in the LMP and to facilitate effects analysis, four different mixes of successional forest conditions were defined and assigned to prescriptions, which were then allocated to NFS lands. These four options describe objectives for percentages of early-successional forest to be provided by natural causes or management actions, percentages of mid- and late-successional forests combined (including old growth), and percentages of late-successional forest (including old growth). Objectives were set for these measures because these were deemed the most meaningful measures of habitat availability for dependent species. The options were designed to cover the full spectrum of successional mixes needed to cover the range of preferences documented for forest-associated species. In other words, if each of these options is allocated to some portion of the landscape, all forest-associated species should find some portion of the landscape with optimal successional forest mixes.

Option 1 is assigned to those areas for which there are no specific objectives for creating early-successional forests through management actions. These areas would be expected to provide primarily mid-and late-successional forest habitats in the short term, with late-successional/old growth forest conditions eventually predominating. Option 2 also are areas with no specific objectives for early-successional forests, but creation of such habitat through management action may provide up to four percent of forested acres in early-successional forest conditions, where compatible with the emphasis of the prescription. These areas have an objective of a minimum of 75 percent of forested acres in mid- and late-successional forest and a minimum of 50 percent in late-successional forest. Therefore, these areas also are expected to become dominated by late-successional forests over time. Option 3 areas are characterized by objectives to create an intermediate mix of forest successional stages, with four to ten percent of forested land in early-successional forest condition. Objectives for older forests in these areas are to maintain a minimum of 50 percent of forested acres in mid- to late-successional forest and a minimum of 20 percent in late-successional forest. Option 4 areas are characterized by a mix of forest successional stages, with an emphasis on early-successional forests. Objectives are to maintain 10-17 percent of forested acreage in early-successional, 20 percent in mid-and late-successional forests, and ten percent in late-successional forest. Expected percentages of successional forest conditions by option are summarized in Table 3-42.

Table 3-42. Targeted percentage of forested acreage in early-successional, mid- and late-successional, and late-successional/old growth forest by successional mix options allocated to NFS lands.

Successional Mix Option	Early Successional	Mid- and Late-Successional	Late-successional/Old Growth
1	0	100	100
2	0-4	>75	>50

Table 3-42. Targeted percentage of forested acreage in early-successional, mid- and late-successional, and late-successional/old growth forest by successional mix options allocated to NFS lands.			
Successional Mix Option	Early Successional	Mid- and Late-Successional	Late-successional/Old Growth
3	4-10	>50	>20
4	10-17	>20	>10

Allocation of these prescription options to NFS lands varies across alternatives. Forestwide mixes of successional habitats by alternative may be compared by comparing the acreage allocated to each of these four successional stage options (Table 3-43). These allocation percentages may be combined with desired successional mix percentages (Table 3-42) to estimate total forest-wide successional forest mixes (Table 3-43). These estimates represent unconstrained attainment of forest successional stage objectives, and provide an additional means to compare alternatives.

Table 3-43. Percent of total forest acres allocated to successional stage options 1, 2, 3, and 4, by alternative, and projected percentages of total forested acreage to be maintained in early successional forest, mid-and late-successional forest, and late-successional forest, if option objectives are met.							
Alternative	Percent of Forested Acreage Allocated to Forest Successional Option				Projected % of Forested Acreage by Successional Stage		
	1	2	3	4	Early	Mid and Late	Late
A	39	27	27	7	2-5	74	59
B	32	35	30	3	2-5	74	56
D	28	3	22	47	6-10	51	39
E	86	5	8	1	<1-1	94	90
F	27	0	49	24	4-9	56	39
G	71	1	28	0	1-3	86	77
I	44	0	48	9	3-6	69	54

Alternatives E and G offer the highest emphasis on late successional habitats (90% and 77%, respectively), whereas Alternatives D and F represent the lowest (39%). Alternatives D and F would provide up to ten percent and nine percent early successional habitat conditions, respectively.

SPECTRUM modeling provides a means for examining attainment of desired successional mixes at future points in time within the constraints of other factors such as existing age-class distribution. Modeled mixes of successional stages at ten and 50 years of plan implementation vary by alternative due to the differences in management intensity and emphasis (Table 3-44, Table 3-45, and Table 3-46). The model was applied only to acres that 1) were assigned to a prescription with a specific early successional habitat objective greater than zero and 2) were classed as

suitable for timber management. Some management could possibly occur on additional acres, and therefore these represent very conservative estimates of early successional habitat and liberal estimates of mid-and late-successional habitat.

The SPECTRUM projections show a similar pattern among alternatives to those illustrated by the successional class option analysis above. Alternatives G and E would provide the least amount of early successional habitat while Alternatives F and D would provide the most (Table 3-44). Alternatives G and E would provide the greatest amount of late successional habitat while Alternatives F and D would provide the least (Table 3-46). Compared to current conditions, for Alternatives F and D, the quantity of late successional habitat would decrease at year ten but increase by year 50. In year 10, Alternatives F and D would increase the quantity of early successional habitat over the currently available amount. All alternatives except Alternative G and E would increase the quantity of early successional habitats at year 50.

Table 3-44. Expected percent of forested acreage in early-successional forest conditions on the CNF, after 10 and 50 years of implementing forest plan alternatives. (derived from SPECTRUM models November 22, 2002)

Alternative	Year 10	Year 50
A	2.6	4.0
B	2.8	4.1
D	5.4	6.4
E	0.6	0.9
F	5.3	8.0
G	1.4	2.3
I	2.9	4.8

Table 3-45. Expected percent of forested acreage in mid- and late--successional forest conditions on the CNF, after 10 and 50 years of implementing alternatives. (derived from SPECTRUM models November 22, 2002)

Alternative	Year 10	Year 50
A	83.1	84.9
B	82.7	83.7
D	80.5	76.2
E	85.7	96.5
F	80.5	72.5
G	84.4	91.0
I	83.0	82.7

Table 3-46. Expected percent of forested acreage in late-successional forest on the CNF, after 10 and 50 years of implementing alternatives. (derived from SPECTRUM models November 22, 2002)		
Alternative	Year 10	Year 50
A	46.1	69.9
B	46.1	68.7
D	43.4	57.2
E	48.2	82.3
F	43.5	54.4
G	47.4	76.5
I	46.0	66.7

Management Indicators

Mean breeding density of prairie warblers calculated from several studies (Hamel 1992) is 0.4 breeding pairs/ha. Mean territory size was 1.6 hectare (ha) in Indiana, and 0.5 ha in Maryland (NatureServe 2001). In a multi-year study in South Carolina, breeding densities were recorded from 0.3 to 0.6 pairs/ha in a longleaf pine plantation (Droge 1993, Wagner 1994, Irby 1995, Irby 1996). Because of the tight association of breeding prairie warblers with early-successional forests, prairie warbler populations are expected to vary by alternative in direct relation to the abundance of this successional stage. Based on Table 3-43, Alternatives D and F would provide the most habitat, and Alternative E would provide the least habitat (Table 3-47). Because of the relatively small differences in projected proportions of early successional habitat across alternatives (Table 3-43), changes in prairie warbler population levels are overall expected to be relatively small.

Table 3-47. Expected population trend[1] of prairie warbler on the CNF under each alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	=	=	+	-	+	-	=
50 years	=	=	+	-	++	-	=

[1] Population trend expressed as expected change from current levels: “++” = relatively large increase, “+” = increase, “=” = little to no change, “-“ = decrease, “- -“ = relatively large decrease.

8.1.3 Cumulative Effects

Across the landscape in which the national forest exists, cumulative mixes of successional forests will be affected by actions on private lands, and results of insect and disease outbreaks and storms that create relatively large patches of canopy tree mortality. Although outbreaks and storms are difficult to predict, levels of these influences and private land factors are not expected to vary across alternatives. These external factors would be considered in site-specific planning under all alternatives to moderate cumulative effects. Measureable amounts of early-successional forests created by outbreaks or storms would be included in

calculations of existing conditions, which would be used to determine whether management actions are needed to meet early-successional forest objectives. If objectives are met through these unplanned events, creation of additional early-successional forest by management action would not be planned. Presence of quality successional forest habitats on surrounding private lands, to the extent they can be known, would be considered during site-specific planning to determine where within the range of successional forest objectives is most desirable for NFS lands. However, in order to provide for the diversity of plant and animal communities on NFS land as required by the NFA, effort would be made under all alternatives to achieve successional mixes on NFS lands that are within the objectives or desired conditions of each allocated prescription and its associated successional mix option. Although exact mixes would vary somewhat across alternatives as described in the preceding section, when viewed cumulatively across the landscape, it is expected that the NFS lands would provide the majority of late-successional forests and private land would provide a greater proportion of early-successional forests under all alternatives.

Early successional habitat was an occasional but unpredictable component of the historical landscape. Its maintenance on the future landscape will make its distribution more certain and regular over time. Outcomes vary by alternative, with Altermatives E and G resulting in lowered distribution and abundance and Alternatives D and F providing greater distribution and abundance. Other Alternatives are in between. Distribution of these habitats will be good for Alternatives D and F; poor for for Alternatives E and G; and fair for all others. Abundance will be common for Alternatives D and F; rare for Alternatives E and G; and occasional for all other alternatives (Table 3-74 and Table 3-75, Terrestrial Viability Section 15.1).

Mix of successional habitat conditions (Mixed Landscapes) is more prevalent today compared to historic conditions due to private land uses, and will likely remain so in the future under all alternatives. Abundance is expected to be common for all alternatives. Distribution is expected to be good for all alternatives (Table 3-74 and Table 3-75, Terrestrial Viability Section 15.1).

8.2.0 High Elevation Early Successional Habitats

8.2.1 Affected Environment

While early-successional habitats are important for many species throughout the Southern Appalachian region, a relatively small but very specialized subset require these habitats at high elevations, generally above 3000 to 3500 feet elevation (SAMAB 1996:76; Hunter et al. 1999:52-60). The limited and declining abundance of these habitats has put associated species at risk. For the purposes of this analysis, high-elevation early-successional habitats are defined to include Open woodlands, savannahs, and grasslands; old fields; and regenerating forests 0-10 years old.

The SAA used remote sensed data to estimate presence of approximately 27,000 acres of high-elevation early-successional habitat within the Southern Appalachian

region, of which approximately one quarter occurs on NFS land (SAMAB 1996:79). These habitats have been declining as a result of succession of old fields, fire suppression, and reduced management intensity on national forests (Hunter 1999:54). Although abundance of these habitats likely peaked in the late 1800's along with farming at high elevations, evidence suggests some level of these habitats was present prior to European settlement due to the effects of burning by Native Americans, and grazing of bison and elk (Hunter 1999:53). Current trends in populations of associated species such as golden-winged warblers (*Vermivora chrysoptera*) and Appalachian Bewick's wren (*Thyromanes bewickii altus*) suggest that these habitats are below desired levels of abundance needed to maintain the full complement of native species on NFS land. Table L, Appendix E identifies additional species of viability concern associated with early-successional habitats found at high elevations (over 3000 ft).

On the CNF, there are approximately 6,910 acres of early-successional habitat above 3000 feet elevation, which represents four percent of the total Forest high elevation acreage (167,421 acres). This figure does not include acreage of ROW, balds and maintained openings along the A.T. and other locations, which are more difficult to quantify.

Management Indicators

Acreage of early-successional habitat at high elevations is used as an indicator of management effects on this habitat element. The golden-winged warbler is identified in the National Strategic Plan as an emphasis species and will be monitored on the CNF, but not as a MIS. It is not an effective MIS because there are no consistent breeding records for the CNF and consequently trend analysis is not feasible. Its populations would primarily be evaluated based on presence or absence in targeted habitat types or in response to experimental habitat treatments. Remaining populations of this species are concentrated in southwestern North Carolina with very few known breeding pairs remaining in Georgia, South Carolina, Virginia, and Tennessee. The golden-winged warbler is closely associated with second growth areas and abandoned fields characterized by clumps of shrubs and saplings, scattered trees and grassy or herbaceous ground cover (Confer 1981). Optimal patch size for this and many other associated species is 20-100 acres (Hunter 1999:57). Once open habitats are established, the optimum management techniques may be a rotation of burning (approximate a 10 year cycle), or intermittent mowing (Hunter 1997).

The chestnut-sided warbler (*Dendroica pensylvanica*) is selected as the most appropriate MIS for high-elevation early-successional habitats because of its strong association with these habitats. It is effectively monitored using established protocols and is likely to indicate the effects of management activities on the suitability of high elevation early seral habitats for associated wildlife. This warbler is a disturbance-dependent specialist found in early-successional habitats, and its populations are in decline (Trend –0.69, P value 0.05258, Sauer 2001). Chestnut-sided warblers are closely associated with stand replacement burns, extensive blowdowns, riparian early-successional habitat created by flooding or beaver activity (Richardson 1995, Askins 2000), and may reach their highest densities in clearcuts

(Freedman 1981). At high elevations, deciduous shrubs or laurel brush along streams or field borders, deciduous second growth, alder thickets, and large forest clearings (Richardson 1995) provide suitable nesting and foraging habitat for this species. In portions of the Appalachians chestnut-sided warblers were found in thickets of young chestnut trees which die prior to reaching maturity (Richardson 1995). Near optimal habitat conditions are characterized by regeneration or shrub dominated deciduous conditions typically containing blackberry, or *Rubus* spp. (Richardson 1995), with woody plants between one and ten meters in height. Populations of chestnut-sided warblers have been observed to decline with a decrease in *Rubus* spp. (Pfeifer Nature Center 2002). In the absence of large-scale natural disturbances, management practices (prescribed burning, timber harvesting) that effectively provide early-successional habitat will best manage for this species throughout its range (Schulte 1998).

8.2.2 Direct and Indirect Effects

The LMP includes an objective to maintain 1000 acres above 3000 feet in an early-successional condition. Alternatives vary in the amount of this condition that could possibly be maintained (Table 3-48) due to differing allocations of prescriptions to high elevation areas. Alternatives B and I most closely approximate maintenance of existing condition (6,910 acres). Alternatives D and F would nearly double the existing acreage. For Alternative I, managers project actual implementation of 1,000 acres due to issues including road access, high cost, and other resource constraints.

Table 3-48. Expected acreage of NFS land above 3000 feet maintained in high option, early successional habitats by alternative for the CNF

	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Acres maintained in high-elevation early-successional habitat	4,870	5,905	12,575	1,412	12,516	1,977	5,682

To more broadly assess opportunity for creation and maintenance of high-elevation early-successional habitats across alternatives, allocations of prescriptions to high elevation areas were summarized by four forest successional stage options. These options define desired mixed of forest successional stages (see section on Successional Forests for full description of successional stage options). Prescriptions were also rated for their compatibility with vegetation management. Both successional stage option and vegetation management intensity rating indicate levels of opportunity for creating and maintaining high-elevation early-successional habitat.

All alternatives provide some level of opportunity to create this habitat type. Alternatives D and F, followed by Alternative I, offer the highest opportunity to create landscape-scale high elevation, early successional habitat because of the highest number of acres allocated to prescriptions with early successional options 3 and 4 (allowing 4-10% and 10-17% in the 0-10 year age classes, respectively) (Table 3-49);

and because of the highest number of acres allocated to prescriptions with few constraints on use of vegetation management (class=high likelihood of management) (Table 3-50) due to scenic values and emphasis on other species groups.

Table 3-49. Expected range of acres of early successional habitat over 3000 feet in elevation allocated to each successional stage option by alternative on the CNF

Alternative	Forest Successional Stage Option[1]			
	1	2	3	4
A	0	0-1287	1,253-3,134	265-450
B	0	0-1456	1,136-2,840	947-1,609
D	0	0-120	1,296-3,240	5,420-9,214
E	0	0-4	358-896	301-512
F	0	0	3,077-7,692	2,838-4,824
G	0	0	799-1,997	0
I	0	0	2,273-5,683	0

[1] –Successional Stage Options:
1 - No objective for creating early-successional forest: areas are expected to provide mid- and late-successional forest habitat.
2 – Areas with predominance of mid and late-successional forests, but up to 4% in early-successional forest.
3 – Areas with mid and late-successional forests common, but 4 to 10% in early-successional forest.
4 - Areas with emphasis on early-successional forests, with 10-17% in early-successional forest

Table 3-50. Acres of NFS land over 3000 feet in elevation allocated to prescriptions as rated for likely level of vegetation management by alternative on the CNF

Alternative	Vegetation Management Level			
	None	Low	Moderate	High
A	0	1,518	3,194	4, 870
B	0	2,083	3,994	5,905
D	0	6,716	9,646	12,575
E	0	660	1,036	1,412
F	0	5,915	9,216	12,516
G	0	799	1,398	1,997
I	0	2,273	3,978	5,683

Management Indicators

The highest density reported for chestnut-sided warbler is 1.9 pairs/ha recorded in clearcuts (Freedman 1981). Hamel (1992:C-7) reports mean breeding densities of 0.3 pairs/ha from 13 censuses. Six years following a tornado in western New York, population densities of chestnut-sided warblers peaked at 1.2 pair/ha with an observed density on a control site of 0.04 pair/ha (Pfeifer Nature Center 2002). Other observations suggest that the highest densities of chestnut-sided warblers are associated with the earliest stages of forest succession (Green 1978). Population levels of this species are expected to vary among alternatives in proportion to the

amount of high-elevation early-successional habitat provided (Table 3-49 and Table 3-50). Alternatives D and F would provide most habitat, and Alternatives E and G would provide the least acreage of habitat.

Table 3-51. Expected population trend[1] of chestnut-sided warbler on the CNF under alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	=	=	+	-	+	-	=
50 years	=	=	++	-	++	-	=

[1] Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

8.2.3 Cumulative Effects

Trends in land use and management (i.e., lack of fire, maturing of existing early successional habitat) resulting in loss of high quality early-successional habitats at high elevations are likely to continue on private lands. Forest health threats, while causing overstory mortality in some high-elevation forest communities that may contribute to high-elevation early-successional conditions, are not expected to create the habitat structure needed by all associated species. In light of these cumulative effects, efforts to maintain quality high-elevation early-successional habitats on NFS lands will be critical to sustaining associated species.

Distribution of this habitat type likely increased during European settlement, but has declined recently. Desired maintenance levels are lower than those acreages created in recent history, but higher than present acreage (6,910 acres). Somewhere in between likely represents historical reference conditions. Abundance is expected to be occasional for Alternatives D and F, and rare for all other alternatives. Distribution would be good for Alternatives D and F, poor for Alternatives E and G, and fair for all other alternatives (Table 3-74 and Table 3-75, Terrestrial Viability Section 15.1)

8.3 Permanent Openings and Old Fields, Rights of Way, Improved Pastures

8.3.1 Affected Environment

Habitats considered here include permanent openings and old fields, utility right-of way, and improved pastures. Other early successional habitats such as woodlands, grasslands, and early successional forests are discussed elsewhere in this document.

Permanent Openings and Old Fields

Permanent grass/forb and seedling/sapling/shrub habitats are important elements of early successional habitat. Permanent openings typically are maintained for wildlife habitat on an annual or semi-annual basis with the use of cultivation, mowing, or other vegetation management treatments. These openings may contain

native grasses and forbs, but many are planted to non-native agricultural species such as clover, orchard grass, winter wheat, annual rye, or other small grains. Old fields are sites that are no longer maintained and or succeeding to forest or are maintained on a less frequent basis (5-10 year intervals, usually with burning and mowing). They are largely influenced by past cultural activities and may be dense sod or a rapidly changing field of annual and perennial herbs, grasses, woody shrubs and tree seedlings.

Permanent openings are used by a variety of wildlife, both game and non-game species. The benefits of permanent openings to white-tailed deer are well documented. Permanent openings, especially those containing grass-clover mixtures, are used most intensively in early spring, but also are an important source of nutritious forage in winter, especially when acorns are in short supply (Wentworth et al. 1990, Kammermeyer et al. 1993). Kammermeyer and Moser (1990) found a significant relationship between openings and deer harvest with only 0.13 percent of the land area in high quality openings. Forest openings also are a key habitat component for wild turkeys throughout the year (Thackston et al. 1991, Brenneman et al. 1991). Maintained openings provide nutritious green forage in the winter and early spring and seeds during late summer and fall. Because of the abundance of insects and herbaceous plants produced in these openings they are especially important as brood rearing habitat for young turkeys (Nenno and Lindzey 1979; Healy and Nenno 1983). Linear openings, especially those associated with young regenerating forests provide optimal brood habitat conditions for ruffed grouse (Dimmick et al. 1996).

There also are numerous wildlife benefits from openings maintained in native species. Native warm season grasses provide nesting, brood-rearing, and roosting habitat for northern bobwhite and other grassland species of wildlife (Dimmick et al. 2001). Native species are well adapted to local environments and generally require less intensive maintenance following establishment.

Old fields provide food and cover for a variety of wildlife species. A number of disturbance-dependent birds, such as northern bobwhite, grasshopper sparrow, golden-winged warbler, and blue winged warbler are associated with old field habitat (Hunter et al. 2001). Recently abandoned fields are important for rabbits and many small mammals (Livaitis 2001). Woodcock use old fields as courtship, feeding, and roosting sites (Straw et al. 1994, Krementz and Jackson 1999). Although managed less intensively than other types of permanent openings, some degree of periodic management is necessary to maintain these habitats.

There are approximately 1,517 acres of permanent maintained openings on the CNF (Table 3-52). This represents 0.2 percent of the total national forest acres. Many were created by the expansion of log landings following timber harvest or by closing and seeding old roads to create linear openings. They are maintained with funding provided by the Tennessee Wildlife Resources Agency (TWRA), the Forest Service, and partners including the National Wild Turkey Federation (NWTF). Many are planted in non-native grass-clover mixtures, which include combinations of white or red clovers along with wheat, rye, oats, orchard grass, and ryegrass. Some of the older openings are dominated by fescue and/or annual weed species, and some of

the recently renovated openings are planted to grain sorghum. Old fields acreage is currently unknown.

Table 3-52. Current acreage of permanent maintained openings on the CNF

Ranger District	Spot (Acres)	Linear (Acres)	Total Acres
Ocoee-Hiwassee	196	181	377
Tellico	105	155	260
Nolichucky-Unaka	416	125	541
Watauga	235	104	339
TOTAL	952	565	1,517

Rights-of-Way and Improved Pastures

Although pastureland acreage has declined over the last 50 years, pastures still comprise approximately seven percent of the southeastern U.S.A (USDA Forest Service 2001). For SAA Area, pastures comprise approximately 17 percent of the area, 99 percent of which is on private land (SAMAB 1996). There are no comparable estimates for rights-of-way.

Utility ROWs and improved pastures typically are managed for purposes other than to provide wildlife habitat. However, they can provide wildlife benefits if managed appropriately. Rights-of-way can be established and maintained in plantings that enhance their benefits to wildlife. Once established, maintenance costs generally are reduced. There are approximately 1300 acres of powerline ROW on the CNF. Right-of-way acreage was estimated by multiplying the existing 85 miles of powerline ROW known to the CNF by an average width of 125 feet. The majority of these support a mixture of herbaceous plants and shrubs and are maintained by a variety of methods

The conversion of fescue pastures to native warm season grasses improves habitat conditions for northern bobwhite and numerous grassland species (Dimmick et al. 2001). Featured sites are primarily old farms that were in cultivation when acquired by the Forest Service. Native warm season grass plantings have been established at Doc Rogers fields, several tracts along the French Broad River, and along a powerline ROW between the Ocoee and Hiwassee Rivers. Emphasized species include bluestems, Indian grass, switchgrass and native legumes. An experimental native cool season grass planting (Virginia wild rye) has been established along the Nolichucky River. These plantings total approximately 215 acres and were established with funds provided by the Forest Service, TWRA, TVA and several sportmen’s organizations including Quail Unlimited.

8.3.2 Direct and Indirect Effects

Permanent Openings and Old Fields

No specific objectives for the quantity of permanent openings are established in the revised forest plan. Through the prescription allocation process described above, the forest will be zoned into areas of varying intensity of opening maintenance and

development. The desired amounts of openings for a specific portion of the forest will be determined through site-specific analysis.

The management prescriptions vary in how they treat the creation and maintenance of permanent openings. Each prescription has been assigned to one of three options.

Option 1 - Existing old fields and wildlife openings are not maintained, but are allowed to succeed to forest. In some cases, existing openings may be obliterated through tree planting and elimination of non-native species. New permanent wildlife openings are not created.

Option 2 - Existing old fields and openings for wildlife may be present and maintained, but no expansion of openings or creation of new permanent openings of this type occurs. Native species are emphasized when establishing food plants for wildlife. Some openings provide permanent shrub/sapling habitats as a result of longer maintenance cycles.

Option 3 - Existing old fields and openings for wildlife may be present and maintained. Expansion of existing openings and/or creation of new openings may occur. Non-invasive non-natives are sometimes used when establishing food plants for wildlife, but native species are used where feasible and cost effective. Some openings provide permanent shrub/sapling habitats as a result of longer maintenance cycles..

Table 3-53 displays the acres of existing permanent openings in each permanent opening option by alternative for the CNF.

Table 3-53. Acres of Existing Permanent Openings in each Permanent Opening Option and Proportion of Total CNF Acres, by Alternative

Alternative	Permanent Opening Option					
	Option 1 No Maintenance of Existing Openings		Option 2 Existing Openings Maintained/ No new openings		Option 3 Existing Openings Maintained/ New openings allowed	
Alternative A	119,463	(19%)	132,477	(21%)	383,060	(60%)
Alternative B	68,148	(11%)	120,246	(19%)	446,606	(70%)
Alternative D	66,704	(11%)	362,851	(46%)	205,445	(32%)
Alternative E	161,971	(26%)	138,333	(21%)	334,696	(53%)
Alternative F	99,575	(16%)	138,994	(22%)	396,431	(62%)
Alternative G	169,245	(27%)	207,203	(32%)	258,552	(41%)
Alternative I	126,658	(20%)	152,320	(24%)	356,022	(56%)

A combination of factors such as hunting regulations, hunter access, forest management intensity, and permanent opening development influence levels of hunting opportunity. Alternative B would provide the highest number of acres where existing openings could be maintained and new openings developed, and would therefore provide some elements of high hunting opportunity. Alternative D would provide least opportunity for expansion of the permanent opening network and this element of hunter opportunity. For all alternatives, very few acres of existing

openings would be lost due to lack of ability to maintain them (Option 1) because few openings currently exist in unroaded areas with poor motorized access.

For all alternatives, monitoring could be conducted to determine effects of recreational use (e.g. horseback riding, mountain biking, OHV use, and camping) on desired vegetation within permanent openings

Right-of-Way and Improved Pastures

In general, existing utility rights-of-way would be treated similarly under all alternatives. Rights-of-way typically are managed by permit holders who would be encouraged to manage these to the extent possible to enhance their value to early-successional species. In addition, forestwide standards have been established that prohibit broadcast herbicide application for maintenance and require site-specific environmental analysis prior to maintenance operations.

Because of the benefits of native warm season grasses to numerous species of wildlife, forests have established objectives to convert existing fescue pastures to native warm season grasses. For the Alternative I, an objective was established to convert 140 acres of fescue to native grasses. Rates of conversion are expected to be similar across all alternatives.

8.3.3 Cumulative Effects

Permanent openings are utilized by a variety of wildlife species and are important to hunter success and satisfaction. However, they comprise less than one percent of the CNF landscape. The habitat conditions provided in these permanent openings are very different from those provided by lawns, ball fields and golf courses that are much more common on adjacent private land. Generally, the openings on private land are not maintained in the grass-clover or native warm season grass mixtures available in the Forest Service openings. Therefore, most of the openings on private land do not provide comparable benefits to wildlife or hunting opportunity. In addition, the Forest Service does not have control of the management of the openings on private land. Areas that currently provide habitat may be developed in the future and therefore cannot be relied upon to provide long-term wildlife benefits. It therefore is important to maximize the benefits from this limited acreage on the national forests by maintaining these openings in high quality habitat conditions. Other open-land habitats such as rights-of way and some types of improved pastures are abundant on private land. Because of the abundance of these habitats on private land, management of these habitats not a major focus of national forest management. Selected opportunities to convert abandoned cropland and fescue fields to native warm season grasses will be pursued when feasible across all alternatives.

8.4.0 Forest Interior Birds

8.4.1 Affected Environment

Habitat fragmentation is a key issue for viability of local populations of breeding birds in some mature mesic deciduous forest settings. Birds in this group (Table L, Appendix E, Mature Forest Interiors) avoid forest edges during nesting and are

adapted to forest interior conditions. Most are neotropical migrants that primarily nest and raise young in the temperate Americas. These species are grouped for effects analysis due to their sensitivity to forest fragmentation and edge effects (Hamel 1992: Appendix G1-G2).

Studies conducted in the mid-western U.S. have documented that forest interior species may not successfully breed in small patches of otherwise suitable habitat. Quality of their forest interior habitat is measured in part by proportion of edge, an artifact of juxtaposing forested and non-forested habitats. Edges fragment forest interior habitats and are associated with increased predation and brood parasitism by the brown-headed cowbird in agricultural settings (Primack 1993; Yahner 1998). However, characteristics of the surrounding landscape, such as percent forest cover, determine the magnitude of local edge effects. Findings of Robinson et al. (1995) indicate that large landscapes with at least 70-80 percent forest cover offer high potential as quality habitat for forest interior species, where adverse effects of edge are reduced to levels compatible with productive populations.

Donovan et al. (1997) found that abundance of the brown-headed cowbird in a midwestern U.S. setting was significantly greater in highly fragmented landscapes (less than 15 percent forested) than in moderately fragmented (45-55% forested) or unfragmented (>90% forested) landscapes, but abundance in moderate and unfragmented landscapes did not differ. Landscape-scale habitat patterns significantly influenced overall nest predation patterns and cowbird abundance. However, local effects of livestock grazing and horse corrals caused high variation between landscape units with similar percent forest characteristics. The specific types of non-forested habitats present may be important.

As a general rule, parasitism levels of 25 percent or less and daily nest predation rates of four percent or less should give most forest interior species "at least a chance" (Robinson 1995) of having self-sustaining local populations (also May and Robinson 1985; Donovan et al. 1995). Based on the work of Robinson et al. (1995), these parasitism rates are associated with a minimum of 70-80 percent forest cover at a landscape (75,000 acre) scale for a midwestern U.S. setting.

Duguay et al. (2001) found that in a forested setting in West Virginia (Monongahela National Forest, >88% forest cover), “fifteen years after harvest, cuts placed within otherwise extensively forested areas do not result in the type of edge effects (population sinks) observed in areas fragmented by agriculture in the midwestern U.S.” They also concluded that implementing relatively small cuts that create edge on a small proportion of the landscape may not result in increased nest failure, provided that other factors such as proximity to cowbird feeding sites are not prominent. The study involved tracking 556 nests of 46 species over a four-year period and calculation of daily nest survival rates.

Other habitat factors are known to influence productivity of this species group. Presence of young forest patches within a forested landscape is likely to have positive benefits for immature birds. Vega Rivera (1998) and Anders et al. (1998) found that after fledging, juvenile wood thrushes disperse from mature forest habitats and enter early-successional forests where they feed on invertebrates and

fruit. Use of these habitats was very high relative to their availability. Later in the season, they shifted back into mature forest habitats. Fledglings preferred areas with dense understory and ground cover with species such as blackberry, sumac, and grape. Such areas may be provided by relatively small even-aged regeneration areas or by smaller dispersed canopy gaps. Scattered canopy gaps and associated dense understories likely were characteristic of old growth mesic deciduous forests. Open habitats such as pastures, old fields, and managed wildlife openings were rarely used.

The significance of NFS lands to this species group was analyzed at both regional and forest scales in the SAA (SAMAB 1996b: 69-73). This analysis of forest interior habitat focused primarily on patterns of land use (forested vs. non-forested) and measures of edge effects at a landscape scale. Based on this analysis, there are approximately nine to 10.5 million acres of suitable habitat in the SAA Area with about 4.7 to 5.4 million acres (52%) located within tracts greater than 5,000 acres.

Approximately 70 percent of suitable habitat and 51 percent of the largest tracts are privately owned, while 23 percent of suitable habitat and 39 percent of the largest tracts are on NFS land. A notable difference is found within the Blue Ridge Mountains, where approximately 40 percent of suitable habitat and half of the largest tracts occur on NFS land. Within the SAA area, the majority of forest interior habitat occurs within the Blue Ridge Mountains, followed by the Northern Ridge and Valley/Cumberland Mountains. The Southern Ridge and Valley and Southern Cumberland Plateau have the smallest relative amount (SAMAB, 1996b:73).

To determine the landscape context of the CNF, a shifting window analysis was conducted using 1990 National Land Cover Data (U.S. EPA 2002). Percent forest cover within a surrounding landscape of 75,000 acres (per Donovan et al. 1997) was calculated for each 90-meter grid cell located on the national forest and nearby private land. For this analysis, Deciduous, Evergreen, and Mixed Forest, and Woody Wetlands were classified as forested lands. All other land cover types, including recent clearcuts (transitional cover type), were classed as non-forest cover. This analysis indicates the entire southern CNF, and a great majority of the northern portion of CNF, occurs within a landscape that is more than 70 to 80 percent forested (Figure 3-16).

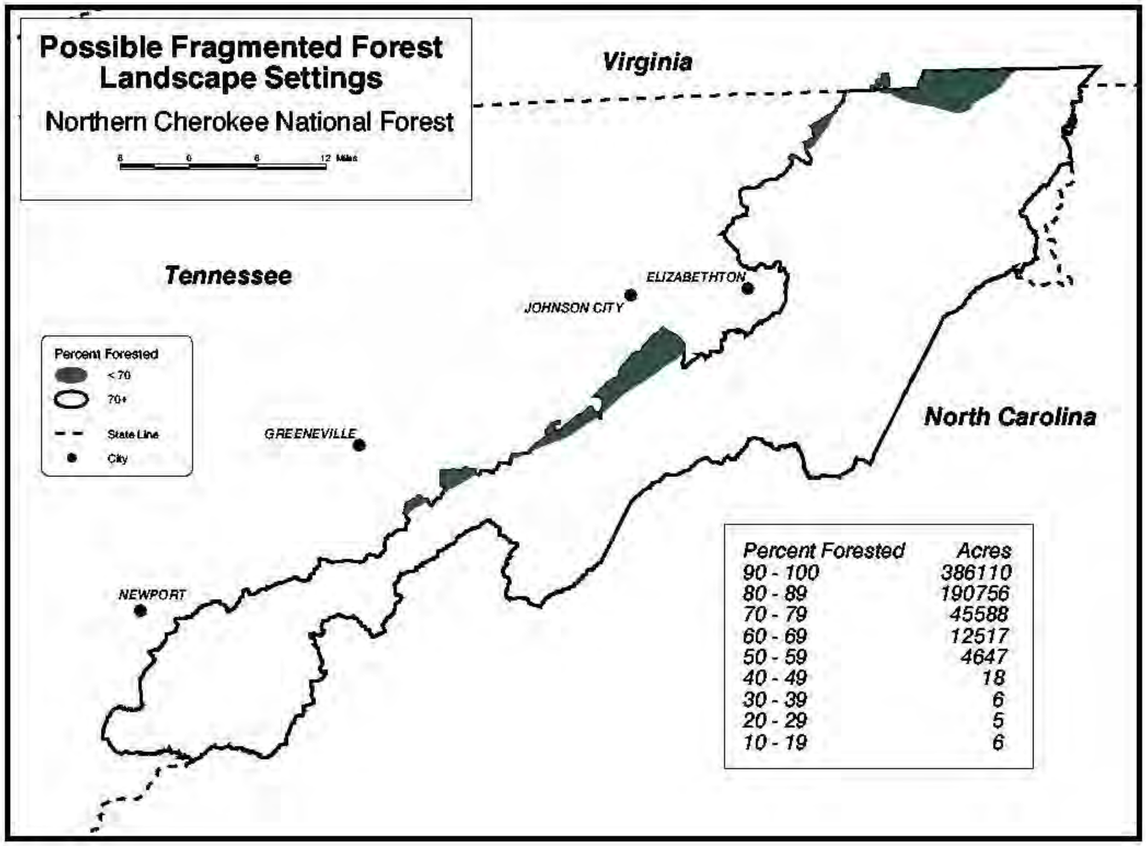


Figure 3-16. Composite map of percent forested land cover within 75,000-acre circles surrounding each 90-meter square grid cell on and near the northern CNF, based on 1990 National Land Cover Data (US EPA 2002) and CISC ownership data (USFS December 2002).

Two areas comprising 17,199 acres within the northern CNF have settings that are less than 70 percent forested, where edge effects could adversely affect productivity of forest interior birds (Figure 3-16). These two locations comprise less than three percent of the total forest acreage. One narrow band stretches from the Dry Creek, Middle Creek, and Horse Creek drainages north to Rich and Buffalo Mountains. These areas lie within the larger, predominantly agricultural Camp Creek watershed. A portion also lies within North Indian Creek watershed, which is predominantly forested.

The second area is Rockhouse Run and Backbone Rock, extending from the northern forest boundary in Sullivan County, Tennessee into Virginia and east of Holston Lake. Agriculture is a common use of private lands within the South Holston River watershed. The Big Laurel Creek watershed is predominantly forested, again with common agricultural use of private lands.

Currently, the CNF provides 250,984 acres of mid- and late- successional mesic deciduous forest, comprising 44 percent of total forest acres. About 89 percent of total mesic deciduous forest acres are in mid- and late-successional stages. The vast

majority (96%) of these older mesic forests are found within landscape settings that are more than 70 percent forested.

Management Indicators

The ovenbird (Seiurus aurocapillus) is selected as an appropriate MIS because of its association with mature deciduous forest interiors. The ovenbird typically nests in older closed-canopied deciduous and mixed deciduous-coniferous forests with deep litter layer and limited understory. It is effectively monitored using established protocols and is likely to indicate the effects of cumulative forest fragmentation across a landscape setting. Large, contiguous forested tracts are needed to support successful breeding and long-term population viability (NatureServe 2002). The species is declining in some parts of its range, although the overall trend seems to be stable or slowly increasing (0.7%/year). Threats include forest fragmentation and related brood parasitism and nest predation. Habitat is lost or degraded in the short-term by management activities that open the canopy (NatureServe 2002). However, in a managed forest landscape setting, forest fragmentation may not impair male pairing success.

8.4.2 Direct and Indirect Effects

Implementation of forest plan alternatives would create edge in mesic deciduous forest interior habitats during creation of early-successional forest habitats, road construction, some types of recreation development, and routine maintenance and permitting of small clearings including easements and rights-of-way. These edges could cause adverse effects to productivity of forest interior species in some settings.

Amount of edge generated would vary by alternative, particularly as caused by creation of early-successional forest habitats in or near mid- and late-successional mesic deciduous forests (Table 3-54). On the CNF, these older forests are allocated to prescriptions with medium and high objectives for early successional forest habitats at the highest rate in Alternative F, followed by Alternatives D and I. Alternatives A, B, and G are expected to result in associated edge at lower levels than F, D and I. Lowest levels of associated edge are expected under Alternative E.

Table 3-54. Percentage of mid- and late-successional mesic deciduous forest acreage allocated to prescription objectives for early-successional forest by alternative, CNF, 2002.

	Alternative						
Prescription objective for overall percent of early- successional forest	A	B	D	E	F	G	I
None	46	40	34	87	31	76	51
Low (0-4% of area)	26	31	3	3	0	<1	0
Medium (4-10% of area)	22	26	23	9	48	23	43
High (10-17% of area)	6	3	40	1	20	0	7

Much of the acreage that is most suitable for use by forest interior species would be allocated to prescriptions that do not have specific early successional forest objectives (Table 3-54, row marked "None"). Table 3-55 depicts acreage allocated to prescriptions with "low" to "medium" early successional forest objectives, where relatively low levels of active management would likely occur. These low levels of management are most likely to have positive effects on this species groups. Alternatives E and G would provide most acreage with "low" to "medium" objectives, and Alternatives F and D provide least acreage with these same objectives.

Table 3-55. Acres of mid-late successional mesic hardwood forests within forest cover contours of > 70% forested landscape setting assigned to early successional stage options 1 (0-4% of area) or 2 (4-10% of area), by Alternative, for the CNF, 2002.

Alternative	A	B	D	E	F	G	I
	139,881	173,478	92,825	218,169	75,891	186,681	121,841

In the short-term, adverse effects of edge are most likely to occur in the two areas shown by analysis to be within landscapes less than 70 percent forested (Figure 3-16). Regardless of varying levels of edge created under plan alternatives, edge created on the rest of the forest is not expected to have significant short-term effects due to the current landscape context. High levels of forest regeneration on national forests could negatively shift percent of forest cover as calculated for this analysis; however, such effects would require simultaneous implementation of relatively high levels of regeneration over large landscapes. This situation is unlikely due to the prevalence of prescriptions with low to no early-successional forest objectives. Alternatives F and D, due to their abundant allocation of acreage to high early-successional forest objectives, is most likely to result in this effect. No alternative includes high levels of forest conversion to other land use types, and therefore no meaningful long-term change in landscape cover type is expected due to direct or indirect effects of national forest management. In the long-term, effects of forest edge on the national forest will largely depend on the cumulative effects of land-use changes on private lands surrounding the national forest.

Alternatives that shift age-class distribution of mesic deciduous forests to younger age classes would have negative effects on interior birds through reduction in acreage of suitable habitat. Table 3-17, Mesic Deciduous Forests Section 6.1 depicts allocations by successional stage option by alternative. Alternatives F and D are associated with the highest rates of forest regeneration and would most limit abundance of suitable habitat for these species.

Some positive effects may be expected where alternatives permit low to moderate levels of vegetation management for creation of young mesic hardwood forest patches, due to use of these habitats by fledgling birds for food and cover (Vega Rivera 1998, Anders et al. 1998). The relative balance of these positive effects and potential negative edge effects is dependent on the landscape context and the relative abundance of mature and young forests. On balance, effects are expected to be positive where mid- and late-successional forests are common, and forest cover on surrounding landscapes predominate. The balance shifts to negative as landscapes go below 70 percent forest cover and young forests or forest openings become common.

Management Indicators

Hamel (1992:C-7) lists mean breeding densities for the ovenbird ranging from 1.5 to 24 pairs per 40 ha. Population trends for ovenbird are expected to vary among alternatives in proportion to the amount of interior forest habitat provided in the chart below. Alternatives D and Fwould result in the highest acreage of actively managed older mesic forests, which could cause a short-term decline in ovenbird habitat. Alternative E and G would provide the largest acreage of ovenbird habitat during the planning period.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	=	=	--	+	-	+	=
50 years	+	=	--	++	-	++	=

1 Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

8.4.3 Cumulative Effects

Historically, the interior forest condition was likely widespread. Today it is dependent in large part on landscape context, including influence of privately-owned lands. As currently defined, the forest interior condition would likely remain widespread in the future on NFS lands under most alternatives due to the large block of mature forest represented by the national forest. The fully regulated forest of Alternatives D and F would reduce distribution of this condition. Abundance is expected to remain common, and distribution is expected to remain good for all alternatives except Alternatives D and F, for which distribution is expected to be fair (Table 3-74 and Table 3-75, Terrestrial Viability Section 15.1).

Regional Landscape Setting

Although the current supply of forest interior habitat on national forests within the SAA area is good to excellent (a range of 68% to 96% forest interior habitat; SAMAB 1996b), the context of land use trends is relevant, because conditions on surrounding private lands can adversely affect habitat suitability for forest interior bird on NFS land by increasing densities of cowbirds and nest predators. Currently, about 75 percent of the Southern Appalachian area is rural and privately owned. Forested private land within the region has declined by about 220,000 acres since 1982. Similarly, pasture and cropland have also decreased by about 300,000 acres. In contrast, developed acreage has increased by more than 600,000 acres, most prominently in the Blue Ridge and the Southern Mountain and Piedmont Sections (SAMAB 1996a).

Like agricultural and rangeland uses, developed acreage has a negative influence on forest interior species by encouraging nest predation (by crows and jays, mid-sized mammals including domestic cats) (Wilcove 1985; Crooks and Soule 1999; Hawkins 1998) and brood parasitism by cowbirds.

Rapid population growth, economic growth and diversification, better employment and wages, declining farming, and better housing translate into rising pressures on

the natural resources of the Southern Appalachian region for the foreseeable future (SAMAB 1996a). New transportation corridors connecting communities will have direct and cumulative influences on development and subsequent loss of forested land.

Forested private lands adjacent to national forests reduce the influence of developed land on core areas of forest interior habitat on national forest. However, the continued forested condition is tenuous, and acreage will most certainly decrease. Future land use trends over the next 15 years will likely include a decrease in suitable forest interior habitat acreage found in large tract sizes, primarily due to development and increasing urbanization. The severity of edge effects and fragmentation will be most prominent in the currently agriculture-dominated landscapes (SAMAB 1996b: 72) especially in locations where NFS ownership occurs in small to medium patch sizes.

Cherokee National Forest Landscape Setting

Bird productivity is likely most secure from landscape-level edge effects in Polk and Monroe Counties, Tennessee, which have low projected human population growth, a high percentage of public land ownership, and very consolidated patterns of public ownership, both in Tennessee and in adjacent NFS lands in Georgia and North Carolina. Bird productivity is least secure in Sullivan, Washington, and Greene Counties, Tennessee, which are characterized by more rapid predicted growth, smaller acreage in public ownership, and more fragmented public land ownership (Table 3-56). In these counties critical social trends coincide with possible existing fragmented landscape conditions. Two areas are most at risk of moving significantly below the less than 70 percent forest land-use threshold due to ownership patterns and land-use trends. These are 1) the Dry Creek, Middle Creek, and Horse Creek drainages north to Rich and Buffalo Mountains and 2) Rockhouse Run and Backbone Rock (Figure 3-16).

Table 3-56. Projected increase, people per square mile, from 1990 -2010 in counties in proximity to the CNF

Projected Increase	County and (Percent Public Ownership)
2-4%	Polk (56%), Johnson (26%)
5-7%	Monroe (36%), Cocke (>18%),
	Unicoi (47%)
8-12%	Greene (<1%), McMinn (<1%)
13-19%	Carter (38%)
20-108%	Sullivan (15%), Washington (8%)

From SAMAB 1996a, Tables 2.19 and 2.2, pages 37-38. For counties <25% publicly owned, figure derived from percent Forest Service acreage in that county. Counties in bold may provide least favorable forest interior habitats in the future.

Because of land ownership patterns, the majority of the CNF is expected to remain within predominantly forested landscapes under all alternatives. Within these lands, mid- and late-successional mesic deciduous forests are expected to be common

under all alternatives, but least common for Alternatives F and D (Table 3-18, Mesic Deciduous Forests, Section 6-1). Due to the combination of these factors, most national forest habitats are expected to support varying degrees of productive populations of forest interior birds under short-term implementation of all alternatives. As long as small regeneration areas and other openings constitute a relatively small proportion of the total landscape and cowbird foraging areas do not dramatically increase, most CNF lands will likely continue to serve as source populations for surrounding, lower quality habitats for the foreseeable future. All alternatives would include monitoring of bird populations within these habitats, as well as changes in landscape context through re-evaluation of percent forest cover as new land cover data become available. Validation of forest interior bird productivity on national forests is a research need.

8.5.0 Old Growth

8.5.1 Affected Environment

The provision of old growth, along with its amount and distribution, was identified as a public issue common to each of the five forests in revision in the fall of 1996. At the same time, Forest Service lead efforts were underway to provide regionally consistent guidance for addressing old growth in plan revisions.

In 1989 Chief Dale Robertson issued a national position statement on old growth. Beginning in 1990, the Southern and Eastern Regions of the Forest Service, NFS; the Forest Service Southern, Northeastern, and North Central research stations; and the Nature Conservancy (TNC) began efforts to develop science-based old growth definitions for the east. The effort proved to be problematic in large part because so few representatives of old growth conditions exist, and their life history was so poorly known that quantifying the range of natural variability was imprecise. After five years of effort, in December, 1995 the Southern Regional Forester chartered a Region 8 Old Growth Team to develop the scientific old growth definitions as ‘operational and useful’. In June of 1997 the Old Growth Team completed a report entitled *Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region*; hereafter, called the ‘old growth report’ (Forest Service, 1997). Using this report as a guide the CNF completed a preliminary inventory in 1997. This inventory was based on age criteria for each old growth community type, wilderness acres, and acres allocated for bear old growth in the 1986 Forest Plan. The inventory identified about 136,171 acres as possible old growth. About 87% of the possible old growth acreage came from stands in existing wilderness. All community types were well-represented except montane & allied spruce, spruce-fir, and bottomland hardwood, on the landscape at the sub-section level (ecological classification hierarchy (Fryar, Roger D. 1997).

The old growth report gave operational definitions for sixteen old growth community types that, among them, encompassed nearly all of the forest cover types in the southeast. The operational definitions established four criteria which had to be met before a stand would be considered “existing” old growth: (1) a minimum age in the oldest age class, (2) no obvious human-caused disturbance that conflicts with old growth characteristics, (3) minimum basal areas of stems five inches diameter at

breast height (dbh.) and larger, and (4) the dbh of the largest trees. The second criteria is measured qualitatively, the other three criteria are quantifiable and vary by old growth community type. The old growth report also generally charged each forest to provide: (1) distribution of large (more than 2,500 acres), medium (100 thru 2,500 acres), and small (10 thru 99 acres) potential old growth patches; and (2) representation of all potential old growth forest community types for each ecological section unit. The distribution guidance does not specify an amount, such as acres or percent of area. In addition, old growth patches were assumed to be occurring on national forest in a matrix of mid to late successional forest conditions, providing connectivity without old growth allocations being physically contiguous. Representation was limited to ensuring that old growth community types were present, not a total amount nor an amount per each community. Amounts were to be based on public issues and ecological capabilities of the land.

The Biological Significance of Old Growth

As of 1997, no species had been identified in the southeastern U.S.A that were considered old growth obligates; that is, requiring old growth for some portion or all of their life cycle. Therefore, the provision of existing or future old growth in the LMP revisions is not directly linked in a cause and effect relationship to the viability of any species.

However, old growth is a condition that is particularly rich in habitat attributes for a variety of wildlife and these attributes occur in close association (intra-stand) with one another as opposed to a landscape scale (inter-stand) distribution. A wider variety of habitat niches are available than in earlier life stages of the same community. The long development period with low disturbance is conducive to the formation of multiple canopy layers that would potentially include “emergent” trees, dominant and co-dominant trees, suppressed trees, and a forest floor shrub layer. Canopy gaps of various sizes caused by: (a) the death in-place of a single tree, or (b) the deaths in-place of small groups of trees, or (c) the falling of a group of trees, in comparison with their immediate surroundings provide micro-sites with higher light regimes, higher stem counts, and an “edge effect” both around the edge of the gap and back into the surrounding stand. Standing dead trees provide large and small diameter snags for foraging, perching, and cavity excavation. Down logs and limbs provide a substrate for wood decomposing fungi and insects; cover for small mammals, amphibians, and insects; and in later stages a “nurse log” for the establishment of new tree seedlings. Large-diameter living trees, with a long-term exposure to natural damaging agents, have the potential through wood-rotting fungi activity for the formation of large cavities suitable for bear, raccoon, squirrel, bats, or other cavity users. The heavy limb structure that develops in some tree species as they age provides sturdy nest platforms for species such as bald or golden eagles.

The Social Significance of Old Growth

Whether biologically necessary to species or not, old growth is of social value. A general perception would be that it is intelligent to have old growth habitat on the landscape. In Aldo Leopold’s words, ‘*The first rule of intelligent tinkering is to keep all the parts.’* Some recognize are aware that old growth obligates do occur in other

parts of the world; therefore, a conservative approach would be to provide old growth locally. As with wilderness, this perception appears to be a desire for places almost completely unmodified by humans whether or not those holding such a value ever visit them; that is, an “existence” value. The value of old growth is also related to the idea that good stewardship is to restore ecological conditions. In simplest terms, society needs to “fix back what we have broken”. There also appears to be a desire to have what is valued occurring at the landscape level that people can relate to as frame of reference.

In more pragmatic terms, old growth serves other recognized social values. Old growth is a desirable recreation setting, both for biological variety and for the associated state of mind from knowing one is in an “old growth” setting. Old growth serves as a “biological time machine” in that social value is a reference area for what ecologically comparable areas may have been previously and would potentially be restored to given a similar amount of time and disturbance history. Old growth social values are a valuable component of showing a comprehensive ecological, and dynamic through conservation education. Old growth is a source of scientific information, such as through tree ring analysis.

The analysis of old growth begins with identifying the old growth communities that are appropriate to each national forest. The CNF has nine of the 16 old growth forest communities. In addition, the knowledge of how big a “pool”’ of acres is available in total (regardless of age) for each old growth community is important. This information then becomes a baseline against which the allocations within each alternative would potentially be compared.

Table 3-57 below shows the old growth types for the CNF located in the Blue Ridge Mountain Ecological Section. For some of the old growth types, the provision of large blocks is not feasible because the Forest Service does not administer enough lands ecologically appropriate for that type.

Table 3-57. Occurrence and acreage of old growth types for the CNF

Old Growth Type No.	Old Growth Type Name	Total Acres of Each Type
1	Northern Hardwood Forest	18,516
31	Montane Spruce-Fir Forest	647
5	Mixed Mesophytic-Hardwood Forest	138,850
2	Conifer-Northern Hardwood Forest	52,072
21	Dry to Mesic Oak Forest	125,188
25	Dry and Dry to Mesic Pine-Oak Forest	55,753
22	Dry and Xeric Oak Forest	64,991
24	Xeric Pine and Pine-Oak Forest	140,872
28	Eastern Riverfront and River Floodplain Hardwood Forests	1,796

(Source: Cherokee NF GIS database.)

Each of the forest used the old growth report to respond to the old growth issue. The old growth report recognizes three categories of old growth for the purpose of forest

planning. The categories are existing old growth, possible old growth and future old growth.

Existing Old Growth

A preliminary inventory of possible old growth was done in conujunction with the Analysis of the Management Situation for this Plan Revision and for the Southern Appalachian Assessment (SAMAB 1996). The preliminary inventory is displayed in the Southern Appalachian Assessment, Terrestrial Report (SAMAB 1996). The inventories included only those stands that met the attribute age criteria for the old growth community type, were in existing wilderness, or were allocated for bear old growth in the current Forest Plan. For this analysis approximately 87 percent of the acreages in possible old growth came from stands in existing Wilderness. All ecological communities except Montane & Allied spruce and spruce-fir and bottomland hardwood community types are well represented on the landscape. The results of the preliminary inventory are listed below:

Table 3-58. Preliminary Old Growth Inventory

Ecological Community Type	Approximate Acres Identified in Preliminary Old Growth Inventory
Northern Hardwood	10,519
Conifer-Northern Hardwood	2,545
Mixed Mesophytic	35,952
Dry-Mesic Oak	41,173
Dry & Xeric Oak	19,114
Xeric Pine & Pine-Oak	27,543
Dry & Dry-Mesic Oak-Pine	20,120
Montane & Allied Spruce Spruce-Fir	577
Bottomland Hardwood	438

Existing old growth is defined by the old growth report as forest stands that meet all four criteria (age, disturbance, basal area, and tree size) described in the operational definitions.

Historic vegetation inventory did not include data sufficient to determine whether or not all four of these criteria are satisfied. The amount of existing old growth meeting the four criteria is not known at this time for the CNF. Stands with old growth characteristics would have to be verified during the life of the LMP. Given the land use history of the CNF, the amount of existing old growth is expected to be low.

Possible Old Growth

Possible old growth consists of forest stands that meet one or more of the old growth requirements. Table 3-59 below details the acreage of forest that meet the minimum age for their old growth type and the percentage of old growth type. The stands would need to be checked to determine if the stands meet the other three old growth requirements and are appropriate for management as old growth.

Table 3-59. Amount of possible old growth by old growth community type for the CNF (All Rx's).				
Old Growth Community Type	OG No.	Total Acres of Community Type	Possible OG Acres	Possible OG as Percent of Total OG Community Type
Northern Hardwood Forest	1	18,516	1,739	7.5
Montane Spruce-Fir Forest	31	647	0	0
Mixed Mesophytic-Hardwood Forest	5	138,850	2,183	1.4
Conifer-Northern Hardwood Forest	2	52,072	206	.3
Dry to Mesic Oak Forest	21	125,189	3,495	2.5
Dry and Dry to Mesic Pine-Oak Forest	25	55,753	3,327	5.8
Dry and Xeric Oak Forest	22	64,984	8,280	12.7
Xeric Pine and Pine-Oak Forest	24	140,872	5,102	3.9
Eastern Riverfront and River Floodplain Hardwood Forests	28	1,086	0	0
(Source: CNF GIS database.)				

Future Old Growth

Future Old Growth is non-technically defined as any prescription with a management direction that features little or no timber harvesting. These stands contain little if any existing old growth at the present time.

Each alternative evaluated includes management prescriptions that provide future old growth indirectly as the result of management focused on other values, such as wilderness. Included in this category of future old growth are riparian areas and unsuitable lands within suitable management prescriptions. The primary focus of old growth management in the short-term is restoring it on the landscape. The primary (not the only) component of restoration is simply time for existing stands to age through the gradual development of old growth conditions. For that reason, alternatives are compared by the sum of the acreage they allocate to future old growth prescriptions.

Some lands placed in the category of possible old growth for this analysis would not potentially be managed as possible old growth. Some lands would require project level examination to determine if they are appropriate for old growth management, such as unsuitable prescriptions, unsuitable land within suitable prescriptions and riparian areas. In addition, lands would be examined during the implementation of the LMP determine if they meet the four criteria for old growth and are appropriate for old growth classification. If lands do not meet the criteria for old growth, then lands would be managed according to the given prescription. Wilderness and proposed wilderness would be managed as old growth due to the nature of the prescriptions. The following table (Table 3-60) shows future old growth by alternative and management prescription.

Table 3-60. Future Old Growth Acres by Compatible Mg.Rx						
Mgmt Rx No.	Acres					
	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
1.A	66,699	66,700	66,701	66,701	66,701	66,660
1.B	28,107	1,446	0	49,873	73,650	20,266
2.B.1	1,254	1,254	1,254	1,254	1,254	1,110
2.B.2	0	0	85	77	77	757
2.B.3	0	0	0	0	0	2,578
4.A	35,628	38,191	36,505	33,473	30,803	36,269
4.B.2	607	566	574	397	397	0
4.E.1	0	0	0	330	0	1,105
4.F	11,159	17,466	9,539	17,683	17,808	20,975
4.I	4,855	0	0	4,855	4,927	0
4.K	4,494	4,632	4,632	4,632	4,632	4,640
5.A	1,524	1,524	1,524	1,524	1,524	1,524
5.B	605	605	605	605	605	605
6.A	10,986	50,351	0	15,795	19,007	0
6.B	0	0	0	5,307	5,307	0
6.C	1,270	0	0	0	0	0
6.E	5,142	0	0	3,955	3,955	0
7.D	2,125	2,772	2,142	5,942	1,965	2,043
7.E.1	0	0	0	184,288	11,906	0
9.A.2	18,111	18,074	0	0	0	0
9.A.4	23,513	23,541	7,965	0	8,181	0
9.B.1	0	1,186	416	0	0	0
9.B.2	0	1,404	1,323	0	49	0
9.F	9,859	9,873	9,865	9,856	7,013	6,609
12.A	7,921	0	0	49,873	116,842	15,741
12.B	16,760	0	0	39,294	22,792	38,647
rip	41,611	41,493	52,307	15,554	26,418	44,924
un_lc	108,584	108,388	139,241	42,111	61,237	109,213
Total	400,812	389,464	334,675	549,094	487,047	373,664
(Source: CNF GIS database.)						

Table 3-60 does not display data for Alternative F, which is based on the current forest plan and uses a different set of land allocations. The total future old growth for Alternative F is 234,525 acres, which is the unsuitable forest land in the current forest plan (Table IV-3, 1986 Plan). This figure is useful for comparison with the other alternatives.

Table 3-61. Acres by OG Community by Alternative for Possible and Future OG						
Community	Alt A.	Alt B	Alt D	Alt E	Alt G	Alt I
Conifer Northern Hardwood	26,264	25,634	22,033	42,399	34,913	23,139
Dry Mesic	81,315	78,968	68,613	108,490	97,528	76,879

Oak						
Dry Xeric Oak	49,977	48,238	41,528	62,229	58,657	48,018
Dry and Dry Mesic Oak-Pine	39,437	39,009	34,691	51,080	46,024	36,944
Eastern Riverfront	297	297	297	320	320	297
Hardwood Wetland Forest	33	33	33	101	33	33
Mixed Mesophytic	95,054	93,318	80,384	123,573	113,935	92,186
Montane & Allied Spruce	647	647	647	647	647	647
Northern Hardwood	17,802	17,646	17,066	18,097	18,212	17,366
River Floodplain Hardwood	562	492	467	545	570	540
Xeric Pine & Pine Oak	75,416	74,375	61,845	108,926	92,965	65,238
nonfor	3,787	3,715	3,547	4,500	4,197	3,745
zeroFT	18,819	15,569	13,760	31,124	23,352	18,132
	409,410	397,940	344,911	552,030	491,352	383,163

8.5.2 Direct/Indirect Effects

The amount of existing old growth on the CNF would be anticipated to be low given the current situation. Possible and future old growth would potentially be examined at the project level to determine if it meets the requirements for status as old growth. All of the alternatives contain possible and future old growth in varying amounts.

Stands chosen for management as old growth would not be affected by other forest uses. Stand replacement events such as fire and storm damage would potentially result in local adverse effects on old growth. Forest health problems such as hemlock woolly adelgid and gypsy moth would potentially result in large scale adverse effects on specific old growth community types.

The high percentage of the national forest aged 60 to 90 years would generally serve well as a connective matrix for old growth patches. Site-specific evaluation would determine specific needs for connective corridors. Land Management Plan objectives and standards for spruce-fir, eastern hemlock, mixed mesophytic, and northern hardwoods place limitations on management that would potentially contribute to the amount of future old growth. Objectives and standards for threatened, endangered and sensitive species also would potentially contribute to

the amount of old growth. The contribution of other management direction to the establishment of old growth would potentially also be considerable.

The old growth communities would be managed under all alternatives. Much of the acreage would be future old growth, which would be in management prescriptions that favor the development of old growth. There would be a plan goal to protect, maintain and restore large medium and small patches of old growth. The area occupied by old growth forest would increase in each alternative.

Because representative old growth communities would be managed in all alternatives, the LMP revision would have no adverse direct or indirect effects on old growth communities. There would potentially be no known species dependant on old growth forests; however, managing old growth communities would have a beneficial effect on the assemblage of species dependant on late successional forests.

8.5.3 Cumulative Effects

Plan direction would be to protect, restore, and maintain an appropriate representation of old growth community types. The goal and objective for old growth communities as discussed would be followed. The exact amounts and mixes would potentially vary across alternatives as described in the preceding section, but when viewed cumulatively across the landscape, would provide representative old growth at the forest level. Therefore, there would potentially be no adverse cumulative effects to the old growth communities or their associated species.

9.0 Terrestrial Habitat Attributes

The following sections describe existing conditions and potential effects by alternative for special terrestrial habitat attributes on the CNF.

9.1.0 Riparian Habitats

9.1.1 Affected Environment

This section focuses on terrestrial habitat aspects of riparian areas; aquatic aspects of these ecologically important areas are covered under assessment of watersheds and aquatic systems.

Terrestrial riparian habitats encompass the transition area between aquatic systems and upland terrestrial systems. All wetlands (including beaver ponds), as well as margins of varying widths along streams, rivers, lakes, ponds, and reservoirs, are contained within terrestrial riparian habitats. These areas provide a number of critical functions for associated species. Most importantly, they provide rich, moist environments, not often found in upland areas. Riparian terrestrial habitats may serve as corridors for wildlife movement, allowing for daily travel and seasonal migration. The riparian area may serve as a connector of habitats and populations allowing gene flow to occur, thus keeping populations genetically vigorous (Harris 1988).

Riparian habitats ideally include a mosaic of native plant and animal communities and successional stages, with a predominance of late-successional forests. Late-successional riparian forests contain multiple canopy layers that provide a variety of

ecological niches, thermal and protective cover, and maintenance of moist conditions. Decadence of older forests provide an abundance of snags and downed wood, which also help retain moisture and provide important habitat substrate for reptiles, amphibians, small mammals, invertebrates, and mosses and liverworts. The majority of riparian dependent species need or prefer late-successional forest conditions for the diverse structure and the moist, temperature-moderated microclimates they provide.

Disturbance regimes in riparian areas differ from those of adjacent uplands in important ways. Sheltered topographic positions and moist conditions generally reduce disturbance caused by wind and fire. Disturbance sources more common in riparian areas are beaver activity, and flooding and channel scour, especially along stream banks. These operate in addition to more universal factors, such as insect and disease outbreaks. One of the most important disturbance factors in riparian areas for at least the past thousand years is anthropogenic clearing, which, even prior to European settlement, was sufficient to create large areas of early-successional riparian habitats such as canebrakes (Brantley and Platt 2001). Concentration of anthropogenic disturbances in riparian habitats was the result of the high fertility and level terrain of these areas. Such effects were likely most predominant along larger streams and rivers. Today, these same factors continue to drive anthropogenic disturbance in these areas. The value of these areas for human uses has resulted in many riparian zones along major watercourses remaining in private ownership while upper reaches were converted to public ownership. Prior to European settlement, anthropogenic disturbance along smaller streams, which are more typical of NFS lands, was likely less extensive, resulting in a greater predominance of late-successional conditions in these riparian areas. The challenge for federal land managers today is to try to restore, to the extent possible, the network of mature forest riparian corridors critical to many species and to water quality.

The SAA (SAA; SAMAB 1996) included analysis of cover classes within 100 feet of watercourses for the entire study area. Satellite data with 30-meter resolution were used, resulting in only larger watercourses being detected. The 100-foot corridor width was selected due to the precision of the database and because riparian corridors of 100-160 feet can be useful for correlation of the riparian landscape to stream habitat and biological integrity (SAMAB 1996: 72). Based on this analysis, within the SAA study area there are approximately 2.3 million acres in the riparian zone. Land cover classes for the riparian study area were: 70 percent forested, 22 percent pasture/herbaceous, three percent cropland, 4.3 percent developed/barren, and 0.7 percent wetland. Ownership of land in the riparian zone in the SAA area is mainly private, approximately 85 percent , with national forests being the next major owner at approximately ten percent. The remaining five percent is in national parks, the Cherokee Indians' ownership, other federal holdings, and state parks and forests (SAMAB 1996:71-74).

Riparian forest cover varied across the study area from more than 90 percent to less than 25 percent, with the Ridge and Valley ecoregion tending to have less forest cover in the riparian zone than the Blue Ridge and other ecoregions. The analysis

also found that “lands in federal ownership, such as national forests and national parks, have significantly more forest cover in the riparian zone than do lands in other ownerships.”

Riparian areas are important habitat elements that run through all other management prescriptions. On the CNF, implementation of standard riparian buffers would result in approximately 126,040 acres of riparian corridor associated with perennial and intermittent streams. This represents 20 percent of the total national forest acres on this unit.

One hundred and forty-two species of viability concern are associated with late-successional terrestrial riparian habitats in the southern Appalachian region (Table 3-73, Terrestrial Viability section). Of these, thirty-six species are of concern on the CNF (Table 3-79, Terrestrial Viability section and Table L, Appendix E).

The primary indicator used to assess terrestrial habitat conditions within riparian areas is forest-wide acreage of riparian corridors by successional stage. In addition, the Acadian flycatcher (*Empidonax virescens*) is selected as an appropriate MIS for mid- and late-successional riparian forest habitat. It requires deciduous forest near streams for breeding, and is not often found outside of these habitats during the breeding season (Hamel 1992:193). Its presence indicates riparian forests with relatively high levels of canopy cover and low levels of management disturbance, conditions required or preferred by many other riparian associated species.

9.1.2 Direct and Indirect Effects

Under all alternatives, riparian corridors are managed under the Riparian Prescription. The prescription defines these corridors by setting minimum widths of 100 feet on either side of perennial streams and 50 feet on either side of intermittent streams, but also indicates that these corridors would include all of the true riparian area where it can be readily determined. The management goal for riparian corridors is to maintain or enhance the structural and functional integrity of riparian areas and associated aquatic and upland systems. Riparian corridor characteristics important to structural and functional integrity for terrestrial wildlife include habitat connectivity; vegetation diversity (including age, species composition, and vegetation layer diversity), vegetation vigor, abundance of snags and woody debris, and a width that is adequate to retain riparian habitat functions (Knutson and Naef, 1997). Riparian corridors include the concept of buffering streams to retain important stream functions, but they also encompass the functional aspects of riparian areas relative to uplands. Therefore, they present the opportunity to manage riparian habitat as a more completely functioning system in which streams and uplands mutually influence each other (Knutson and Naef, 1997, Tiner 1999). Based on a literature review conducted by Werger (1999), a 100-foot riparian buffer will provide habitat for many terrestrial wildlife species. The forested landscape-scale setting of the national forest will provide the wider riparian areas required by forest interior bird species in most locations. (See section 8.4.0 for further discussion).

To provide for riparian integrity, management standards are included in the Riparian Prescription. These include provisions to provide desirable levels of woody debris, and controls on impacts from grazing, recreational uses, mineral development, and

fireline construction. Vegetation management is limited to that needed to maintain or improve riparian function. Zones around channeled ephemeral streams are also recognized as special areas, with standards designed to ensure protection of channels and their function as part of the riparian network.

Implementation of the riparian prescription under all alternatives is expected to increase the acreage within riparian corridors that is in late-successional forest as a result of allowing forests in these areas to age. Increases in older forests would result in increases in abundance of snags and downed wood, important habitat components for many riparian dependent species. It would also result in abundant and well-distributed habitats characterized by shaded, low-disturbance, moist-soil microsites, which are preferred habitat for a large number of species. Overall, trends are expected to create a distribution of both early and late-successional riparian forest on NFS land that is roughly similar to the conditions that supported associated species prior to European settlement Patches of early-successional habitat associated with road crossings and other human developments are not expected to diminish the role of riparian areas as landscape corridors because of their small size and relative rarity, and their occurrence within a predominately mature forest matrix.

For the Acadian flycatcher, the direct and indirect effect of all alternatives would be positive. Analysis indicates that, under all alternatives, in 50 years the riparian corridors would move toward the desired condition for the Acadian flycatcher, i.e. mature to older-aged forests. Acadian flycatcher populations are expected to follow trends in mature riparian forest due to the close association between this species and habitat type. Breeding densities in suitable habitat average 14.5 pairs per 100 acres, with high densities reaching 43 pairs per 100 acres (Hamel 1990: C-5).

Table 3-62. Expected population trend[1] of the Acadian flycatcher on the CNF under alternatives 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.

Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	+	+	+	+	=	+	+
50 years	++	++	++	++	+	++	++

[1] Population trend expressed as expected change from current levels: “++” = relatively large increase, “+” = increase, “=” = little to no change, “-“ = decrease, “- -“ = relatively large decrease.

9.1.3 Cumulative Effects

Cumulatively, networks of riparian corridors across the national forest landscape have been fragmented by mixed ownerships and land use conversion. This condition is expected to persist across all alternatives. Alteration of riparian areas from conditions needed to support dependent species is most prevalent along larger rivers and streams, which are disproportionately under private ownership. Historically these sites likely provided the best quality habitat for riparian dependent species, and an especially large proportion of the landscape’s early-successional riparian component due to their use for Native American agriculture. These sites still are

most likely to provide large areas of early-successional riparian habitat due to private land management actions. Many riparian areas are in land uses that are no longer suitable for either early- or late-successional riparian species. Expected trends for riparian areas on NFS land, moving toward mature forest dominance with a small component maintained in early-successional habitat near human developments, would contribute to sustaining associated species on the landscape. However, under all alternatives abundance and distribution of both early- and late-successional riparian habitats would be reduced relative to conditions that supported associated species prior to European settlement (see Table 3-74 and Table 3-75, Terrestrial Viability section).

9.2.0 Snags, Dens, and Downed Wood

9.2.1 Affected Environment

Large woody debris (including branches, large logs, stumps, and root wads) is an important habitat component both to streams and terrestrial areas. It is important both structurally and as a source of energy. Large snags provide birds with nesting and feeding sites, singing perches, and as lookout posts for predators and prey (Howard and Allen 1988). Bats roost and produce maternity colonies under exfoliating bark. Amphibians, reptiles, small mammals, and invertebrates utilize woody debris as cover. Animals use snags, logs, and stumps as denning sites. Downed wood and logs are used for drumming by grouse to attract mates. Turtles and snakes use logs in streams and overhanging branches for basking and sunning. Large woody debris in riparian areas is used as cover by amphibians, insects, and other invertebrates, and small mammals. Small mammals utilize logs as travel ways. Fungi and other decomposers of woody debris are key components of food webs. Rotting wood tends to absorb moisture during wet periods and release it in dry periods thus helping to maintain a cooler microclimate (Ernst and Brown 1988, Knutson and Naef 1997).

Within the stream system, downed wood from riparian trees and shrubs greatly influence channel morphology and aquatic ecology. By obstructing stream flow, large woody debris stores and distributes sediment, and creates channel features, such as pools, riffles, and waterfalls. Wood also traps organic matter, which allows this material to be processed by instream organisms. Fish and insects occupy the pools and riffles created by the large woody debris, and riparian forest regeneration occurs on deposited sediment (Lassettre and Harris 2001).

Den trees, defined as living trees with hollows or cavities inhabited by animals, also are a critical habitat component for many species. They are used for nesting, roosting and hibernating. Many species of potential viability concern are associated with snags, downed wood, or den trees (Table L, Appendix E).

Hunter (1990) states that little information is available on how much large woody material is sufficient to support associated species. He cites literature that reviews expert opinion on snags, with a recommendation of 2-4 snags per acre being a “reasonable target.” Generally, for most dependent wildlife, the more snags the better for associated species.

Viability of the Indiana bat is critically tied to snags because of their use as roosts. The need to avoid disturbance to this species is the driving factor in considering effects of management on snags (Section 11.11, Indiana Bat).

Snags, downed wood, and den trees are typically most abundant in late-successional forests. Current abundance of late-successional forest by community type is shown under the section on Successional Forests (Section 8.1). This information indicates late-successional forests are abundant on the forest. Snags and downed wood also may be extremely abundant in forests affected by mortality events such as storms and insect and disease outbreaks.

Management Indicators

The pileated woodpecker (*Dryocopus pileatus*) is selected as an MIS because it requires large snags for nesting and feeding. The occurrence of this species may be correlated with forested habitats with abundant large dead trees and fallen logs (Hamel 1992:190), which also are used by other woodpeckers, owls, and numerous other birds, mammals, and amphibians. It requires large cavity trees for nesting, and forages on dead trees and downed logs across a variety of community types. This species is selected to help indicate the effects of management activities on the availability of forests with desired abundance of snags. Its use as an indicator is limited by its wide-ranging habits, which causes it to be documented in forest types that are not particularly suitable. It also occurs at relatively low densities, reducing the number of data points available for trend estimates. Local analysis would therefore be limited; analysis of regional trends across several national forests would provide more analytical power. Populations are also tracked by the annual Breeding Bird Surveys (BBS) and bird point counts conducted throughout the Southeast.

Population monitoring would be combined with information on forest age-class distribution and snag densities to provide a full picture of management effects on snag-dependent wildlife. The acreage of late-successional forest is an appropriate indicator of the effects of management on these habitat elements because of the woodpecker's relative abundance in this successional stage.

9.2.2 Direct and Indirect Effects

Forestwide direction under all alternatives states that unless necessary for small scale projects involving insect or disease control or facility development, or to provide for public and employee safety, standing snags and den trees would not be cut or bulldozed during vegetation management treatments unrelated to timber salvage. For timber salvage treatments, all live den trees, and a minimum average of six snags per acre from the largest size classes would be retained. Distribution of retained snags may be clumped.

In stand regeneration treatments greater than ten acres in size, a minimum average basal area of 15 square feet per acre is retained throughout the rotation. Although this basal area pertains to live trees, priority is given to retaining the largest available trees that exhibit characteristics provided by snags and those favored by roosting Indiana bats (sloughing bark, cracks and crevices).

Forestwide direction for potential black bear den trees under all alternatives states that den trees would be left during all vegetation management treatments occurring in habitats suitable for bears. Potential den trees are greater than 20 inches DBH and are hollow with a broken top.

Direction within Prescription 8.E.1, ruffed grouse, states that at least one large, greater than 12 inch diameter downed tree would be left per acre during management activities, to be a potential drumming log (see Section 12.3, Ruffed Grouse).

With these provisions included under all alternatives, existing snags, downed wood, and den trees would be well maintained on NFS land. Fire may reduce snags and downed wood in fire-dependent communities, but can also cause some tree mortality creating new snags and downed wood. Reduced density of these habitat elements may be expected in fire-dependent communities.

Recruitment of new snags, downed wood, and den trees is most dependent on providing abundant late-successional forests. Expected percentages of late-successional forests are presented in Section 8.1, Successional Forests. This analysis indicates that Alternatives D and F would provide least emphasis on these habitats (39%); and Alternative E, followed by Alternative G, would provide most emphasis (90% and 77%, respectively).

With the above protection and management provisions and the continuous creation of more habitat through aging age-class distributions, most alternatives will result in an increasing abundance and improved distribution of these habitat elements over the next 50 years, with benefits to associated species. Implementation of Alternatives D and F would likely result in a decline from the existing levels of snags, whereas other alternatives would provide increased amounts of late successional forest with snag recruitment. Increased mortality of trees due to forest health threats potentially would increase abundance of snags and downed wood regardless of management approaches (see cumulative effects discussion below). Although den trees are also expected to increase in abundance as forests age, restoring an abundance of very large diameter den trees will require longer than 50 years of forest growth in many forest community types.

Management Indicators

Because of their dependence on large snags, pileated woodpecker populations are expected to follow trends in snag availability and the abundance of older forests. Based on projected proportion of forest acreage in late successional stage conditions (Table 3-43, Successional Forested Habitats) compared to current conditions, population trends should increase under all alternatives except for Alternatives D and F. However, because pileated woodpeckers breed at relatively low densities (2.1 pairs per 100 acres on average, Hamel 1990:C-4), obtaining robust datasets on populations is difficult. Therefore, to examine national forest trends in abundance of this species, data will likely need to be pooled with that from other national forests within the ecoregion and evaluated by comparing national forest trends with overall regional and range-wide trends.

Table 3-63. Expected population trend[1] of pileated woodpecker on the CNF under 10 and 50 years following plan adoption. Population trend estimates are based on expected trends in habitat quantity and quality.							
Time Period	Alternative						
	A	B	D	E	F	G	I
10 years	+	+	-	+	-	+	+
50 years	+	+	-	++	-	++	+

[1] Population trend expressed as expected change from current levels: "++" = relatively large increase, "+" = increase, "=" = little to no change, "-" = decrease, "- -" = relatively large decrease.

9.2.3 Cumulative Effects

Across landscapes containing the national forest, NFS lands are expected to provide a disproportionately large share of the best quality habitats for species associated with snags, downed wood, and den trees. This result is expected because of the predominant distribution of older forests on NFS lands and other public lands compared to private lands (Section 8.1, Successional Forests). This disparity is expected to increase over time as other land uses affect abundance of older forests on private lands. Forest health threats also are expected to substantially add to cumulative effects on these habitat elements, by increasing tree mortality. The increasing number of threats and increasing severity of effects has created an abundance of snags and downed wood at many locations on the national forest. This trend is expected to continue into the foreseeable future as forests age and many threats expand their zone of influence (Section 16.0, Forest Health). While national forest management can reduce the severity of tree mortality in some locations, forest health threats are nevertheless expected to have a substantially positive effect on abundance and distribution of snags and downed wood under all alternatives. Den trees, which generally need longevity to become high quality habitat elements for wildlife, are likely to be negatively affected by forest health threats across alternatives

Distribution of forests with desired levels of snags and downed wood is a function of forest age and health. Increasing forest ages and numerous forest health threats indicate that snags will be well distributed in the future. Loss of American chestnut snags and downed wood resulted in a decline in longevity of these features on the landscape.

Distribution of forests with desired densities of den trees is also a function of forest age. Distribution should improve over time as forests age, but will not likely reach age class distributions where large den trees are as well distributed compared to historic conditions.

The abundance of all three of these habitat attributes is expected to be common across all alternatives. Distribution is expected to be fair for all alternatives except for Alternatives D and F, for which distribution is expected to be poor (Table 3-74 and Table 3-75, Section 15.1, Terrestrial Viability).

10.0 Aquatic Habitats

10.1 Affected Environment

The CNF (Table 3-64) manages approximately 2,960 miles of perennial and 3,527 miles of intermittent streams (Nicolo 2002). The miles of channeled ephemeral streams are estimated to be about three times the length of the intermittent channels or about 10,800 miles. All 16,495 miles of streams in these categories support aquatic communities. Of the 2,960 miles of perennial streams, only 792 miles are capable of supporting fish; 275 miles are considered as coolwater fisheries (water temperatures often exceed 70º F in the summer). The remaining 517 miles are coldwater fisheries. In addition, CNF has 13 lakes and ponds covering 125 acres. Most of this acreage is in Indian Boundary (97 acres) and Chilhowee Lakes (7 acres).

Table 3-64. Managed aquatic habitats that occur on CNF

Aquatic Habitats	Miles/Acres
Ephemeral Streams	10,800 miles
Intermittent Streams	3,527 miles
Perennial Streams (No fish)	2,168 miles
Coldwater Fish Streams	517 miles
Coolwater Fish Streams	275 miles
Warmwater Fish Ponds	125 acres

Several large rivers and reservoirs occur on CNF or form a portion of the boundary. The Forest Service has no legal responsibility for the management of these waters and no requirement (under NFMA) to maintain viable populations, with the exception of threatened, endangered, and sensitive species, which are monitored for viability. These large rivers and reservoirs are managed by the TVA and are not affected by Forest activities. Table 3-65 displays these habitats.

Table 3-65. Several large rivers and reservoirs flow across or are within the CNF proclamation boundary. No viability goals are established for aquatic species that are dependent on these habitats except threatened, endangered, and sensitive species.

Body of Water	Acres or Miles in Proclamation Boundary
South Holston Reservoir	7,580 acres
Watauga Reservoir	6,430 acres
Parksville Lake (Ocoee #1)	1,900 acres
Ocoee #2	0 acres
Ocoee #3	480 acres
South Holston River	4.0 miles
Watauga River	5.0 miles
Nolichucky River	12.5 miles

Table 3-65. Several large rivers and reservoirs flow across or are within the CNF proclamation boundary. No viability goals are established for aquatic species that are dependent on these habitats except threatened, endangered, and sensitive species.

Body of Water	Acres or Miles in Proclamation Boundary
French Broad River	19.0 miles
Pigeon River	9.0 miles
Little Tennessee River	25.0 miles
Hiwassee River	24.5 miles
Ocoee River	12.5 miles

Aquatic Habitats

Water quality in coldwater habitats is generally described as infertile with total alkalinity <20 ppm; total hardness <20 ppm; and neutral (pH 7.0) to slightly acid pH 5.5). Most of these streams (75%) have steep gradients (>4%) and are small (order 3) to medium sized streams (order 7). Only two percent of the coldwater streams are large rivers (order 8 or 9).

Coolwater habitats generally have slightly higher alkalinity and hardness levels but the pH levels are comparable to the coldwater streams. Coolwater streams tend to have lower gradients. Only 54 percent are greater than four percent. Stream size (order) is quite similar to coldwater streams with only nine percent being classified as large rivers (order 8 or 9).

All lakes and ponds are inherently infertile reflecting the alkalinity, hardness and pH values of their feeder streams. Ponds constructed for recreational fishing are limed every three years to raise the alkalinity level and increase the uptake of fertilizer that is added each year. These treatments increase the fish production providing more opportunities for recreational fishing.

Biota

The aquatic diversity in the southeastern U.S.A is globally significant for a variety of animal groups including crayfish, insects, snails, mussels, fish, amphibians, and reptiles (Herrig and Shute 2002). Concurrent with high diversity is the tendency for many of these species to be endemic to small ranges often leading to such rarity that protective legal status is necessary to insure their survival. Comparable species diversity and rarity occurs on CNF (Table 3-66). Intensive surveys have been conducted for fish and mussels. Data for the other groups are being collected but surveying has not been as rigorous because they include no threatened or endangered species.

Table 3-66. Five aquatic groups have species tracked in the CNF database. Crayfish have not been surveyed and are not tracked but will be added in the future.

Group	Number			
	Species	Endangered	Threatened	Sensitive
Amphibians	4	0	0	0
Insects	8	0	0	8
Snails	4	0	0	0
Mussels	28	4	1	9
Fish	154	4	4	10
Total	194	8	5	27

Over 5000 individual records document individual species locations within 758 stream reaches on CNF. New data are entered into the database annually from Forest Service, TWRA, TVA, Universities, contractors, and other bonafide sources.

10.2 Direct/Indirect Effects

Management activities that release sediment through ground disturbance would potentially pose the greatest threat to the aquatic environment. Other threats include the removal of large trees located close to aquatic systems. These large trees provide shade, which aids in the regulation of stream temperatures. In addition, they are essential components in the continuous replacement of large woody debris to stream channels. Large logs and stumps create diverse habitat niches in streams vital to aquatic organisms.

Roads affect the timing and volume of stream discharges by: intercepting and concentrating surface and subsurface flows; expanding or decreasing the channel networks; and reducing infiltration. The historic hydrological patterns within a watershed are altered affecting the functions and processes to which the riparian and its inclusive aquatic communities have adapted. Roads located within the Riparian prescription that either parallel or cross a stream would present the greatest potential for allowing pollutants into surface waters. Except on major highways, where CNF does not have jurisdiction, there are few examples of bulk transport of hazardous chemicals on forest roads. Some transport of hazardous chemicals including diesel fuel, oil, and pesticides occurs but is limited to: 1) private individuals using roads that lead to private residences; 2) campers and other recreating publics; and 3) loggers and other contractors working under Forest Service contracts. Opportunities to address concerns related to hazardous materials are limited to these contract workers. Clauses in Forest Service contracts specify safe handling measures for hazardous materials.

Migration and movement of aquatic species are primarily restricted at road crossings by hanging culverts, high water velocity, inadequate swimming depth, or any combination of these three factors. Migration and movement barriers would potentially be desirable (in rare cases) to protect a native species (brook trout) from a non-native competitor (rainbow trout). During watershed level analysis, the aquatic communities should be sampled above and below any culverts that could be barriers. Where the aquatic community above a culvert appears to have lost components, a decision should be made to either restock the unoccupied habitat through seining or electrofishing or replace the culvert to facilitate natural movement back into the area.

To protect aquatic habitats and organisms, riparian corridors would be established along all perennial and intermittent streams. Riparian corridors would be managed to retain, restore, and/or enhance the inherent ecological processes and functions of riparian communities. Management activities within these corridors are governed by Riparian Prescription standards. Ephemeral channels, which are outside of the riparian corridors, and general water quality are protected by Forestwide standards. When projects are implemented with full consideration of these standards, no direct or indirect adverse effects to aquatic organisms or to the aquatic habitats that sustain them would occur (USDA Forest Service 1973). In order to verify that these standards are adequate, some ground disturbing projects would be monitored for: filter strip widths (implementation monitoring), off-site sediment movement (effectiveness monitoring), and aquatic invertebrate community composition (validation monitoring).

10.3 Cumulative Effects

Direct and indirect adverse effects to aquatic communities are minimized by the riparian and forestwide watershed standards; however, these effects are not eliminated from the entire watershed. Incrementally, the adverse effects of Forest Service activities could accumulate to levels that threaten the viability of aquatic species. In addition to NFS lands, activities are also carried out on private lands in many of the 5th level watersheds. Since the viability of an aquatic species is generally assessed at the 5th level or higher watershed, it is important to consider all activities which might affect its viability regardless of land ownership.

Clingenpeel (2002) developed a process to estimate sediment yield and analyze the cumulative effects of proposed management actions on water quality and aquatic species viability at the 5th level watershed scale. The process predicts sediment yields as a surrogate for determining cumulative impacts to water quality and specifies a Watershed Condition Rank (WCR) for each of the 24 5th level watersheds under each of the seven alternatives (Table 3-67). The WCR in each watershed was consistent for all seven alternatives. Consequently, the cumulative effects analysis addresses only one WCR for each watershed. Possible Watershed Condition Ranks are: Excellent; Average; Below Average.

Forest objectives for watersheds with an Excellent WRC (four watersheds) are to maintain or improve aquatic health through the implementation of Riparian Prescription standards. The probability is low for adverse effects to aquatic species and their associated habitats in these watersheds.

Forest objectives for watersheds with an Average WRC (17) are the same as watersheds with Excellent WRC ratings with the addition of the requirement that during watershed assessments surveys are conducted to determine the sources of impairment and appropriate treatments are prescribed when they occur on NFS lands. No additional adverse effects to water quality or aquatic species should occur. Three watersheds ranked Below Average. During watershed assessments, surveys are conducted to determine the sources of impairment. Appropriate treatments are prescribed with emphasis placed on restoring these watersheds to their fully productive levels.

Table 3-67. The Watershed Condition Ranks for each of the 24 5th level watersheds evaluated is displayed.

Hydrologic Unit Code (HUC)	HUC Name	Watershed Condition Rank
6010103060	L. Watauga River	Below Average
6010108060	Nolichucky River	Below Average
6020003040	Upper Ocoee River	Below Average
5050001010	Upper New River	Average
6010103010	Roane Creek	Average
6010103020	Watauga River	Average
6010103030	Elk River	Average
6010106010	Pigeon River	Average
6020002040	Conasauga Creek	Average
3150101010	Conasauga River	Average
6010108010	N. Carolina Streams	Average
6010102010	Big Laurel Creek	Average
6010102030	S. Holston Lake	Average
6010103040	Doe River	Average
6010103050	Stone Creek	Average
6010105070	Fr. Broad River	Average
6010108030	N. Indian Creek	Average
6010108050	Camp Creek	Average
6020002030	Hiwassee River	Average
6020003020	Lower Ocoee River	Average
6010105080	Big Creek	Excellent
6010108031	S. Indian Creek	Excellent
6010204020	L. Tennessee River	Excellent
6010204040	Tellico River	Excellent

11.0 Threatened And Endangered Species (Includes Candidates)

The following sections describe existing conditions and potential effects by alternative for Threatened, Endangered, and Candidate species known to, or potentially occurring on the CNF.

11.1 Rock Gnome Lichen (*Gymnoderma lineare*)

11.1.1 Affected Environment

Rock gnome lichen (*Gymnoderma lineare*) is a rare squamulose lichen that is endemic to the southern Appalachian mountains of North Carolina, Tennessee, South Carolina, and Georgia. This species is the only member of it's genus that occurs in North America and is similar in appearance to the more common genus *Cladonia*. Rock gnome lichen was listed as endangered by the USFWS on January 18, 1995 (Federal Register 1995) and a recovery plan (U.S. Fish and Wildlife Service 1997) was developed for this species in 1997 that includes a rangewide summary of

existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

Gymnoderma lineare (Evans) Yoshimura and Sharp, is currently known from a total of thirty-five extant locations within four states (North Carolina, Tennessee, South Carolina, and Georgia) and has been extirpated from at least five sites where it was historically known to occur. Thirty of the remaining thirty-five sites are located on public lands where long-term protection may be afforded, yet many of these sites have experienced recent declines (U.S. Fish and Wildlife Service 1997).

Gymnoderma lineare populations are restricted to high elevation sites that are often bathed in fog, or steep humid gorges at lower elevations. High humidity seems to be an important habitat factor and the dense colonies are usually limited to near vertical, moist rock faces. Very little information exists regarding the life history or population biology of the species including dispersal mechanisms, and consequently populations are rather arbitrarily defined based on spatial separation (U.S. Fish and Wildlife Service 1997).

Gymnoderma lineare populations are threatened by recreational impacts associated with hikers, climbers, and sightseers, collectors, and the indirect effects of habitat modifications associated with logging and other disturbances. Air pollution and exotic pests also may be contributing to habitat declines through their effect to high elevation spruce/fir forests. No cause has been documented for the extirpation of the five historic sites, though one was suspected to have been impacted by highway construction and the other four sites currently are subject to heavy recreational use. Most populations occupy an area less than one square meter and only eight of the remaining thirty-five populations cover greater than two square meters (U.S. Fish and Wildlife Service 1997) leaving all sites vulnerable to impact despite their occurrence on public (protected) lands.

The combined factors of small populations and habitat declines related to factors that cannot be controlled by Forest Service management (air pollution and exotic pests) heighten the importance of maintaining existing populations and quality habitat. This necessitates the implementation of a rangewide monitoring program to detect population changes.

Gymnoderma lineare is known from one site on the CNF located at Roan Mountain. Under the LMP this site occurs on lands allocated to the Unique Areas (4K) and Rare Communities (9.F) prescriptions under all alternatives.

11.1.2 Potential Effects

A recovery plan (U.S. Fish and Wildlife Service 1997) was completed for *Gymnoderma lineare* in 1997. The plan emphasizes the protection and monitoring of existing populations and inventory of suitable habitats to locate new populations. Major threats to populations include the singular or cumulative effects of habitat loss caused by recreational trampling (scraping), collection, air pollution, and declining forest canopies in adjacent high elevation forests.

The Rare Community (9.F) and Unique Areas (4K) prescriptions and associated standards provide adequate protection for *Gymnoderma lineare* from potential negative effects of management activities on the CNF. Additionally, the CNF LMP includes forestwide standards that protect rare communities wherever they occur, protect individuals and locations of federally-listed threatened or endangered species, and control exotic species where they are causing adverse effects to federally-listed threatened or endangered species.

The combination of prescription allocations, forestwide standards, and site specific mitigations described above afford very good protection to *Gymnoderma lineare* populations and habitats from potential negative effects due to forest management activities. Despite this, factors out of the control of the Forest Service, such as air pollution and exotic insects (for which no adequate control exists), continue to threaten the species' habitat which will continue to pose risks to it's long-term viability, especially since most sites are very small in areal extent.

As stated above, thirty of the thirty-five populations occur on public lands. This enhances the conservation potential for this species throughout it's range. The adherence to a common monitoring protocol across public ownerships will enhance the ability to reach recovery objectives for this endangered species.

On the CNF, all known sites for *Gymnoderma lineare* are currently protected under all LMP alternatives. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of Forest Service Manual (FSM) 2672. Despite this, factors out of the control of the Forest Service, such as air pollution and exotic insects, continue to threaten the species' habitat which will continue to pose risks to it's long-term viability, especially since most sites are very small in aerial extent. Based upon this, under the implementation of any Plan alternative a determination of "not likely to adversely effect" is made for *Gymnoderma lineare*.

11.2 Spreading Avens (*Geum Radiatum*)

11.2.1 Affected Environment

Spreading avens (*Geum radiatum*) is a rare perennial herb that is endemic to a limited area of the Blue Ridge mountains of North Carolina and Tennessee. spreading avens was listed as endangered by the USFWS on April 5, 1990 (Federal Register 1990) and a recovery plan (U.S. Fish and Wildlife Service 1993) was developed for this species in 1993 that includes a rangewide summary of existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

At the time of the writing of the recovery plan, eleven sites were known for this species, nine in North Carolina, one in Tennessee, and one spanning the border of both states. Twenty populations of spreading avens are currently known to exist (NatureServe 2002). At least five more sites in North Carolina are known to have been occupied historically, but are now considered extirpated.

Geum radiatum typically occurs on rocky exposures at high elevations on the edges of spruce-fir forests, northern hardwood forests, or balds. The plants grow in association with other pioneer perennial herbs on rocky cliffs and ledges that receive direct sunlight for some portion of the day.

Very little is known about specific life history and population biology parameters for this species. Because the species is confined to just a few small areas on rocky summits, populations are extremely vulnerable to a variety of threats including atmospheric pollution, climatic extremes, erosion, natural succession, recreational developments, and trampling by sightseers, hikers, and climbers.

Under the LMP the three locations of *Geum radiatum* on the CNF are allocated to prescriptions 4K (Unique Areas) and 9.F (Rare Communities) which were developed to protect the integrity of the unique biological and physical resources found at Roan Mountain.

11.2.2 Potential Effects

Geum radiatum will be considered recovered when there are at least sixteen self-sustaining populations that are fully protected from identified threats (USFWS 1993). According to NatureServe (2002) twenty known populations currently exist, however none are currently considered secure. The CNF LMP includes forestwide objectives and standards that protect individuals and locations of federally-listed threatened or endangered species, and control exotic species where they are causing adverse effects to federally-listed threatened or endangered species. Any proposed projects within the vicinity of known populations of spreading avens will be evaluated for potential effects to the species and appropriate mitigation measures would be developed to ensure no detrimental effects occur.

The combination of forestwide objectives, standards, site specific mitigations, and prescription allocations described above afford very good protection to *Geum radiatum* populations and habitats from potential negative effects due to forest management activities. Despite these protections, the relatively small area occupied by this species leave it at some risk from catastrophic events.

On the CNF, the known sites for *Geum radiatum* are currently protected under all LMP alternatives. Mitigating measures for identified recreational impacts near the sites have been implemented. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Despite this, factors out of the control of the Forest Service, such as atmospheric pollution and climatic extremes, threaten the species’ and it’s long-term viability, especially since all sites are very small in aerial extent. Based upon this, under the implementation of any Plan alternative a determination of “not likely to adversely effect” is made for *Geum radiatum*.

11.3 Roan Mountain Bluet (*Houstonia montana*)

11.3.1 Affected Environment

Roan Mountain bluet (*Houstonia montana*) is a rare perennial herb that is endemic to a limited area of the Blue Ridge mountains of North Carolina and Tennessee. Roan mountain bluet was listed as endangered by the USFWS on April 5, 1990 (Federal Register 1990) and a recovery plan (U.S. Fish and Wildlife Service 1996) was developed for this species in 1996 that includes a rangewide summary of existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

Eight populations of Roan Mountain bluet are currently known to exist (NatureServe 2002), seven in North Carolina, and one spanning the border of North Carolina and Tennessee. At least one more site in North Carolina is known to have been occupied historically, but is now considered extirpated.

Houstonia montana typically occurs on rocky exposures at high elevations over mafic bedrock. The plants grow in gravel filled pockets on cliff ledges or talus slopes and occur on sites that are often bathed in frequent mountain fog and only receive direct sunlight for short periods of the day. Most known locations occur on cliff sites that are difficult to census without climbing gear, thus population sizes are primarily based upon estimates of the numbers of plant clumps present at each site.

Very little is known about specific life history and population biology parameters for this species. Because the species is confined to just a few small areas on rocky summits, populations are extremely vulnerable to a variety of threats including atmospheric pollution, climatic extremes, erosion, natural succession, recreational developments, and trampling by sightseers, hikers, and climbers.

Under the LMP the one location of *Houstonia montana* on the CNF is allocated to prescription 4K (Unique Areas) and 9.F (Rare Communities) which were developed to protect the integrity of the unique biological and physical resources found at Roan Mountain.

11.3.2 Potential Effects

Houstonia montana will be considered recovered when there are at least nine self-sustaining populations that are fully protected from identified threats (USFWS 1996). Since only eight known populations currently exist, recovery objectives obviously include either finding new naturally occurring populations, or re-introducing the species into appropriate habitat within it's historical range. The LMP includes an objective to increase the number of populations or occurrences through reintroduction or propagation efforts.

The CNF LMP includes forestwide objectives and standards that protect individuals and locations of federally-listed threatened or endangered species, and control exotic species where they are causing adverse effects to federally-listed threatened or endangered species. Any proposed projects within the vicinity of known populations of Roan Mountain bluet will be evaluated for potential effects to the species and

appropriate mitigation measures would be developed to ensure no detrimental effects occur.

The combination of forestwide objectives, standards, site specific mitigations, and prescription allocations described above afford very good protection to *Houstonia montana* populations and habitats from potential negative effects due to forest management activities. Despite these protections, the relatively small area occupied by this species leave it at some risk from catastrophic events.

On the CNF, the known site for *Houstonia montana* is currently protected under all LMP alternatives. Mitigating measures for identified recreational impacts near the site have been implemented. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Despite this, factors out of the control of the Forest Service, such as atmospheric pollution and climatic extremes, threaten the species' and it's long-term viability, especially since all sites are very small in aerial extent. Based upon this, under the implementation of any Plan alternative a determination of "not likely to adversely effect" is made for *Houstonia montana*.

11.4 Small Whorled Pogonia (*Isotria medeoloides*)

11.4.1 Affected Environment

The small whorled pogonia (*Isotria medeoloides*) was listed by the USFWS as endangered in 1982 and revised to threatened status in 1992 based on discovery of new sites, achievement of protection for many of the sites, and additional life history and population information. This information and much of the following is taken from the revised recovery plan (U.S. Fish and Wildlife Service 1992) written for the species.

Isotria medeoloides (Pursh.) Raf. is a federally listed orchid known from 16 states, including Virginia, West Virginia, North and South Carolina, Georgia and Tennessee (NatureServe 2001). This species occurs in three primary population centers, consisting of New England, the southern extreme of the Appalachian Blue Ridge at the juncture of North and South Carolina, Georgia, and Tennessee, and the coastal plain and piedmont region of Virginia, with outliers in Delaware and New Jersey. Disjunct populations occur in six sites in Pennsylvania, Ohio, Michigan, Illinois, and Ontario (U.S. Fish and Wildlife Service 1992). In the Southern Appalachian planning region, the only small whorled pogonia sites occurring on NFS lands are located on the Chattahoochee and Sumter National Forests in Georgia and South Carolina, respectively. The locations on these national forests are especially important because they are the only sites of the orchid known in the two states.

This species is found primarily in second and third-growth deciduous and mixed-deciduous/coniferous forests. Ages of the older trees on the sites vary from as young as 30- years- old in South Carolina to 80-years-old in Virginia. The forest habitat in which this orchid is found is not rare, yet only a small percentage of the habitat has colonies of small whorled pogonia. Site characteristics are highly variable, but are usually mesic, with sparse to moderate ground cover and a relatively open understory

canopy. Old logging roads or streams are often nearby. Many sites show signs of past agricultural use (USFWS 1992, pers.obs).

The primary threat to the small whorled pogonia throughout its range is habitat destruction by residential and commercial development. Collection of plants, recreational use, herbivory, and inadvertent damage from research activities are also cited as harming populations. Whereas heavy timbering and clear-cutting are considered threats, selective timbering may not be harmful to a population (U.S. Fish and Wildlife Service 1992).

No populations of small whorled pogonia are currently known from the CNF, though there is one site on private land near the forest. The CNF does have habitat similar to other locations where the species occurs. Small whorled pogonia sites on the Chattahoochee National Forest in Georgia are near a stream and have sparse ground cover. Two sites there have a dense coverage of New York fern (*Thelypteris noveboracensis*). Habitat varies from mixed hardwoods to hardwoods mixed with white pine and hemlock.

11.4.2 Potential Effects

The Recovery Plan for Small Whorled Pogonia (U.S. Fish and Wildlife Service 1992) lists several implementation tasks for recovery of the species. Those listed for federal agencies consist primarily of protection through existing laws and coordination with other governmental agencies and conservation organizations. The Forests in Georgia, South Carolina and Virginia have been implementing these tasks as well as conducting inventories for new locations of the orchid.

In South Carolina and Georgia, there is a concern that under-and midstory vegetation may be shading plants and possibly causing a decline in individual colonies. Vegetative removal studies have been conducted in Maine in 1993 and 1996, with possible positive response of the *Isotria* to the increased light at the forest floor (Dibble et al 1997). Vegetative removal studies began in New Hampshire in 1998, but will take at least five years to determine any effects of the removal (Sperduto, pers. comm). The recovery plan identifies the need for further research into effects of vegetation removal in small whorled pogonia sites, and thus there is an opportunity for the national forests to experiment with such removal. Any risks of habitat manipulation through vegetation manipulation would likely be outweighed by potential benefits to the species (D. Harris, pers. comm.) Because the orchid is protected under the ESA, no activities with potential to affect the plants either adversely or beneficially can take place in the sites without concurrence from, or consultation with, USFWS.

The CNF conducts project-level botanical inventories in sites with potential habitat for TES plants, prior to any ground disturbing activities taking place. Any populations of small whorled pogonia or other federally listed species are completely protected from any adverse direct or indirect effects of the activities. This will continue to occur under all alternatives in accordance with procedures outlined in the Region 8 supplement of FSM 2672.

Forestwide standards in the LMP that provide protection to the small whorled pogonia are those standards that protect individuals and sites of federally listed species and those that control exotic species where they are adversely affecting federally listed species.

A number of the small whorled pogonia sites occur on state and Federal lands, affording the species protection from development. According to the recovery plan (U.S. Fish and Wildlife Service 1992), 47 percent of known sites have some level of habitat protection. Private land sites in other states are being protected through agreements and conservation easements between the landowner and the state (U.S. Fish and Wildlife Service 1992). However, private landowners are not required to protect federally listed plants, and thus public land is critical in protecting and aiding in recovery of the species.

According to the recovery plan, monitoring results of protected populations followed for years have shown a decline in viability, and many extant colonies may not be viable. Causes for the declines are not known, but the loss of habitat functionality may be a factor. Until causes of declines are known, viability of the small whorled pogonia could be at risk throughout its range. Meanwhile, populations of *Isotria medeoloides* will be protected through enforcement of the ESA and efforts made to strengthen protective regulations at the state and local levels (U.S. Fish and Wildlife Service 1992).

There are currently no known sites of *Isotria medeoloides* on the CNF. To ensure no adverse effects to small whorled pogonia occur on CNF, botanical inventories will be conducted where needed to protect this species from potential adverse effects of management activities in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Because of the protective measures discussed above, implementation of any Plan alternative is not likely to adversely affect the small whorled pogonia.

11.5 Ruth's Golden Aster (*Pityopsis ruthii*)

11.5.1 Affected Environment

Ruth's golden aster (*Pityopsis ruthii*) is a rare member of the sunflower family that is endemic to two river systems in southeastern Tennessee. Ruth's golden aster was listed as endangered by the USFWS on July 18, 1985 (Federal Register 1985) and a recovery plan (U.S. Fish and Wildlife Service 1992) was developed for this species in 1992 that includes a rangewide summary of existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

The global distribution of *Pityopsis ruthii* (Small), coincides with an exposure of Precambrian phyllite and graywacke boulders along short stretches of the Hiwassee and Ocoee rivers in Polk County, Tennessee. Plants are restricted to cracks in the boulders and are dependent upon periodic flood scour to reduce competition within their fragile habitat. The populations of Ruth's golden aster on both rivers have been cooperatively monitored since 1987 by the TVA, Tennessee Department of Environment and Conservation (TDEC), and USDA Forest Service. The population on

the Hiwassee River has long been estimated to contain about 10,000 individuals and is monitored by random sampling at several key sites. A detailed census and assessment of the Hiwassee population was completed in 2000. The results of this census indicate a total of 8,235 plants along a four-mile section of the river. The Ocoee River population is much smaller, an average of only 650 plants, and is monitored by a total census each year. Despite sixteen years of monitoring resulting in an extensive dataset on total plant numbers, little information exists regarding the life history or population biology of the species including dispersal mechanisms. The fact that this species occupies such a small geographic area leaves it vulnerable to a variety of factors, despite the high number of individuals in the populations.

The Ocoee River supports a major recreational whitewater sporting business that brings thousands of people to the river each summer. Visitation to the river by rafters, canoers, and kayakers has increased the opportunity for human contact with Ruth's golden aster. In 1984, a total of 78,700 people floated the Ocoee River. In 1987, this number increased to 128,507, an increase of nearly 50,000 individuals in only four years. The 1996 Olympic Event on the Ocoee has further increased the popularity of the sport. Large boulders in the river that are popular stop-over sites for the rafters often coincide with Ruth's golden aster habitat. However, through a program of providing conservation education to the recreational guides that operate trips on the river, much of this concern has been alleviated. Despite this, the sheer numbers of people recreating on the river during the summer undoubtably have some effect on this species.

The Hiwassee River population is more remote than the Ocoee River population and consequently has not been directly impacted by human uses. Occasional trampling by fisherman may occur along the Hiwassee, but the biggest threat is considered to be competition from encroaching herbaceous and woody vegetation. Neither of the two rivers that support Ruth's golden aster have natural flow regimes as they did in the past, both having been extensively modified through a series of dams and power plants beginning in the early 1900's. This modification is thought to be a major factor in the long-term survival of the species. It is thought that the Ruth's golden aster plants depend upon periodic flood scour to remove competing vegetation from the narrow cracks in the boulders that it occupies along the river. With a lack of flooding, soil begins to build up in the cracks, and herbaceous and woody vegetation can become established closer and closer to the water's edge, effectively crowding and eventually covering the golden aster's habitat. This situation is most pronounced on the Hiwassee River where a water-diverting flume built in 1943 effectively dewatered the section of river that supports the plants. The current flow in that portion of the river now comes primarily from the tributary streams.

On the Ocoee River, a similar water-diverting flume was built in 1912 leaving the riverbed essentially dry during periods of power generation. In 1976 the flume was closed for repairs and was not rebuilt until 1983. It was during that seven-year period, when water was again allowed to flow freely through the channel, that the river became a popular site for private and commercial whitewater sports. When the diversion flume was put back into operation in 1983, the lobby from the whitewater sports groups was so strong that a compromise was developed that allowed

scheduled releases of water down the channel on a weekly basis for recreational purposes. While not the same as natural flows, this system of regulated "floods" provides a simulation of the flood scour needed to maintain habitat for Ruth's golden aster and the vegetative encroachment is less here than along the Hiwassee River.

Under the LMP there are no special management prescriptions allocated to the locations where *Pityopsis ruthii* occurs, however, under all alternatives, all known occurrences of this species occur on lands that will be included in the unmapped riparian buffers for the Ocoee and Hiwassee rivers.

11.5.2 Potential Effects

A recovery plan (U.S. Fish and Wildlife Service 1992) was completed for *Pityopsis ruthii* in 1992. The plan emphasizes the protection and monitoring of existing populations and research into population and environmental parameters that can be used to determine long-term viability. An informal interagency recovery group composed of members from the above mentioned agencies and the USFWS is currently re-writing portions of the recovery plan to incorporate new information and recovery objectives based upon results from the annual monitoring data. Through the auspices of the recovery group, the USDA FS, TVA, USFWS, and TDEC are collaborating with researchers from the University of California at Davis to develop a population viability analysis for Ruth's golden aster. Annual monitoring is being modified to incorporate some environmental and life history variables that will provide more predictive power to the analysis.

Due to the habitat loss that is occurring along the Hiwassee River, experimental habitat manipulation is being developed through the cooperative work of the USDA Forest Service, TVA, TDEC, and USFWS. Manual removal of the encroaching plants and treatment with spot herbicide applications has been proposed, with strict monitoring of the effects on Ruth's golden aster, before and after the removal. It is hoped that through a combination of habitat treatments and eventually a system of controlled water release, that suitable habitat for this species will persist into the future.

The CNF LMP includes forestwide standards that protect individuals and locations of federally-listed threatened or endangered species, and control exotic species where they are causing adverse effects to federally-listed threatened or endangered species. Any proposed projects within the vicinity of known populations of Ruth's golden aster will be evaluated for potential effects to the species and appropriate mitigation measures would be developed to ensure no detrimental effects occur.

The combination of forestwide standards, site specific mitigations, and prescription allocations described above afford very good protection to *Pityopsis ruthii* populations and habitats from potential negative effects due to forest management activities. Despite these protections, the relatively small area occupied by this species leave it at some risk from catastrophic events.

On the CNF, all known sites for *Pityopsis ruthii* are currently protected under all LMP alternatives. Mitigating measures for identified recreational impacts along the Ocoee River have been implemented and experimental habitat manipulations are underway

along the Hiwassee River to ameliorate potential habitat loss. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Despite this, factors out of the control of the Forest Service, such as catastrophic flooding, threaten the species' and it's long-term viability, especially since the entire known range of the species is very small in aerial extent. Based upon this, under the implementation of any Plan alternative a determination of "not likely to adversely effect" is made for *Pityopsis ruthii*.

11.6 White Fringeless Orchid (*Platanthera integrilabia*)

11.6.1 Affected Environment

White fringeless orchid (*Platanthera integrilabia*) is listed as a Candidate for federal listing by the USFWS and is on the Regional Forester's Sensitive Species List for the Southern Region. A conservation strategy (Bailey, 2001) was developed for this species in 2001 on the CNF that includes a rangewide summary of existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

Platanthera integrilabia (Corell) Luer is currently known from a total of sixty-one extant locations within five states (Alabama, Georgia, Kentucky, Mississippi, and Tennessee) and is considered extirpated from three states (North Carolina, South Carolina, and Virginia). Existing populations are summarized in Table 3-68.

Table 3-68. The Distribution of White Fringeless Orchid (*Platanthera integrilabia*) Populations by State Throughout it's Range.

State	Total Number Of Extant Sites	Total Number of Historic Sites	Total Number Of Extant Sites on Forest Service Lands
Alabama	7	1	?
Georgia	8	1	?
Kentucky	12	3	?
Mississippi	1	2	?
North Carolina	0	3	0
South Carolina	0	1	0
Tennessee	33	9	2
Virginia	0	?	0

Data from State Heritage Programs (Bailey 2001)

Platanthera integrilabia populations occur across a wide geographic area and consequently are found under a diverse array of environmental conditions. Because of this, it is difficult to characterize the specific habitat requirements for any given locale, however, in general plants are found in wet, flat, boggy areas, stream heads, or seepage slopes in acidic muck or sand in association with species of *Sphagnum moss* and one or more of the following fern species: Cinnamon fern (*Osmunda cinnamomea*), chain fern (*Woodwardia areolata*), and New York fern (*Thelyptris noveboracensis*).

The rarity of *Platanthera integrilabia* throughout it's range may be dependent on a combination of several factors including natural rarity of habitat, habitat loss, low seed germination rates, low flowering and fruit-set rates, and lack of effective pollinators. Habitat loss is recognized as the primary threat to the species rangewide and can be manifested directly through habitat conversion, or indirectly, though alterations to the hydrology at a given site that occur as secondary effects from activities such as road building, timber harvest, etc. Siltation of habitat, herbivory, and competition from exotic species are other threats that may impact populations.

Like many orchid species, *Platanthera integrilabia* is dependent upon a symbiotic relationship with a fungus for seed germination (Zettler et al. 1990, Zettler and McInnis 1992, Zettler 1994, Currah et al. 1997). While an individual orchid capsule may produce thousands of dust-like seeds, only a tiny fraction of those seeds will be dispersed to a site that supports adequate habitat conditions and the required fungal species for seed germination. While many orchid species have a symbiotic relations with several different fungal species, it has been suggested (Crock 1996, Zettler 1996) that the distribution of *Platanthera integrilabia* is further limited by the fact that there may be only a single fungal symbiont capable of initiating seed germination. Zettler (1996) showed that both in the lab and under natural conditions only three percent of *Platanthera integrilabia* seeds germinate to produce a seedling plant. Similarly, only a very small percentage of individuals ever flower and set viable seeds. With so many biological constraints affecting the viability of populations, the importance of maintaining existing populations and quality habitat through land management is heightened.

Platanthera integrilabia is known from two locations on the CNF. The Polk County site (first reported in 1996) contains approximately 40 individuals, only four of which were in flower when first discovered. The McMinn County site (first reported in 1981) is estimated to contain several thousand plants and is the largest known site in the world for this rare plant. Annual monitoring since 1996 has shown a range in flowering individuals from 140 to 868 in a given year (numbers based on transect data, not 100% sample).

Under the LMP the integrity of both sites will be protected in all alternatives by adherence to the standards listed in the riparian prescription and forestwide standards that protect channeled ephemeral streams. The McMinn County site is also allocated to the rare community prescription. Table 3-69 provides a summary of the applicable prescriptions for each site by alternative:

Table 3-69. Applicable Prescriptions at *Platanthera integrilabia* Sites by Alternative (first prescription is the actual site, second prescription is the surrounding area – Rx 11 is unmapped)

Site	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
McMinn	9.F, 11	9.F, 11	9.F, 11	9.F, 11	N/A	9.F, 11	9.F, 11
Polk	11, 8.C	11, 9.A.3	11, 8.C	11, 9.A.3	N/A	11, 8.C	11,8.C
Prescription Key: 0=Custodial, 8.C=Black Bear Habitat Management, 9.A.3=Watershed Restoration Areas, 9.F=Rare Communities, 11=Riparian Areas.							

11.6.2 Potential Effects

A conservation strategy (Bailey 2001) was completed for *Platanthera integrilabia* on the CNF in 2001. The strategy emphasizes monitoring of existing populations and inventory of suitable habitats to locate new populations. Major threats to CNF populations are listed as follows: Feral hogs; Plant poachers; Exotic/invasive plants; Alterations to existing hydrology.

In 1996, a fence enclosure was erected at the McMinn County site that excludes hogs from the main area of the bog where the orchids occur. Annual monitoring of this site has detected the presence of the non-native grass *Microstegium vimineum* in the small drainages that feed the bog. This species rapidly colonizes disturbed soils in both full sun and shaded conditions and is extremely difficult to eradicate, but the species seems unable to penetrate the established, dense herbaceous cover within the bog. At this time there is no practical method to treat this species near this site without adverse effects to numerous other species in the area. This need for this treatment may change in the future if the species is able to invade the bog. A similar fenced enclosure was erected at the Polk County site also in 1996.

The Rare Community (9.F) and Riparian (11) prescriptions provide adequate protection for *Platanthera integrilabia* at the McMinn County site from potential negative effects of management activities on the CNF. Additional measures (fenced enclosure) have also ameliorated potential effects from feral hogs at this site. The Polk County site was inventoried in 2002 to determine it's rare community status. The community is best described as a "Cumberland Forested Acid Seep" (NatureServe 2001) which is considered to be a rare community on the CNF. Under the LMP, the site would be protected by the rare community (9.F) prescription standards and the riparian prescription which is designed to maintain the integrity of habitats within that zone. Additionally, the CNF LMP includes forestwide standards that 1) protect channeled ephemeral streams, 2) protect individuals and locations of species needed to maintain their viability within the planning area, and 3) control exotic species where they are causing adverse effects to species of viability concern within the planning area.

The combination of prescription allocations, forestwide standards, and site specific mitigations described above afford very good protection to *Platanthera integrilabia* populations and habitats from potential negative effects due to forest management activities. Despite this, the species has some inherent biological limitations that could continue to pose risks to it's long-term viability, especially at sites where population numbers are low.

Table 3-69 (above) shows that out of sixty-one extant sites for the species rangewide, few occur on Forest Service lands. Based upon this, it is apparent that while Forest

Service conservation actions may contribute to rangewide viability, they cannot maintain it. Cumulatively, the long-term viability of the species across it's range is at great risk.

On the CNF, all wetland habitats and known sites for *Platanthera integrilabia* are currently protected under all EIS alternatives. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Site specific mitigations to ameliorate the effects of feral hogs have been implemented at both sites, yet potential impacts to individuals remain at both sites through plant poaching. An assessment of potential impacts from invasive exotic plants has not indicated a tangible threat this time. Inherent biological limitations based upon population dynamics may continue to pose risks to the species long-term viability, especially at small sites. Based upon this, under the implementation of any Plan alternative a determination of "may impact individuals but not likely to cause a trend to federal listing or a loss of viabilty" is made for Platanthera integrilabia.

11.7 Blue Ridge Goldenrod (*Solidago spithamaea*)

11.7.1 Affected Environment

Blue Ridge goldenrod (*Solidago spithamaea*) is a rare member of the sunflower family that is endemic to a limited area of the Blue Ridge mountains of North Carolina and Tennessee. Blue Ridge goldenrod was listed as threatened by the USFWS on March 28, 1985 (Federal Register 1985) and a recovery plan (U.S. Fish and Wildlife Service 1987) was developed for this species in 1987 that includes a rangewide summary of existing population information and a comprehensive literature review. Much of the information provided below is taken from that document.

Three populations of Blue Ridge goldenrod are currently known to exist (NatureServe 2002), two in North Carolina, and one spanning the border of North Carolina and Tennessee. Three more sites were known to have been occupied historically, all of which have undergone extensive recreational and residential development and have been extirpated.

Solidago spithamaea occurs primarily in full sun at high elevations and is associated with rock outcrops, cliffs, and balds. Very little is known about specific life history and population biology parameters for this species. Because the species is confined to just a few small areas on rocky summits, populations are extremely vulnerable to a variety of threats including atmospheric pollution, climatic extremes, erosion, natural succession, recreational developments, and trampling by sightseers, hikers, and climbers.

Under the LMP the one location of *Solidago spithamaea* on the CNF is allocated to prescription 4K (Unique Areas) which was developed to protect the integrity of the unique biological and physical resources found at Roan Mountain.

11.7.2 Potential Effects

Solidago spithamaea will be considered recovered when there are at least five self-sustaining populations that are fully protected from identified threats (USFWS 1987). Since only three known populations currently exist, recovery objectives obviously include either finding new naturally occurring populations, or re-introducing the species into appropriate habitat within it's historical range. The LMP includes an objective to increase the number of populations or occurrences through reintroduction or propagation efforts.

The CNF LMP includes forestwide objectives and standards that protect individuals and locations of federally-listed threatened or endangered species, and control exotic species where they are causing adverse effects to federally-listed threatened or endangered species. Any proposed projects within the vicinity of known populations of Blue Ridge goldenrod will be evaluated for potential effects to the species and appropriate mitigation measures would be developed to ensure no detrimental effects occur.

The combination of forestwide objectives, standards, site specific mitigations, and prescription allocations described above afford very good protection to *Solidago spithamaea* populations and habitats from potential negative effects due to forest management activities. Despite these protections, the relatively small area occupied by this species leave it at some risk from catastrophic events.

On the CNF, the known site for *Solidago spithamaea* is currently protected under all EIS alternatives. Mitigating measures for identified recreational impacts near the site have been implemented. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Despite this, factors out of the control of the Forest Service, such as atmospheric pollution and climatic extremes, threaten the species' and it's long-term viability, especially since all sites are very small in aerial extent. Based upon this, under the implementation of any Plan alternative a determination of "not likely to adversely effect" is made for *Solidago spithamaea*.

11.8 Virginia Spiraea (*Spiraea virginiana*)

11.8.1 Affected Environment

Virginia spiraea is a southern Appalachian endemic occurring in the southern Blue Ridge and Appalachian Plateau physiographic provinces (Ogle, 1991). This species is a clonal shrub that reproduces completely or almost completely through vegetative means. Habitat is rocky, flood-scoured riverbanks in gorges or canyons, where woody competition is reduced and riverwash deposits create sites for vegetative propagule establishment (U.S. Department of the Interior, Fish and Wildlife Service 1990). NatureServe Explorer (2001) describes the habitat as periodically flood-scoured banks of high-gradient mountain streams or along lower stream reaches. Plants are often found on geologically active areas with erosion, deposition, and slumping, along rivers with dynamic flooding regimes, sandbars, scoured river shore and flatrock habitat with crevices. These areas also are associated with cobbles, boulders, and

massive rock outcrops with sandy or clay soils. The areas can be periodically xeric. Plants are often seen in silt mud and sand.

Threats include reservoir construction (inundation of plants or alteration of natural flood regimes), human disturbance of riverbank habitats, and competing vegetation (U.S. Department of the Interior, Fish and Wildlife Service 1990).

NatureServe Explorer (2001) provides detailed information on physical habitat and associated species for occurrences of this species. The Recovery Plan for Virginia spiraea (U.S. Department of Interior, Fish and Wildlife Service, 1991) summarizes the number of clones by state and by ownership as follows:

West Virginia: 26 clones total; 2 in state park, 1 in national forest (?), the rest in private ownership.

Virginia: 17 clones total; 3 in state park, 1 on Corps of Engineers, 1 private, and 12 clones on the Guest River in a mixture of national forest and private.

Kentucky: 2 clones total; 1 (2?) on national forest, 1 private.

Tennessee: 21 clones total; 4 national park, 4 state park, 2 national recreation area, 2 mix of national recreation area and private, and 9 private.

North Carolina: 11 clones total; 7 clones private, and 4 clones a mix of national forest and private.

Georgia: 7 clones total; 2 in state park, and 5 in private.

Currently there are no known sites of Virginia spiraea on the CNF. One historic site was located in Unicoi County on CNF lands, however the species has not been seen there now for many years.

11.8.2 Potential Effects

The implementation schedule for the Virginia spiraea recovery plan (U.S. Department of Interior, Fish and Wildlife Service, 1991) includes five items that directly relate to Forest Service management:

Identify and monitor threats to each existing population.

Enforce laws protecting the species and/or its habitat.

Conduct rangewide searches for additional populations.

Conduct site-specific manipulation to maintain existing populations.

Reintroduce the species within its historical range.

Negative impacts from recreational use are a real threat. In West Virginia, recreational activities including fishing, hiking, camping, and boating have damaged nearly all sites (West Virginia Department of Natural Resources 2000). Competition from other plant species is the other serious threat. In some cases, alteration of normal flood scour events may allow native competing vegetation to affect Virginia

spiraea populations. Invasive non-native plant species also have the potential to out-compete Virginia spiraea.

Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Any populations of Virginia spiraea or other federally listed species are completely protected from any adverse direct or indirect effects of the activities. This will continue to occur under all alternatives.

Forestwide standards in the LMP that provide protection to Virginia spiraea are those standards that protect individuals and sites of federally listed species and those that control exotic species where they are adversely affecting federally listed species.

The LMP includes objectives taken from recovery plan (U.S. Department of the Interior, Fish and Wildlife Service 1990) and includes language that would encourage re-introduction within historic range. Opportunities may exist in the future to re-establish this species on the CNF.

There are currently no known sites of *Spiraea virginiana* on the CNF. To ensure no adverse effects to this species occur on CNF, botanical inventories will be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672. Because of the protective measures discussed above, implementation of any Plan alternative is not likely to adversely affect the Virginia spiraea.

11.9 Bald Eagle (*Haliaeetus leucocephalus*)

11.9.1 Affected Environment

The bald eagle ranges over most of the North American continent, from as far north as Alaska and Canada, down to Mexico. Experts believe that in 1782 when the bald eagle was adopted as our national bird, their numbers may have ranged from 25,000 to 75,000 nesting pairs in the lower 48 states. Since that time the species has suffered from habitat destruction and degradation, illegal shooting, and most notably from contamination of its food source by the pesticide DDT. In the early 1960's, only 417 nesting pairs were found in the lower 48 states. In 1999, more than 5,748 nesting pairs of bald eagles were recorded for the same area, resulting primarily from the banning of DDT in the U.S.A in 1972 aided by additional protection afforded under the ESA (USDI Fish & Wildlife Service, 1999).

Bald eagles have few natural enemies but usually prefer an environment of quiet isolation from areas of human activity (i.e. boat traffic, pedestrians, or buildings), especially for nesting. Their breeding areas are generally close to (within 4 km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect general availability of primary food sources including fish, waterfowl, rodents, reptiles, amphibians, seabirds, and carrion (Andrew and Mosher 1982, Green 1985, Campbell et al. 1990). Although nesting territory size is variable, it typically may encompass about 2.59 square kilometers (Abbott 1978). Most nest sites are found in the midst of large wooded areas adjacent to marshes, on farmland, or in logged-over areas where scattered seed trees remain (Andrew and Mosher 1982). The

same nest may be used year after year, or the birds may alternate between two nest sites in successive years. Bald eagles mate for life and are believed to live 30 years or more in the wild. Breeding bald eagles in Virginia appear to be permanent residents, whereas the young disperse extensively northward and southward. Although bald eagles may range over great distances, they usually return to nest within 100 miles of where they were raised (USDI Fish & Wildlife Service, 1995).

Winter home ranges for eagles can be very large, especially for non-breeding birds. They generally winter throughout the breeding range but are more frequent along the coast. These birds commonly roost communally.

The primary threats to the bald eagle include loss of nesting, foraging, and roosting habitat especially along shorelines, disturbance by humans, biocide contamination, decreasing food supply, and illegal shooting (Byrd and Johnstone 1991, Buehler et al. 1991). Bald eagles also have died from lead poisoning as a result of feeding on waterfowl that had inadvertently ingested lead shot. In 1991, the USFWS completed a program to phase out lead shot for waterfowl hunting.

All confirmed recent use of the CNF is for wintering residents; no nesting activity has been confirmed on NFS lands. However, two recent nests have been documented at Tellico Lake on TVA lands adjacent to CNF. The secondary protection zones around these nests overlapped with Forest Service lands.

The Forest Service, TWRA, and other partners attempted to re-establish breeding status on CNF lands through a hacking project at South Holston Lake in 1991-1995. Twenty-nine individuals were released at that location. Multiple winter resident birds, both mature and immature, have been sighted at Parksville (Ocoee) Lake, South Holston Lake, and Watauga Lake for the past decade. Monitoring for nesting activity continues on an annual basis in cooperation with the TVA and the TWRA.

11.9.2 Potential Effects

Timber harvesting, road building, and prescribed burning activities have the potential to impact the bald eagle or its habitat should it occur near streams, lakes, or other wetlands. Human disturbance from roads, trails, and campgrounds can also adversely affect the use of an area for nesting or roosting by eagles.

The LMP and all alternatives include a standard establishing 1500-foot protection zones around bald eagle nests and communal roost sites. Vegetation management that would affect forest canopy within these zones is prohibited, and other activities that may disturb eagles are prohibited within these zones during periods of use. The Riparian Prescription, with its emphasis on low levels of disturbance and maintenance of mature forest, provides direction for management of shorelines where bald eagles may forage. This direction also would be the same across all alternatives. No additional specific provisions related to foraging habitat are included due to the variety of circumstances that may be involved. These issues would be addressed during site-specific analysis.

Because this management direction addresses critical needs for habitat and protection of roosts and nests from human disturbance, the LMP and alternatives are

not likely to adversely affect the bald eagle, and should provide conditions beneficial to this species. Additional site-specific analysis would be done on all projects with the potential for affecting this species. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672.

11.10 Northern Flying Squirrel (*Glaucomys sabrinus coloratus*)

11.10.1 Affected Environment

The Carolina and Virginia subspecies of the northern flying squirrel were listed as Endangered under the ESA in 1985. A recovery plan was completed in September 1990. Since that time, nest box studies and live trapping efforts have been used to determine the presence or absence of this species within habitats considered suitable. Results of these efforts have shown the species to be scattered throughout remnant stands of spruce/fir and northern hardwood types in North Carolina, Virginia and Tennessee and also some areas with stands of northern hardwoods/hemlock. Some apparent core areas (areas of greater squirrel concentrations) have been determined. Recent studies involving concentrated trapping and nest box checks in Virginia have shown numbers of northern flying squirrels greater than was previously thought to occur. Conditions of the hardwood habitat component are improving for this species in most of its range due to the aging of the forests it prefers. The conifer component has declined dramatically. Fraser fir has declined dramatically. Although the red spruce component appears to be expanding its range into nearby northern hardwood stands in some areas of Virginia, it has also suffered some mortality due to recent SPB infestations at Roan and Unaka Mountains of Tennessee (D. Duerr 2002). In addition, the hemlock woolly adelgid is expected to cause significant loss of the hemlock component. The number of captured southern flying squirrels (*Glaucomys volans),* a species that may displace the northern flying squirrel, has also increased in some areas along with those of the northern flying squirrel.

The implementation schedule for the northern flying squirrel recovery plan (U.S. Department of Interior, Fish and Wildlife Service 1990) includes several items that directly relate to management of national forests:

Protect existing habitat (occupied & high potential of suitability).

Survey potential habitat to locate additional populations.

Monitor known populations.

Monitor loss or degradation of high elevation forest resulting from insect damage and/or air pollution.

Monitor the effects of modification or loss of habitat resulting from timber operations, roads, trails, or other recreation developments.

Development of educational materials or programs about the species.

The distribution of northern flying squirrels is generally associated with high elevation boreal habitats, especially spruce/fir and northern hardwood forests within the

Southern Appalachians. Each subspecies has a relict distribution of small and potentially vulnerable isolated populations that are separated by vast areas of unsuitable habitat. The subspecies *G. s. coloratus* is known from five isolated localities: three in the western mountains of North Carolina and two localities in the eastern mountains of Tennessee (USDI, Fish & Wildlife Service 1991). Populations of *G. sabrinus coloratus/fuscus* (subspecies taxonomy undetermined) are also known to occur in two counties in southwest Virginia (USDI, Fish & Wildlife Service 1990).

These subspecies occur primarily in the ecotone or vegetation transition zone, between coniferous and northern hardwood forests. Both forest types are used in search of food but the hardwood areas are needed for nesting (Weigl 1977). Northern flying squirrels have been shown to utilize deciduous hardwood, and hardwood/hemlock habitats some distance away from spruce/fir stands (Weigl and Osgood 1974, Weigl 1978, Payne et al. 1989, Boynton 1989, Weigl et al. 1992). Because of the flying squirrel's small size, the climatic severity of its habitat, and the abundance of avian and mammalian predators, secure nesting sites represent a critical limiting factor (USDI, Fish & Wildlife Service, 1990). Recent information from studies in Virginia indicate that flying squirrels appear to select tree cavities, woodpecker holes in decadent snags, cavities under root wads, underground rock dens, and nest boxes where available during periods of cooler weather. (Hackett and Pagels, personal communication, 2002). Leaf nests in tree canopies are also used during warmer weather. Nest cavities are often found in yellow birch trees (*Betula allegheniensis* Britton.) and bark from this species is commonly used as nest material (Odom 1995).

Food availability and abundance may affect the distribution of G*. sabrinus ssp.* and the periodic dependence on certain species of fungi may be a factor in restricting the subspecies to high-elevation, mesic habitats (USDI, Fish & Wildlife Service, 1990). Studies from the western U.S.A have shown that the primary food for the northern flying squirrel from July – December is hypogeous fungi and from January thru June is epiphytic lichens (Maser et al. 1986, Maser and Maser 1988). They also consume seeds, buds, fruit, staminate cones, insects, and other animal material (McKeever 1960), and have been observed ingesting tree sap (Foster and Tate 1966; Schmidt 1931).

Reproductive information is limited for these subspecies. Investigators working with other subspecies mention two litters of 2-6 young per year and a gestation period of 37-42 days (Muul, 1969; Davis, 1963). Trapping data from the southern Appalachians provide evidence of only a single litter in spring or summer. Nest box data from Virginia and West Virginia indicates from one to five young per female (M. Fies & C.Stihler, personal observation). Two captive females from North Carolina each had litters of four young (P. Weigl, pers. obs.). Based upon studies from North Carolina and Tennessee, average normal lifespan for northern flying squirrels is estimated at three years with five years being the oldest wild recaptured individual observed (Weigl et al. 1999). Like many small rodent species, the northern flying squirrel has many predators. It is unlikely that many squirrels live more than about a year (Hackett and Pagels, personal communication, 2002).

Population estimates are not available, but the northern flying squirrel appears to be extremely rare throughout the southern Appalachians. These subspecies are also very difficult to capture and study. Northern flying squirrels may periodically abandon particular habitats or undergo periodic population oscillations making them undetectable for extended intervals (USDI, Fish & Wildlife Service 1990).

Two populations are known from the CNF. One population near Haw Knob is known from Tennessee through a single 1982 record. Attempts to resurvey the area in 1991 yielded only southern flying squirrels. However, another northern flying squirrel was captured in 1991 within 1-2 miles in North Carolina, where the majority of suitable habitat is located (Weigl et al. 1991). No spruce or fir is available to this local population, and hemlock may provide the needed conifer component. Hemlock woolly adelgid infestations could affect habitat suitability in the future.

A second location is Roan Mountain, site of one of the largest and best studied populations. Although the population appeared to be in decline in winter of 2000, current trend data is not available at this time (Weigl 2002). Unaka Mountain has some elements of suitable habitat, but a 1991 survey yielded only southern flying squirrels.

The northern flying squirrel is vulnerable to a number of both natural and human-related impacts. Habitat degradation or destruction from timber harvesting, road or trail construction, firewood gathering, air pollution, insects, wildfire, overuse from forest visitors, and the possibility of global warming could threaten this species and/or its habitat. Any activity that reduces the amount of spruce/fir forest, northern hardwood forest, or the hemlock/northern hardwood forest, or increases the oak component within northern hardwood stands may adversely affect northern flying squirrels.

11.10.2 Potential Effects

The LMP and the 9.F Prescription (Rare Communities) provide for the protection and restoration of spruce/fir communities and includes a standard that limits vegetation management within .5-mile of habitat occupied by the northern flying squirrel. The spruce/fir community is unsuitable for timber harvesting, road construction or reconstruction and motorized access is limited to currently existing roads. The most frequent use of these high elevation spruce/fir and northern hardwood forests is dispersed recreation activities such as hunting, hiking, and camping. Associated trail construction and firewood gathering could occur within these forest types after appropriate project-level affects analysis finds a no effect determination. Such activities that affect vegetation would not affect the northern flying squirrel because they would not be allowed within the .5-mile protection area around occupied habitat.

The protection of existing spruce/fir habitat should benefit the northern flying squirrel. In addition, standards require the retention of patches of hemlock during silvicultural treatments and would have a positive effect on the Haw Knob population. The habitat of the Haw Knob population has been mapped and allocated to the rare community prescription (9.F). Roan Mountain also occurs within a unique protective prescription (4.K).

The Revised Forest Plan and its alternatives are not likely to adversely affect this species because this management direction addresses the critical needs for habitat and protection of the northern flying squirrel. All alternatives would improve habitat conditions for the species. Additional site-specific analysis would be done on all projects with the potential for affecting the species. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672.

11.11 Indiana Bat (*Myotis sodalis*)

11.11.1 Affected Environment

The distribution of Indiana bats is generally associated with limestone caves in the eastern U.S. (Menzel et al. 2001). Within this range, the bats occupy two distinct types of habitat. During summer months, maternity colonies roost under sloughing bark of dead and partially-dead trees of many species, often in forested settings (Callahan et al. 1997). Reproductive females require multiple alternate roost trees to fulfill summer habitat needs. Adults forage on winged insects within three miles of the occupied maternity roost. Swarming of both males and females and subsequent mating activity occurs at cave entrances prior to hibernation (MacGregor et al. 1999). During this autumn period, bats roost under sloughing bark and in cracks of dead, partially-dead and live trees.

Wintering colonies require very specific climatic regimes within cold, humid caves or mines primarily west of the Appalachian Mountains (Barbour and Davis 1969; Menzel et al. 2001). Few sites provide these conditions, and approximately 85 percent of the entire known population inhabits only nine caves or mine shafts (Menzel et al. 2001; USDI FWS 1999).

Although most hibernacula have been protected, the Indiana bat range-wide population has declined by about 60 percent since the 1960's (USDI FWS 1999). Causes of decline are not known; declines have continued despite efforts to protect all known major hibernacula. Researchers are focusing studies on land use practices in summer habitat, heavy metals, pesticides and genetic variability in attempt to find causes for the declines.

Within the planning analysis area, hibernacula are known to NFS lands in Virginia and Alabama, and to other lands in Tennessee and Georgia. Recommended habitat management includes protecting known significant hibernacula from human impacts, retaining forested condition around the entrances to significant hibernacula, and evaluating opportunities to protect Indiana bats through land acquisition (Menzel et al. 2001).

It is difficult to quantify summer roosting habitat for Indiana bat at a range-wide, regional or local level due to the variability of known roost sites and lack of knowledge about landscape scale habitat characteristics of maternity roosts. Within the planning area, maternity roost sites are known from Virginia and Tennessee. Forest management practices that affect occupied roost trees may have local impacts on Indiana bat populations. However, the bats live in highly altered

landscapes, depend on an ephemeral resource--dead and dying trees--and may be very adaptable. Anecdotal evidence suggests that these bats may respond positively to some degree of habitat disturbance (USDI FWS 1999).

No hibernacula are known from the CNF. An effort of 300 net nights of forest-wide sampling has yielded one capture of a lactating female on the Tellico Ranger District in 1999. Indiana bat vocalizations have been recorded using ANABAT technology from two locations on the same district (Cochran et al. 2000). Libby et al. (2000) also reported additional captures of juvenile and adult Indiana bats in Monroe County and adjacent counties of Tennessee and North Carolina. Therefore, there is a very high likelihood that at least this area of CNF supports a summer maternity colony or colonies. The CNF is located within about 16 miles of a known hibernaculum at GSMNP, where several maternity roosts have also been located (USDI National Park Service 2002). Four additional hibernacula are located within 40-70 miles from CNF (USDI Fish and Wildlife Service 1997).

General standards that would help ensure adequate roost habitat include retention of snags whenever possible; prescribed burning to restore and maintain uncluttered, open midstory foraging conditions (using only cool season backing fires in karst areas); and ensuring a continuous supply of oaks, hickories, and ash as well as other trees with exfoliating bark (Menzel et al. 2001).

11.11.2 Potential Effects

If Indiana bat hibernacula are discovered on the CNF in the future, effects would be the same under all alternatives because standards would provide consistent protective measures. Until caves and mines have been surveyed for use by bats, it is assumed that federally-listed bats are present and habitat is maintained for them. Human intrusion would be regulated within .25 miles of significant sites by closing public access routes as needed and by prohibiting recreational activities (camping, fire-building) at cave or mine entrances. Although no hibernacula have been identified on the CNF, if they are found in the future, further consultation with the U.S. Fish and Wildlife Service would determine needed buffers around the area. Forestwide standards require installation of gates or other protective structures at entrances of all caves and mines occupied by significant populations of all bats, including Indiana bats.

Research is needed on effects of forest management on Indiana bat summer roosting ecology (Menzel et al. 2001). Potential roost trees could be directly affected by vegetation management, firewood and salvage sales, routine maintenance/permitting of small clearings including easements, rights-of-way and reasonable access to privately-owned lands, and road construction. Implementation of Alternative D could result in the highest levels of vegetation disturbance and possible impact to currently occupied and potentially occupied roost trees. For any alternative that allows active vegetation management for any purpose, there is potential for “take” of a maternity roost tree. However, standards described below would minimize the chance of take for all alternatives.

Properly implemented prescribed burns have potential to provide beneficial effects including improvement of foraging habitat conditions and creation of additional snag

roosts. The flame lengths of dormant season prescribed burns are not likely to have a direct effect on roost trees, and Indiana bats would be absent from the general forest area during this period. Growing season burns (conducted June 1 through August 1) have the potential to have direct effects on roost trees and particularly nonvolant young, and there is potential for "take". To avoid injury to young bats, site-specific (project level) surveys for Indiana bat would be required under all alternatives to determine that the bats are not likely present before implementing the burn. This would require project-level consultation with USFWS.

Under all alternatives, known Indiana bat roosts would be protected from cutting and modification until they were no longer suitable, unless treatments were needed for public or employee safety. This action would require project-level consultation with USFWS. Snags with exfoliating bark would be protected unless projects involved salvage harvests, insect and disease control, or facility construction.

The forest's fuelwood program allows the public to purchase and collect wood, often standing or leaning dead trees, for personal use. The program is regulated by issue of site-specific permit, and collection occurs primarily along roadsides and other specified areas with easy access. During the years 2000-2002, the forest issued an average of 89 fuelwood collection permits per year, resulting in the average collection of an approximately 193 CCF (hundred cubic feet) each year. This roughly translates into 1,380 trees each year (11 inch diameter, 32 feet in length), or approximately nine acres of snags each year, scattered across the forest. Most wood is collected from the Ocoee Ranger District, followed by the Watauga Ranger District, where few TES bat occurrences have been documented. The smallest proportion (an average of 12 permits per year consisting of about 21 CCF or 150 trees (11% of the forest-wide program) was collected on the Tellico Ranger District, where Indiana bat maternity activity has been documented. Although risk of take cannot be completely eliminated while this program is implemented, the risk of direct effects to maternity roosts can be minimized by excluding larger shagbark hickories from the fuelwood program, and by prohibiting collection of snags for fuel wood between May 1 and August 15, when maternity roost trees may be occupied. Some risk of taking an unoccupied maternity roost tree would exist. Based on surveys of all known caves and mine portals, the forest does not currently offer habitat for hibernacula, and therefore the fuelwood program is not expected to affect swarming and mating bats. Some risk of taking a migratory bat roost would exist, although during this life stage use of individual roost trees is expected to be very temporary in nature.

All types of vegetation treatments (salvage, even-aged and uneven-aged regeneration) would require varying levels of snag retention and specific retention of leave trees. In stand regeneration treatments greater than ten acres in size, a minimum average basal area of 15 square feet per acre of live trees is retained throughout the rotation, and priority is given to retaining the largest available trees that exhibit characteristics favored by roosting Indiana bats (sloughing bark, cracks and crevices). Routine (non-catastrophic) salvage treatments occurring between May 15 and August 15 would require site-specific (project level) surveys for Indiana bat to determine that the bats are not likely present before implementing the treatment.

This would require project-level consultation with USFWS. Treatment of catastrophic salvage events would require a separate NEPA analysis and appropriate level of consultation with USFWS.

All alternatives are not likely to adversely affect the Indiana bat. Although levels of vegetation management are not likely to diminish summer roosting or foraging habitat in a significant way, the possibility for "take" cannot be completely eliminated with any level of management. However, forestwide standards should reduce the potential for "take" to levels that are insignificant and discountable.

11.12 Gray Bat (*Myotis grisescens*)

11.12.1 Affected Environment

The gray bat occupies a limited geographic range in limestone karst areas of the southeastern U.S. (USDI FWS 1982). The bat is more narrowly restricted to cave habitats than any other mammal occurring in the U.S., and occupies caves year-round. Most individuals migrate seasonally between maternity and hibernating caves. About 95 percent of the known population inhabits nine winter caves.

Limiting factors for the gray bat may include warm caves in the northern portion of its range, and cold caves in the southern portion. A key cause of decline appears to be human disturbance and loss of cave habitat quality. The recovery plan (USDI FWS 1982) recommends actions focused on cave acquisition and gating.

Deforestation of areas around occupied cave entrances and in between caves and large water sources (feeding corridors) may have a detrimental effect. Forest cover provides protection from predators, especially for young bats. Retention of forested corridors around cave entrances, along river and perennial stream edges, and along reservoir shorelines within 25 km of known gray bat maternity caves is important (USDI FWS 1982; LaVal et al. 1977; Best et al. 1995).

Although the gray bat is currently listed as endangered, some bat researchers have endorsed a proposed status change to threatened due to population increases and successful protection of many inhabited caves (Currie and Harvey 2002). Gray bats are now estimated to number over 2.6 million individuals.

Both major hibernacula and Priority 1 maternity caves are known from Alabama and Tennessee. No hibernacula or maternity caves are known from the CNF. An effort of 300 net nights of forest-wide sampling has yielded 41 confirmed captures of gray bat, including a pregnant female. All captures occurred on the Nolichucky-Unaka Ranger District within the French Broad River and Nolichucky River watersheds (Cochran et al. 2000). One adult male captured on CNF was recaptured in a privately owned maternity cave approximately nine miles from the original capture site. Based on these results, CNF provides riparian foraging habitat for nearby nursery colonies. Maternity sites exist within the proclamation boundary and could be purchased during the planning period if available for sale.

11.12.2 Potential Effects

Possible effects under all alternatives are alteration of cave habitats through management or human recreation activities; removal of forest cover around caves or along riparian foraging corridors; and loss of water quality limiting production of aquatic insects.

Effects to gray bat caves would be the same under all alternatives. For each alternative, standards would protect all hibernacula and maternity colony sites that are discovered or purchased. Although no hibernacula have been identified on the CNF, forestwide standards require installation of gates or other protective structures at entrances of all caves and mines occupied by significant populations of all bats, including gray bats. Human intrusion would be controlled within .25 miles of these sites. These sites would be protected by maintenance of a .25 mile vegetated buffer. Standards also require development of prescribed burning plans that identify caves and mines as smoke-sensitive targets. Until caves and mines have been surveyed for use by bats, it is assumed that federally-listed bats are present and habitat is maintained for them.

Effects on foraging habitat are expected to be the same under all alternatives since riparian corridors will be well protected. The CNF has an estimated allocation of 126,030 acres of riparian corridor along all perennial streams (2,960 miles) and all intermittent streams (3,527 miles). These acres will be managed under Prescription 11 (Riparian Corridors) for all alternatives. The objective of this prescription is to retain, restore or enhance ecological processes and functions of these systems. The minimum forested corridor width provided for perennial streams, lakes and ponds is 100 feet on either side of the waterway, unless interdisciplinary site specific analysis determines that a smaller or larger width is required to accomplish project objectives. In addition, forestwide direction for all alternatives provides that a minimum of 15-20 square feet/acre basal area of tree cover be retained along a 25-foot zone on each side of channeled ephemeral streams (10,800 miles). These standards will not only provide forest cover for foraging and protection from predation, but will also ensure high water quality to support the aquatic insect prey base. Further site-specific consultation with USFWS would be required for projects within 20 miles of known maternity sites, if those projects may affect canopy cover along perennial streams or forested lake shorelines.

The LMP and its alternatives may effect, not likely to adversely affect this species because management direction protects key habitat elements. All alternatives would improve or maintain foraging, roosting and maternity/hibernacula habitat conditions for this species, with the exception of Alternative F, which does not provide a similar, explicit level of protection. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672.

11.13 Spruce Fir Moss Spider (*Microhexura montivaga*)

11.13.1 Affected Environment

This species is historically known from six mountain peaks in western North Carolina and eastern Tennessee (Coyle 1999). The restricted range of each of the surviving populations of the spider causes them to be extremely vulnerable to extirpation from a single event or activity (USDI FWS 1998).

Typical optimal habitat is moist, well-drained moss mats growing on rocks and boulders in shaded conditions of mature high elevation (5,500 feet to 6,100 feet elevation) forests of Fraser fir, with scattered red spruce. Minor habitat components include the transition zone between the fir-spruce habitat and northern hardwood forest with boulders and rock outcrops (Coyle 1999). Quality of these conifer forests is deteriorating rapidly due to infestations of the balsam woolly adelgid (an exotic insect pest introduced from Europe) and possibly regional-scale air pollution. Other factors could include additional stress factors to the spruce-fir community and possibly site deterioration due to past land-use history (unregulated logging and burning). The spider requires high and constant humidity. Loss of forest canopy due to fir mortality leads to desiccation of habitat (USDI FWS 1998). Fraser fir loss is extensive at four or more of the known sites (possible exceptions Grandfather and Roan Mountains).

The species was first discovered on the CNF in 1998 during a survey at Roan Mountain (Coyle 1999). Critical habitat was designated at this location in both Carter County, Tennessee and Mitchell and Avery Counties, North Carolina (Federal Register 2001). A specific genus of moss, *Dicranodontium* spp., appears to be a significant habitat associate here (Coyle 1999).

General threats to the spruce-fir forest type are discussed in Section 6.2 (Spruce-Fir Forests). Threats that the Forest Service has the ability to minimize include collection of fir seedlings and cones, and recreation development including trail and facility construction and activities such as boulder climbing. Recreation development resulting in removal or thinning of canopy trees within these stands may cause remaining trees to be more susceptible to exposure shock (Nicholas et al. 1992). Moss collection and uncontrolled wildfire could also affect moss mats utilized by the spider (Coyle 1999).

11.13.2 Potential Effects

For all alternatives, spruce-fir forests would be managed under the Rare Community (9.F) prescription to optimize their natural distribution, abundance and condition, and implementation of projects should have beneficial effects to the spider (Section 6.2 Spruce-Fir Forests). Prohibition of moss collection, fraser fir seedling and cone collection, and facility development in suitable spider habitat at Roan Mountain would help to perpetuate the health of the community and habitat for the spider. Fire suppression and a prohibition on boulder climbing within suitable habitat would also help to protect moss mats and benefit the spruce-fir moss spider.

The Revised Forest Plan and its alternatives are not likely to adversely affect this species because this management direction addresses the critical needs for habitat

and protection of the spruce-fir moss spider, and should improve or maintain habitat conditions for the species. Where needed to protect this species from potential adverse effects of management activities, project-level surveys would be conducted in accordance with procedures outlined in the Region 8 supplement of FSM 2672.

11.14 Amber Darter (*Percina antesella*) Williams and Etnier

11.14.1 Affected Environment

The amber darter was federally listed as endangered in 1985. Concurrent with the listing was the designation of 33.5 miles of critical habitat. The species is endemic to the upper Coosa River system. Three populations were known to exist; but specimens have not been collected from two of these rivers (Etowah River and Shoal Creek – a tributary to the Etowah River) for over 20 years. The extant population is in the Conasauga River with the upper limit of documented occurrence located 0.7 miles down stream of the Cherokee National Forest in Polk County, TN. This population is estimated to contain 0 individuals on CNF lands. Artificial propagation is not being developed.

No population or habitat objectives are established for the amber darter on the Cherokee National Forest. While monitoring Conasauga logperch on the National Forest, ichthyologists will be instructed to search specifically for amber darters in areas with suitable habitat. When recovery opportunities arise, they will be coordinated with the Fish and Wildlife Service and the Tennessee Wildlife Resources Agency.

The amber darter is found in flowing pools and deeper runs of this small river over a clean sand to fine gravel substrate. Spawning behavior is thought to involve the release of eggs in the gravel substrate with no nest building or parental care. Food items emphasize snails, limpets, and invertebrates.

11.14.2 Potential Effects

The loss of amber darters is attributed to siltation from agriculture, logging, and the associated road building. For the population near the CNF, potential management influences include: sedimentation and altered flow associated with roads and crossings. Forestwide and riparian standards would protect the amber darter and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would allow the temporary loss of small patches of streamside forest canopies when insect infestations and the related control measures (such as cut and leave or cut and remove) are necessary. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by forestwide standards to protect rivers and streams from accidental spills. Implementation of the forestwide and riparian standards would insure that the selection of any alternatives is not likely to adversely affect the amber darter.

11.15 Appalachian Elktoe (*Alasmidonta ravenliana)* Lea

11.15.1 Affected Environment

The Appalachian elktoe was federally listed as endangered in 1994. The species is endemic to the upper Tennessee River system including the Little Tennessee River and the French Broad River. Two extant populations persist: 1) in the main stem of the Little Tennessee River in Swain and Macon Counties, N.C.; and 2) in scattered locations in the Doe and Nolichucky Rivers including an isolated sub-population in Nolichucky River on the CNF (Unicoi County, Tennessee). This population is estimated to contain 100-1000 individuals on CNF lands. Artificial propagation is not being developed.

The sub-population of Appalachian elktoe mussels in the Nolichucky River is located in the only suitable habitat for this species on the CNF. Preservation of this sub-population along with approximately one mile of occupied habitat on NFS lands is the recovery objective for Appalachian elktoe mussels on the CNF.

Annually, a portion of this sub-population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to document the status (age distribution) and trend. The results will be reported in the annual monitoring and evaluation report. At least once every five years, a professional malacologist will survey the entire suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized. If augmentation of this sub-population is determined to be necessary, the forest will coordinate with USFWS and TWRA.

This species is found in small to large rivers with cool, well-oxygenated water flowing at moderate to fast rates. Gravel, cobble, and boulders are the preferred substrate. Habitat conditions also need to meet the requirements of the banded sculpin, which is the host for the glochidia. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.15.2 Potential Effects

The decline and extirpation of most populations of Appalachian elktoe mussels is attributed to siltation from logging, mining, agriculture and construction; organic and inorganic pollutants from industrial, agricultural, and other point and non-point sources; habitat loss do to impoundments, channelization and dredging. For the CNF population, permitted ground disturbing activities have the greatest potential to affect individual mussels. The Nolichucky River would be protected by Forestwide and riparian standards from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the

forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the Appalachian elktoe.

11.16 Blue Shiner (*Cyprinella caerulea)* Jordan

11.16.1 Affected Environment

The blue shiner was federally listed as threatened in 1992. The species is endemic to the Cahaba and Coosa River systems. Six extant populations persist; four are in Alabama, one is in Georgia, and the third is in Tennessee and Georgia. The Tennessee and Georgia population is in the Conasauga River (Polk and Bradley Counties) part of which is on the CNF. This population is estimated to contain greater than 1000 individuals on CNF lands. Artificial propagation is being developed by Conservation Fisheries, Incorporated.

The sub-population of blue shiners in the Conasauga River is located in the only suitable habitat for this species on the CNF. This population appears to be stable. Preservation of this sub-population along with approximately 5.5 miles of occupied habitat on NFS lands is the recovery objective for blue shiners on the CNF.

Annually, the population is monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians assist with this monitoring. An index (of blue shiners per hour of survey) has been developed and is used to assess the status (age distribution) and trend for the Conasauga River population. The results are reported in the annual monitoring and evaluation reports. The Forest Service supported the development of propagation techniques. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

The blue shiner is found in small rivers and large streams with moderate gradients over a sand or sand and gravel substrate. Water willow beds are often present. Spawning occurs in the crevices of rocks or logs with no parental protection provided after spawning is completed. Food items are dominated by terrestrial insects. Silt free water and a substrate free of fine sediments that could fill in spawning crevices are extremely important.

11.16.2 Potential Effects

The loss of occupied habitat for blue shiners is attributed to siltation from agriculture, logging, and the associated road building; nutrient enrichment and water withdrawal for home site development; and inundation from dam construction. Populations have also become isolated by dams. For populations of blue shiners on or near the CNF, potential management influences include: sedimentation and altered flow. Forestwide and riparian standards would protect the blue shiner and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would allow the temporary loss of small patches of streamside forest canopies when insect infestations and the related control measures (such as cut and leave or cut and remove) are necessary. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the blue shiner.

11.17 Conasauga Logperch (*Percina jenkinsi*) Thompson

11.17.1 Affected Environment

The Conasauga logperch was federally listed as endangered in 1985. The species is endemic to the Conasauga River. Concurrent with the listing was the designation of 11 miles of critical habitat; two of these miles are located on the CNF in Polk County, Tennessee. The Conasauga logperch has been documented upstream of the critical habitat through the CNF in both the Conasauga and Jacks Rivers. This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is being developed by Conservation Fisheries, Incorporated.

The sub-population of Conasauga logperch in the Conasauga River appears to be stable or declining. Preservation of this sub-population along with approximately 5.5 miles of occupied habitat on NFS lands is the recovery objective for Conasauga logperch on the CNF. The Forest Service is supporting the development of captive breeding protocols for possible augementation or re-introduction efforts.

Annually, this population is monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians assist with this monitoring. An index (of Conasauga logperch per hour of survey) has been developed and is being used to assess the status (age distribution) and trend for the Conasauga River population. The results are reported in the annual monitoring and evaluation reports. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

The Conasauga logperch is found in flowing pools of this small river over a gravel to cobble substrate. Spawning behavior is unknown but other members of this genus deposit their eggs in gravel substrate with no nest building or parental care. Food items consist of invertebrates, which are obtained by flipping rocks with their noses and grabbing the dislodged organisms. Silt free water and a substrate free of fine sediments are extremely important.

11.17.2 Potential Effects

The loss of habitat for Conasauga logperch may be attributed to siltation from agriculture, logging, and the associated road building. For the CNF population, potential management influences include: sedimentation and altered flow. Forestwide and riparian standards will protect the Conasauga logperch and its habitat from sediment released during management activities. Under current management, vegetation treatments have been largely limited within the streamside and riparian zones. Exceptions have included the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the Conasauga logperch.

11.18 Cumberland Bean (*Villosa trabalis)* Conrad

11.18.1 Affected Environment

The Cumberland bean was federally listed as endangered in 1976. The species is endemic to the tributary streams of the Tennessee and Cumberland River systems. Four extant populations persist. Three are in the tributaries to the middle Cumberland River: 1) the Little South Fork River; 2) Buck Creek; and 3) Rockcastle River. The fourth population is in the Hiwassee River in Polk County, Tennessee on the CNF. This population is estimated to contain greater than 1000 individuals on CNF lands. Artificial propagation is not being developed.

The population of Cumberland bean mussels in the Hiwassee River is located in the only suitable habitat for this species on the CNF. This population appears to be stable. Preservation of this population along with approximately 9.7 miles of occupied habitat on NFS lands is the recovery objective for the Cumberland bean on the CNF.

Annually, a portion of this population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to document the status (age distribution) and trend. The results are reported in monitoring and evaluation report. At least once every five years, a professional malacologist will survey the entire suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized. If augmentation of this sub-population is determined to be necessary, the forest will coordinate with USFWS and TWRA.

This species is found in large streams and small rivers in fast current with gravel or sand and gravel substrate. Fish host is unknown. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.18.2 Potential Effects

The decline and extirpation of most populations of Cumberland bean is attributed to dam construction and impoundments. Siltation from logging, mining, agriculture and construction; organic and inorganic pollutants from industrial, agricultural, and other point and non-point sources; and habitat loss do to channelization and dredging have aggravated the situation for the surviving populations. For the population of Cumberland bean on the CNF, potential management influences include: sedimentation and altered flow. Forestwide and riparian standards would protect the Cumberland bean and its habitat from sediment released during management

activities. Vegetation treatments would be limited within the streamside and riparian zones.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the Cumberland bean.

11.19 Duskytail Darter (*Etheostoma percnurum*) Jenkins

11.19.1 Affected Environment

The duskytail darter was federally listed as endangered in 1993. The species is endemic to the upper Tennessee and Cumberland River systems. Four extant populations persist: three in Tennessee and one in Virginia. One of these populations is in Citico Creek on the CNF (Monroe County, Tennessee). This population is estimated to contain greater than 1000 individuals on CNF lands. A population of duskytail darters has been established into Abrams Creek in the GSMNP from progeny of the Citico Creek population. An experimental population of duskytail darters has been authorized for the Tellico River in Monroe County, Tennessee on the CNF. Stocking will begin in 2003. Artificial propagation is being developed by Conservation Fisheries, Incorporated.

The population of duskytail darters in the Citico Creek on the CNF appears to be expanding up stream further onto the CNF. The experimental population being introduced into the Tellico River will be monitored and augmented. Preservation of the population in approximately four miles of occupied habitat in Citico Creek and restoration of the population to approximately seven miles of habitat in the Tellico River on NFS lands are the recovery objectives for the duskytail darters on the CNF.

Annually, these populations will be monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians will assist with this monitoring. An index (of duskytail darters per hour of survey) has been developed and is being used to assess the status (age distribution) and trend for the Citico Creek population. A similar index will be developed for the Tellico population. The results are reported in the annual monitoring and evaluation report. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in rocky areas with moderate to fast current in large creeks and large rivers. Slab rocks, free from sediment, are essential for nesting as well as hiding cover. The eggs are attached to the under side of the slab rock and the male remains with the nest guarding the eggs. Food items include midge larvae, mayfly nymphs, and micro-crustaceans. Sight feeding is probably important.

11.19.2 Potential Effects

The decline and extirpation of most populations of duskytail darters is attributed to the general deterioration of water quality resulting from siltation from logging, mining, and waste discharges. The relic populations are isolated by reservoirs. For the CNF population, potential management influences include: sedimentation and altered

flow. Forestwide and riparian standards will protect the duskytail darter and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would allow the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to fish would be locally increased light and water temperature.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the duskytail darter.

11.20 Fine-lined Pocketbook (*Lampsilis altilis*) Conrad

11.20.1 Affected Environment

The fine-lined pocketbook was federally listed as threatened in 1993. The species historically occurred in the Alabama, Tombigbee, Black Warrior, Cahaba, Tallapoosa, Coosa River systems, and their tributaries. The extant population that exists in the Conasauga River (Polk and Bradley Counties, Tennessee) is up stream and down stream of the CNF. This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is being developed by Tennessee Aquarium/Tennessee Aquatic Research Institute.

The sub-population of fine-lined pocketbook mussels in the Conasauga River is located in the only suitable habitat for this species on the CNF. The Conasauga River was surveyed in 1999 and this species was frequently collected; however, the status of the population was not determined. Preservation of the sub-population along with approximately 5.5 miles of occupied habitat on the NFS lands is the recovery objective for the fine-lined pocketbook on the CNF.

Annually, the Conasauga River population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to document the status (age distribution) and trend. The results will be reported in the annual monitoring and evaluation reports. At least once every five years, a professional malacologist will survey all suitable habitat managed by the national forests to evaluate the expansion or contraction in habitat being utilized. Artificial propagation and augmentation are being supported by the Forest Service. When recovery opportunities arise, they will be coordinated with the USFWS and TWRA.

This species is found in moderate to swift currents over stable sand, gravel, and cobble substrates in large rivers to small creeks. The largemouth bass, redeye bass, spotted bass, and green sunfish have been identified as suitable fish hosts for the glochidia (Haag et al. 1999). Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels such as the fine-lined pocketbook require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high

chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.20.2 Potential Effects

The decline and extirpation of most populations of fine-lined pocketbook mussels may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Passage of host fish may also be a factor. For the population of fine-lined pocketbook mussels on or near the CNF potential management influences include: sedimentation and altered flow. Forestwide and riparian standards would protect the fine-lined pocketbook and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions include the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to mussels would be locally increased light and water temperatures, and altered planktonic food availability.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the fine-lined pocketbook.

11.21 Georgia Pigtoe (*Pleurobema hanleyanum*) Lea

11.21.1 Affected Environment

The Georgia pigtoe is designated as a candidate for federal listing. Prior to its rediscovery by Evans (2001), this species was believed to be extinct. The Georgia pigtoe is endemic to the Alabama River system and its tributaries. The only extant population that exists is in the Conasauga River (Polk and Bradley Counties, Tennessee) on and down stream of the CNF. This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is not being developed.

The population of Georgia pigtoe mussels in the Conasauga River is located in the only suitable habitat for this species on the CNF. The Conasauga River was surveyed in 1999 and this species was infrequently collected. The status of the population was not determined. Preservation of the sub-population along with at least one mile of occupied habitat on NFS lands is the conservation objective for the Georgia pigtoe on the CNF. Opportunities for expanding the population further up stream on the CNF may exist. Development of artificial propagation techniques and augmentation will be supported by the Forest Service. When such opportunities arise, they will be coordinated with USFWS and TWRA.

Annually, this population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to predict the status (age distribution) and trend, although these animals are so rare that collection of any individuals would be significant. The results will be reported in the annual monitoring and evaluation report. At least once every five years, a professional malacologist will

survey the entire suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized.

This species is found in areas with good current flowing over coarse sand and gravel substrate in small rivers. The fish host for the glochidia is unknown. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.21.2 Potential Effects

The decline and extirpation of most populations of Georgia pigtoes is not well documented but sedimentation is given as the most likely threat (NatureServe 2002). Passage of host fish may also be a factor. For the population of Georgia pigtoes on or near the CNF potential management influences include sedimentation and altered flow. Forestwide and riparian standards would protect the Georgia pigtoe and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions have included the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to mussels would be locally increased light and water temperatures, and altered planktonic food availability.

Other sources of pollutants would, generally, not be permitted on the CNF with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the Georgia pigtoe mussel.

11.22 Slabside Pearlymussel (*Lexingtonia dolabelloides*) Lea

11.22.1 Affected Environment

The slabside pearlymussel is designated as a candidate for federal listing. The species is endemic to the Tennessee River system. Extant populations persist in the Clinch, Powell, Elk, Duck, and Hiwassee (in Polk County on the CNF) Rivers in Tennessee; in the North Fork and Middle Fork Holston Rivers in Virginia; and in the Paint Rock River of Alabama. The CNF population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is not being developed.

The population of slabside pearlymussels in the Hiwassee River is located in the only suitable habitat for this species on the CNF. This population appears to be stable. Preservation of this population along with approximately 9.7 miles of occupied habitat on NFS lands is the conservation objective for the slabside pearlymussels on the CNF.

Annually, a portion of this population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to document

the status (age distribution) and trend. The results will be reported in the annual monitoring and evaluation report. At least once every five years, a professional malacologist will survey all suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in small streams to large rivers (Tennessee River) in moderately strong current with sand, fine gravel and cobble substrate. Fish hosts for the glochidia include the popeye shiner, rosyface shiner, telescope shiner, saffron shiner, silver shiner, and Tennessee shiner. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.22.2 Potential Effects

The decline and extirpation of most populations of slabside pearlymussel is attributed to channel alterations, inundation by reservoirs, siltation by agriculture and clear-cutting, chemical and organic pollution, and commercial clamming. Gravel mining activities are a threat in the Powell and Elk Rivers as well as coal mining activities. For the population of slabside pearlymussel on the CNF potential management influences include sedimentation and altered flow. Forestwide and riparian standards would protect the slabside pearlymussel and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones.

Other sources of pollutants would, generally, not be permitted on the NFS lands with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the slabside pearlymussel.

11.23 Smoky Madtom (*Noturus baileyi*) Taylor

11.23.1 Affected Environment

The smoky madtom was federally listed as endangered in 1984. Concurrent with that listing was the designation of 6.5 miles of critical habitat in Citico Creek. The species is known only from the Little Tennessee River system. One extant population persists in Citico Creek in Monroe County, Tennessee on the CNF. This population is estimated to contain 100-1000 individuals on CNF lands. A population of smoky madtoms has been established into Abrams Creek in the GSMNP from progeny of the Citico Creek population. An experimental population is authorized in the Tellico River in Monroe County, Tennessee on the CNF. Stocking will begin in 2003. Artificial propagation is being developed by Conservation Fisheries, Incorporated.

The population of smoky madtoms in the Citico Creek on the CNF appears to be stable with some expansion down stream. The experimental population being

introduced into the Tellico River will be monitored and augmented. Preservation of the population in approximately eight miles of occupied habitat in Citico Creek and restoration of the population to approximately seven miles of habitat in the Tellico River on NFS lands are the recovery objectives for the smoky madtom on the CNF. The Forest Service supported the development of propagation techniques for this species. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

Annually, these populations will be monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians will assist with this monitoring. An index (of smoky madtoms per hour of survey) has been developed and is being used to assess the status (age distribution) and trend for the Citico Creek population. A similar index will be developed for the Tellico River population. The results are reported in the annual monitoring and evaluation report.

This species is found in large streams with slab rocks, free from sediment. These rocks are essential for nesting as well as hiding cover. The eggs are laid in a clutch under the slab rock and guarded by the male. Feeding occurs at night. Food includes aquatic invertebrates. Sight is probably not as important in feeding as are the barbels and other dermal taste buds.

11.23.2 Potential Effects

The extirpation of the first known population of smoky madtoms resulted from a fish removal project in the Great Smoky Mountain National Park. The greatest threat to the Citico Creek population is an accidental chemical spill that could destroy this population. Two other significant threats are sedimentation from ground disturbing activities (especially vehicles, horses, and people compacting and denuding the stream banks); and habitat destruction from recreational swimmers who pile slab rocks in the streams to create dams with deep pools. The slab rocks are essential to smoky madtoms for spawning and cover. The deep, slow flowing pools are not quality habitat for this species. Campsites and “pull offs” along Citico Creek have been closed and stabilized to protect these sensitive riparian areas. The Citico Creek population is isolated from the Abrams Creek and Tellico River populations by reservoirs.

Forestwide and riparian standards will protect the smoky madtom and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would include the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the NFS lands with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the smoky madtom.

11.24 Snail Darter (*Percina tanasi*) Etnier

11.24.1 Affected Environment

The snail darter was federally listed as endangered in 1975; reclassified to threatened in 1984. The species is endemic to the upper Tennessee River where it occurred in the main stem and in lower reaches of major tributaries. There are eight extant populations, all in Tennessee, including one in the Hiwassee River, Polk County, Tennessee which extends onto the CNF. This population is estimated to contain 100-1000 individuals on CNF lands. Artificial propagation is not being developed.

The population of snail darters in the Hiwassee River is located in the only suitable habitat for this species on the CNF. This population appears to be stable and expanding further upstream on the CNF. Preservation of this population along with approximately two miles of occupied habitat on NFS lands is the recovery objective for the snail darter on the CNF.

Annually, this population will be monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians will assist with this monitoring. An index (of snail darters per hour of survey) will be developed for the Hiwassee River population with the results reported in the annual monitoring and evaluation report. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in large rivers in current over sand and gravel shoal areas. They rely on coloration for camouflage or they may burrow into the substrate for cover. The eggs are laid in loose gravel; no parental care is provided. Food includes aquatic snails and other invertebrates.

11.24.2 Potential Effects

The decline of most populations of snail darters is attributed to inundation by reservoirs and dredging of river channels. This species does have some sensitivity to sediment (food source and spawning). For populations of snail darters on or near the CNF, potential management influences include: sedimentation and altered flow. Forestwide and riparian standards will protect the snail darter and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones.

Other sources of pollutants would, generally, not be permitted on the NFS lands with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the snail darters.

11.25 Southern Pigtoe (*Pleurobema georgianum*) Lea

11.25.1 Affected Environment

The southern pigtoe was federally listed as endangered in 1993. The species occurred in the Coosa River system and its tributaries. Three extant populations

include: Shoal Creek and Big Canoe Creek in Alabama; and the Conasauga River in Georgia and Tennessee on the CNF. This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is being developed by Tennessee Aquarium/Tennessee Aquatic Research Institute.

The population of southern pigtoe mussels in the Conasauga River is located in the only suitable habitat for this species on the CNF. The Conasauga River was surveyed in 1999 and this species was frequently collected. The status of the population was not determined. Preservation of the population along with at least 5.5 miles of occupied habitat on NFS lands is the recovery objective for the southern pigtoe on the CNF. Development of artificial propagation techniques and augmentation will be supported by the Forest Service. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

Annually, this population will be monitored by CNF biologists and technicians. An index of mussels per hour of survey will be developed to document the status (age distribution) and trend. The results will be reported in monitoring and evaluation report. At least once every five years, a professional malacologist will survey all of the suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized.

This species is found in sand, gravel, and cobble shoals and runs in small rivers and large streams. The fish host for the glochidia is unknown. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column.

11.25.2 Potenatial Effects

The decline and extirpation of most populations of southern pigtoe mussels may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Passage of host fish may also be a factor. For the population of southern pigtoe on or near the CNF potential management influences include sedimentation and altered flow. Forestwide and riparian standards would protect the southern pigtoe and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would include the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to mussels would be locally increased light and water temperatures, and altered planktonic food availability.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the southern pigtoe mussel.

11.26 Spotfin Chub (*Erimonax monacha*) Cope

11.26.1 Affected Environment

The spotfin chub was federally listed as threatened in 1977. The species is endemic to the Tennessee River where it was widely distributed in major tributaries. Only four extant populations persist: 1) Little Tennessee River system in North Carolina; 2) Duck River in Tennessee; 3) Emory River in Tennessee; and 4) the North Fork of the Holston River in Virginia. These populations do not occur on or near the CNF. A population of spotfin chubs has been established into Abrams Creek in the GSMNP. An experimental population is authorized in the Tellico River in Monroe County, Tennessee on the CNF. Stocking began in 2002. All of the populations are isolated by reservoirs. This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is being developed by Conservation Fisheries, Incorporated.

The Forest Service supported the development of propagation techniques for this species. The experimental population being introduced into the Tellico River will be monitored and augmented. Restoration of this population to approximately seven miles of habitat in the Tellico River on NFS lands is the recovery objective for the spotfin chub on the CNF.

Annually, this population will be monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians will assist with this monitoring. An index (of spotfin chubs per hour of survey) will be developed for the Tellico River population with the results reported in the annual monitoring and evaluation report. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in large sized streams in slow to swift current over substrates free of sedimentation. As with most minnows, this species is found in schools. Eggs are laid in a crack in a rock; no parental care is provided. Spotfin chubs are diurnal feeders. Foods include aquatic insects, which are located through sight and tactile stimuli.

11.26.2 Potential Effects

The decline and extirpation of most populations of spotfin chubs may be attributed to the general deterioration of water quality resulting from impoundments, coldwater releases from dams, inundation of habitat by reservoirs, siltation from mining (especially coal mines), and waste discharges. This species does have some sensitivity to sediment. For the population of spotfin chubs on or near the CNF potential management influences include sedimentation and altered flow. Forestwide and riparian standards will protect the spotfin chub and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would allow the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the spotfin chub.

11.27 Tan Riffleshell (*Epioblasma florentina walkeri*) Wilson and Clark

11.27.1 Affected Environment

The tan riffleshell mussel was federally listed as endangered in 1977. The species was widely distributed in the Cumberland and Tennessee River systems but only two extant populations persist: 1) in the Middle Fork of the Holston River; and 2) in the Hiwassee River on the CNF (Polk County, Tennessee). This population is estimated to contain less than 100 individuals on CNF lands. Artificial propagation is being developed by Virginia Technological University.

The population of tan riffleshell mussels in the Hiwassee River is located in the only suitable habitat for this species on the CNF. This population is extraordinarily rare; only three live individuals have been seen since 1995. This population was augmented with juveniles from the Middle Holston River in 1999. Preservation of this population along with approximately 9.7 miles of occupied habitat on NFS lands is the recovery objective for the tan riffleshell on the CNF.

Annually, this population is monitored by CNF biologists and technicians. An index of mussels per hour of survey has been developed to document the status (age distribution) and trend. The results are reported in monitoring and evaluation report. At least once every five years, a professional malacologist will survey all suitable habitat managed by the CNF to evaluate the expansion or contraction in habitat being utilized. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in small to moderate sized rivers in riffles with coarse substrates. Water willow is often present. Habitat conditions also need to meet the requirements of sculpins and greenside, fantail, and redline darters which may serve as the host for the glochidia. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column. Mussels require clean gravel riffles and are especially susceptible to stream degradation resulting from low dissolved oxygen levels or high chlorine concentrations in waterways. Furthermore, this mussel requires waters of low turbidity in order to be able to attract potential host fish to the glochidia.

11.27.2 Potential Effects

The decline and extirpation of most populations of tan riffleshell mussels may be attributed to dam construction and impoundments. Siltation from logging, mining, agriculture and construction; organic and inorganic pollutants from industrial, agricultural, and other point and non-point sources; and habitat loss do to channelization and dredging have aggravated the situation for the surviving populations. For the populations of tan riffleshell mussels on the CNF potential

management influences include: sedimentation and altered flow. Forestwide and riparian standards would protect the tan riffleshell and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the tan riffleshell mussel.

11.28 Yellowfin Madtom (*Noturus flavipinnis*) Taylor

11.28.1 Affected Environment

The yellowfin madtom was federally listed as threatened in 1977. The species is endemic to the Tennessee River system up stream of Chattanooga, Tennessee. Only three extant populations persist: 1) in Citico Creek in Monroe County, Tennessee on the CNF; 2) Powell River in Tennessee; and 3) Copper Creek and the North Fork of the Holston River in Virginia. A population of yellowfin madtoms has been established into Abrams Creek in the GSMNP from progeny of the Citico Creek population. An experimental population is authorized in the Tellico River in Monroe County, Tennessee on the CNF. Stocking will begin in 2003. The Citico Creek population is estimated to contain 100-1000 individuals on CNF lands. Artificial propagation is being developed Conservation Fisheries, Incorporated.

The population of yellowfin madtoms in the Citico Creek on the CNF appears to be stable to increasing. Development of artificial propagation techniques and augmentation was supported by the Forest Service. The experimental population being introduced into the Tellico River will be monitored and augmented. Preservation of the population in approximately four miles of occupied habitat in Citico Creek and restoration of the population to approximately seven miles of habitat in the Tellico River on NFS lands are the recovery objectives for the yellowfin madtom on the CNF.

Annually, these populations will be monitored by professional ichthyologists familiar with the species and its habitat. CNF biologists and technicians will assist with this monitoring. An index (of yellowfin madtoms per hour of survey) has been developed and is being used to assess the status (age distribution) and trend for the Citico Creek population. A similar index will be developed for the Tellico River population. The results are reported in the annual monitoring and evaluation report. When recovery opportunities arise, they will be coordinated with USFWS and TWRA.

This species is found in small to medium sized streams with moderate current free of sedimentation. Cover, especially flat slab rocks, is essential for nesting as well as hiding. The eggs are laid in a clutch under the slab rock and guarded by the male. Feeding usually occurs at night. Food includes aquatic invertebrates. Sight, tactile and chemical stimuli are used to locate food.

11.28.2 Potential Effects

The decline and extirpation of most populations of yellowfin madtoms is attributed to pollution and siltation from logging, mining, agriculture and construction. The greatest threat to the Citico Creek population is an accidental chemical spill that could destroy the entire population. Two other significant threats are sedimentation from ground disturbing activities (especially vehicles, horses, and people compacting and denuding the stream banks); and habitat destruction from recreational swimmers who pile slab rocks in the streams to create dams with deep pools. The slab rocks are essential to yellowfin madtoms for spawning and cover. The deep, slow flowing pools are not quality habitat for this species. Campsites and “pull offs” along Citico Creek have been closed and stabilized to protect these sensitive riparian areas. All of the yellowfin madtom populations are isolated from each other by reservoirs.

Forestwide and riparian standards will protect the yellowfin madtom and its habitat from sediment released during management activities. Vegetation treatments would be limited within the streamside and riparian zones. Exceptions would include the temporary loss of small patches of streamside forest canopies due to insect infestations and related control measures such as cut and leave or cut and remove. Primary effects to fish would be locally increased light and water temperatures.

Other sources of pollutants would, generally, not be permitted on the national forest with the exception of herbicide applications, which are governed by Forestwide standards to protect rivers and streams from accidental spills. Implementation of the Forestwide and riparian standards would insure that the selection of any of the alternatives is not likely to adversely affect the yellowfin madtom.

12.0 Demand Species

12.1 WHITE-TAILED DEER

12.1.1 Affected Environment

White-tailed deer use a variety of forest types and successional stage to meet their year-round needs. In the Southern Appalachians, regeneration areas and older forests provide complementary benefits to deer (Johnson et al. 1995). Older forests generally are most important in the fall and winter. When available, acorns are the dominant fall and winter food item (Wentworth et al. 1990a). When acorns are scarce, the bulk of the diet consists of leaves of broadleaf evergreen shrubs, primarily rhododendron (*Rhododendron maximum*). Deer nutrition, reproduction, weights, and antler characteristics are influenced by the availability of acorns (Harlow et al. 1975, Feldhammer et al. 1989, Wentworth et al. 1990a, 1992). Use of even-aged regeneration areas was very low in winter (Wentworth et al. 1990b). However in the spring and summer, regeneration areas provide an abundance of food and are heavily utilized (Wentworth et al.1990b, Ford et al. 1993). Young regenerating stands contain substantial quantities of woody browse, herbs, fungi, and soft mast, all of which are limited in older forests (Johnson et al. 1995). Food plots, especially those containing clover-grass mixtures, are used most intensively in early spring.

They also are an important source of nutritious forage in winter, especially when acorns are in short supply (Wentworth et al. 1990b).

In eastern hardwood forests, Barber (1984) recommended that at least 50 percent of the acreage should consist of mature mast trees with the remainder containing an interspersion of evergreens, shrubs and vines, and openings with herbaceous and young-growth woody vegetation. Based on utilization data, current deer densities in the Southern Appalachians can be maintained by providing approximately five percent in regenerating stands (Wentworth et al. 1990b). Wentworth et al. (1989) concluded that approximately two percent of the area in high quality wildlife openings would be necessary to adequately buffer the effects of a poor acorn year.

White-tailed deer are present throughout the SAA area. Population densities generally are medium to high in the Northern Ridge and Valley, Allegheny Mountains, Northern Cumberland Mountains, and Southern Appalachian Piedmont Sections, and low to medium in the remainder of the SAA area (SAMAB 1996: 50-60). High population densities are associated with greater amounts of cropland and lesser amounts of developed and coniferous forestland. Current deer densities generally are higher on private land, national forest, and state lands than other ownerships. Deer densities have greatly increased in the last 25 years. This increase likely is related to both nonhabitat factors such as extensive restoration efforts, protection, and conservative harvest strategies as well as increased acorn capability resulting from the increase in mid-to late-successional oak forests.

Recreation generated by deer hunting produces $400 million annually in Tennessee (TWRA 2000). Game harvest regulations and habitat improvement techniques including prescribed burning and wildlife opening development have helped create healthy deer populations throughout the State. Harvest data are used to derive deer population estimates. In 1970, CNF deer densities were listed as low (less than 15 deer per square mile) throughout the forest. In 1995, northeastern forest counties supported medium densities (15 to 30 deer per square mile) and southern counties continued to support low densities (SAMAB 1995:50-55). Higher northeastern densities presumably result from higher interspersion of privately owned agricultural lands with forested federal lands and predominance of hardwood sites.

Future trends include continued expansion of the deer herd in eastern Tennessee, including the less productive mountain counties. In middle and western Tennessee, efforts are now focused on slowing herd growth due to human-wildlife conflicts (TWRA 2000).

12.1.2 Direct and Indirect Effects

As discussed above, white-tailed deer require a mixture of forest/successional stage habitats to meet their year-round habitat needs. Key requirements include the interspersion of mature mast-producing stands during the fall and winter, early successional habitats to provide browse and soft mast, and permanent openings. The effects of each of the alternatives on these key habitat features are discussed in detail in previous sections (hard mast in Oak and Oak-Pine Forests, Successional Forested Habitats, and Permanent Openings). Populations are controlled in part by

harvest regulations set by the TWRA as well as habitat conditions managed by the Forest Service.

Although all alternatives would support viable populations of white-tailed deer, implementation of Alternatives D and F would likely support highest population levels and highest levels of hunter demand until hard mast production became a limiting factor.

12.1.3 Cumulative Effects

White-tailed deer populations and opportunities for deer hunting on the CNF would be expected to remain stable or increase slightly during the planning period, with largest increases expected under alternatives that support higher levels of active vegetation management (Alternatives D and F). Herd expansion will likely continue throughout the state of Tennessee, particularly on state and private lands managed specifically for game enhancements. Although the CNF will not offer levels of hunting opportunity comparable to these lands, the CNF will continue to offer unique opportunities to hunt older and larger size classes of deer.

12.2 EASTERN WILD TURKEY

12.2.1 Affected Environment

Wild turkey occupy a wide range of habitats, with diversified habitats providing optimum conditions (Schroeder 1985). This includes mature mast-producing stands during fall and winter, shrub-dominated stands for nesting, and herb-dominated communities, including agricultural clearings for brood-rearing. Habitat conditions for wild turkey can be enhanced by management activities such as prescribed burning and thinning (Hurst 1978; Pack et al. 1988), and the development of herbaceous openings (Nenno and Lindzey 1979, Healy and Nenno 1983).

For the eastern hardwood region, Wunz and Pack (1992) recommended maintaining 50 to 75 percent of the area in mast producing condition and approximately ten percent in widely distributed permanent herbaceous openings in addition to the temporary openings that result from timber harvest and other activities. They suggest that regeneration area should be 30 acres in size or less. Light thinnings (less than 20% of BA) are recommended to enhance the herbaceous component of the stands. Heavier thinnings, which increase the quantity of woody species, are less desirable. Prescribed burning in conjunction with thinning in oak forests can be used to enhance brood habitat. Other important habitat components include spring seeps, especially in area with regular snow cover, and a diversity of soft mast producing plants (e.g. dogwood, black gum, grape, blueberries, etc).

For the southern pine region, Hurst and Dickson (1992) recommended that at least 15 percent of the area should be kept in mature hardwoods such as streamside zones or pine-hardwood corridors. Forest openings and soft mast species also are important habitat components. Pine plantations should be thinned frequently and burned on a 3-to-5 year rotation to enhance herbaceous vegetation and soft mast production.

Eastern wild turkeys are present throughout the SAA area. Population densities generally are medium to high in the Northern Ridge and Valley, Allegheny Mountains, Northern Cumberland Mountains, and Southern Appalachian Piedmont Sections, and low to medium in the remainder of the SAA area (SAMAB 1996: 60-61). High population densities are associated with greater amounts of oak forest and cropland, and lesser amounts of developed and coniferous forestland. Current turkey densities generally are higher on private land, state, and NFS lands than other ownerships. Wild turkey populations have expanded in range and density in the last 25 years. As with deer, this increase likely is related to both nonhabitat factors such as extensive restoration efforts, protection, and conservative harvest strategies as well as increased acorn capability resulting from the increase in mid-to late-successional oak forests.

In 1970, turkeys were essentially absent from the northern CNF, and densities were listed as low for the southern CNF (less than 6 turkeys per square mile). By 1995, populations had increased throughout--16 percent of the forest supported low densities, 83 percent supported medium densities (6-15 turkeys per square mile), and one percent supported high densities (greater than 15 turkeys per square mile) (SAMAB 1995:49, 55-60). Hunter harvest for the south CNF (Polk County) has declined since 1997. Causes are unknown but may be related to lack of interpersion of herb-dominated habitats for brood-rearing and possible law enforcement issues.

12.2.2 Direct and Indirect Effects

As discussed above, wild turkey require a mixture of forest/successional stage habitats to meet their year-round habitat needs. Key requirements include the interspersion of mature mast producing stands during fall and winter, shrub dominated stands for nesting, and herb dominated communities, including permanent openings for brood-rearing. Disturbance also may be a concern during the nesting season. The effects of each of the alternatives on these key habitat features are discussed in detail in previous sections (Oak and Oak-Pine Forests--hard mast), Successional Forested Habitats and Permanent Openings). Populations are controlled in part by harvest regulations set by the TWRA as well as habitat conditions managed by the Forest Service.

Although all alternatives would support viable populations of wild turkey, implementation of Alternatives D and F would likely support highest population levels and highest levels of hunter demand unless hard mast production became a limiting factor.

12.2.3 Cumulative Effects

Turkey populations and opportunities for turkey hunting on the CNF would be expected to increase during the planning period, with largest increases expected under alternatives that support higher levels of active vegetation management (Alternatives D and F). Some localized declines may continue due to lack of interspersion of open habitats with forested habitats, especially on the southern CNF where federal ownership of land is consolidated. Turkey populations will likely continue to expand throughout the state of Tennessee, particularly on state and private lands managed specifically for game enhancements.

12.3 RUFFED GROUSE

12.3.1 Affected Environment

Ruffed grouse utilize a variety of forest habitats and successional stages. Nesting cover generally is located in poletimber or larger hardwood stands (Harris 1981, Thompson and Dessecker 1997). Haney (1996) also reported use of old-growth cove hardwood forests in the Southern Appalachians for nesting and brood rearing. While nesting habitat does not appear to be limiting, close interspersion with secure adult cover and brood habitat is important (Thompson and Dessecker 1997).

Key features of brood cover are security and an abundant high protein food source. Insects are most abundant in habitats characterized by lush herbaceous vegetation (Dimmick et al. 1996). Thompson and Dessecker (1997) describe brood cover as 3-7 year-old regenerating stands containing significant herbaceous component and shrub-dominated old fields and herbaceous openings. In Georgia, broods preferred upland hardwood sapling (greater than 10 year-old) and poletimber habitats, but also used sawtimber stands, although not in proportion to availability (Harris 1981). Regeneration areas (less than 6 years-old) and evergreen shrub thickets were avoided. Brood habitats were characterized by dense and diverse herbaceous vegetation that provided low overhead cover with freedom of movement beneath. Dimmick et al. (1996) suggest that the lack of interspersion of areas with a well developed herb layer and areas of high stem density for protective cover may be one of the limiting factors in southeastern grouse populations. They suggest that brood habitat could be enhanced by the conversion of logging roads and log landings to linear food plots by planting clover/grass mixtures, which will provide bugging areas in close proximity to secure cover.

Adult cover, including drumming habitat usually consists of young regenerating forest (6-15 year-old) or shrub cover (Thompson and Dessecker 1997). The dense cover provides protection from both avian and mammalian predators. Secure cover is provided in habitats with good vertical structure (8,000+ stems/acre) of 15-20 foot saplings (Kubisiak 1989). Dimmick et al. (1996) reported that males began to orient their drumming sites around or in clearcuts within three years post harvest. In Georgia, drumming habitat was associated with the presence of a relatively dense understory of heath shrubs, primarily flame azalea and mountain laurel (Hale et al. 1982). No strong preference for timber types or stand condition classes was evident. Harris (1981) found that males preferred upland hardwood sawtimber, generally associated with evergreen shrub thickets during the breeding and postbreeding seasons.

Dimmick et al. (1996) found that breeding male density (based on drumming counts) increased significantly in response to clearcutting in Tennessee. A similar response to timber harvest was reported from oak-dominated forests in Missouri (Wiggers et al. 1992). Highest grouse densities occurred where 7-to-15 year-old hardwood regeneration comprised greater than 14 percent of the area.

In oak forests of the Central Hardwood region, Thompson and Dessecker (1997) recommended managing on an 80-year rotation, which would maintain approximately 15 percent of the forest in brood or adult cover (3-15 years old). Appropriate

regeneration methods include clearcut, seedtree, and shelterwood methods. Residual basal areas should not exceed 20 ft^2/acre. Cutting units should be greater than five acres, and preferably 10-40 acres in size. Group selection is not recommended since the regeneration patches are too small to provide large enough patches of contiguous habitat. In Missouri, Kurzejeski et al. (1987) also recommended managing oaks on an 80-year rotation, but suggested harvest units should be less than 20 acres in size. In another study in Missouri oak forests, Wiggers et al. (1992) recommended maintaining more than 14 percent in 7- to 15-year-old hardwood regeneration. Kubisiak (1985) recommended the use of shelterwood cuts or clearcuts of 20 acres or less, leaving designated groups or scattered oaks (residual basal area less than 20 ft^2) with potential as mast-bearers or den trees. Larger cuts up to 40 acres are acceptable if in linear strips.

Dominant fall and winter foods in the Southern Appalachians include leaves and fruits of greenbrier (*Smilax* spp.), the leaves of mountain laurel (*Kalmia latifolia*), fruits of grapes (*Vitis* spp.) and oaks (*Quercus* spp.), and Christmas fern (*Polystichum acrostichoides*) (Seehorn et al. 1981). Similarly, Stafford and Dimmick (1978) reported that greenbrier, mountain laurel, and Christmas fern were the dominant fall and winter food items in the Southern Appalachian region of Tennessee and North Carolina. When available, acorns comprise a significant proportion of the diet (Seehorn et al. 1981, Servello and Kirkpatrick 1987, Kirkpatrick 1989, Thompson and Dessecker 1997). They provide a high-energy food source during the critical winter period when forage quality is limited (Servello and Kirkpatrick 1987, Kirkpatrick 1989). However, lack of secure cover in open oak stands may limit their use by grouse (Stafford 1989, Thompson and Dessecker 1997). Kubisiak (1985) suggested that 40-60 percent of a compartment be maintained in stands of mast-bearing age.

Ruffed grouse are found primarily in the Northern Ridge and Valley, Allegheny Mountains, Northern Cumberland Mountains, Blue Ridge Mountains, Northern Cumberland Plateau, and Southern Cumberland Mountains (SAMAB 1996:66-67). Low-density populations also extend into the adjacent portions of the Central Ridge and Valley, Southern Cumberland Plateau, Southern Ridge and Valley, and Southern Appalachian Piedmont. Population densities generally are moderate in the Blue Ridge Mountains and low to moderate elsewhere. Current grouse densities generally are higher on NFS lands, national parks, and the Cherokee Indian Reservation than on other ownerships. Regional grouse population densities have declined over the last 25 years. The declining trend likely is largely due to the reduction of forest cover in the sapling-pole successional class, which is important to this species.

For both 1970 and 1995, 39 percent of the CNF supported high grouse populations (greater than 10 grouse per square mile); 37 percent supported medium populations (5-10 grouse per square mile) and 24 percent supported low populations (less than 5% per square mile) (SAMAB 1995:66). Highest densities are found in the northern counties closer to the core range of the grouse, and lowest densities are found in Polk County closer to the southern range limits. Based on reported hunter success, Tennessee populations overall may have experienced a slight rate of decline since 1987. This decline is related to reduced availability of

hardwood habitat in the 0-20 year age class due to reductions in timber harvest levels. Present supply and demand seems relatively stable (TWRA 2000).

12.3.2 Direct and Indirect Effects

Although ruffed grouse use a variety of forest habitats and successional stages, population responses are most strongly tied to the availability of early successional habitat, particularly hardwood shrub-seedling habitat.

Table 3-70 shows the acres allocated to active vegetation management prescriptions with early successional habitat or timber volume objectives of at least eight percent in the 0-10 year age class (7.E.2, 8.A.1, 8.B, 8.C, 8.E.1, 9.H, 10.A, 10.B) by Alternative. The acreage allocated to these prescriptions varies among alternatives. Implementation of Alternatives D and F would offer highest levels of quality grouse brood habitat and adult cover, with 78,085 acres targeted specifically for grouse management (Prescription 8.E.1) in Alternative F. Prescription 8.E.1 would provide up to 17 percent acreage in the 0-10 year age class. Alternatives C and E would provide lowest overall opportunity to increase grouse brood habitat and adult cover; however, Alternative E would provide at least one emphasis area specifically for grouse management (Strawberry Mountain, 3,029 acres).

Table 3-70. Acres allocated to Prescriptions with Early Successional Habitat or Timber Objectives of at least 8% by Alternative for the CNF

Alternative	Acres Allocated to All Rx with Early Successional Habitat/Timber Objectives	Acres Allocated to 8.E.1 (Ruffed Grouse Rx)
Alternative A	214,559	2,615
Alternative B	189,775	2,608
Alternative D	440,419	0
Alternative E	51,390	3,029
Alternative F	485,235	78,085
Alternative G	119,487	0
Alternative I	341,011	0

Many prescriptions will provide suitable and/or optimal conditions for grouse through the development of early-successional habitat. The effects of each of the alternatives on this key habitat feature is discussed in detail in previous sections (Successional Forested Habitats and High Elevation Early Successional Forest). Populations are controlled in part by harvest regulations set by TWRA as well as habitat conditions managed by the Forest Service.

Although all alternatives would support viable populations of ruffed grouse, implementation of Alternative F, followed by Alternative D, would likely support highest population levels and highest levels of hunter demand.

12.3.3 Cumulative Effects

Present supply and demand seems relatively stable (TWRA 2000) and this trend would be expected to continue through the planning period. A continued or expanded program of active vegetation management would enhance grouse populations and hunter success rates. Because of the site factors found within the CNF (primarily high elevations), the forest will continue to provide a key base for grouse hunting within the state of Tennessee.

12.4 Black Bear

12.4.1 Affected Environment

The black bear (Ursus americanus) uses a wide variety of habitats in the southern Appalachians, occurring primarily on national forests and national parks of the Southern Blue Ridge, Northern Cumberland, and Allegheny Mountains and the Northern Ridge and Valley. These public lands in Virginia, West Virginia, North Carolina, Tennessee, and Georgia connect to form a forested landscape of over six million acres where bears are generally distributed at low to medium densities. The increase of older oak forests in this large block of habitat, along with increased protection and conservative hunter harvest, has allowed bear populations throughout the southeastern mountain region to moderately increase over the past 30 years. Bears generally are absent from the Cumberland Plateau, Southern Cumberland Mountains, Southern Ridge and Valley and Piedmont (SAMAB 1996:61).

Tennessee's black bear population is estimated at 1,000 to 1,500 animals, half of which may occupy the CNF. Bait station survey data and legal harvest data indicate a significant population increase since 1980 (TWRA 2000).

Much of this increase is attributed to the TWRA's establishment of six black bear reserves on the CNF totaling 187,600 forest service acres (89% of total reserve acres). From south to north, these areas are Ocoee, Tellico, Andrew Johnson, Unicoi, Laurel Fork, and Kettlefoot Reserves. These are large, contiguous core areas protecting breeding female bears from excessive hunting mortality. The areas are closed to wild boar hunting with dogs and to bear hunting. The habitat in these areas is managed in support of TWRA's goals to maintain existing bear population levels, to maintain bear habitat quality and quantity, and to sustain opportunities for bear hunting outside the reserves and for wildlife viewing opportunities.

In the southern Appalachians, including the CNF, important habitat elements are habitat remoteness, habitat diversity, den site availability, and availability of hard mast.

Levels of human access within bear habitat determine the degree of negative effects on bears (Beringer 1986; Brody and Pelton 1989). Generally, high bear population densities are associated with areas of low open road density (SAMAB 1995:87). Low-traffic roads and trails are used by bears as travel ways and provide the benefit of additional edge and associated soft mast, whereas high traffic volumes have a negative impact (B. Fletcher, pers. comm.). Effects vary based on the duration and time of year the road or trail is open for use and the number and type of recreation

users present. Recreation trails (hiking, mountain biking, ATV, or horseback) can potentially provide similar disturbance.

Black bears are opportunistic omnivores and consume a variety of seasonal plant and animal foods including flowering plants, grasses, various roots and tubers, and especially soft mast (grapes, berries, apples, etc.). However, availability of hard mast (acorns and hickory nuts) is critical throughout the winter, and reproductive success is closely related to this habitat factor (Eiler 1981; Wathen 1983; Eiler et al. 1989). Total production of hard mast and production by individual trees can fluctuate from year to year due to climatic and other factors (Downs and McQuilkin 1944; Fowells 1965).

Under general southern Appalachian forest conditions, most oaks produce acorns from 40 years of age until death (150-200+ years), although production drops off in later years (USDA Forest Service 1990). Average annual white oak acorn production begins to decline when trees reach about 30 inches dbh (diameter at breast height) (Greenberg 1999; Johnson 1994), and northern red oak acorn production declines at about 30 inches (Greenberg 1994). Black and scarlet oaks are prolific producers at smaller size classes. Chestnut oaks production peaks at about 20 inches dbh and production remains relatively stable after that (Johnson 1994). Acorn production can be sustained over time by ensuring adequate regeneration of oaks, releasing "super-canopy" highly productive oaks and providing a wide variety of species and age classes of oaks across the landscape.

Since bears utilize nearly any abundant plant or animal food, they are likely to thrive when a diversity of forest age classes and food sources are available. Vegetation management can provide much of this diversity (Reagan 1990). Naturally occurring events such as ice storms, wildfires, and hurricanes provide habitat diversity, but at random intervals and locations; benefits may be limited and unreliable.

Bears den in a wide variety of sites including road culverts, abandoned buildings, and in vegetation (Carlock et al. 1983). Traditional dens are found on the ground in caves, rockfalls, or under the root mass of uprooted trees, and in hollow trees. Carlock et al. (1983) and M. Vaughan (pers. comm.) found that hollow trees are preferred dens. Brody (1984) found that ground dens are preferred in the North Carolina mountains. Preference may be related to availability and may be a learned behavior (Brody 1984).

12.4.2 Direct and Indirect Effects

Actions of the state game commissions, including regulation of hunter harvest and establishment of bear reserves, are primary influences on bear population levels. However, National Forest management determines habitat features such as levels of public access, levels of vegetation diversity, and availability of mast and den trees.

Availability of potential den trees on the CNF is augmented by a forest wide standard requiring their retention during all vegetation management treatments. "For this reason, the black bear was selected as an MIS to help indicate management effects on meeting hunting demand for this species." Potential dens are trees greater than 20 inches diameter breast height that are hollow with broken tops (Carlock et al.

1983). This standard applies across all alternatives. Den availability is addressed under Section 9.2.0, Snags, Dens, and Downed Wood. Alternative D would likely maintain existing levels of dens, whereas other alternatives would likely provide increased amounts of late successional habitat with associated den recruitment. Alternative E would provide highest acreages of late successional habitat and potential dens.

Due to the current healthy status of the CNF bear population (TWRA 2000), the assumption is made that sustaining existing levels of habitat remoteness is acceptable. Existing remoteness within TWRA's bear reserves will be retained by a forest wide prohibition of a net increase in open road miles in each bear reserve, as well as forest wide prohibition of development of new motorized trail systems. These standards will apply across all alternatives. In many cases, bear reserves overlap with existing or proposed wilderness or roadless areas, including Big Frog, Citico, Sampson Mountain, and Pond Mountain Wildernesses. These areas provide unroaded habitat for bears. Alternatives G, E and C would provide highest total acres of unroaded remote habitats, and Alternatives B and D would provide least acres (Table 3-71).

Table 3-71. Expected acres of unroaded habitat for forest plan alternatives on the CNF, October 30, 2002.

Alternative	Rx 1.A, 1.B, 12.B Acres
Alternative A	111,571
Alternative B	68,148
Alternative D	66,704
Alternative E	155,877
Alternative F	99,575
Alternative G	163,151
Alternative I	125,578

Also related to human access are issues of inappropriate food and trash disposal and occurrence of "nuisance bear" activity (Stiver 1988; Rogers 1976). The CNF developed a forest wide objective and a RX 8.C (Black Bear) standard to provide recreation facilities, recreation services, public information, and enforcement to minimize wildlife access to human food and trash where appropriate. This would minimize bear mortality and injury related to "nuisance" bear behavior.

Habitat diversity is addressed under Section 8.1, Successional Habitats. Alternatives D and F would provide the most opportunities to generate early successional habitats to provide soft mast (emphasis on 6-10% of total forest acres), but would not increase availability of den trees. Alternative I would provide the next highest level of early successional habitats (3-6%) and would also increase availability of den trees. All other alternatives would offer opportunities to generate soft mast on less than 5% of the total forest landscape.

Hard mast issues are addressed in Section 6.4, Oak and Oak-Pine Forests. The quantity of mid- and late successional oak forests and related acorn availability is expected to increase under all alternatives during the planning period with the exception of Alternatives D and F, due to the emphasis on high levels of management targeting older oaks. An alternative that balances current mast production with future maintenance of the oak community type is likely best for bears. Quantity of mast will vary across alternatives but will be abundant and sufficient to maintain viability of oak mast dependent species in all alternatives.

Black bear populations are expected to remain viable across the CNF throughout the planning period, across alternatives. Implementation of Alternatives D and F may cause availability of den trees to be a limiting factor to bear populations because dens would not increase on the landscape beyond current conditions (Section 9.2.0, Snags, Dens, and Downed Wood), and highest reproductive rates have been linked with suitable den trees in the southern Appalachians (Carlock et al. 1983; M. Vaughan 2002). Alternatives D, B and F would provide lowest sustained acreage of unroaded or remote habitats, and Alternatives D and F would provide lowest potential acreage for hard mast production. Alternative I would provide a combination of opportunities to manage for future oak regeneration, current production of den trees and both soft and hard mast, and an intermediate acreage of unroaded habitat condition.

12.4.3 Cumulative Effects

The current status of Tennessee's black bear population is good (TWRA 2000). The overall regional forecast is for potential bear habitat to remain stable on public land, including the CNF and adjacent Great Smoky Mountains National Park. Decreases are expected on private lands due to continued loss of forested habitats and increased development (SAMAB 1996:87).

12.5 Wild Trout

12.5.1 Affected Environment

Three species of trout are managed for sport fisheries on the CNF: rainbow, brown and brook trout. Only the brook trout is native to the Southern Appalachian Mountains. Both the rainbow and brown trout were introduced to the forest in the early 1900's by the state of Tennessee. All three species are well established and are known to occur in many stream reaches on the forest (rainbow trout – 185 miles; brown trout -80 miles; brook trout – 90 miles).

Trout have the highest water quality needs for both spawning and feeding of all fish species found on the CNF. They are sensitive to water temperature increases and to chemical changes. Trout are dependent on instream structures for hiding cover. Large logs and other forms of instream structure are in limited supply in most forest streams (Flebbe and Dolloff 1991). Trout will benefit from log installation.

Annually, the populations of brown and rainbow trout are monitored in Beaverdam Creek, Laurel Fork and North River by TWRA in cooperation with the Forest Service. While the population levels fluctuate year to year, the overall trend for these

representative populations is stable (Habera et. al 2001). Brook trout are monitored by the above agencies with assistance from Trout Unlimited and appear to be stable. TWRA evaluated the status of all known brook trout streams in 1985 (Bivens, Strange and Peterson); they repeated the evaluation in 1998 (Strange and Habera) and found all populations on the CNF to still be present. Further, there was no significant loss in occupied miles of habitat. Portions of the habitats occupied by all three trout species are surveyed by Forest Service personnel each year.

12.5.2 Direct/Indirect Effects

TWRA has developed and enforced excellence regulations to manage the wild trout fisheries. On most streams the daily limit is seven trout with no minimum size. Some streams have restrictions on the number (3) and/or size (> 6 inches) of brook trout that may be harvested. Fishing pressure on wild trout streams does not appear to exceed the capacity of the resource. Most remote streams receive little fishing pressure; however, large trout are not produced because the life cycle of trout in the Southern Appalachian Mountains is usually limited to three years (Masterson 1991) and growth in these relatively infertile streams is slow. Other special regulations to protect the wild trout fisheries include restricted creel limits, minimum sizes, and tackle limitations on easily accessed and heavily fished streams (Tennessee Fishing Regulations).

Wild trout would be affected from forest management activities that disturb the ground, open the riparian canopy, or remove large wood from the vicinity of the stream channel. Under all alternatives, the Riparian Prescription remains constant. While some alternatives allow different levels of ground disturbance, the standards in the Riparian Prescription require a filter strip between any ground disturbing activity and all perennial and intermittent streams. This filter strip is designed to prevent any significant amount of sediment from reaching the stream channel. Sediment destroys spawning habitat for trout and diminishes the macroinvertebrate production (primary food for trout) in streams. Disturbance of the riparian canopy is not permitted unless the activity benefits riparian dependent species, including wild trout, or to protect private land and infrastructure. Opening of the riparian canopy would increase the exposure of the stream channel to sunlight and alter the temperature regime of the water. Trees within the Riparian Corridor are managed to provide sufficient amounts and sizes of large woody debris to maintain habitat complexity and diversity for aquatic and riparian dependent species.

Most streams on the forest lack sufficient quantities of large woody debris in the stream channel (Flebbe and Dolloff 1991). This condition is a relict of the exploitation logging that occurred prior to Forest Service management of the lands. The Forest Service cuts and anchors trees into the stream channel to provide some habitat structure for trout and other aquatic species.

12.5.3 Cumulative Effects

The Riparian Corridor standards not only insure that direct and indirect adverse effects do not occur to the aquatic community but also minimize the cumulative effects of sediment. Aquatic macroinvertebrate communities would be monitored

prior to and following some ground disturbing activities to validate the effectiveness of the filter strip standards.

Few changes have been made to trout regulations over the past decade with the populations remaining stable. Legal harvest levels are not causing declines in any wild trout populations. Some poaching may be occurring but is more significant to stocked trout populations (see Demand species: Stocked Rainbow Trout section).

The viability of the three wild trout species on the CNF is not at risk.

12.6 Stocked Rainbow Trout ("Put and Take")

12.6.1 Affected Environment

Catchable size (7 to 10 inches) rainbow trout are stocked into 20 streams covering 70 miles of water on the CNF. These "Put and Take" waters provide a coldwater stream fishing opportunity that is unique from the wild trout described previously (Demand Species: Wild Trout). All "Put and Take" streams are beside Forest Service maintained roads ensuring good public access. The objective for this fishery is to increase the number and quality of trout harvested. Based on Tennessee's stocking schedule, most stocked rainbow trout are intended to be harvested within two weeks of their release. Fishing license sales (TWRA 1995) indicate the number of anglers that pursue stocked rainbow trout in Tennessee continues to increase.

Water quality requirements for "Put and Take" trout fisheries are not as high as for wild trout. Spawning habitat, cover and macroinvertebrate (food) production are not issues for this recreational activity. Clean, clear water with a back drop of forested hillsides are important to the anglers (TWRA 1995). Waters that provide marginal (temperature gets too warm in the summer) habitat for wild trout have often been selected for "Put and Take" fisheries.

12.6.2 Direct/Indirect Effects

Harvest regulations provide the only management effects to the stocked rainbow trout fisheries. Poaching is a serious effect on this resource. Both state and federal law enforcement officers are involved in minimizing illegal fishing activities. Special regulations have been implemented in order to increase the availability of stocked trout to the broadest public.

12.6.3 Cumulative Effects

Enforcement of the harvest regulations across the CNF will ensure the continuation of this recreational fishery. Viability of "Put and Take" rainbow trout is not a concern since they are not intended to become permanent residents in the streams where they are stocked.

12.7 Black Bass and Bream in Streams

12.7.1 Affected Environment

Four species of black bass (largemouth, smallmouth, spotted, and Coosa) and five species of bream or sunfish (bluegill, green sunfish, redbreast sunfish, rock bass and

shadow bass) occur in 65 and 235 miles, respectively, of cool water streams on the CNF. All are native to the CNF; however, the Coosa bass which is native to the Conasauga River system, has been introduced to Hiwassee River system.

Habitat considerations for these species include: 1) clear water – all are site feeders (feeding on fish and invertebrates); and 2) large woody debris – all are dependent on instream cover. These species benefit from the maintenance and installation of large woody debris into coolwater streams. Sediment that has settled to the stream bottom is not a significant factor to any of these fish since they build nests and protect their eggs and young.

Forest Service crews sample about ten percent of the coolwater streams annually to document the viability of the game and non-game fish and the condition of the aquatic habitat.

12.7.2 Direct/Indirect Effects

The Tennessee Wildlife Resources Agency has established daily limits of five black bass, twenty rock bass and no limit for bream. There are no length limits or special gear restrictions. This fishery resource is not being over used. There are few streams on the forest where anglers regularly fish for black bass and even fewer where they seek bream.

Bass and bream in coolwater streams would be affected by forest management activities that removed large wood from the vicinity of the stream channel. Temperature changes associated with riparian canopy removal and sediment associated with ground disturbance would have little effect on these species. Under all alternatives, the Riparian Prescription remains constant. Trees within the Riparian Corridor are managed to provide sufficient amounts and sizes of large woody debris to maintain habitat complexity and diversity for aquatic and riparian dependent species. The removal of large woody debris from the Riparian Corridor is not allowed except to protect private land and infrastructure.

Most streams on the CNF lack sufficient quantities of large woody debris in the stream channel. This condition is a relict of the exploitation logging that occurred prior to Forest Service management of the lands. The Forest Service cuts and anchors trees into the stream channel to provide some habitat structure for black bass, bream, and other aquatic species.

12.7.3 Cumulative Effects

The Riparian Corridor standards not only insure that direct and indirect adverse effects do not occur to the aquatic community they also minimize the cumulative effects. Aquatic macroinvertebrate communities would be monitored prior to and following some ground disturbing activities to validate the standards.

Few changes have been made to the coolwater stream fishing regulations over the past decade with the populations remaining stable. Legal harvest levels are not causing declines in any coolwater game species populations and poaching is not a significant issue.

The viability of the three black bass and five bream species found in coolwater streams on the CNF are not at risk.

12.8 Black Bass and Bream in Ponds

12.8.1 Affected Environment

Largemouth bass, bluegill, redbreast sunfish, and channel catfish are managed in various combinations in 13 warmwater ponds that have been constructed and are managed for recreational fishing. They are generally less than two acres in size with two exceptions: Indian Boundary Lake – 96 acres and Chilhowee lake seven acres. All are managed for game fish but more emphasis is placed on recreational swimming at the two larger lakes.

Monitoring of populations is conducted in conjunction with TWRA every three years. When Indian Boundary Lake was last surveyed crappie were present. Regulations have been relaxed for this species in an effort to control its population.

Three ponds (total of 4 acres) are treated with lime every three years to raise the pH; liquid fertilizer is added monthly during the summer months to increase the fish production and recreational fishing opportunities. Habitat improvements including brush piles, anchored logs, and culverts (for channel catfish spawning) are installed into the ponds as needed.

12.8.2 Direct/Indirect Effects

The daily limit for largemouth bass is five fish. Bluegill, redbreast sunfish and channel catfish have no daily limit. There are no length limits or special gear restrictions. This fishery resource is not being over used. Electrofishing and seining surveys have shown balanced populations between largemouth bass and bream.

The fish species managed in warmwater ponds are not likely to be affected by any forest management activities. Ponds constructed for recreational purposes are not included in the Riparian Corridor; however, because the ponds are managed for recreation, little disturbance should occur close to the ponds. Site specific analysis would be done for projects that could affect the ponds.

12.8.3 Cumulative Effects

Few changes have been made to the warmwater fishing regulations over the past decade with the populations remaining stable. Legal harvest levels are not causing declines in any warmwater game species populations and poaching is not a significant issue. Forest management activities generally, would not occur near these ponds.

The viability of the largemouth bass, bluegill, redbreast sunfish and channel catfish found in warmwater ponds on the CNF are not at risk.

13.0 Migratory Birds

13.1 Affected Environment

Key migratory bird issues within plan revision national forests are related to landscape-scale forest fragmentation and availability of forest interior habitats, the distribution and relative amounts of varying age classes of forest, restoration of declining habitats such as spruce-fir forest and open woodland/grassland habitats, and need for consistent monitoring and data management across forests. These issues are discussed in detail in Section 8.4 (Forest Interior Birds) and Section 6.0 (Major Forest Communities), and in Gaines and Morris (1996).

National forests in the planning area provide millions of acres of forested land cover. As habitat quality continues to decline on many privately-owned lands due to conversion to urban and suburban land uses, these federal lands continue to provide good quality habitat for nesting, wintering and transient migratory birds.

13.2 Direct and Indirect Effects

National forests in the planning area evaluated management and conservation recommendations developed for land birds, including migratory birds, by Partners in Flight (PIF). PIF is a cooperative effort involving partnerships among federal, state, and local government agencies, foundations, professional organizations, conservation groups, industry, the academic community and private individuals. The effort was launched in response to growing concerns about declines in populations of land bird species and to emphasize conservation of birds not covered by existing conservation initiatives.

PIF developed Bird Conservation Plans for each physiographic province within the planning area. The plans are science-based, long-term and proactive strategies for bird conservation across all land ownerships designed to ensure long-term maintenance of healthy populations of native land birds.

Forest Service biologists worked with PIF regional and local coordinators to identify key management opportunities for high priority species on NFS lands, and considered incorporation into appropriate Land Management Plans. Effects of plan alternatives for high priority species will be addressed in Section 15.1 (Terrestrial Species Viability).

Despite habitat protection on federal lands within the Southern Blue Ridge Physiographic Province, 30 percent of breeding species have declined sharply in the last 30 years, and an additional 18 percent have shown possible declines (Hunter et al. 1999). Key land bird conservation issues within this province are summarized below.

Conservation and restoration of spruce-fir and northern hardwood forest communities and associated boreal bird species. Spruce-fir forests are treated as rare communities in the CNF plan; they will be maintained and restored to the extent possible across all alternatives. Standards protect the spruce-fir type from conversion to other forest types and from silvicultural practices except those designed to maintain or restore the type

in all alternatives. An additional standard ensures that a minimum of 75 percent of the northern hardwood forest type be maintained in mid-late successional stages, and that 50 percent of the type be maintained in late successional or old growth condition.

Large patches of mature hemlock-white pine, northern hardwoods and mixed mesophytic (mesic hardwood) forests are uncommon due to past land management. Older stands of northern hardwood and mixed mesophytic hardwood forests cover only about one percent of the Southern Blue Ridge land base. There is a need to increase and maintain late successional acreage for these types. In addition, some low elevation forests, especially riparian forests, are fragmented on private lands. The CNF established a standard to maintain 75 percent of the total forestwide acreage of northern hardwood, mixed mesophytic and river floodplain forest in mid- to late-successional or older condition. Carolina hemlock forests are treated as rare communities in the CNF plan; they will be maintained and restored across all alternatives. Forests dominated by eastern hemlock will not be subject to regeneration harvest. Hemlock will be retained as patches during all silvicultural treatments.

Many early successional species at mid- to high elevations have declined due to forest maturation, fire suppression, elimination of grazing, and decline in active forest management on federal lands. The CNF establishes an objective to create or maintain 1,000 acres of high elevation early successional habitat through forest regeneration and/or maintenance of old fields, and open woodlands, savannahs, and grasslands.

A predominance of forest stands in the 40-80 year age class on NFS lands has resulted in a closed canopy condition with poorly developed understory and subcanopy. There is an overall lack of forest with "old growth" characteristics, including a multi-layered canopy, snags and downed woody debris. The CNF added an objective to cooperate with USFWS to increase structural habitat diversity in up to five percent of closed-canopied mid- and late-successional mesic deciduous forest, including old growth restoration areas, by retaining large trees and creating small canopy gaps suitable for Cerulean warbler and associated species.

Development of private land to resort, urban and suburban uses is creating increased fragmentation effects at a landscape level. See Section 8.4 Forest Interior Birds.

Direct effects to specific habitats are discussed in the EIS sections referenced above.

In addition to direct effects on forested habitat, effects of migratory bird collision with communications towers was considered. "Construction of these towers (including radio, television, cellular, and microwave) increases at an estimated six to eight percent annually in the U.S.A. According to the Federal Communication Commission's *2000 Antenna Structure Registry*, the number of lighted towers greater than 199 feet above ground level (AGL) currently number over 45,000 and the total number of towers over 74,000. Non-compliance with the registry program is

estimated at 24 to 38 percent, bringing the total to 92,000 to 102,000. By 2003, all television stations must be digital, adding potentially 1,000 new towers exceeding 1,000 feet AGL." (USDI Fish and Wildlife Service 2000).

"The construction of new towers creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. Communications towers are estimated to kill 4-5 million birds per year."

Two mechanisms of bird mortality occur at communications towers (USDI Fish and Wildlife Service 2002). The first is when birds flying in poor visibility conditions do not see the structure (i.e., blind collision). Towers that are lighted at night for aviation safety may help reduce blind collisions, but they bring about a second mechanism for mortality. When there is a low cloud ceiling or foggy conditions, refracted light creates an illuminated area around the tower. Migrating birds lose their stellar cues for nocturnal migration and a broad orienting perspective on the landscape in these weather conditions. The lighted area may be the strongest cue for navigation, and birds remain in the lighted space by the tower. Mortality occurs when they collide with the structure and guy wires, or even other migrating birds, as more and more passing birds gather into the relatively small, lighted space. The lights apparently do not attract birds, but hold birds that pass within the vicinity.

The CNF adopted forestwide standards requiring removal of obsolete communications towers, location of new communication equipment on existing towers where possible, and coordination of new tower planning and construction with USFWS in an effort to reduce tower collision mortality and to comply with the Migratory Bird Treaty Act, the ESA, and the Bald and Golden Eagle Act.

13.3 Cumulative Effect

Effects of the various alternatives on the viability of selected PIF priority species are discussed in Section 15.1 (Terrestrial Species Viability).

14.0 Invasive Non-Native Plants and Animals

14.1 Affected Environment

A multitude of invasive, non-native plants threaten the integrity of native ecosystems in the southern Appalachian area. These include, but are not limited to, species such as kudzu, privet, Japanese honeysuckle, multiflora rose, and Nepal grass. The SAA (SAMAB 1996) provides a summary of the major threats from invasive plant species.

Although not mentioned in the SAA, the wild boar (*Sus scrofa*) is another example of non-native species that is negatively affecting certain habitats in the southern Appalachians (Lacki and Lancia 1986, Singer et al 1984, Wood 1977, Bratton 1975). Wild boars were introduced into the southern Appalachian mountains in the early 1900's. Originally brought in to be hunted, they eventually escaped from their enclosed hunting reserves in North Carolina and over time have become a naturalized component of the area's fauna (TWRA 2000). Management of this species is somewhat controversial in that it is desired by some hunters as a major game species, yet it's impacts to the natural environment must be mitigated.

On the CNF, the following non-native invasive plant species are tracked through project level inventories: Tree of heaven (*Ailanthus altissima*), small carpetgrass (*Arthraxon hispidus*), autumn olive (*Eleagnus umbellata*), English ivy (*Hedera helix*), sericea lespedeza (*Lespedeza cuneata*), privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), Nepal grass (*Microstegium vimineum*), princess tree (*Paulownia tomentosa*), kudzu (*Pueraria lobata*), and multiflora rose (*Rosa multiflora*). While other invasive plant species may occur with scattered distributions on the CNF, these species are recognized as having significant occurrences with a high potential for impacts to native communities on the CNF.

Portions of Polk and Monroe counties within the CNF comprise TWRA south Cherokee Wildlife Management Area. TWRA's management goal for this area includes an annual harvest of 200 wild boar per year through the year 2006 (TWRA 2000).

14.2 Direct and Indirect Effects

In 1999 the Southern Region released a Noxious Weed Management Strategy that outlined five emphasis areas, 1) Prevention and Education, 2) Control, 3) Inventory, Mapping, and Monitoring, 4) Research, and 5) Administration and Planning. This was followed in 2001 with the development of the Regional Forester's Invasive Exotic Plant Species list.

The CNF LMP includes numerous Goals, Objectives, and Standards to address the potential impacts of non-native invasive species. These include control efforts and maintenance and restoration of native species.

Negative effects from non-native invasive species will be minimized under all Plan alternatives through adherence to Regional policy and the implementation of Plan Goals, Objectives, and Standards. Previous work illustrating the success of this type of management include the conversion of a large kudzu patch near the Conasauga River to an open meadow supporting native grasses and wildflowers, fencing rare plant populations to exclude wild boars, and converting approximately 200 acres of fescue fields to native warm season grasses since 1997.

14.3 Cumulative Effects

With an increased emphasis on the management of non-native invasive species in the southern Appalachian area, particularly plant species, it is expected that impacts from these species will be reduced from current levels across federal lands.

15.0 Species Viability

15.1 Terrestrial Species Viability Evaluation

National Forest Management Act regulations, adopted in 1982, require that habitat be managed to support viable populations of native and desirable non-native vertebrates within the planning area (36 CFR 219.19). USDA regulation 9500-004, adopted in 1983, reinforces the NFMA viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired non-native plants, fish, and wildlife. These regulations focus on the role of habitat management in providing for species viability. Supporting viable populations involves

providing habitat in amounts and distributions that can support interacting populations at levels that result in continued existence of the species well-distributed over time.

The Southern Appalachian region supports extremely high levels of biological diversity relative to other regions, viewed both nationally and globally. As a result, large numbers of species are present for which population viability may be of concern. Detailed demographic or habitat capability analysis to evaluate population viability is not feasible for this large number of species. Therefore, our goal for this evaluation is to use a clearly defined, transparent process to identify species for which there are substantive risks to maintenance of viable populations, and to ensure consideration of appropriate habitat management strategies to reduce those risks to acceptable levels where feasible.

For comprehensiveness and consistency, evaluation of species viability was coordinated across several national forests undergoing simultaneous plan revisions. These forests are the Jefferson National Forest, CNF, Sumter National Forest, Chattahoochee and Oconee National Forests, and National Forests in Alabama. These forests encompass portions of the Southern Appalachian, Piedmont, and East Gulf Coastal Plain ecoregions. However, the scale for this assessment is set by NFMA regulations as the "planning area," or the area of the NFS covered by a single forest plan. Therefore, separate risk assessment was done for each national forest covered by a separate forest plan. Risk assessment was further split where national forest units under the same forest plan occur in different ecoregions, or are widely separated geographically. Although viability evaluation was coordinated across the ecoregions, analysis presented here focuses on information relevant to the CNF.

Because NFMA regulations require providing habitat for species viability within the planning area, focus of this evaluation is on habitat provided on NFS land. Surrounding private lands may contribute to, or hinder, maintenance of species viability on NFS land, but are not relied upon to meet regulation requirements. For this reason, habitat abundance was assessed based on conditions found on NFS land. Habitat distribution, however, was assessed considering the condition of intermixed ownerships and conditions, which may affect the interactions of species among suitable habitat patches on NFS land.

Evaluation of migratory birds focused on breeding populations only, unless otherwise indicated. This focus does not mean that wintering and migrating populations were not considered during planning, but that viability evaluation makes most sense when viewed in terms of the relative stability of breeding populations.

Much of the foundational information used in this evaluation was compiled by NatureServe, under a participating agreement with the Forest Service. NatureServe is an international non-profit organization, formerly part of TNC. Its mission is to develop, manage, and distribute authoritative information critical to conservation of the world's biological diversity. Partnership with NatureServe was sought as a means to ensure the best available information on species status and habitat relationships was used in this evaluation. Under this agreement, NatureServe staff engaged numerous species experts and state heritage programs to develop a relational

database that includes relevant information on species' status, habitat relationships, and threats to viability.

Viability Evaluation Process

Risk to maintenance of viability over the next 50 years was assessed for each species in relation to each of its principle habitat relationships by plan revision alternative. Risk assessment was based on three factors: 1) current species abundance, 2) expected habitat abundance in 50 years, and 3) expected habitat distribution in 50 years (

Figure 3-17). Once risk ratings were developed, we assessed how well management strategies across alternatives provide for species viability.

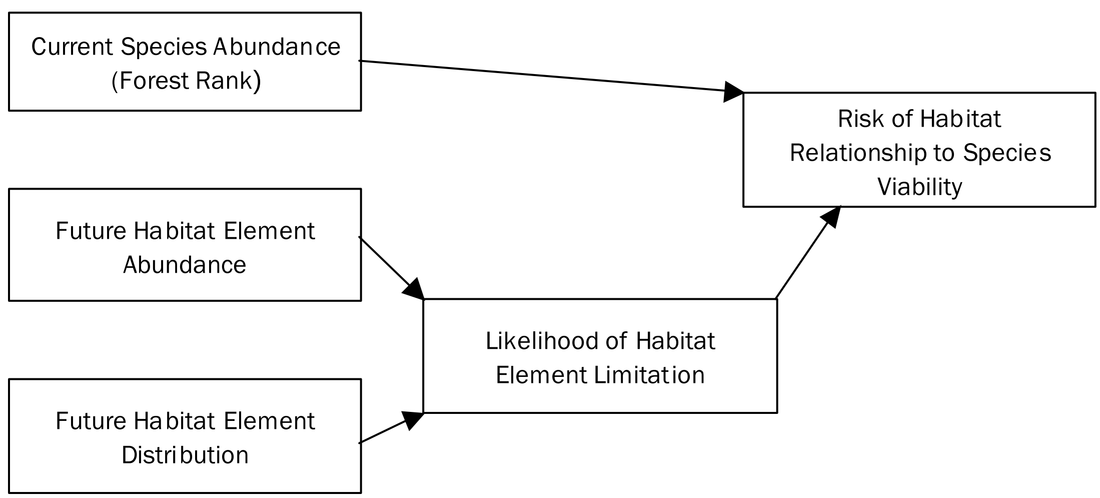


Figure 3-17. Relationship of variables used to rate the risk to viability resulting from a species' relationship with a habitat element.

A comprehensive list of species with potential viability concern was compiled for the CNF. The list includes those species found, or having the potential to be found, on the national forest from the following categories:

Species listed as proposed, threatened, or endangered under the federal ESA,

Species listed on the Regional Forester's Sensitive Species list,

Species identified as potential viability concern,

Birds of conservation concern as identified by the Partners In Flight initiative, and

Declining species of high public interest.

Species lists from all national forests in the Southern Appalachian and Piedmont Eco-regions, and Coastal Plain forests in Alabama, were pooled to create comprehensive

lists of species of potential viability concern. NatureServe staff and contractors assigned abundance ranks for each species on the comprehensive eco-region list for the CNF. These Forest Ranks, or F Ranks, follow the conventions used by NatureServe and others in defining State and Global Ranks (Table 3-72).

F Ranks were used in viability risk assessment as a categorical variable representing a species' current abundance. Forest Service biologists reviewed F Ranks developed by NatureServe to identify any inconsistencies between these rankings and Forest Service information. Discrepancies in this abundance variable were resolved through coordination with NatureServe and it's contractors. Where conflicting information or opinion on species abundance occurs, the most conservative information (i.e., that indicating lowest abundance) was used. Refinements to the process were made to account for discrepancies in projected habitat outcomes resulting from the use of two different models (SPECTRUM and IMI). Habitat outcomes are discussed below in Table 3-72 and Table 3-73.

Only those species that are both confirmed present and rare or of unknown abundance (F1 through F3, and F?) on the CNF were assessed for viability risk. Species ranked as F? were treated as F1 species to provide a conservative approach to those species for which abundance information is not available. Species that are currently abundant on the forest (F4, F5) are assumed to be at low risk of losing viability within the next 50 years, and, therefore, were not further evaluated for viability risk.

Table 3-72. Forest Ranks (F Ranks) and definitions used to define status of species on the CNF as part of species viability evaluation for LMP, 2002.

F Rank	F Rank Definition
F0	Not present; no known occurrences on the forest unit, and forest is outside species' range or habitat not present.
F1	Extremely rare on the forest unit, generally with 1-5 occurrences.
F2	Very rare on the forest unit, generally with 6-20 occurrences.
F3	Rare and uncommon on the forest unit, from 21-100 occurrences.
F4	Widespread, abundant, and apparently secure on the forest unit.
F5	Demonstrably secure on the forest unit.
F?	Present on the forest, but abundance information is insufficient to develop rank.
FP	Possibly could occur on the forest unit, but documented occurrences are not known.
FH	Of documented historical occurrence on the forest unit; may be rediscovered.
FX	Once occurred but has been extirpated from the forest unit; not likely to be rediscovered.

Because viability regulations focus on the role of habitat management in providing for species viability, habitat condition was the primary factor used to drive species viability evaluation. NatureServe staff and contractors identified habitat relationships for all species of potential viability concern, linking each species to vegetation

community types, successional stages, and habitat attributes as appropriate. Based on this information, each species was linked by Forest Service biologists to one or more habitat elements. These habitat elements (Table 3-73) roughly correspond to categories of management direction included in the revised LMP, and to sections of effects analysis included in this EIS. NatureServe staff reviewed and provided adjustments to species' assignment to these habitat element groups.

Table 3-73. Habitat elements and number of associated viability concern species (SA Ecoregion) used to plan for, and assess risk to, viability of terrestrial species during forest plan revision, CNF

Habitat Element	Element Description	# Of Potential Viability Concern Species Associated With Habitat Element: Southern Appalachian Ecoregion
Bogs, Fens, Seeps, Seasonal Ponds	Bogs, fens, seeps, seasonal ponds characterized by saturated soils	242
Open Wetlands	Open wetlands, marshes, beaver ponds, generally characterized by having some permanent standing water	63
River Channels	Riverine gravel and sand bars, and river banks subject to flood scour	51
Glades and Barrens	Glades and barrens characterized by shallow soils, exposed parent material, and sparse or stunted vegetation	119
Carolina Hemlock Forests	Forests dominated by Carolina hemlock	4
Table Mountain Pine Forests	Forests and woodlands dominated by table mountain pine and maintained by periodic fire	10
Spruce-Fir Forests	High elevation forests dominated by healthy red spruce and Fraser fir	90
Beech Gap Forests	Forests at high elevation mountain gaps dominated by American beech and subject to wind and frost effects.	1
Basic Mesic Forests	Basic mesic or "rich cove" forests characterized by calciphilic herbs and usually dominated by maples, basswood, and buckeye.	43
Rock Outcrops and Cliffs	Rock outcrops and cliffs characterized by exposed rock, shallow soils and sparse vegetation	218

Table 3-73. Habitat elements and number of associated viability concern species (SA Ecoregion) used to plan for, and assess risk to, viability of terrestrial species during forest plan revision, CNF

Habitat Element	Element Description	# Of Potential Viability Concern Species Associated With Habitat Element: Southern Appalachian Ecoregion
Spray Cliffs	Rock that remains wet for all or most of the year, associated with waterfalls or seepage	36
Grassy Balds	Grassy balds	45
Shrub Balds	Shrub balds	20
Caves and Mines	Caves and mines with microclimates capable of supporting associated biota	58
Mature Mesic Hardwood Forests	Mid- and late-successional mesic deciduous forests, including northern hardwood, mixed mesophytic, mesic oak, and bottomland hardwood forests	200
Mature High-Elevation Mesic Hardwood Forests	Mid- and late-successional mesic hardwood forests at high elevations, primarily northern hardwood forests	115
Mature Hemlock Forests	Mid- and late-successional eastern hemlock and eastern hemlock-white pine forests in native settings, typically on stream terraces and other mesic sites	33
Mature Oak Forests	Dry to mesic mid- and late-successional oak and oak-pine forests subject to moderate levels of disturbance sufficient to maintain the oak component	71
Mature Yellow Pine Forests	Mid- and late-successional southern yellow pine and pine-oak forests maintained in open conditions by frequent fire	19
Early-Successional Forests	Early-successional forests, typically aged 0-10 years and dominated by woody species	24
High Elevation Early Succession	Early-successional habitats at high elevations, including early-successional forests, open woodlands, and old fields	19
Mature Forest Interiors	Mature forest interiors with minimal adverse effects due to forest edge.	9
Canopy Gaps	Mid- and late-successional mesic deciduous forests with a diverse vertical and horizontal	49

Table 3-73. Habitat elements and number of associated viability concern species (SA Ecoregion) used to plan for, and assess risk to, viability of terrestrial species during forest plan revision, CNF		
Habitat Element	Element Description	# Of Potential Viability Concern Species Associated With Habitat Element: Southern Appalachian Ecoregion
	structure as a result of gaps in the canopy	
Woodlands, Savannas, and Grasslands	Open woodlands and savannas characterized by low canopy cover and rich grass-dominated understories, and maintained in open conditions by periodic fire. Grasslands with little to no overstory, usually occurring as patches within woodland and savanna complexes and maintained by periodic fire	137
Mixed Landscapes	Landscapes characterized by a broad mix of successional habitats	27
Late Successional Riparian	Riparian areas dominated by mid- and late-successional deciduous forests	142
Snags	Forests containing an abundance of snags	14
Downed Wood	Forests containing an abundance of downed wood and thick leaf litter	81
Den Trees	Forests containing an abundance of large hollow trees suitable as den trees	4
Hard Mast	Forests producing abundant hard mast	0
Remoteness	Remote habitats away from frequent human disturbance	9
Lakeshores	Forested shores of lakes and ponds	7
Water Quality	High water quality in streams and lakes	6

Effects to these habitat elements are analyzed in this EIS under other sections. Based on these analyses, each habitat element was assigned categorical values by alternative to indicate future abundance (Table 3-74) and distribution (Table 3-75), general likelihood that the habitat element would limit viability of associated species (Table 3-76), and overall effect of national forest management on the habitat element (Table 3-77).

The future abundance variable (Table 3-74) is defined as the abundance of the associated habitat element in fifty years if the alternative were selected and implemented over that fifty-year period. This variable indicates the abundance of the habitat element on NFS land only, to provide focus on the role of the national forest planning area in supporting associated species. It's focus on national forest land only reflects recognition that viability is to be provided within the "planning area"

(area covered by the forest plan). Definitions of abundance categories are stated in quantifiable terms in order to be objective as possible; however, in many cases quantifiable estimates of future abundance are not available. In these cases, knowledge of Forest Service biologists was used to assign abundance values based on current conditions and the magnitude and direction of effects expected under each alternative.

Table 3-74. Values used to categorize projected abundance of each habitat element after 50 years of implementing each alternative.

Habitat Abundance Value	Description
Rare	The habitat element is rare, with generally less than 100 occurrences, or patches of the element generally covering less than one percent of the national forest planning area.
Occasional	The habitat element is encountered occasionally, and generally is found on one to 10 percent of the national forest planning area.
Common	The habitat element is abundant and frequently encountered, and generally is found on more than 10 percent of the national forest planning area.

Similar to the future abundance variable, the future distribution variable (Table 3-75) is defined as the distribution of the associated habitat element in fifty years if the alternative were selected and implemented over that fifty-year period. In contrast to the abundance variable, it includes consideration of intermixed ownership patterns and conditions, and their general effects on movements and interactions of individuals among the suitable habitat patches found on NFS land. Because assessing adequacy of habitat distribution for a species requires a level of knowledge not available for most species, and the number of species being evaluated is very large, we have defined habitat distribution in terms of a historical reference condition—that which was present prior to the major perturbations associated with European settlement of the planning area. This period is generally defined as 1000 to 1700 A.D. This approach relies on the assumption that a habitat distribution similar to that which supported associated species during recent evolutionary history will likely contribute to their maintenance in the future, and that the further a habitat departs from that historical distribution, the greater the risk to viability of associated species. This approach has its own set of difficulties, as evidence of presettlement conditions relevant to the planning area is often anecdotal and scarce (see introduction to section 3.0, Biological Elements for a brief discussion on historical forest conditions). In addition, the reference period may have included a wide variety of local conditions in proximity to growing aboriginal population centers and their accompanying use of agriculture and fire during the early portion of this period, and then their subsequent dramatic decline due to disease epidemics following early European contact. Nevertheless, the precision required to assign the categorical values for this variable is not high, and may be supported by general positions described in mainstream conservation literature (see Wear and Greis 2002). Knowledge of Forest Service biologists was used to assign distribution values, based on interpretations of historical conditions supported by conservation literature,

current conditions, and magnitude and direction of effects expected under each alternative

Differences in scale between the Habitat Abundance and Habitat Distribution variables is intentional in order to bring two different pieces of information into the analysis. Habitat Abundance has been defined in terms of the amount of habitat on national forest land only. This definition reflects the amount of habitat available to support a species on the national forest, in recognition of regulation requirements that viability be provided within the "planning area" (area covered by the forest plan). Habitat Distribution, on the other hand, is defined to include the landscape setting of national forest lands, which includes the intermingled private lands and broken ownership patterns that provides the context for national forest populations and may affect ability of individuals living on national forest lands to interact with each other.

Table 3-75. Values used to categorize projected distribution of each habitat element after 50 years of implementing each alternative

Habitat Distribution Value	Description
Poor	The habitat element is poorly distributed within the planning area and intermixed lands relative to conditions present prior to European settlement. Number and size of habitat patches and/or their evenness in distribution across the landscape is greatly reduced.
Fair	The habitat element is fairly well distributed within the planning area and intermixed lands relative to conditions present prior to European settlement. Number and size of habitat patches and/or their evenness in distribution across the landscape is somewhat reduced.
Good	The habitat element is well distributed within the planning area and intermixed lands relative to conditions present prior to European settlement. Number and size of habitat patches and/or their evenness in distribution across the landscape is similar to or only slightly reduced relative to reference conditions.

Habitat element abundance and distribution variables were combined to create one variable to indicate the general likelihood that the habitat element would be limiting to populations of associated species (Table 3-76). In this general context, habitat limitation refers to a habitat factor—quantity, distribution, or quality—that results in risk to continued existence of the species within the planning area. Everything else being equal, quality habitat elements that are rare and poorly distributed are those most likely to cause risk to viability of associated species; those that are common and well distributed are least likely to cause risk to viability of associated species.

Table 3-76. Likelihood of habitat limitation (High, Moderate, and Low) to associated species as derived from habitat abundance and distribution values.

Habitat Abundance	Habitat Distribution		
	Poor	Fair	Good
Rare	High	High	Moderate

Occasional	High	Moderate	Low
Common	Moderate	Low	Low

Providing for species viability requires providing abundant and well-distributed habitat in ways that allow existing populations to persist or expand. The ability of existing populations to respond to available habitat depends in part on their current robustness, which is generally a function of population size. In general, for a given habitat condition, small populations will be at more risk than large populations. To reflect this fact, likelihood of habitat limitation variable was combined with a species' F Rank for each species/habitat element interaction to generate viability risk ratings (Table 3-77). Associations of very rare species with habitat elements that are likely to be most limiting were identified as those most at risk; associations of more common species with habitats less likely to be limiting received lower risk ratings. Ratings include three levels of "high" risk (Table 3-77) to ensure that results err on the side of caution.

Table 3-77. Viability risk ratings for species/habitat interactions as a function of a species' F Rank and likelihood of habitat element limitation variables.

Likelihood of Habitat Element Limitation	Species F Rank		
	F1 or F?	F2	F3
High	Very High	High	Moderately-High
Moderate	High	Moderately-High	Moderate
Low	Moderately-High	Moderate	Low

Once viability risk ratings were developed for each species/habitat relationship, habitat elements most commonly associated with risks to species viability were identified by counting the number of very high, high, and moderately high ratings associated with each. To assess the role of national forest management in minimizing viability risk associated with each habitat element, a management effects variable was assigned to each habitat element by alternative. The management effects variable (Table 3-78) categorizes the goal of management for the habitat element, the expected resulting trend, and any additional opportunity for minimizing viability risk. Numbers of very high, high, and moderately-high risk ratings were summarized by management effects variable by alternative to assess how well alternatives address viability-related habitat needs.

Table 3-78. Values used to categorize the effect of national forest management in minimizing or contributing to species viability risk associated with each habitat element by alternative

Management Effect Value	Description

Table 3-78. Values used to categorize the effect of national forest management in minimizing or contributing to species viability risk associated with each habitat element by alternative

Management Effect Value	Description
1	Abundance and distribution of the habitat element is maintained or improved by providing optimal protection, maintenance, and restoration to all occurrences (with limited exceptions in some cases). Little additional opportunity exists to decrease risk to viability of associated species because management is at or near optimal.
2	Abundance and distribution of the habitat element is improved through purposeful restoration, either through active management or passively by providing for successional progression. Opportunity for decreasing risk to associated species is primarily through increasing rates of restoration, where possible.
3	The habitat element is maintained at approximately current distribution and abundance, though location of elements may shift over time as a result of management action or inaction. Opportunity to reduce risk to viability of associated species is primarily through adopting and implementing objectives to increase abundance and distribution of the habitat element.
4	Regardless of management efforts, the habitat element is expected to decrease in distribution and abundance as a result of factors substantially outside of Forest Service control (e.g., invasive pests, acid deposition). Opportunity to reduce risk to viability of associated species is primarily through cooperative ventures with other agencies and organizations.
5	The habitat element is expected to decrease in distribution and abundance as a result of management action or inaction. Opportunity to reduce risk to viability of associated species is primarily through adopting and implementing objectives to maintain or increase this habitat element.

Distribution of viability risk was also summarized by species status, i.e., federally listed under the ESA, listed as Regional Forester's sensitive species, or identified as locally rare or of other concern. The species status summary highlights the relative role of other provisions included in law and policy that result in additional consideration of at-risk species during planning.

Viability Evaluation Results

Species viability evaluation for the CNF included consideration of 1,202 species of the Southern Appalachian ecoregion. Of these species, 400 are considered rare and are known to occur on the CNF. Outcomes for habitat elements, as described under individual effects analysis sections, are summarized in Appendix E, Table K, using the four variables described in Table 3-74, Table 3-75, Table 3-76, and Table 3-78.

These variables indicate expected habitat condition following fifty years of implementing each forest plan revision alternative.

Ratings of risk to viability for each species/habitat relationship by alternative are presented in Appendix E, Table L. To facilitate comparison of effects of alternatives on species viability, the number of very-high, high, and moderately-high risk ratings are summarized for each alternative by habitat element (Table 3-79), management effect (Table 3-80), and species status (Table 3-81).

Viability risk rating summaries indicate relatively small differences among alternatives relative to effects on species viability for most habitat elements. This similarity results from planning efforts to include in all alternatives provisions to provide for species viability in compliance with NFMA regulations. Examples of such provisions common to all alternatives (except Alternative F, which represents the current forest plan) are the prescriptions for rare communities and riparian corridors. Similarity of viability outcomes among alternatives also results from the influence of external forest health threats, which represent serious risks to forest communities and associated species regardless of alternative. Differences among alternatives are also muted by the small scale of actions contemplated under all alternatives relative to the more extensive effects to ecological systems that have occurred to national forest landscapes since European settlement. Broader scale effects will likely continue to have similar important effects to species viability regardless of which alternative is selected.

Despite similarities, some differences in effects of alternatives are apparent (Table 3-79). Alternatives D and F (current Plan) result in greater risk to more species than other alternatives primarily because of the focus on establishing balanced age-class distributions. This focus results in reduced distribution and abundance of older forests and the diverse structure they provide. Alternatives F and D show higher numbers of very-high risk species/habitat relationships than other alternatives. Alternatives I, B, A, E, and G provide more optimal mixes of habitats for the full range of species' needs.

Evaluation results indicate, under all alternatives, high levels of risk to species viability are associated with certain key habitats. Highest risks are associated with 1) bogs, fens, seeps, and seasonal ponds, 2) rock outcrops and cliffs, 3) mature high and low elevation mesic hardwood forests, 4) spruce-fir forests, 5) late-successional riparian forests, 6) woodlands, savannas, and grasslands, and 7) basic mesic forests. These and other habitats are displayed in Table 3-79 along with the number of associated species of viability concern by alternative, broken into categories of viability risk.

Bogs, fens, seeps, and seasonal ponds are critical to maintaining species viability due to their natural rarity on the landscape, their decline during European settlement due to beaver control and drainage for agriculture, and the number of rare species associated with them. Provisions of the rare community prescription provide for optimal protection and management of all occurrences of these habitats under all alternatives except Alternative F; therefore, opportunities for further reducing risk to viability of associated species are limited. Under Alternative F such habitats would

likely be maintained, but would not receive the focused attention provided by the rare community prescription.

Similar to the wetland habitats described above, other rare communities such as rock outcrops and cliffs, woodlands, savannas and grasslands, and basic mesic forests are critical to maintaining species viability due to their unique habitat attributes and relative rarity on the landscape. Provisions of the rare community prescription provide for optimal protection and management of all occurrences of these habitats under all alternatives except Alternative F; therefore, opportunities for further reducing risk to viability of associated species are limited. Under Alternative F such habitats would likely be maintained, but would not receive the focused attention provided by the rare community prescription.

There are over 200 Southern Appalachian species of viability concern associated with mature mesic hardwood forests, including mature high-elevation mesic hardwood forests (Table 3-73). The majority of these forests would be allocated to prescriptions that would maintain the predominance of older conditions in all alternatives except D and F. For alternative I, about half would be allocated to older successional options, and half to younger successional stage options. For this reason, Alternatives F, D and I would result in risk to 58 associated species compared to all other alternatives, which would result in risk to 27 species (Table 3-79). However, for alternative I, habitats for species at risk will be maintained, whereas in Alternatives D and F, habitats may decline (Table 3-80). Alternatives D and F would result in risk to 50 species associated with mature high-elevation mesic hardwood forests, compared to all other alternatives, which would result in risk to 38 species. Implementation of Alternatives A, B, E, or G would provide highest emphasis on viability of this species group. Across all alternatives, forestwide objectives and standards have been established to minimize the acreage of these forests prescribed burned and reduce the impacts of prescribed fire in these communities when included as part of landscape-level burn units. In addition, a CNF standard ensures that a minimum of 75 percent of the northern hardwood, mixed mesophytic and river floodplain forest types would be maintained in mid-late successional stages, and that 50 percent of each of those types be maintained in late successional or old growth conditions.

Spruce-fir forests are critical to maintaining species viability because they are naturally limited to the highest elevations, and represent the edge of range for many associated species. They therefore support large numbers of species of potential viability concern. While their distribution may be somewhat reduced compared to historical conditions, the biggest threats to this community and associated species are impacts from the balsam woolly adelgid, for which effective control methods are not known. Additionally impacts from air pollution are substantial; significant broad-scale coordinated efforts are needed to resolve this issue. Although spruce-fir forests are provided optimal protection and management under the rare community prescription, external threats are more likely to determine the fate of this community and viability of associated species. Little opportunity for reducing risks through typical national forest management is apparent under any alternative.

Riparian habitats are critical to maintaining species viability due to their unique position on the landscape which includes the transitional zone between aquatic and terrestrial habitats. The majority of riparian dependent species need, or prefer, late-successional forest conditions for the diverse structure and the moist, temperature-moderated microclimates that they provide. The riparian prescription is designed to produce late-successional forest conditions and provide optimal protection to riparian dependent species across all alternatives. With the implementation of the riparian prescription additional opportunities to further reduce risks to species viability through management are limited. Alternative F (the current Plan) is not subject to the proposed riparian standards, however it does contain substantive riparian protection, though perhaps less focused than in the other alternatives, particulary in respect to ephemeral channels. The viability of 31 species of moderately high risk associated with late-successional riparian habitats should be adequately protected under all alternatives through the implementation of the riparian prescription and associated standards.

Table 3-79. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each habitat element by alternative

Habitat Element/Risk	Alternative						
	A	B	D	E	F	G	I
Bogs, Fens, Seeps, Seasonal Ponds							
Very High	43	43	43	43	43	43	43
High	24	24	24	24	24	24	24
Moderately High	15	15	15	15	15	15	15
Total	82	82	82	82	82	82	82
Open Wetlands							
Very High	9	9	9	9	9	9	9
High	2	2	2	2	2	2	2
Moderately High	0	0	0	0	0	0	0
Total	11	11	11	11	11	11	11
River Channels							
Very High	7	7	7	7	7	7	7
High	4	4	4	4	4	4	4
Moderately High	1	1	1	1	1	1	1
Total	12	12	12	12	12	12	12
Glades and Barrens							
Very High	7	7	7	7	7	7	7
High	2	2	2	2	2	2	2
Moderately High	2	2	2	2	2	2	2
Total	11	11	11	11	11	11	11
Carolina Hemlock Forests							
Very High	1	1	1	1	1	1	1
High	1	1	1	1	1	1	1
Moderately High	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3
Table Mountain Pine Forests							
Very High	0	0	0	0	0	0	0
High	1	1	0	1	1	1	0
Moderately High	1	1	1	1	1	1	1
Total	2	2	1	2	2	2	1
Spruce-Fir Forests							
Very High	20	20	20	20	20	20	20
High	10	10	10	10	10	10	10
Moderately High	6	6	6	6	6	6	6
Total	36	36	36	36	36	36	36
Beech Gap Forests							
Very High	1	1	1	1	1	1	1
High	1	1	1	1	1	1	1
Moderately High	0	0	0	0	0	0	0
Total	2	2	2	2	2	2	2
Basic Mesic Forests							
Very High	5	5	5	5	5	5	5

Table 3-79. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each habitat element by alternative

Habitat Element/Risk	Alternative						
	A	B	D	E	F	G	I
High	7	7	7	7	7	7	7
Moderately High	7	7	7	7	7	7	7
Total	19	19	19	19	19	19	19
Rock Outcrops and Cliffs							
Very High	0	0	0	0	36	0	0
High	36	36	36	36	21	36	36
Moderately High	21	21	21	21	4	21	21
Total	57	57	57	57	61	57	57
Spray Cliffs							
Very High	0	0	0	0	13	0	0
High	13	13	13	13	1	13	13
Moderately High	1	1	1	1	1	1	1
Total	14	14	14	14	15	14	14
Grassy Balds							
Very High	13	13	13	13	13	13	13
High	6	6	6	6	6	6	6
Moderately High	2	2	2	2	2	2	2
Total	21	21	21	21	21	21	21
Shrub Balds							
Very High	4	4	4	4	4	4	4
High	1	1	1	1	1	1	1
Moderately High	1	1	1	1	1	1	1
Total	6	6	6	6	6	6	6
Canebrakes							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Caves and Mines							
Very High	4	4	4	4	4	4	4
High	1	1	1	1	1	1	1
Moderately High	0	0	0	0	0	0	0
Total	5	5	5	5	5	5	5
Mature Mesic Hardwood Forests							
Very High	0	0	0	0	0	0	0
High	0	0	27	0	27	0	27
Moderately High	27	27	31	27	31	27	31
Total	27	27	58	27	58	27	58
Mature High-Elevation Mesic Hardwood Forests							
Very High	0	0	23	0	23	0	0
High	23	23	15	23	15	23	23

Table 3-79. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each habitat element by alternative							
Habitat Element/Risk	Alternative						
	A	B	D	E	F	G	I
Moderately High	15	15	12	15	12	15	15
Total	38	38	50	38	50	38	38
Mature Hemlock Forests							
Very High	5	5	5	5	5	5	5
High	0	0	0	0	0	0	0
Moderately High	6	6	6	6	6	6	6
Total	11	11	11	11	11	11	11
Mature Oak Forests							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	9	9	9	9	9	9	9
Total	9	9	9	9	9	9	9
Mature Yellow Pine Forests							
Very High	0	0	0	0	0	0	0
High	5	5	5	5	5	5	5
Moderately High	1	1	1	1	1	1	1
Total	6	6	6	6	6	6	6
Early-Successional Forests							
Very High	0	0	0	1	0	1	0
High	1	1	0	1	0	1	1
Moderately High	1	1	1	0	1	0	1
Total	2	2	1	2	1	2	2
High Elevation Early Succession							
Very High	3	3	0	3	0	3	3
High	3	3	0	3	0	3	3
Moderately High	0	0	3	0	3	0	0
Total	6	6	3	6	3	6	6
Mature Forest Interiors							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	1
Canopy Gaps							
Very High	0	0	0	0	0	0	0
High	0	0	6	0	6	0	0
Moderately High	6	6	7	6	7	6	6
Total	6	6	13	6	13	6	6
Woodlands, Savannas, and Grasslands							
Very High	17	0	17	17	17	17	0
High	9	17	9	9	9	9	17
Moderately High	4	9	4	4	4	4	9
Total	30	26	30	30	30	30	26

Table 3-79. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each habitat element by alternative

Habitat Element/Risk	Alternative						
	A	B	D	E	F	G	I
Mixed Landscapes							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	6	6	6	6	6	6	6
Total	6	6	6	6	6	6	6
Late Successional Riparian							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	31	31	31	31	31	31	31
Total	31	31	31	31	31	31	31
Early-Successional Riparian							
Very High	1	1	1	1	1	1	1
High	3	3	3	3	3	3	3
Moderately High	1	1	1	1	1	1	1
Total	5	5	5	5	5	5	5
Snags							
Very High	0	0	0	0	0	0	0
High	0	0	4	0	4	0	0
Moderately High	4	4	2	4	2	4	4
Total	4	4	6	4	6	4	4
Downed Wood							
Very High	0	0	0	0	0	0	0
High	0	0	19	0	0	0	0
Moderately High	19	19	20	19	19	19	19
Total	19	19	39	19	19	19	19
Den Trees							
Very High	0	0	0	0	0	0	0
High	0	0	2	0	2	0	0
Moderately High	2	2	0	2	0	2	2
Total	2	2	2	2	2	2	2
Hard Mast							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Remoteness							
Very High	3	3	3	3	3	3	3
High	0	0	0	0	0	0	0
Moderately High	0	0	0	0	0	0	0
Total	3	3	3	3	3	3	3
Lakeshores							
Very High	0	0	0	0	0	0	0

Table 3-79. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each habitat element by alternative							
Habitat Element/Risk	Alternative						
	A	B	D	E	F	G	I
High	2	2	2	2	2	2	2
Moderately High	0	0	0	0	0	0	0
Total	2	2	2	2	2	2	2
Water Quality							
Very High	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0
Moderately High	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	1
All Habitat Elements							
Very High	143	126	163	144	212	144	126
High	155	163	200	155	155	155	189
Moderately High	192	197	194	191	176	191	201
Total	490	486	557	490	543	490	516

Of key interest are habitat elements that are associated with high risk to species viability, and for which risk may be reduced by improving abundance and distribution through management. Pine and pine-oak forests, Table Mountain pine forests, woodlands, savannas, and grasslands, mountain balds, early successional forests, and glades and barrens all fit this category. Potential restoration activities within these communities are described in sections 6 (Major Forest Communities), 7 (Rare Communities), and 8 (Successional Habitats). For early successional habitats, including high elevation, Alternatives D and F would provide the best abundance and distribution. For other habitat elements, emphasis varies across alternatives with no single alternative providing a clear benefit to all habitats (see Section 8).

Alternatives D and F are the alternatives that would cause a relative decline in selected habitat elements as a direct result of management (Table 3-80). These elements include mature mesic hardwood forests, mature high-elevation mesic hardwood forests, mature oak forests, Table Mountain pine forests, mature forest interiors, snags, downed wood, and den trees (Appendix E, Table K).

Table 3-80. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each category of management effect by alternative.							
	Alternative						
Management Effect/Risk	A	B	D	E	F	G	I
Provide Optimal Protection and Management for All Habitat Occurrences							
Very High	93	93	93	93	0	93	93
High	99	99	99	99	2	99	99
Moderately High	51	51	51	51	1	51	51
Total	243	243	243	243	3	243	243
Improve Habitat Abundance and Distribution Through Restoration							
Very High	4	4	1	1	1	1	4

Table 3-80. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each category of management effect by alternative.

	Alternative						
Management Effect/Risk	A	B	D	E	F	G	I
High	13	30	14	9	14	9	29
Moderately High	62	80	14	70	13	70	44
Total	79	114	29	80	18	80	77
Maintain Habitat Abundance and Distribution							
Very High	20	3	20	23	162	23	3
High	32	23	9	35	79	35	50
Moderately High	66	53	41	57	74	57	93
Total	118	79	70	115	315	115	146
Reduce Habitat Abundance and Distribution as Result of External Factors							
Very High	26	26	26	26	26	26	26
High	11	11	11	11	11	11	11
Moderately High	13	13	13	13	13	13	13
Total	50	50	50	50	50	50	50
Decline in Habitat Abundance and Distribution as Result of Management							
Very High	0	0	23	1	23	1	0
High	0	0	67	1	49	1	0
Moderately High	0	0	75	0	75	0	0
Total	0	0	165	2	147	2	0
Total for All Management Effect Categories							
Very High	143	126	163	144	212	144	126
High	155	163	200	155	155	155	189
Moderately High	192	197	194	191	176	191	201
Total	490	486	557	490	543	490	516

Planning for, and evaluation of, species viability for forest plan revision has focused primarily on providing desired abundance and distribution of habitat elements, in compliance with NFMA regulations. Risks to species viability can be much reduced by additional provisions present in existing law and policy. These include specific consideration of effects to federally listed threatened and endangered species, those proposed for such listing, and Regional Forester's Sensitive Species, in biological assessments and evaluations conducted as part of all national forest management decisions. These assessments and evaluations identify where additional protective measures are warranted to provide for continued existence of the species on NFS land. Projects that may affect federally listed or proposed species must be coordinated with the USFWS. In support of these requirements, these species are often the focus of inventory and monitoring efforts. Additional species-based provisions included in all forest plan revision alternatives supplement existing law and policy. All alternatives include general and species-specific provisions for federally listed species, developed through coordinated planning with the USFWS.

Table 3-81. Number of species/habitat relationships rated as of very high, high, and moderately high risk to terrestrial species viability for each category of species status by alternative.

	Alternative						
Species Status/Viability Risk	A	B	D	E	F	G	I
Federally Listed or Proposed as Threatened or Endangered							
Very High	7	7	8	7	13	7	7
High	6	6	7	6	2	6	6
Moderately High	3	3	1	3	1	3	3
Total	16	16	16	16	16	16	16
Regional Forester's Sensitive Species							
Very High	26	23	30	27	46	27	23
High	38	38	43	37	28	37	42
Moderately High	37	39	45	37	40	37	43
Total	101	100	118	101	114	101	108
Locally Rare and Other Species							
Very High	110	96	125	110	153	110	96
High	111	119	150	112	125	112	141
Moderately High	152	155	148	151	135	151	155
Total	373	370	423	373	413	373	392
Total for All Species Status Categories							
Very High	143	126	163	144	212	144	126
High	155	163	200	155	155	155	189
Moderately High	192	197	194	191	176	191	201
Total	490	486	557	490	543	490	516

In conclusion, differences in effects to viability risk among alternatives are relatively small for most habitat elements (Table 3-79). High- risk species/habitat relationships are primarily a result of forest health threats and historical influences that have further reduced distribution and abundance of naturally rare habitat elements. In general, effects of proposed management strategies are small relative to historical impacts and future external threats (Table 3-80). Risks to species viability are minimized by forest plan revision alternatives B, A, E, G, and I that provide more optimal mixes of habitats for the full range of species needs.

Slight differences in results presented here from those in the DEIS are primarily the result of updates to species' status information (F Ranks) made during the comment period through review and coordination with NatureServe and their contractors. Additional changes are the result of adding species inadvertently omitted from the DEIS. These adjustments have not resulted in substantial changes to overall patterns of risk, or conclusions relative to overall effects of alternatives. It is important to note that information on the status and ecology of this great diversity of species is constantly changing and will continue to do so as the revised forest plan is implemented. Lists of species of viability concern and related information will be maintained and updated as part of plan implementation; however, this updating will

typically be small and incremental, and is not expected to change the overall conclusions of this analysis during this planning period..

15.2 Aquatic Species Viability Evaluation

National forests are required to manage aquatic habitats for the maintenance of viable populations of existing native and desired non-native vertebrate species in the planning area (36 CFR 219.19 and USDA Regulations 9500-004). The NFMA defines a viable population as "…one which has the estimated number and distribution of reproductive individuals to insure its continued …" The Act further states, "…habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." The planning area is defined as the NFS lands included in the LMP.

This assessment evaluates the viability risk for aquatic species by watershed. Where a viability risk exists at the watershed level, further assessment of the role of Forest Service management in mitigating or contributing to the problem is given.

Methods and Assumptions

Habitat alteration is the major cause of decline of aquatic diversity in the South. Channelization, impoundment, sedimentation, and flow alterations are the most common physical habitat alterations associated with the decline of aquatic species (Walsh et al. 1995; Etnier 1997; Burkhead et al. 1997). Other human-induced impacts to aquatic species include pollution, introduced species, and over-harvesting (Miller 1989).

Habitat quality within a freshwater ecosystem is determined by activities within the watershed (Abell et al. 2000; Scott and Helfman 2002). Therefore, the number and intensity of activities in a watershed may be used to estimate the amount of quality habitat available for aquatic species.

To determine if there is adequate quality habitat for aquatic species, the condition of individual watersheds needed to be determined. Watershed condition was determined from the physical and anthropogenic interactions within the watershed. Four stressors to aquatic habitats were identified: sedimentation, point-source pollution, alterations in water temperature, and altered stream flows. The extent and detail required to address all watersheds, including private land, made it necessary to determine values from geographic data. These values were compared among the watersheds and a condition or set of conditions was determined.

Hydrologic units (HU) or watersheds are defined as areas that drain to a common point. Fifth level watersheds are generally between 40,000 and 250,000 acres. There are 24 fifth level watersheds that include NFS lands. These watersheds were digitally determined; then using GIS technology, overlain with other geographic information layers including ownership, streams, roads, point sources, dams, and land use from the 1970's and 1990's.

The layers were intersected with the 5th level watersheds. The attributes of these layers were quantified as a percent of the watershed or as a density (miles per

square mile). Table 3-82 shows the layers, the geographic data, attributes, the data sources, and the stressors they represent.

Table 3-82. Data layers were used to display and develop stressors that caused degradation to aquatic habitats in the 5th level watersheds.

Layer	Geographic Data	Attribute	Source	Stressors
watersheds	planning unit	5th level watershed	NRCS and USFS	------
ownership	ownership pattern	percent NFS lands	Forests GIS	------
streams	riparian areas	riparian acres	EPA Basins III	------
land use	land types	erosion values	National Land Use Classification Data	Sediment
slope class	contour lines	slope class	Digital Elevation Models	Sediment
ecoregion	physiographic zone	erosion values	EPA Basins III	Sediment
other land disturbances	other disturbances not covered	erosion values	Forest personnel	Sediment
roads	road density in riparian area	miles of roads per square mile of land	Tiger Census Data	Sediment Temperature
land use	riparian areas with open forest canopy	percent open canopy in riparian areas	EPA Basins III [1970's] and EPA Region 4 [1990's]	Temperature
dams	density of dams	number of dams per square mile of land	EPA Basins III	Altered Flow
point sources	density of point sources	number of pollution point sources per square mile of land	EPA Basins III (cerlis, ricris, and npdes sites)	Point Source Pollution

Current Watershed Conditions

Each watershed was rated (as excellent, average, or below average) for sediment, temperature, altered flow and point sources of pollution. The ratings were determined from natural breaks in the data using Jenk's optimization formula (Clingenpeel 2002). A sediment model (Clingenpeel 2002) predicted sediment

loads, above baseline, in each 5th level watershed (Watershed Condition Rank - WCR). Table 3-83 displays the ratings of each 5th level watershed.

The stressors were evaluated to determine current watershed condition ranking and expected changes associated with each LMP alternative. The Watershed section (Chapter 3, Physical Elements, 2.0 Watershed) assessed the aquatic habitat changes by alternative for five decades. No significant differences are predicted between the current sediment loads and those expected under each alternative. The remainder of this aquatic viability assessment assumes that current levels of stress to that portion of the 5th level watershed managed as NFS lands will not change under any alternative during any of the five decades assessed.

Table 3-83. Four habitat stressors were assessed in each 5th level watershed. Those watershed having a high viability risk are highlighted.

5th Level Watershed	Sediment (WCR)	Point Source Pollution	Temperature	Altered Stream Flow
6010103060	Below Average	Below Average	Below Average	Average
6010108060	Below Average	Average	Below Average	Average
6020003040	Below Average	Average	Average	Average
6010103020	Average	Average	Below Average	Average
6010102030	Average	Average	Below Average	Average
6010108050	Average	Average	Below Average	Average
5050001010	Average	Average	Average	Average
6010103010	Average	Average	Average	Average
6010103030	Average	Average	Average	Average
6010106010	Average	Average	Average	Average
6020002040	Average	Average	Average	Average
6010102010	Average	Average	Average	Average
6010108030	Average	Average	Average	Average
3150101010	Average	Excellent	Average	Excellent
6010103040	Average	Average	Average	Average
6010103050	Average	Average	Average	Excellent
6010105070	Average	Average	Average	Excellent
6010108010	Average	Average	Average	Average
6020002030	Average	Average	Average	Average
6020003020	Average	Excellent	Average	Excellent
6010105080	Excellent	Average	Average	Average
6010108031	Excellent	Average	Average	Average
6010204020	Excellent	Average	Excellent	Excellent
6010204040	Excellent	Average	Average	Average

Aquatic Species Sensitivity to Stressors

Assessing the viability risk for each aquatic species documented on NFS lands and additional species not yet documented would be an impractical task. As a surrogate,

the viability of the rarest aquatic species (federally threatened and endangered, Forest Service sensitive, and locally rare species [TES-LR]) are assessed at 5th level watersheds. If these TES-LR species are viable, then it is assumed other aquatic species with wider ranges are also viable.

A stressor to an aquatic system is only a factor when a species sensitive to that stressor occurs within that watershed. For example, most aquatic species are not dependent on cold water temperatures in the summer. Consequently, a slight increase in summer water temperatures would not have an adverse affect on them. Temperature is a stressor to an aquatic system only when physical conditions in the watershed cause water temperature to rise and aquatic species sensitive to high water temperatures are present.

In order to determine if the stressors identified above are affecting the aquatic systems, sensitivity levels to the four stressors were assigned to each TES-LR species (Table 3-84 and Appendix F, Table F-4). These ratings were based on published literature and personal communications (Terwilliger 1991; Etnier and Starnes 1993; Byron Freeman, Wendell Haag, Melvin Warren, Bernard Kuhajda, Stephen Hiner, and Arnold Eversole personal communications). Threats to aquatic species viability are not limited to these four variables; however, GIS coverages are not available for channelization, introduced species, over-harvest, and other variables. For forest level planning it is assumed that these four stressors adequately describe land disturbance activities in the planning area.

Table 3-84. Federally threatened and endangered and CNF sensitive and locally rare aquatic species (Status – E = federally listed as endangered; T = federally listed as threatened; S = CNF sensitive; LR = CNF locally rare) were evaluated for their sensitivity to the four stressors – sediment (S), point source pollution (P), temperature (T), and altered flow (A).

Common Name	Scientific Name	Status	Stressors
Appalachian elktoe	*Alasmidonta raveneliana*	E	SPA
Helma's net-spinning caddisfly	*Cheumatopsyche helma*	S	SP
bog turtle	*Clemmys muhlenbergii*	S	A
blue shiner	*Cyprinella caerulea*	T	SPTA
tan riffleshell	*Epioblasma florentina walkeri*	E	SPA
spotfin chub	*Erimonax monacha*	T	SPA
sharphead darter	*Etheostoma acuticeps*	S	SPTA
holiday darter	*Etheostoma brevirostrum*	S	SPTA
coldwater darter	*Etheostoma ditrema*	LR	SPTA
duskytail darter	*Etheostoma percnurum*	E	SPA
trispot darter	*Etheostoma trisella*	LR	SPTA
wounded darter	*Etheostoma vulneratum*	S	SPA
Tennessee pigtoe	*Fusconaia barnesiana*	S	SPA
Cherokee clubtail	*Gomphus consanguis*	S	SP
green-faced clubtail	*Gomphus viridifrons*	S	SP
lined chub	*Hybopsis lineapunctata*	LR	SPTA

Table 3-84. Federally threatened and endangered and CNF sensitive and locally rare aquatic species (Status – E = federally listed as endangered; T = federally listed as threatened; S = CNF sensitive; LR = CNF locally rare) were evaluated for their sensitivity to the four stressors – sediment (S), point source pollution (P), temperature (T), and altered flow (A).

Common Name	Scientific Name	Status	Stressors
mountain brook lamprey	*Ichthyomyzon greeleyi*	S	P
fine-lined pocketbook	*Lampsilis altilis*	T	SPA
Tennessee heelsplitter	*Lasmigona holstonia*	S	SPA
green floater	*Lasmigona subviridis*	S	SPA
slabside pearlymussel	*Lexingtonia dolabelloides*	S	SPA
mountain river cruiser	*Macromia margarita*	S	SP
William's giant stonefly	*Megaleuctra williamsae*	S	SP
smoky madtom	*Noturus baileyi*	E	SPA
yellowfin madtom	*Noturus flavipinnis*	T	SPA
frecklebelly madtom	*Noturus munitus*	LR	SA
Allegheny snaketail	*Ophiogomphus alleghaniensis*	S	SP
Edmund's snaketail	*Ophiogomphus edmundo*	S	SP
Appalachian snaketail	*Ophiogomphus incurvatus*	S	SP
amber darter	*Percina antesella*	E	SPA
blotchside logperch	*Percina burtoni*	S	SPA
Consauga logperch	*Percina jenkinsi*	E	SPTA
longhead darter	*Percina macrocephala*	S	SPTA
bronze darter	*Percina palmaris*	S	SPA
olive darter	*Percina squamata*	S	SPA
snail darter	*Percina tanasi*	T	SPA
fatlips minnow	*Phenacobius crassilabrum*	S	SPA
Tennessee dace	*Phoxinus tennesseensis*	S	SPA
southern pigtoe	*Pleurobema georgianum*	E	SPA
Georgia pigtoe	*Pleurobema hanleyianum*	S	SPA
Tennessee clubshell	*Pleurobema oviforme*	S	SPA
Alabama creekmussel	*Strophitus connasaugaensis*	S	SPA
Alabama rainbow	*Villosa nebulosa*	S	SPA
Cumberland bean	*Villosa trabalis*	E	SPA
Coosa combshell	*Villosa vanuxemensis umbrans*	S	SPA

Stressors, TES-LR Sensitivity, and NFS lands

Watersheds where aquatic species have a viability risk are those where a stressor (sediment, point source pollution, temperature and altered flows) is significant and a TES-LR species sensitive to that stressor is present. Sediment is a significant stressor when it is rated Average or Below Average; Point Source Pollution, Temperature, and Altered Flow are significant stressors when they are rated Below Average.

Altered Flow

Altered flow is not a stressor in any of the 24 5th level watersheds. The risk to viability for aquatic species in all of the 5th level watersheds from alter flow is low (Appendix F, Table F-3).

Point Source Pollution

Only the Lower Watauga (6010103060) watershed is stressed from point source pollution. Eleven (Appendix F, Table F-4) TES-LR species sensitive to this stressor could occur in the Lower Watauga watershed. The point sources within this watershed are all downstream of NFS lands. Consequently, while the viability risk for aquatic species from point source pollution in the Lower Watauga watershed is high, point source pollution from NFS lands is not contributing to this stressor and Forest Service management activities cannot mitigate these impacts.

Temperature

Five watersheds are stressed by temperature alterations, specifically - elevated water temperatures during the summer months (Appendix F, Table F-3). The sharphead and longhead darters are TES-LR species sensitive to temperature found in these five watersheds (Table 3-85). Two factors contribute to increased water temperatures based on the Sediment Model (Clingenpeel 2002): 1) road density in riparian areas; and 2) riparian areas with open forest canopy. Both of these factors are addressed by specific standards in this plan revision (Riparian Prescription) and in the current plan (Management Area 18). Based on these standards, the Cherokee National Forest did not contribute to increasing stream temperatures under the previous FLRM Plan and will not contribute under any of the alternatives. Viability is at risk to aquatic species sensitive to increases in water temperature in these five watersheds; however, management of NFS lands is not contributing to this stressor but, in fact, decreases the level of risk throughout the watersheds.

Table 3-85. All of the watersheds stressed by temperature alterations, support TES-LR aquatic species that are sensitive to elevated water temperatures.

Watershed	Watershed Name	Sharphead Darter	Longhead Darter
6010102030	South Holston Lake	X	X
6010103020	Watauga River		X
6010103060	Lower Watauga River		X
6010108050	Camp Creek	X	
6010108060	Nolichuky River	X	

Sediment

Twenty watersheds are stressed by sediment and 43 of 45 TES-LR species are sensitive to sediment (Table 3-83). There is a concern for the viability of aquatic species in each of these watersheds; consequently, further evaluation was

conducted to determine if aquatic species would be stressed by NFS land management activities under the new FLRM Plan. The evaluation includes: 1) expected sediment sources; 2) on-going sediment monitoring; and 3) current status of sediment sensitive aquatic species.

The Sediment Model (Clingenpeel 2002) was designed to isolate three sediment sources: roads, private lands, and NFS lands. The relative proportion each of these sources contributes to the sediment load is: roads - 16%; private lands – 81%; and NFS lands – 3%. The proportion of sediment in each 5th level watershed attributable to NFS lands management is small. The annual monitoring and evaluation report (CNF Monitoring and Evaluation Report FY2001 and FY2002) documents the habitat quality of monitored stream reaches. About 90 percent of the streams surveyed met the objective for stream substrate embeddedness (a measure of sediment rates). Again, a small proportion of the degraded habitat was attributable to Forest Service management activities. In most instances, Forest Service roads were identified as the primary sediment sources and recommendations were made to mitigate these adverse effects.

The population trends for all aquatic TES-LR species surveyed on NFS lands were stable to upward. Finally, trout are among the most sensitive aquatic species in terms of their tolerance to sediment. In the watersheds where sediment is a stressor and trout occur, the populations of trout (brook, brown and rainbow) have remained stable over the past 17 years (CNF Monitoring and Evaluation Report FY2001 2002). 127 stream reaches support trout. Many of these streams were sampled multiple times during this time frame and the trout populations remained fairly constant. The presence of so many independent populations of trout strongly suggests that sediment is not a significant stressor to aquatic TES-LR species on NFS lands. The viability risk to aquatic species throughout the watersheds is high; however, on NFS lands the viability risk from sediment is low and the quality of water coming off NFS lands may be mitigating some of the adverse effects throughout the watersheds.

Conclusions

The level of risk to viability with respect to sediment is high for three watersheds, moderate for seventeen, and low for four at the coarse filter scale. Aquatic habitat stressors identified in specific watersheds should be considered during project analysis to insure that Forest Service proposals do not contribute to the adverse effects already existing and, to the extent feasible, mitigate some of those impacts.

Many TES-LR aquatic species require miles of streams and rivers to ensure their viability. Often, NFS lands do not encompass sufficient habitat to insure their long term survival. Regardless of management on CNF lands, extirpations may occur in some 5th level watersheds.

16.0 FOREST HEALTH

Forest health concerns for the CNF include insects, diseases, and potential storm damage. Damage to forest communities occurs in varying degrees depending on

community types and species composition, location on the landscape, age of the forested community, past disturbance, and weather conditions.

16.1 Annosum Root Rot

16.1.1 Affected Environment

Annosum root disease, caused by (*Heterobasdion annosum)*, is a root and butt rot of conifers. In the south, the disease is most often associated with pine stands that have been partially cut (thinned) and occur on sandy, well-drained soils; but can be found in pine stands on a variety of soils and forest conditions. In the Appalachian Mountains, white pines are very susceptible to annosum regardless of soil type.

16.1.2 Direct/Indirect Effects

Annosum root disease would be expected to increase in pine stands where partial cuts occur (i.e. thinning and unevenaged management of pine stands). In areas with no management activity, the incidence of annosum root rot should not change from current levels. Annosum would decrease as the management emphasis shifts to mixed pine and hardwood types rather than predominately pine.

In alternatives where pine stands, especially white pine, would be maintained/restored and thinned regularly, the disease incidence would increase. This increase is based on the assumption that stump treatment with borax would not be used. Annosum root disease is predicted to remain at current levels or decrease for alternatives with little or no harvest activity. Alternatives where there would potentially be some vegetative management, but little or no pine thinning, annosum would remain at current levels or decrease.

The following table displays acres of pine that would potentially be harvested in the first period, by Alternative, for forested communities with significant pine components. The larger the number of acres the higher risk for annosum root disease:

Table 3-86. Displays acres by community type with pine component that could be harvested in the first period.

Community Types	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Conifer/HdWd	765	453	1,370	674	1,078	744	747
Virginia Pine	3,378	3,339	3,972	831	4,474	2,098	3,227
Xeric Pine/Pine Oak	1,000	1,197	1,157	1,000	1,607	1,000	1,000
Total Acres	5,143	4,989	6,499	2,505	7,159	3,842	4,974

Alternative F would have the highest risk for annosum and alternative E would have the lowest risk. Alternative I would be slightly higher than the average for all alternatives.

16.1.3 Cumulative Effects

This LMP revision emphasizes management practices that establish and maintain naturally occurring species and their ecological distribution rather than pine

plantations. The risk of damage from annosum would potentially decrease on the CNF for all alternatives. Pine plantations on lands adjacent to the CNF would be managed on short rotations and would not normally be thinned. Incidence of annosum root disease on these adjacent lands would remain at current levels or possibly increase.

16.2 Beech Bark Disease

16.2.1 Affected Environment

Beech bark disease (*Nectria coccinea var. faginata*) is a complex of the beech scale (*Cryptococcus fagisuga*) (a non-native insect), and at least two different fungal pathogens of the inner bark (one native and the other non-native) that can kill American beech. Without the scale insect to provide entrance wounds through the bark, the fungal pathogens cannot cause disease. There is a slight amount of resistance in the population of American beech to the scale insect, but it is not known how or whether this resistance can be practically exploited. Therefore, wherever American beech grows on the CNF, American beech would be considered susceptible to mortality from beech bark disease. However, impacts would vary depending on the density of beech. American beech occurs as a minor component in cove or upland hardwood stands and as a significant component of northern hardwood communities. This disease would result in mortality wherever beech occurs but would have the most impact in the northern hardwood communities. Northern hardwood forests occupy about 17,000 acres of the CNF, less than three percent of the total forest acres.

16.2.2 Direct/Indirect Effects

There are currently no known management actions that would reduce or eliminate the beech scale or beech bark disease. The trend of increased damage to American beech caused by this disease will continue for all alternatives.

16.2.3 Cumulative Effects

Decline in beech scale populations will occasionally occur over large areas suggesting that environmental factors would affect the insect. This disease is expected to increase for all alternatives. Currently, no monitoring program specifically addresses this disease and detection of beech mortality will rely on general detection flights conducted annually.

16.3 Butternut Canker

16.3.1 Affected Environment

This disease, caused by a non-native fungus (*Sirococcus clavigigenti-juglandacearum*), was introduced as early as the mid-1960s. During the past 30 years the disease has killed 90 percent of the butternut population (SAMAB 1996). There may be some resistance to the disease but most trees are susceptible. The butternut population is currently very sparse due to natural distribution of the species and mortality caused by this disease.

16.3.2 Direct/Indirect Effects

This LMP revision has no proposed treatments that would impact butternut. All alternatives will allow for Forest Health Protection and cooperators to identify, protect, and propagate individuals that exhibit adequate levels of resistance.

16.3.3 Cumulative Effects

Environmental conditions appear to have no impact on butternut canker and the incidence of this disease will likely continue and become more prolific for all alternatives. Butternut canker will continue to result in mortality of butternut trees regardless of management practices. The development and propagation of resistant strains of butternut is the only management action currently having positive results. All alternatives will allow for this to continue.

16.4 Dogwood Anthracnose

16.4.1 Affected Environment

Dogwood anthracnose (*Discula destructive*) was first observed in the U.S.A in Washington State in 1976 and in New York two years later. The disease has spread rapidly down the Appalachians, primarily on *Cornus florida*, eastern flowering dogwood. Infection begins as leaf spots that may enlarge to kill the entire leaf. The fungus also infects twigs and spreads to the main stem. Later, the main stem of the infected tree develops cankers and epicormic shoots along the entire length. Stem cankers are capable of killing dogwoods, however, larger trees often die two to three years after the first symptoms are observed due to the stress of repeated defoliation.

Dogwood is an important understory and midstory species in many forest communities on the CNF.

Infection occurs wherever dogwood occurs but is most likely to occur at higher elevations and on moist sites. Shade increases the risk of infection and mortality due to slower drying conditions. Also, southern or western aspects tend to have less severe infection, possibly because of drier conditions and more sunlight.

16.4.2 Direct/Indirect Effects

Dogwood will not be harvested on the CNF and would not be targeted for removal during site preparation treatments for reforestation. Disturbances and opening of forest stands promotes more rapid foliage drying, which could decrease disease spread and intensification. Risk of infection increases in stands where there would be full crown cover, high humidity, and poor conditions for foliage to dry.

Alternatives with the most disturbances would potentially provide additional sunlight and more favorable drying conditions that reduce the risk of infection to dogwoods in the understory of these forested communities. However, as the harvested areas regenerate and develop, canopy closure will occur, dogwood will again occupy an intermediate or overtopped position in the stand, and conditions more favorable to disease will return.

Open canopy conditions provide better drying conditions that result in reduced mortality to dogwood by the anthracnose fungus. The table below displays impacts that influence drying conditions to the midstory.

Table 3-87. Projected harvest acres per year by Alternative							
Alternatives	A	B	D	E	F	G	I
Acres thinned	200	200	200	200	200	200	200
Acres Regenerated	1,602	1,710	3,268	384	3,228	878	1,740

Alternatives D and F would have the most proposed harvest activity while alternatives E and G have the least. It would be expected that dogwood would have more favorable growing conditions in alternatives D and F. Some damage would occur to individual dogwood stems during harvest activities but sprouting and seedling development would occur.

16.4.3 Cumulative Effects

Dogwood mortality will continue on the CNF and on adjacent lands. Individuals that exhibit some resistance would continue to be identified by research and Forest Health Protection. No treatment for this disease exists for general forest conditions. Treatments and management practices for ornamentals and other high valued trees has improved survival rates for dogwoods in these settings. No alternative adequately addresses this disease and mortality from anthracnose will continue across the CNF.

16.5 Gypsy Moth

16.5.1 Affected Environment

Gypsy moth (*Lymantria dispar*) is a major defoliator of hardwood trees in both forest and urban landscapes. It was introduced from Europe into Massachusetts sometime between 1867 and 1869. Because the favored host, oak, is widespread in the eastern deciduous forests, gypsy moth thrives and continues to escape its range west and south each year. By the 1980's, gypsy moth was established throughout the northeast. Today the area considered generally infested includes parts of Virginia, just north of the CNF. Gypsy moth is projected to occur on the forest between the year 2010 and 2025 (SAMAB 1996). The CNF can anticipate gypsy moth attack on the north end of the forest as early as the year 2010 and for the south end of the forest as early as 2020.

Gypsy moth larvae feed on more than 300 species of trees, shrubs, and vines. Favored hosts include oak, apple, birch, basswood, witch hazel, and willow. Hosts moderately favored include maple, hickory, beech, black cherry, elm, and sassafras. Least favored hosts are ash, yellow poplar, American sycamore, hemlock, pine, spruce, black gum, and black locust. Feeding on less favored host plants usually occurs when high-density larval populations defoliate the favored tree species and move to adjacent, less favored species of trees to finish their development.

The adult gypsy moth female cannot fly, so natural spread is limited to the distance that larvae can disperse on wind currents. Other methods of dispersal include transport of gypsy moth life stages, including egg masses, over very long distances on vehicles, outdoor household articles, and nursery products. Transporting of moth life stages by humans has been responsible for isolated infestation ahead of the general infestation. In Tennessee, isolated populations have been established in Rhea, Washington, Grainger, Johnson, Sequatchie, Unicoi, and Monroe counties. Counties within the CNF are Washington, Johnson, Unicoi, and Monroe counties. All isolated populations have been treated to eradicate the isolated population.

Susceptibility to defoliation is defined as the likelihood of a forest stand being defoliated if an insect population is present (Smith 1962). A stand's susceptibility for gypsy moth defoliation is determined by species composition, site factors, and stand history. Susceptible stands are defoliated more frequently than resistant stands and in many years are the only stands supporting a gypsy moth population large enough to cause noticeable defoliation. Stands that are resistant to defoliation are not defoliated or may be defoliated only in years of epidemic conditions, especially when they are located adjacent to susceptible stands.

The single most important factor determining the susceptibility of a stand is species composition. Oak species are highly favored by gypsy moths. Stands that contain few susceptible species presumably would not support populations of young larvae and are resistant to defoliation. Conversely, stands with large numbers of susceptible species would support large gypsy moth populations. The following classification of trees preferred by gypsy moth is the result of the 1986 defoliation on the western Pennsylvania Allegheny Plateau.

Table 3-88. Species preference for Gypsy Moth Defoliation (Fosbroke and Hicks 1989)

Immune	Resistant	Susceptible
Serviceberry	Black Birch	White Oak
Yellow-poplar	Red Maple	Northern Red Oak
	Other Hardwood	Scarlet Oak
	Sugar Maple	Chestnut Oak
	Black Cherry	Black Oak
	Softwoods/Pine	

Other factors that characterize susceptible sites are slow growth, frequent drought stresses, and low foliage biomass. Dry, rocky ridge tops with shallow soils are prime examples of susceptible sites. Disturbances also are common in susceptible stands. Frequent fire, heavy cutting, slash disposal, grazing, windthrow, and ice storm damage are just a few of the disturbances associated with susceptible stands. Larvae also use human-made refuges such as signs, fences, buildings, and trash.

Tree mortality depends on the condition of the tree and the number of consecutive defoliations. The proximal cause of death is oak decline, a disease that can be initiated or exacerbated by defoliation. The most severe losses occur in stands with high-risk oak decline attributes and suffering from recent drought stress.

Although species vary in their ability to recover from gypsy moth defoliation, most would succumb after a few years of repeated attack. In some stands, trees die after several years of defoliation while in others a single defoliation would kill trees. Species composition and tree vigor are the major factors in tree mortality caused by gypsy moth defoliation.

Tree mortality from gypsy moth infestations would be most significant for oak and mixed oak-pine communities. Dry and xeric sites occupied by oak would be impacted more than other sites. This includes the following forested communities found on the CNF:

Table 3-89. Acres by community types most susceptible to GM damage for the CNF

Dry to Mesic Oak	Dry and Dry to Mesic Pine Oak	Dry and Xeric Oak
126,138 acres	61,080 acres	69,836 acres

Southern Region Forest Health Protection staff at the Asheville, NC field office have developed a gypsy moth vulnerability rating system (GMV) that classifies the likely severity of mortality in forest stands after gypsy moth defoliation (SAMAB 1996). The rating system uses information contained in the CISC that are also important in oak decline risk rating. These variables include forest cover type, forest condition class, site index, and age of the forested community. It applies five categories for risk of mortality in the event of gypsy moth defoliation, Unaffected, Low, Moderate, High, and Extreme. Risk ratings for the CNF are as follows:

Table 3-90. Current Conditions for gypsy moth vulnerability

Risk Category	Acres	Percent of Total Forested Acres
Insufficient Data	83,934	13.5 %
Unaffected	26,963	4.3 %
Low	43,869	7.1 %
Moderate	171,736	27.6 %
High	158,142	25.4 %
Extreme	137,055	22.1 %

16.5.2 Direct/Indirect Effects

Gypsy moth defoliation for the CNF is approximately eight to 12 years away. All alternatives provide for suppression of gypsy moth but due to high costs and concerns for aerial application of insecticides only small portions of the CNF would potentially be treated. Populations are controlled by disease epidemics caused by fungal and viral pathogens. Priorities for control through the application of insecticides would be for areas of high value such as developed recreation sites or administrative areas. Suppression in the general forest could occur in the future.

Impacts would be most severe for oak and mixed oak upland hardwoods communities. Outbreaks would be most severe in areas of the forest that would have been under drought conditions, have received damage from fire, or possible wind damage. Long-term losses following gypsy moth outbreaks would be more

visible in forested communities that have a component of scarlet oak and black oak, especially on well drained soils. Defoliation from GM that occurs 2-3 years concurrently will result in greater tree mortality than infestations that occur intermittently. Where defoliation occurs, mast crops may decline or fail for the current year in white oak, and possibly two years for red oaks.

Factors that are managed and result in changes to gypsy moth vulnerability would be stand condition class, species composition, and stand age. Achieving early successional objectives proposed for each alternative would provide opportunities to change vulnerability based on these three factors. The table below displays acres and percent of total forested acres by risk category that result from the establishment of early successional acres as proposed by each alternative. These acres and percentages can be compared to current conditions in Table 3-91 above.

Table 3-91. Gypsy Moth Vulnerability in year 2017

Risk Category	Low	Moderate	High & Extreme
Alt A	43,869 Ac (7%)	134,866 Ac (22%)	316,051 Ac (51%)
Alt B	39,595 Ac (6%)	130,592 Ac (21%)	133,784 Ac (52%)
Alt D	43,869 Ac (7%)	134,866 Ac (22%)	121,718 Ac (48%)
Alt E	42,069 Ac (7%)	133,096 Ac (21%)	137,098 Ac (53%)
Alt F	43,869 Ac (7%)	134,866 Ac (22%)	121,916 Ac (48%)
Alt G	41,675 Ac (7%)	132,672 Ac (21%)	135,864 Ac (53%)
Alt I	39,519 Ac (6%)	130,516 Ac (21%)	133,708 Ac (52%)

Currently, there are approximately 295,000 acres in the High and Extreme vulnerability groups or about 47 percent of the total forested acres. Even if early successional objectives are achieved in the first period, seven out of nine alternatives would have more than 50 percent of the forested acres rated as High and Extreme vulnerability to gypsy moth. As forest communities get older, the more vulnerable they become. Even with projected harvest activities for each alternative the number of acres moving from the moderate level to the High and Extreme Level maintains the High and Extreme level above 50 percent. Alternatives with the highest level of High and Extreme acres would be C, E, G, and H. The lowest number of acres projected in the High and Extreme group would be found in alternatives D and F.

As the active front of gypsy moth infestation approaches the CNF, mortality for susceptible forest types would be overwhelming. Defoliation and mortality would be especially heavy for older, upland oak sites during drought years.

The mortality of canopy trees would result in an increase in understory vegetation. The effect is relatively short-lived. This vegetation provides forage and cover for some wildlife species, such as deer.

16.5.3 Cumulative Effects

Increasing recreational use of national forests, national parks, and state parks in east Tennessee provides opportunities for isolated infestations of gypsy moth ahead of the generally infested area now located in Virginia. As in the past, isolated infestations would be treated through the Slow The Spread (STS) program on all

ownerships to eradicate the isolated population. The STS pilot project (FY 1993-99) demonstrated that the rate of spread of the gypsy moth would be reduced at least 60 percent by treating these isolated infestations. Trapping of male moths would continue on the CNF to monitor isolated populations.

A small isolated population of gypsy moth was detected on private lands in Monroe County, located on the south zone of the CNF. In 2002 this small isolated infestation was treated to eradicate the population. Continued monitoring will provided information on the population and treatment would continue until it is determined the population has been eradicated.

The general infestation of gypsy moth is projected to impact upper east Tennessee as early as 2010 and Southeast Tennessee by 2020. Possible responses to the general infestation range from no treatment, to aggressively implementing management strategies documented in the 1995 FEIS for Gypsy Moth Management in the U.S.A (SAMAB 1996).

Introductions of isolated populations ahead of the general infestation may require the use of insecticides to eliminate (or eradicate) and prevent the gypsy moth from becoming established on the CNF (here, eradication is being used as a delaying tactic by not allowing accidental introductions of GM to become established on a Forest ahead of the natural expansion of the range of this insect).

Gypsy moth impacts are most significant for stands in the oak, oak-pine, and pine-oak community types. Gypsy moth outbreaks will be more frequent and damage more severe on drier sites. Gypsy moth outbreaks associated with severe spring droughts can lead to relatively high levels of mortality in affected oak stands (>15% mortality following a single year of severe drought and defoliation; greater than 30 percent mortality following 2-3 years of severe drought and defoliation). Long-term losses following GM outbreaks will be more conspicuous in scarlet and black oak stands on excessively drained soils. Outbreaks that cause defoliation for 2-3 years in a row will lead to more severe levels of damage to affected stands and outbreaks that recur in the same stand after very short intervening time intervals will lead to greater levels of damage. Mast production would potentially decline or fail in affected oak stands during and following GM outbreaks.

Young, thrifty oak stands will tolerate GM outbreaks somewhat better than older oak stands, although young stands would potentially be defoliated to about the same level as adjacent mature stands. Management actions that reduce oak density will be most effective for stands where oaks comprise less than 50 percent of the stand, assuming that the other tree species would not favor hosts of the GM.

The table below displays forest communities that are vulnerable to gypsy moth infestation and portion of the host type proposed for harvest activities in the first decade by alternative. Harvest activities will regenerate stands with older trees to younger, more vigorous trees that better tolerate defoliation.

Table 3-92. Percent of community Acres Regenerated in first decade by Alternative							
Community Type	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Dry to Mesic Oak 126,138 acres	4.1%	4.4%	5.8%	1.6%	6.6%	2.5%	4.8%
Dry and Dry to Mesic Pine Oak 61,080 acres	6.3%	6.4%	23.5%	0%	18.3%	1.7%	7.8%
Dry and Xeric Oak 69,836 acres	1.4%	1.6%	5.2%	1.4%	3.6%	1.4%	1.5%

Alternatives D and F would have the largest impact on establishing oak stands that would better withstand defoliation from gypsy moth. Alternatives E and G would have the least impact on oak stands.

16.6 Hemlock Woolly Adelgid

16.6.1 Affected Environment

Hemlock woolly adelgid (*Adelges tsugae*) (HWA) was introduced into the eastern U.S.A from Asia in the early 1950's near Richmond, Virginia. The HWA was present on some exotic tree species that a private collector planted in his arboretum. The distribution of the HWA remained localized until the 1960's. The population has since spread throughout the Shenandoah Valley into the Blue Ridge Mountains of Virginia, North Carolina, South Carolina, Tennessee, Georgia and the northeastern U.S.A. Impacts to the host species *Tsuga canadensis* and *T. caroliniana,* eastern and Carolina hemlocks, respectively, are severe. The entire range of eastern hemlock is threatened and could be infested within 30 years. Infestation by the HWA has been detected on the north end of the CNF. There are also well established populations in North Carolina and the GSMNP adjacent to much of the CNF. The CNF can expect to see much of its hemlock infested in the near future.

Once infested, tree mortality usually occurs in less than seven years. Mortality is not restricted to any size or age of hemlock. This insect pest threatens the hemlock resource and also threatens the unique ecosystem it helps comprise. Hemlock provides habitat for a variety of plants and animals and helps to maintain stream temperatures for a variety of aquatic species.

16.6.2 Direct/Indirect Effects

The adelgid spreads predominantly by wind and birds. The CNF currently has one known isolated infestation located on the Watauga Ranger District. Infestation of the general Forest area would be expected in Tennessee in about ten years.

Biological control would be the most promising prospect for control of HWA, however, to date there are no known native predators capable of limiting HWA impact. Researchers continue investigating the native range of HWA for predatory insects. This work looks promising and soon there will be a treatment to control the adelgid by

release of predators. Control of the HWA on individual trees in the urban landscape would be accomplished using a number of insecticides including horticultural oils and insecticidal soaps, providing there would be access to the trees for ground spraying equipment and the entire crown would be saturated. There are no insecticide treatment options available for controlling HWA in the general forest environment.

There is no harvest activity proposed for Hemlock communities in any of the alternatives. However, hemlock would be harvested as an incidental tree occurring in other community types. Damage to hemlock by the HWA will continue for all alternatives.

The mortality of hemlock trees in the canopy would result in an increase in understory vegetation. The effect is relatively short-lived. This vegetation provides forage and cover for some wildlife species, such as deer.

Stream temperatures may rise until the canopy is restored.

16.6.3 Cumulative Effects

Hemlock woolly adelgid will continue to spread across the Southern Appalachian Forests and is expected to infest east Tennessee in about ten years. There is currently no detection method in place and isolated populations may be present on all ownerships in east Tennessee. Isolated infestations would be treated on the CNF, especially in areas where hemlock is important in recreation areas and where water temperature would be an important component of the aquatic habitat.

16.7 Oak Decline

16.7.1 Affected Environment

Oak decline is a disease complex involving environmental stress such as drought, root disease (e.g. *Armillaria* root disease *(Armillaria* spp.), and insect pest of opportunity (e.g. two lined chestnut borer (*Agrilus billineatus*), and physiologically mature trees (SAMAB 1996). Oak decline is a natural ecosystem process that has always affected some component of the forested landscape in the Southern Appalachians. Susceptible trees die within a few years after dieback exceeds one-third of the crown volume.

Factors that determine oak decline risk are forest type (oak density), site productivity (site index), age, and stress factors such as spring defoliation and drought. The highest risk conditions are stands with a large oak component (especially red oak) of advanced age, growing on sites of average or lower productivity, and with a recent defoliation history and prolonged growing season drought. Using forest type, age, and site productivity, risk levels can be predicted (Oak and Croll, 1995). A rating system has been developed by Forest Health Protection (Table 3-93) and is used to estimate the percent of total acres by risk category for current conditions on the CNF.

Table 3-93. Upland hardwood acres for CNF within 4 Oak Decline Risk categories.		
RISK CATEGORY	UPLAND HARDWOOD ACRES	PERCENT OF TOTAL FOREST ACRES
Insufficient Data	25,898 Ac	10%
Unaffected	59, 404 Ac.	23%
Other Damage	5,824 Ac	3%
Decline Damaged	77,390 Ac.	30%
Vulnerable	87,955 Ac.	34%
TOTAL	256,471 Ac.	100 %

16.7.2 Direct/Indirect Effects

Oak decline risks variables amenable to management action on tree species composition, and stand age. Risk could be reduced by favoring non-oak species in partial cuts of various types, but oaks are a critical wildlife habitat component and their removal carries undesirable consequences. Reducing stand age through harvest and regeneration of oak forest types provides the best opportunity for reducing risk. This would be accomplished by meeting early successional objectives and desired conditions in management prescriptions with these objectives. The tables below displays harvest acres by community types that are predominantly oak on dry sites.

Table 3-94. Projected harvest acres for Oak community types, by alternative for the first planning period (10 years).							
	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Dry Mesic Oak	5,171ac	5,590ac	7,320ac	2,020ac	8,284ac	3,129ac	6,043ac
Dry Mesic Oak Pine	3,846ac	3,896ac	14,357ac	47ac	11,181ac	1,037ac	4,766ac
Dry Xeric Oak	1,000ac	1,144ac	3,629ac	1,000ac	2,748ac	1,000ac	1,051ac
Totals	10,017ac	10,630ac	25,306ac	3,067ac	22,213ac	5,166ac	11,860ac

Alternatives that provide the most opportunities to reduce the risk of oak decline by shifting stand age is alternatives D and F. Alternatives E and G provide the fewest opportunities to reduce oak decline risks.

Oak decline potential for the CNF is widespread and no alternative would adequately address risk at the landscape scale over the short-term. Management actions would potentially lower risk locally and a sustained effort over the long-term will gradually lower the risk across the CNF. Prescribed fire on upland oak sites will provide needed disturbance to regenerate oak through sprouting of top killed stems, creating

adequate seedbeds for acorns, and control competing vegetation for established seedlings.

16.7.3 Cumulative Effects

Oak decline will continue to be a forest health issue in the Southern Appalachians, especially on NFS lands because they have a higher incidence of older, oak-dominated stands. Oaks would not be eliminated from decline areas but their numbers are and would continue to be reduced. Oak diversity will also decline because of greater susceptibility of the red oak group to decline compared with the species in the white oak group. In the absence of restoration/reforestation treatments, including prescribed fire, much of the oak component will be replaced by other species already present in competitive positions in the understory. Oak will most likely be replaced by red maple, blackgum, rhododendron, and mountain laurel.

The loss of oak will have effects on ecosystem structure and function. Structure becomes more complex as canopy density is reduced and the number of small openings increases. The number of snags and down wood will also increase. Overall susceptibility to decline and gypsy moth defoliation will be reduced due to fewer and smaller, more vigorous oaks. Hard mast production will continue to be reduced in quantity, quality, and diversity as oak decline incidence increases across the CNF.

16.8 Southern Pine Beetle

16.8.1 Affected Environment

The SPB (*Dendroctonus frontalis* Zimmermann) is the most destructive pine bark beetle in Tennessee and the southern U.S.A (USDA Handbook #575). Pine trees are killed singly, in small groups, or in large numbers, sometimes exceeding hundreds of acres. The SPB is a native pest to the South and occurs in small numbers (endemic) until outbreak or epidemic population levels develop. Infestations can develop into outbreak levels when pine forests are stressed by crowded growing conditions, trees are damaged from ice or wind, during drought conditions, or when stands are considered biologically mature. These stress conditions can often prevent the tree from producing adequate resin flow to "pitch out" the attacking insect, which is the tree’s main defense in a SPB attack. Once pine stands are weakened, they become more susceptible to attack by SPB. Once populations develop in weakened trees, the beetles may spread to healthy trees that normally would resist attack. When beetle populations become large (epidemic), they can successfully attack healthy, vigorous trees and result in widespread mortality. Natural enemies, including diseases, parasites, and predators (primarily the clerid beetle) can help maintain beetle populations at endemic levels. However, these forces seem to have relatively little effect during the early stages of an epidemic when SPB populations explode faster than parasite and predator populations respond to the availability of new host beetle levels. Ultimately, however, these biocontrol agents catch up with and actually exceed the abundant host beetles (food source) and contribute to the collapse of the epidemic. Most major outbreaks last three to five years and occur in irregular cycles of about seven to ten years, sometimes longer in the mountain region.

The SPB attacks all species of pines including white pine, but prefers loblolly, shortleaf, Virginia, and pitch pines all of which are native to the CNF. Pine is a significant component of the forested communities on the CNF and represents large portion of the CNF. To help land mangers reduce stand susceptibility, hazard rating systems have been developed throughout the southeastern U.S.A. In the southern Appalachians, the Mountain Risk System is recommended by Forest Health specialists. A SPB Event monitor for use with the Forest Vegetation Simulator (FVS) has been developed to model the interaction of vegetation management and risk of SPB outbreaks (Courter 2002). This risk of a SPB event is but one of the many variables modeled by this program. Stands are categorized as either Low-, Moderate-, or High-Hazard. The table below displays SPB host types for the CNF.

Table 3-95. SPB Host types by community, CISC forest types, acres, and percent of total forested acres for CNF

CISC Forest Types	Community Type	Acres	Percent of Total Forested Acres
White Pine (3,9,10)	Conifer/Northern HdWd	45,148	7.2 %
Shortleaf Pine (32,12)	Xeric Pine and Pine-Oak	30,105	4.8 %
Loblolly Pine (31)	Xeric Pine and Pine	1,167	0.2 %
Pitch Pine (38,15)	Xeric Pine and Pine	29,314	4.7 %
Virginia Pine (33,16)	Xeric Pine and Pine	73,244	11.7 %
Table Mtn. Pine (39,20)	Xeric Pine and Pine	10,094	1.6 %
TOTAL		189,172	30.2 %

16.8.2 Direct/Indirect Effects

The CNF is currently at the end of the most destructive SPB outbreak known in the history of the CNF. The current infestation began in 1999 and new attacks and spot growth continue to occur in October of 2002. This outbreak population has heavily impacted all pine communities and attacks have been recorded in hemlock and red spruce. Current estimates indicate that between 40,000 and 60,000 acres of host type have been lost to SPB during this outbreak. This is between 23 percent and 35 percent, respectively, of the total host type acres for the CNF.

Data for this LMP revision does not reflect pine mortality resulting from the current outbreak. The outbreak will result in changes to species composition, age, and condition class of pine communities. Discussion of direct and indirect effects would be based on data prior to the current outbreak.

Factors important to SPB susceptibility are presence of host type, age, stand density, and environmental conditions like drought. Factors influencing SPB attack, that would be readily available for analysis, are host type (forest type) and stand age. Stocking data to determine stand density is available for only a small portion of the CNF. There is about 190,000 acres of SPB host type on the CNF and over 62 percent of these acres are over 60 years old. About 30 percent is over 80 years old, making them very vulnerable to SPB attack.

Proposed treatments that will influence change in forest cover type and ages of host type communities is restoration of pure pine communities to more naturally occurring mixed communities like southern yellow pine and upland hardwoods. This is especially true for Virginia pine where it occurs as dense, pure pine stands. These communities are very vulnerable to SPB attack and many acres of this type have been lost in the recent SPB outbreak. Goals for restoration of damaged stands and reforestation of harvested stands will achieve a mixture of pine and upland hardwood that will reduce SPB vulnerability by introducing younger, more vigorous pines and reducing pine density. The table below displays restoration/reforestation opportunities in pine communities by alternative.

Table 3-96. Acres of proposed pine restoration/reforestation by alternative per decade

Community Type	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Conifer/ HdWd	765ac	453ac	1370ac	674ac	1078ac	744ac	747ac
Xeric Pine and Pine Oak	1,000ac	1,197ac	1,157ac	1,000ac	1,607ac	1,000ac	1,000ac
Totals	1,765	1,605	2,527	1,674	2,685	1,744	1,747

The current outbreak has left large acreages of dead pine presenting many opportunities for restoration to healthy and more diverse mixed pine hardwood communities. Alternatives D and F provide the most opportunities to reduce risk of future SPB infestations while all the other alternatives provide about 30 percent less than D and F.

The mortality of canopy trees would result in an increase in understory vegetation. The effect is relatively short-lived. This vegetation provides forage and cover for some wildlife species, such as deer.

16.8.3 Cumulative Effects

Southern pine beetle impacts all ownships that have pine communities. The current infestation has devestated pine communitties on non industrial private lands, industry lands, national park service lands, state lands, and adjacent NFS lands. Since 1999 and especially in 2001 and 2002 private lands adjacent to the CNF, have harvested large areas of pine due to SPB. This outbreak has greatly reduced the amount of mature pine communities on the CNF and adjacent private lands. On much of the SPB damaged land regeneration will occur naturally with little or no site preparation to influence species composition. Where no site preparation, including fire, is used, a shift in species composition is expected. Where red maple, black gum, and mountain laurel are present in the midstory and understory they will develop and occupy canopy positions in the new stand.

16.9 Storm Damage

16.9.1 Affected Environment

Storm damage to trees from tornadoes, hurricanes, snow or ice loading with or without wind, is similar. These stresses cause hardwoods and pines to break off, split, be root sprung, bend and suffer branch and foliage losses. Stresses appear to be much the same, regardless of storm type. Tree crown configuration; age (old, large trees suffer greater damage); size and limberness of stems; branching habit; lean of bole; anchorage based on rooting characteristics and soil; and the presence of root and stem diseases have as much or more to do with tree damage as the intensity of the storm itself.

Elevation can be important in the case of ice and snow damage. Frequently, a variation of one or two degrees in air temperature can result in bands of varying damage on the same hillside at different elevations, depending on the temperatures there at the time of precipitation. However, even here, pre-storm management to minimize damage is not possible because of the natural randomness of weather patterns.

Damage-producing storms appear to have increased in frequency. Major damage has occurred about every four years on Southern Appalachian Forests since the 1980s. Areas affected ranged in size from 100 to 17,000 acres. Affected areas may become larger in the future, as more susceptible older forests are a major component of desired conditions.

Salvage or slash-down of storm-damaged trees and, in some cases, other surrounding trees can be important for several reasons: 1) to reduce safety hazards to visitors and employees; 2) to reduce the possibility of and intensity of fires that would endanger human life, wildlife, rare plants and property; and 3) reduce the possibility of insect and disease outbreaks in residual trees and surrounding stands.

16.9.2 Direct/Indirect Effects

Older forests would be more likely to suffer damage from storms because of larger crowns, larger limbs, and higher incidence of root and stem diseases. Forests over 60 years of age make up about 77 percent of the forested acres on the CNF and would be considered more susceptible to storm damage than younger stands. Storm damage would result in additional stresses to individual trees increasing susceptibility to insects and diseases and in some cases establishing a foot hold for outbreak or epidemic conditions.

The table below displays proposed annual harvests by alternative for the first decade. Proposed harvest acres would come from older age classes.

Table 3-97. Projected harvest acres per year by Alternative

Alternatives	A	B	D	E	F	G	I
Acres thinned	200	200	200	200	200	200	200
Acres Regenerated	1,602	17,097	3,268	384	3,228	878	1,740

Table 3-97. Projected harvest acres per year by Alternative							
Alternatives	A	B	D	E	F	G	I
Total Acres	1,802	19,097	3,468	584	3,428	1,078	1,940

Alternatives D and F would potentially have the most harvest activity while alternatives E and G have the least. None of the alternatives would affect the overall percentage of older forests for the CNF.

Alternatives where objectives include the creation of early successional habitat younger stands, there would be less overall storm damage because younger trees would be damaged less severely and in many cases survive, grow, and mature.

16.9.3 Cumulative Effects

Damage resulting from storms such as ice, snow, and wind would be more likely on national forests and national parks and less likely on state and private lands. State and private lands would generally have less acreage in older forests conditions. Additional stresses resulting from storm damage would potentially be more likely on national forest and national park lands than other ownerships.

RESOURCE MANAGEMENT PROGRAMS

17.0 RECREATION RELATED PROGRAMS

17.1 Developed and Dispersed Recreation

17.1.1 Affected Environment

National forests provide over 191 million acres of public land within the U.S.A. National Forests in the Southern Appalachian region contribute approximately four million acres to the national total and provide unique settings for a variety of outdoor recreation activities such as primitive and developed camping, hunting, fishing, hiking, backpacking, horseback riding, off-highway vehicle (OHV) driving, canoeing/kayaking and whitewater rafting as well as picnicking, sightseeing, nature watching and walking or driving for pleasure.

Market Area

Market areas have been established for different national forests to better evaluate public demand for recreation opportunities. Past research has demonstrated that most national forest visits originate from within a 75-mile (1½ hour driving time) radius. Therefore, the market area has been defined as all counties that fall within a 75-mile straight-line radius from a forest border. (*Cherokee, Nantahala & Pisgah National Forests Recreation Realignment Report* Overdevest and Cordell, 2001).

The market area for the CNF includes the market areas defined for the Nantahala and Pisgah National Forests in North Carolina. These market areas were combined in recognition of shared local markets and similar geography and demographic patterns. (Cordell, 2001). The largest cities within this shared market area include Atlanta, Knoxville, Chattanooga, Charlotte and Winston-Salem.

Opportunities for outdoor recreation are not limited to national forests within the shared market area. CNF currently provides 639,930 acres of public land in east Tennessee. Great Smoky Mountains National Park divides the CNF into two separate sections with the southern section being located closer to urban populations. Other public lands that connect and expand the range of recreation opportunities include the Blue Ridge Parkway, congressionally designated National Recreation Areas, state parks as well as state designated wildlife management areas.

The A.T. provides a unique long distance hiking opportunity across GSMNP and several national forests including Cherokee, Pisgah, Nantahala, Chattahoochee-Oconee and George Washington & Jefferson National Forests. (Refer to Special Areas section on page 351 for further discussion of the A.T.) The establishment of Cumberland Trail State Park is a recent response to a growing demand for additional long distance trails similar to the A.T. When completed, this linear state park will span 230 miles through ten Tennessee counties from Cumberland Gap National Historic Park on the Tennessee-Virginia-Kentucky border, to the Signal Point near Chattanooga.

Other Tennessee State Parks like Fall Creek Falls provide higher levels of accommodation for visitor comfort and convenience. Lodges, stores, golf courses, swimming pools and restaurants are examples of facilities often found at state parks, but typically not provided on national forests.

Tennessee Valley Authority (TVA) manages the majority of water-based recreation opportunities within the market area and on CNF. The lakes and rivers in east Tennessee attract people to pursue a variety of activities such as fishing, whitewater rafting, kayaking and motor boating. The release of water to meet demand for recreational use versus generating power is a continual issue for managers.

Recreation Demand & Trends

Recreation demand is a complex relational mix of people's desires and preferences, availability of time, price, and availability of facilities. The evaluation of current and future demand for recreation on the CNF is based on recent surveys that identify and quantify:

- Estimated number of current recreation visits to the CNF
- Participation rates for recreation activities within the forest market area
- Future activity demand based on projected population growth
- Activity demand by demographic strata.

The recent National Visitor Use Monitoring (NVUM) effort by the Forest Service provided baselines for estimating current use of recreation sites on CNF. These numbers only account for people visiting developed or dispersed sites for the purpose of engaging in a recreation activity. They do not include the millions of people that drive through the national forest.

Table 3-98. Baselines for Recreation Use on CNF	
Type of Recreation Areas	Current Percentage of Total Estimated National Forest Recreation Visits
Day-Use Developed Sites	26%
Overnight-Use Developed Sites	10%
Wilderness (Dispersed Sites)	4%
General Forest Areas (Dispersed Sites)	60%
Total Estimated Annual Visits	100% (1,365,527 visits)

Based on the NVUM data, "developed recreation" areas on the CNF accommodate approximately 36 percent of the total estimated recreation visits. The remaining 64 percent of recreation visits can be defined as "dispersed recreation" that occurs away from developed sites primarily in general forest areas and designated Wilderness.

During a forest visit, people within the defined market area engage in a variety of activities related to either developed or dispersed recreation. Table 3-99 lists the most popular activities and identifies trends in public demand. Participation rates are based on the National Survey on Recreation and the Environment (NRSE), an on-going national telephone survey sponsored by the USDA FS.

Table 3-99. Number of People (in millions) over 16 years old Participating in Recreation Activities in the CNF Market Area with Projected Increase over next 50 years

Recreation Activity	2001 Participation Rate*	2000 # Of People	2010 increase *	2020 increase *	2030 increase *	2040 increase *	2050 increase *
View/photograph nature or scenery	63%	5.76	15% 6.62	31% 7.54	48% 8.53	66% 9.56	86% 10.71
Picnicking	58%	5.32	11% 5.91	23% 6.54	37% 7.29	53% 8.14	71% 9.10
Driving for pleasure	58%	5.28	15% 6.07	31% 6.92	48% 7.81	66% 8.76	86% 9.82
View natural vegetation, trees	47%	4.34	15% 4.99	31% 5.69	48% 6.42	66% 7.20	86% 8.07
View wildlife	47%	4.31	15% 4.96	31% 5.65	48% 6.38	66% 7.15	86% 8.02
Visit historic site	47%	4.28	22% 5.22	47% 6.29	77% 7.58	113% 9.12	155% 10.91
Swimming in streams, lakes	43%	3.92	6% 4.16	13% 4.43	20% 4.70	29% 5.06	41% 5.53
View birds	35%	3.22	15% 3.70	31% 4.22	48% 4.77	66% 5.35	86% 5.99
Visit wilderness or primitive area	35%	3.19	25% 3.99	57% 5.01	96% 6.25	108% 6.64	171% 8.64
Day hiking	34%	3.10	19% 3.69	38% 4.28	59% 4.93	78% 5.52	94% 6.01
Gather berries, mushrooms, etc.	31%	2.86	15% 3.29	31% 3.75	48% 4.23	66% 4.75	86% 5.32

Table 3-99. Number of People (in millions) over 16 years old Participating in Recreation Activities in the CNF Market Area with Projected Increase over next 50 years

Recreation Activity	2001 Participation Rate*	2000 # Of People	2010 increase *	2020 increase *	2030 increase *	2040 increase *	2050 increase *
Warm water fishing	29%	2.66	9% 2.90	17% 3.11	24% 3.30	26% 3.35	26% 3.35
Motor boating	27%	2.49	1% 2.52	3% 2.56	6% 2.64	11% 2.76	17% 2.91
View/photograph fish	24%	2.18	15% 2.51	31% 2.86	48% 3.27	66% 3.62	86% 4.05
Developed Camping	22%	2.04	27% 2.59	60% 3.26	98% 4.04	144% 4.98	201% 6.14
Drive off-road	20%	1.89	5% 1.98	10% 2.08	16% 2.19	23% 2.32	34% 2.53
Coldwater fishing	18%	1.64	9% 1.78	17% 1.92	24% 2.03	26% 2.07	26% 2.07
Mountain biking	18%	1.63	12% 1.83	26% 2.05	42% 2.31	61% 2.62	83% 2.98
Primitive camping	16%	1.48	-2% 1.45	0% 1.48	0% 1.48	5% 1.55	0% 1.48
Rafting	11%	1.03	5% 1.08	9% 1.12	16% 1.19	30% 1.34	51% 1.56
Backpacking	11%	0.98	23% 1.21	57% 1.54	96% 1.92	108% 2.04	171% 2.66
Water Skiing	10%	0.87	1% 0.88	3% 0.90	6% 0.92	11% 0.97	17% 1.02
Small-game Hunting	9%	0.83	97% 1.64	93% 1.60	89% 1.57	83% 1.52	76% 1.46
Big Game Hunting	8%	0.77	97% 1.52	93% 1.49	89% 1.46	83% 1.41	76% 1.36
Horseback riding on trails	8%	0.73	9% 0.83	19% 0.90	27% 0.97	30% 0.99	31% 1.00
Canoeing	7%	0.67	5% 0.70	9% 0.73	16% 0.78	30% 0.87	31% 0.88
Kayaking	2%	0.19	5% 0.20	9% 0.21	16% 0.22	30% 0.25	31% 0.25
Migratory bird hunting	1%	0.10	97% 0.20	93% 0.19	89% 0.19	83% 0.18	76% 0.18

*Participation rates based on *Cherokee, Pisgah, Nantahala National Forests Recreation Realignment Report,* Overdevest and Cordell, 2001. Projections based on *Outdoor Recreation in American Life, A National Assessment of Demand and Supply Trends,* H. Ken Cordell, Principal Investigator, 1999 with the projections converted to a base year of 2000 instead of original base year of 1995.

Demographic information collected within the market area also revealed trends affecting recreation demand. As a large segment of the American population ages, demand is growing for less physically challenging activities such as viewing wildlife and driving for pleasure. The desire for easier access to facilities and forest settings is increasing as the physical abilities of the aging population decreases.

Household sizes of two persons, one person and four persons are becoming more typical. Smaller families, couples and individuals seem to enjoy dispersed recreation activities such as fishing, backpacking and visiting wilderness or other primitive

areas. Demand for facilities that accommodate family reunions and social gatherings may increase as people seek opportunities to connect themselves with larger groups in natural settings.

As population in the market area continues to grow and be developed, public lands such as CNF will increasingly be seen as a place of relaxation, a quiet retreat from the built community. As forest recreation demands grow, recreation activities are likely to conflict more with each other especially on trails, in backcountry, at developed sites, on lakes, streams, whitewater, and on roads and their near by environs. (Cordell, 2001).

RECREATION OPPORTUNITY SPECTRUM

Recreation Supply

For planning purposes, recreation supply is defined as the opportunity to participate in a desired recreation activity in a preferred setting to realize desired and expected experiences. Recreationists choose a setting and activity to create a desired experience.

Three components of supply are settings, activities and facilities. The USDA FS manages a supply of settings and facilities. *The Southern Appalachian Assessment Social, Cultural, Economic Technical Report* (SAA).

The ROS is a planning tool used to identify and evaluate the supply of recreation settings on national forests. Five ROS classes have been inventoried on the CNF. These settings include Primitive (P), Semi-Primitive Non-Motorized (SPNM), Remote Roaded Natural (RN2), Roaded Natural (RN1) and Rural (R).

Primitive (P) is the most remote, undeveloped recreation setting available on the CNF. These settings are generally located three miles or greater from any open road and 5,000 acres or larger in size. Primitive ROS class is limited to areas managed under the Wilderness Act on the CNF. Wilderness areas have been assigned the Primitive management objective even though they may not meet the requirements for size and distance from roads.

Designated Wilderness areas currently range in size from 2,573 to 16,226 acres and do not contain any open roads. With few exceptions, the wilderness acts prohibit the use of mechanized equipment and motorized transport for recreational use, search and rescue, resource protection, trail construction, and maintenance. Groups of visitors are often limited to a specific size to create a sense of isolation and solitude.

Semi-Primitive Non-Motorized areas are generally less remote and can be as small as 2,500 acres in size and only a half-mile or greater from any open road. These settings accommodate dispersed, non-motorized recreation such as hiking, biking, hunting and horseback riding.

Remote Roaded Natural (RN2) is a sub classification of Roaded Natural and accounts for areas on the CNF that either buffer SPNM areas or stand alone as tracts of land 1,500 acres or larger with a low road density of 1.5 miles of road/1,000

acres. Inventoried RN2 areas are managed to provide additional semi-primitive recreation settings either motorized or non-motorized.

Roaded Natural (RN1) is a subclassification of Roaded Natural. Settings are located within a half mile of an open road. These settings include the majoity of developed recreation sites such as campgrounds, picnic areas and river access points. RN1 also accounts for undeveloped, but highly roaded settings popular for dispersed recreation activities such as hunting, fishing, camping and horseback riding.

Rural (R) settings represent the most developed sites and modified natural settings on the forest including the Ocoee Whitewater Center constructed for the 1996 Olympic Whitewater Venue. The majority of the rural settings are provided on private land with the national forest serving as mountainous backdrop for rural development and agriculture in the valleys.

Table 3-100. Current Distributions of ROS Classes on the CNF

Recreation Opportunity Spectrum Class	Current Percentage Of National Forest	Current Inventoried Acres
Primitive (P) - Wilderness on CNF	10%	66,661
Semi-Primitive Non-Motorized (SPNM)	12%	75,294
Remote Roaded Natural (RN2)	26%	167,473
Roaded Natural (RN1)	52%	330,302
Rural (R)	<1%	200
Total	100%	639,930 Acres

The Southern Appalachian Assessment Social, Cultural, Economic Technical Report (SAA) states that in the Southern Appalachian region approximately 45 percent of the region is in Rural Setting, 24 percent in Roaded Natural Setting, 18 percent in Urban, Suburban, or Transitional Setting, eight percent is considered Primitive or Semi-Primitive Setting. This indicates that Primitive and Semi-Primitive settings are in short supply. Great Smoky Mountains National Park, which divides the CNF into two sections, provides the largest Primitive setting in the region.

DEVELOPED RECREATION

A developed site is a discrete place containing a concentration of facilities and services used to provide recreation opportunities to the public and evidencing a significant investment in facilities and management under the direction of an administration unit in the NFS. Recreation sites are developed within different outdoor settings to facilitate desired recreational use such as camping or picnicking.

Developed recreation sites provide different levels of user comfort and convenience based on the assigned ROS setting. Development Levels range from 1 to 5, with Level 1 representing the most primitive, natural settings with minimal or no site amenities. Level 2 improvements are designed primarily for protection of site rather than comfort of users.

Level 3 sites such as Holly Flats Campground provide an equal amount of development for site protection and user comfort. These sites typically include a

vault toilet, designated campsites and a developed water source. Indian Boundary and Chilhowee Recreation Areas are examples of Level 4 campgrounds that offer more user conveniences including bathhouses, paved campsites and options for electric and water hook-ups.

The Ocoee Whitewater Center is the only Level 5 developed site on the CNF. Different levels of the development scale may be present within the same campground or recreation site. For example Loops A and B of a campground may offer electrical hook-ups, but Loop C does not. The inventoried development level of a recreation site represents at least 70 percent of the total facilities.

Supply of Developed Recreation Sites

The Forest Service defines the capacity of developed recreation sites in terms of "people at one time" a site can support (PAOTs). A campsite typically represents five PAOTs and a parking space at a day use site represents three PAOTs. Currently, there are over 90 developed sites managed by the CNF to accommodate different recreation activities. Table 3-101 and Table 3-102 illustrate the different types of facilities provided across the forest and their current capacity in PAOTs.

Table 3-101. Current Capacities of Day-Use Developed Areas on CNF

Type of Day Use Developed Areas	Total Number of Areas	Total Capacity (PAOT)
Picnic Areas	19	780
Beaches & Swimming Areas	4	605
Shooting Ranges	7	90
Parking areas, overlooks, historical & minor interpretive sites	6	355
Visitor Centers	1	755
Total Day-Use Capacity	37	2,585

Table 3-102. Current Capacities of Overnight-Use Developed Sites on CNF

Level of Campground	Total Number of Campgrounds	Total Capacity (PAOTs)
Level 2 Campgrounds	10 (Including 2 horse camps)	605
Level 3 Campgrounds	23 (Including 2 horse camps)	2,840
Level 4 Campgrounds	3	2,172
Total Overnight Capacity	36	5,617

In addition to facilities represented in the tables, there are 76 recreation residences located on the CNF primarily around Parksville Lake. Lake Ocoee Inn also operates on Parksville Lake under a special use permit, and four organizational camps have been established across the forest.

Many Level 2 campgrounds on the CNF have evolved over time in response to riparian resource degradation and sanitation concerns. These sites have been developed in areas of concentrated use mostly along popular river corridors. Site rehabilitation usually includes discreet delineation of campsites and parking areas as well as the provision of a vault toilet either temporary or permanent.

The number of Level 2 campgrounds and day-use sites on the CNF will likely increase as user controls become necessary to mitigate user impacts in popular dispersed sites. Presently, this trend is continuing with the Conasauga River and Spring Creek rehabilitation projects.

Public demand for campsites with a development level of 4 or 5 currently exceeds supply on the CNF especially on weekends. Many visitors desire sites that are more accessible and have options for water and electrical hook-ups. As older campgrounds are reconstructed accessible sites and utilities are being provided. Public use has increased at the upgraded sites, but total site capacity (PAOTs) has remained the same. PAOTs have only shifted from Level 3 to a higher level.

DISPERSED RECREATION

Dispersed recreation is defined as those activities that occur outside of developed recreation sites such as boating, rafting, hunting, fishing, hiking and biking. There are nearly 20 developed recreation sites that facilitate dispersed use of the forest such as trailheads and boat ramps.

Several rivers flowing west through the Appalachian Mountains provide unique recreation settings on CNF. The Nolichucky, Hiwassee, and Ocoee rivers all provide sections of whitewater for kayacking, canoeing and rafting. Other scenic rivers and creeks include the Elk, Tellico, Bald, North, and Conasauga Rivers and Citico and Beaverdam Creeks. Impounded lakes like South Holston, Watauga and Parksville provide flat-water bodies large enough to support motor boating and other recreation activities.

Over 600 miles of non-motorized trails traverse the forest including five nationally designated trails. Refer to Special Areas section for A.T. Motorized trails appropriate for OHVs are limited with less than 30 miles of designated motorcycle/ATV trails on the forest. Open roads with low maintenance levels have traditionally provided some opportunities for street legal motorcycles and 4WD vehicles to access remote, scenic settings on the CNF.

The Tennessee Wildlife Resources Agency has designated the entire national forest as a Wildlife Management Area (WMA) making it the largest WMA within the state. Royal Blue WMA in middle Tennessee is the second largest with 48,000 acres available for hunting and other popular dispersed recreation activities like horseback and OHV riding.

Table 3-103. Developed Access Points for Dispersed Recreation on CNF

Type of Developed Site	Total Number of Sites	Total Capacity (PAOT)
Trailheads	6	95

Table 3-103. Developed Access Points for Dispersed Recreation on CNF		
Type of Developed Site	Total Number of Sites	Total Capacity (PAOT)
River Access Points	5	455
Lake Boat Ramps	5	265
Fishing Sites	2	90
Total	18	905

Table 3-104. Miles of Non-Motorized Trails on CNF	
Type(s) of Non-Motorized Use Allowed	Existing Miles of Designated Trails
Hike only	449.2
Hike and Bike only	60.1
Hike and Horse only	20.6
Hike, Bike and Horse only	108.7
Total	638.6

Table 3-105. Miles of Motorized Multiple Use Trails on CNF	
Type(s) of Motorized Use Allowed	Existing Miles of Designated Trails
Motorcycle only	11.1
ATV only	0
Motorcycle and ATV only	17.7
Street Legal 4-WD, High Clearance Vehicles and Motorcycles only	207*
Total	235.8
*Street Legal Vehicle trails are defined as open NFS Roads with the road management objective Traffic Surface Level D and Maintenance Level 2. Less than 50 of the total 207 miles represented in Table 3-105. have traditionally been used as jeep trails and are typically 7 miles or less in length.	

Table 3-106. Acres of Current Fish and Wildlife Habitat Emphasis Areas	
Type of Fish & Wildlife Habitat Emphasis	Unit of Measure
General Big & Small Game Habitat (Equivalent to 7.E.2, 8.A.1, 8.C, 9.H 10.A, and 10.B)	407,150 acres
Early Successional Habitats (Equivalent to 8.B & 8.E.1)	78,085 acres
Stocked (Put & Take) Streams	67.8 miles of streams
Stocked (Put & Take) Reservoirs	13,600 acres

Management of dispersed recreation is becoming more complex as an increasing number of people depend on public land to provide settings for their preferred activities. The number of Southern private owners allowing the public to recreate on

their land has been decreasing over time. Increasing demands for off-highway vehicle use, hunting, fishing, and other consumptive recreational activities are likely to bring about more recreation participant/land owner conflicts overtime. (Cordell, 2001).

The Royal Blue WMA in middle Tennessee and Upper Tellico OHV area on the Nantahala National Forest provide more opportunities for legal OHV use than the CNF. However, overnight-use associated with the Upper Tellico OHV area on the Nantahala primarily occurs on the CNF to the extent of displacing visitors that have traditionally used the Tellico area for camping, fishing and other dispersed recreation activities.

Other areas on the forest have been evaluated for potential OHV recreation development, but Buffalo Mountain near Johnson City is the only area that has been identified as suitable and compatible with OHV use. As demand exceeds supply, recreational use off designated trails including OHVs, mountain biking, horseback riding and hiking is increasing and establishing patterns of use throughout the national forest.

This unplanned, and sometimes illegal use degrades the quality of the environment especially riparian resources and the visitor experience. An increase in visitor controls and regulations may be necessary in the future to direct visitor use, prevent further resource degradation and avoid the high cost of restoring and rehabilitating damaged landscapes.

17.1.2 Direct/Indirect Effects

Existing recreation demand would potentially be expected to grow for a variety of activities including dispersed and developed recreation (See Table 3-99). Existing use on national forest would potentially increase as recreation demand and populations grow over the next ten years. No changes to existing Wilderness designations (1.A), the Appalachian National Scenic Trail footpath or other nationally designated trails have been proposed in any of the alternatives.

Refer to other sections of the EIS for additional recreation environmental consequences related Wilderness and Roadless Areas, Scenery, Special Areas, Wild & Scenic Rivers and Heritage resources. Cumulative effects for all recreation-related programs are disclosed at the conclusion of the direct and indirect effects sections. Estimates of current recreation visits can be found in Appendix B.

General themes were developed for Alternatives A, B, D, E, G and I that emphasize different resource management objectives. Alternative F represents the current management alternative and provides a baseline for evaluating other alternatives. Each alternative theme and its allocation of prescription areas provide the parameters for redefining the current distribution of the ROS as well as the level of facility development.

National forest management would potentially affect recreation by improving or limiting roaded access; constructing or removing recreation facilities and improvements; changing their development level; restricting, prohibiting or

encouraging use; altering the land to make it suitable or unsuitable for use; and changing the landscape setting. Evaluation of potential recreation effects requires that these elements be considered: activities, setting, and experiences.

RECREATION OPPORTUNITY SPECTRUM

Table 3-107. Estimated Distributions of ROS Classes by Alternative (Area presented as acres)

ROS Class	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
P (1.A & 1.B)	94,809	68,148	66,661	116,578	66,661	140,359	86,926
SPNM	67,759	92,682	75,294	75,294	75,251	52,572	69,834
RN2	188,637	198,063	190,255	195,490	167,473	236,745	195,080
RN1	288,340	280,827	307,510	254,926	330,302	210,039	287,815
R	385	210	210	350	200	215	275
Total	639,930	639,930	639,930	639,930	639,930	639,930	639,930

* Baseline = Alternative F, Existing ROS Inventory (Table 3-100)

Table 3-107 displays estimated distributions of acres of ROS classes by alternative. The differences in distributions of the Primitive (P) ROS class are directly proportional to the allocation of wilderness study areas (1.B) for each alternative. Likewise, decreases in the limited supply of inventoried Semi-Primitive Non-Motorized (SPNM) are related to the reallocation of SPNM areas to the Primitive ROS class.

Increases in SPNM are primarily based on the allocation of prescriptions that emphasize SPNM in the desired range of ROS including 12.B, 4.I and 6.A. Estimated increases in Remote Roaded Natural (RN2) also indicate an increase in the supply of semi-primitive settings on the CNF.

The allocation of approximately 330,302 acres of inventoried Roaded Natural (RN1) is another good indicator for evaluating the supply of semi-primitive settings. To some extent, all alternatives convert a portion of the existing supply of Roaded Natural to more primitive or remote ROS settings.

As illustrated in Table 3-107, Alternative G secures the greatest combined acreage of Primitive and Semi-Primitive Non-Motorized settings on the forest followed by Alternatives E, A and I respectively. These changes in settings would potentially be positive for those visitors seeking a more remote, backcountry experience and less positive for those seeking a more developed setting and motorized access.

Alternatives E, A, and I provide the most similar distribution of ROS classes across the CNF. However, there are thematic differences between these alternatives. Alternative E emphasizes the provision of high quality scenery and diverse recreation settings throughout the forest including a greater increase in Primitive. Existing and new facilities support a wide range of dispersed and developed recreation activities.

Alternative A is primarily focused on recreation development linked to commercial opportunities. The majority of facility improvements would accommodate popular

activities that generate money for local economies. This strategy also includes maximizing use of outfitter guides in semi-primitive settings.

Alternative I is similar to Alternatives E and A and allows for an increase in both Primitive, Semi-Primitive Non-Motorized and Remote Roaded Natural settings. Facility improvements support developed and dispersed recreation, but with an emphasis on maintaining existing facilities to visitor expectations and connecting existing trails to create more loop opportunities.

Alternatives B and D place the least emphasis on recreation as compared to other alternatives. The current level of recreation facilities and infrastructure would remain close to the current level or decrease. Alternative D allows for the smallest decrease in inventoried Roaded Natural settings because road systems are maintained to implement vegetation management activities. Scenic integrity of dispersed settings would decline over time.

Recreation access and settings are more temporal under Alternative B. Landscape restoration activities would potentially change the appearance and/or access to traditional dispersed recreation settings. Over the next 5-10 years, areas would potentially become more accessible and scenic integrity would decline. However, the long-term management objective would allow the area to become less accessible by closing temporary roads. Scenic integrity would be restored over time and the area would provide more primitive, natural settings.

DEVELOPED RECREATION

Table 3-108. Estimated Increase in Capacity of Developed Recreation Areas by Alternative

Type of Development	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
Day-Use Areas	High	Low	Low	Mod	2,585 PAOTs	Low	Mod
Level 2 Campground	Mod	Low	Low	Mod	605 PAOTs	High	High
Level 3 Campground	Mod	Low	Low	Low	2,840 PAOTs	Low	Decrease
Level 4 Campground	High	Low	Low	Mod	2,172 PAOTs	Low	Mod
Total	Mod	Low	Low	Mod	8,202 PAOTs	Low	Mod

*Baseline = Alternative F, Existing Developed Recreation PAOTs (Table 3-101 & Table 3-102)
Low Increase = 0-5% increase in existing PAOTs
Moderate Increase = 6-25% increase in existing PAOTs
High Increase = > 26% increase in existing PAOTs
Decrease = any net loss of existing PAOTs

Table 3-108 displays estimated increase in capacity of developed recreation areas by alternative. Capacity is displayed in terms of People At One Time (PAOT) as previously defined for Table 3-101 and Table 3-102.

Alternatives G, B, and D would provide the least amount of change in developed recreation. The existing capacity and development levels of recreation sites would remain similar to current conditions. Facility maintenance would focus primarily on improvements necessary for public health, safety and accessibility. Visitors would notice changes in accessibility as the required percentage of campsites, picnic tables, restrooms, access paths are reconstructed to accessible standards. Other improvements would be less noticeable including the replacement of septic and water systems.

With little or no change in site capacities, popular sites would be consistently overused and crowded at peak times such as holidays and weekends. This would potentially lower visitor satisfaction over time. Alternative D would potentially create the most over crowding as proposed vegetation management activities in dispersed recreation settings displace visitors to developed recreation sites.

Alternative G allows for new construction of developed recreation sites including trailheads and Level 2 campgrounds as dispersed recreational use increases. These improvements would be motivated by site and resource protection rather than providing visitor comfort and conveniences.

Alternatives A, E and I allow for expansion and improvement of developed recreation on the CNF. Each alternative proposes only a moderate increase due the reality of limited fiscal budgets. With the exception of providing improvements necessary for public health, safety, and accessibility, the focus of recreation development differs between alternatives.

Alternative A maximizes the development of day-use fee areas and the conversion of campgrounds to Levels 4 or 5. Recreation facilities are constructed to serve as a hub and central fee area to disperse recreational use within popular areas as well as accommodate specific user groups.

Alternative E spreads the moderate increase across most development levels in day-use and overnight-use sites. Some Level 3 campground loops would potentally be converted to Level 4 to accommodate existing demand. Likewise, some Level 2 sites would potentially be converted to Levels 3 or 4. New facilities and roads would potentially be constructed if necessary to facilitate a wide range of recreation activities and protect sites.

Alternative I provides for an increase in developed recreation that would be greater than Alternatives D, B and G, but less than Alternatives A and E. Similar to Alternative E, Level 3 campground loops would potentially be upgraded to a Level 4, but only when the site requires heavy maintenance or reconstruction. As visitor use continues to increase at popular “hot spots” Level 2 development would potentially be necessary to help facilitate use and limit resource damage.

New day-use and overnight facilities would potentially be constructed at a development level appropriate for the desired ROS setting. However, maintenance and improvements to existing sites would be a higher priority than constructing new facilities.

DISPERSED RECREATION

Table 3-109. Estimated Increase in Non-Motorized Trails by Alternative

Type of Trail	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
Hike only	Mod	Low	Low	High	449.2 Miles	High	Mod
Hike and Bike only	High	Low	Low	High	60.1 Miles	Low	High
Hike and Horse only	High	Low	Low	High	20.6 Miles	High	High
Hike, Bike and Horse only	Mod	Low	Low	High	108.7 Miles	Mod	High
Total	Mod	Low	Low	High	638.6 miles	Mod	Mod

*Baseline = Alternative F, Existing Miles of Trail (Table 3-104)
Low increase = 0-5% increase of existing miles of trail
Moderate increase = 6-25% increase of existing miles of trail
High increase = >26% increase of existing miles of trail
Decrease = any net loss of existing trail

Table 3-110. Acres of Off-Highway Vehicle Use Areas, 7.C Prescription by Alternative

Type of Motorized Use	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
7.C Designated OHV Area	3,469	0	0	3,469	163 Acres	0	11,139

*Existing trail 100-foot corridor along the 12.8 miles of Buffalo Mountain ATV/Motorcycle Trail.

Table 3-111. Percent of Estimated Change in Motorized Trails by Alternative

Type(s) of Motorized Use Allowed	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
Motorcycle and/or ATV only	Mod	Decrease	Low	Mod	28.8 Miles	Low	High
Street Legal 4-WD, Vehicles and Motorcycles only	Low	Decrease	Mod	Mod	207 Miles	Decrease	Low
Total	Mod	Decrease	Mod	Mod	235.8 Miles	Decrease	Mod

*Baseline = Alternative F, Existing Miles of Motorized Trail (Table 3-105.)
Low increase = 0-10% increase of existing miles of trail

Table 3-111. Percent of Estimated Change in Motorized Trails by Alternative							
Type(s) of Motorized Use Allowed	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
Moderate increase = 11-50% increase of existing miles of trail High increase = > 51% increase of existing miles of trail Decrease = any net loss of existing trail							

Non-Motorized Trails

Alternative E would potentially provide the most opportunities for a wide range of dispersed recreation activities. Alternative E proposes the greatest increase in non-motorized trails with a balanced increase for all user groups including single and multiple use trails throughout the forest.

Alternative A would propose the second highest increase in non-motorized trails. This increase targets single use trails to attract high numbers of mountain bike and horse user groups. New trail construction would be located to maximize connections to local communities and commercial ventures.

Alternative I would potentially allow for a moderate level of trail expansion with the objective of networking existing trails and roads into an interconnected trail system. Single use mountain bike and horse trails would be constructed to reduce user conflicts when necessary for public safety and resource protection. Horse use would be confined to a 300-foot corridor along each side of designated trails and roads to address emerging patterns of user-created horse trails that cause resource damage and visitor confusion.

Alternative G would allow for a moderate level of trail expansion to access the large tracts of proposed Wilderness study areas (1.B). Single use bike trail development would be minimal and some bike use would be displaced due to constraints of the Wilderness Act of 1964. Single use hike and horse trails would be added to the trail system through construction or closure of existing roads.

Alternatives B and D would not support additional trail development. The integrity of scenic views from existing trails would potentially decline due to vegetation management including thinning, regeneration, insect and disease control, prescribed burning and pesticide use.

Patterns of cross-country horseback riding, hiking and biking would continue to be established and degrade the quality of existing trails, affected resources and visitor experience. Only Alternative I limits horseback riding to a specified corridor along trails. Visitors that encounter unmapped or unsigned trail junctions would potentially exacerbate the problem by proceeding down user-created trails. However, a sense of freedom to roam the forest on bike or horseback, which would potentially be essential to the satisfaction of some users, would be retained.

In general, more visitors would experience user conflicts as use increases on the limited supply of single and multiple use trails.

Motorized Trails

Page 317 (Table 3-110) displays the opportunities for motorized trails for each alternative. Alternative I would potentially allocate the most acres to prescription 7.C, Off-Highway Vehicle Use Areas. These acres represent the expansion of the existing Buffalo Mountain ATV trail system that currently provides 12.8 miles of ATV/Motorcycle trail. Alternatives A and E dedicate an equal acreage to this expansion, but the amount is less than half of the allocation under Alternative I. No other alternatives specifically allocate acres to prescription 7.C.

Other prescription areas would potentailly allow for OHV use on designated trails if "screening criteria" is met. Buffalo Mountain reflects the best opportunity to expand OHV opportunities in areas that have been screened. See Appendix J for a list of screening criteria. The allocations of OHV trail riding opportunities in Alternative A, E and I would potentially increase noise disturbance in the affected recreation setting and would potentially displace or lessen the recreation experience of others seeking solitude and quiet forest settings.

Opportunities to provide additional 4WD roads or jeep trails would be limited across all alternatives. Road construction for the purpose of providing high maintenance jeep trails is not feasible especially technically difficult trails. Alternatives D and E would provide the best opportunity to manage the existing 200 miles of high clearance, rough roads to provide jeep trail systems. New road construction for purposes of vegetation management or recreation access would potentially help connect existing 4WD roads.

Alternatives A and I would potentially provide fewer opportunities to connect and manage existing 4WD roads as a large trail system. However, these alternatives support recreation management of existing 4WD roads that would potentially provide opportunities for enjoying selected scenic and remote settings on the CNF if consistent with other resource objectives. Existing opportunities would potentially be decreased under Alternatives B and G.

River Access

River access for purposes of dispersed recreation would be similar for most alternatives because the most practical and safe river access points have already been developed. Rivers identified as eligible for Wild and Scenic River designations are assessed in a separate section of the EIS.

In general, Alternative A would promote development and expansion of sites on the most popular rivers such as the Ocoee, Hiwassee, Nolichucky and Tellico. These sites would be further developed to attract and facilitate additional day-use to boost local economies.

Alternatives E and I would focus facility improvements primarily on public health, safety and accessibility concerns. Alternatives B, D and G would not expand existing river access facilities. Existing facilities would potentially be closed if solutions to public health or safety concerns exceed maintenance budgets. Tennessee Valley

Authority or state agencies would become the primary providers of any additional water-related facilities.

Table 3-112. Estimated Total Acres of Big & Small Game Emphasis Areas by Alternative

Type of Game Habitat	ALT A	ALT B	ALT D	ALT E	ALT F *	ALT G	ALT I
General Habitat	211,944	169,156	440,419	48,361	407,150	119,487	293,580
Early Successional Habitat	2,615	20,619	0	3,029	78,085	0	56,517

*General big & small game habitat includes Prescription Areas 7.E.2, 8.A.1, 8.C, 9.H, 10.A & 10.B. Early successional habitat for game includes Prescription Areas 8.B & 8.E.1.

Alternatives that emphasize prescriptions that provide habitat for big and small game would potentially increase opportunities for hunting and wildlife viewing. Table 3-112 displays the allocation of acres to these types of prescriptions by alternative. All alternatives maintain black bear reserves as designated by the Tennessee Wildlife Resources Commission.

Changes in the quantity of stocked (put and take) streams and reservoirs are not displayed because changes were not proposed in any of the alternatives. However, some streams and reservoirs would potentially become more accessible to the public by increasing recreation access in Alternative E.

In terms of general habitat, Alternative D would potentially allow the most management activity for big and small game habitat. Effects of this emphasis include increased opportunities for hunting and non-consumptive wildlife viewing on some parts of the forest. Visitor experience would potentially be enhanced as chances of encountering big and small game would be increased.

Alternative I would potentially allocate fewer acres to general habitat prescriptions, but specifically provides for early successional habitat to promote grouse populations. Alternative A manages a lesser amount of general and early successional habitat, but promotes seasonal hunting and wildlife viewing opportunities in areas to support local tourism.

Alternatives E and G would provide the least amount of opportunities for habitat manipulation. Opportunities to hunt or view wildlife would not be decreased, but chances of encountering game would potentially be diminished over time as game populations decrease. User conflicts between hunters and trail users would potentially be higher for these alternatives. Access would potentially be most limited under Alternative G due to the greatest increase in Wilderness study areas.

17.2 Wilderness and Roadless Areas

17.2.1 Affected Environment

Wilderness

Congressionally designated wildernesses are protected by law and valued for their ecological, historical, scientific and experiential resources.

Currently in CNF, there are 11 designated wilderness areas containing a total of 66,389 acres or approximately ten percent of the total forest land base. There are no wilderness study areas or recommended wilderness study areas that have not been acted upon by Congress (Table 3-113). Existing wildernesses will be managed to maintain their natural characteristics. Natural occurrences such as outbreaks of insects or disease are allowed as part of the natural cycle. Human-caused intrusions are not allowed. Under emergency conditions, mechanical equipment and motorized transport may be approved for use to control fire that threatens life, property, or the wilderness resource.

Table 3-113. Existing Designated Wildernesses

Name of Wilderness	Acreage	Date Designated
Bald River Gorge	3,721	1984
Big Frog*	7,993	1984/86
Big Laurel Branch	6,332	1986
Citico Creek	16,226	1984
Cohutta*	1,709	1975
Gee Creek	2,573	1975
Joyce Kilmer-Slickrock*	3,832	1975
Little Frog Mountain	4,666	1986
Pond Mountain	6,929	1986
Sampson Mountain	7,992	1986
Unaka Mountain	4,496	1986
TOTAL	66,389	

**Acreages in adjacent states are not shown.*

Roadless Areas

The first step in the evaluation of potential wilderness is to identify and inventory all roadless, undeveloped areas that satisfy the definition of wilderness found in Section 2 (c) of the 1964 Wilderness Act (FSH 1909.12, Chapter 7, item 7.1). Roadless areas are places that have retained or are regaining a natural, untrammeled appearance; any signs of prior human activity are disappearing or being muted by natural forces. Criteria provide for individual roadless areas to include no more than one half mile of improved road for each 1,000 acres.

In the forest planning process, national forests are required to assess roadless areas on a forest (Chapter 7 of FSH 1909.12). A new Roadless inventory was conducted as a part of the SAA with additional guidelines developed by the SAA team and the

Southern Regional Office of the Forest Service to facilitate consistent application of the process.

CNF had 21 inventoried Roadless areas as a result of the RARE II process in the late 1970s. Three of these (Citico Creek, Big Frog and Big Frog Addition A) were studied through the 1975 Eastern Wilderness act and were designated as Wilderness through the 1984 Tennessee Wilderness Act, along with Bald River Gorge. Two areas (Brushy Ridge and Upper Bald River) were released to non-wilderness uses through the Tennessee Wilderness Act. Fifteen areas remained for re-evaluation and two (Big Frog Extension and Sampson Mountain) were added. The two Beaverdam areas were treated as one, as were Pond Mountain and Pond Mountain Addition. A total of fifteen areas were described in Appendix C of the Environmental Impact Statement to CNF's 1986 LMP. Six of these (Big Frog Study Area [combined with two other Big Frog areas already designated], Big Laurel Branch, Little Frog Mountain Study Area, the combined Pond Mountain areas, Sampson Mountain [the Buckeye Falls portion] and Unaka Mountain) were later designated Wilderness during the planning process and amendments to the LMP in 1988. (See Table 3-114)

Table 3-114. Roadless Areas studied during 1986 Planning Process

Area Name	RARE II or Other Proposal	Planning Acres	1986 Disposition	Current Management
Bald River Gorge	RARE II Wilderness proposal	3,887	1984 Wilderness designation	3,721 Wilderness acres; Roadless Inventory addition: 1,730 acres
Beaverdam Creek (2 areas)	RARE II	4,900 and 2,000	EIS	Managed under MA 14, 1988 amendment; Roadless Inventory: 5,240 acres
Big Frog Study Area (a/k/a Big Frog Extension)	Citizen Proposal	3,000	EIS; 1984 WSA; 1986 Wilderness designation	All combined into Big Frog Wilderness, 7,993 acres; Roadless Inventory addition: 370 acres
Big Frog Wilderness Study Area	RARE II	4,626	1984 Wilderness designation	
Big Frog Addition A Wilderness Study Area	RARE II	547	1984 Wilderness designation	

Table 3-114. Roadless Areas studied during 1986 Planning Process				
Area Name	RARE II or Other Proposal	Planning Acres	1986 Disposition	Current Management
Big Laurel Branch	RARE II	6,251	EIS, 1984 WSA 1986 Wilderness designation	6,332 Wilderness acres; Roadless Inventory addition: 5,770 acres
Brushy Ridge	RARE II	4,600	Released for non-wilderness, 1984	Managed under MA 14, 1988 amendment; Roadless Inventory: 7,580 acres
Citico Creek Wilderness Study Area	RARE II	16,000	1984 Wilderness Designation	16,226 Wilderness acres
Devil's Backbone	RARE II	4,100	EIS	Deferred from management under MA 14, 1988 amendment; Roadless Inventory: 4,370 acres
Flint Mill	RARE II Wilderness Proposal	7,166	EIS	Deferred from management under MA 14, 1988 amendment; Roadless Inventory: 9,560 acres
Hickory Flat Branch	RARE II	4,500	EIS	Managed as GFA, MA 15 and/or 16
Iron Mountain	RARE II	13,700	EIS	Managed under MA 14, 1988 amendment
Laurel Fork	RARE II	2,200	EIS	Managed as GFA, MA 15 and/or 16

Table 3-114. Roadless Areas studied during 1986 Planning Process				
Area Name	RARE II or Other Proposal	Planning Acres	1986 Disposition	Current Management
Little Frog Mountain	RARE II Wilderness proposal	4,800	EIS/1984 WSA	4,666 wilderness acres; 2 Roadless Inventory additions: 350 and 660 acres
Nolichucky	RARE II	5,841	EIS	Deferred from management under MA 14, 1988 amendment
Pond Mountain and Pond Mountain Addition	RARE II Wilderness Proposal	4,365 and 2,300	EIS/1984 WSA; 1986 Wilderness designation	Combined into 6,929 Wilderness acres
Rogers Ridge	RARE II	5,841		Deferred from management under MA 14, 1988 amendment; Roadless Inventory: 4,850 acres
Sampson Mountain (formerly Jennings Creek)	RARE II	19,684	EIS	Deferred from management under MA 14, 1988 amendment; Roadless Inventory: 11,620 acres (Bald Mountain)
Sampson Mountain (formerly Jennings Creek-Buckeye Falls)	RARE II	8,319	EIS/1984 WSA; 1986 Wilderness designation	7,992 Wilderness acres; Roadless Inventory addition, 4,590 acres

Table 3-114. Roadless Areas studied during 1986 Planning Process				
Area Name	RARE II or Other Proposal	Planning Acres	1986 Disposition	Current Management
Unaka Mountain	RARE II Wilderness Proposal	4,700	EIS/1984 WSA; 1986 Wilderness designation	4,496 Wilderness acres
Upper Bald River	RARE II	14,900	Released for non-wilderness, 1984	Managed under MA 14, 1988 amendment; Roadless Inventory: 9,290 acres

Generally, these areas offer a semi-primitive non-motorized (SPNM) recreation opportunity. Any portion of the inventoried areas that falls within ½-mile of a road or motorized trail would fall into the Forest's Roaded Natural (RN) ROS class. Areas that are designated Wilderness are managed for a Primitive (P) recreation opportunity; however, CNF has no lands that meet the actual ROS "Primitive" criteria.

Roadless Areas were inventoried in 1995, through a series of public meetings and comments and using inventory guidance issued by the Regional Forester and criteria from the Forest Service Handbook. An inventory of 18 areas was displayed in the SAA. Some are from the RARE II inventory, some are portions of land adjacent to designated wildernesses, and some of these are new areas. The inventory was refined as those Roadless Areas were evaluated for Appendix C.

The CNF's current Roadless Area Inventory is shown in Table 3-115. The 18 inventoried Roadless areas total approximately 85,195 acres that could be recommended for wilderness study. Three of the areas are shared with Jefferson National Forest; however CNF administers the majority of all three. Two are shared with Pisgah National Forest; the majority of one, Slide Hollow, is administered by CNF. An additional 2,366 acres in these five roadless areas fall in adjacent national forests. Bald Mountain roadless area's acreage falls within boundaries of two national forests and is currently administered separately by the two Forests. The entire acreage may be considered as one unit during Pisgah National Forest's Plan revision at a future date.

Table 3-115. SAA Roadless Area Inventory, CNF		
Roadless Area	Total CNF Acres (Approximate)	Total Acres, Adjacent Forests (Approximate)
Bald Mountain (PNF)	11,744*	10,971 (PNF)
Bald River Gorge Addition	1,737	
Beaver Dam Creek (JNF)	5,130	1,133 (JNF)
Big Frog Addition	365	
Big Laurel Branch Addition	5,589	
Brushy Ridge	7,389	

Table 3-115. SAA Roadless Area Inventory, CNF		
Roadless Area	Total CNF Acres (Approximate)	Total Acres, Adjacent Forests (Approximate)
Devil's Backbone	4,283	
Flint Mill Gap	9,629*	
Joyce Kilmer-Slickrock Addition	1,425	
Little Frog Addition NE	335	
Little Frog Addition NW	642	
London Bridge Branch (JNF)	3,431	853 (JNF)
Rogers Ridge (JNF)	4,753	180 (JNF)
Sampson Mountain Addition	3,069*	
Slide Hollow (PNF)	4,195	200 (PNF)
Stone Mountain	5,373	
Sycamore Creek	6,994	
Upper Bald River	9,112	
Total	85,195	13,337
*changes in SAA-reported acreage		

A report evaluating the wilderness potential of each Roadless area was prepared. These evaluation reports consider wilderness potential in three main categories:

Capability—the qualities that make a roadless area suitable or not suitable for wilderness

Availability – an assessment of the non-wilderness resources and demand of the area

Need—a consideration of the amount of wilderness already in the area and region.

These reports are found in Appendix C and are in accord with 36 CFR 219.17.

Outdoor recreation is one of the benefactors of wilderness and is one of the drivers of both wilderness demand and wilderness management. According to trend data collected from 1965 to 1994, the trend in recreation visits to national forest Wilderness has paralleled designations and increased over time. In the Southeast, participation rates and trends, in wilderness indicate a continued increase in visitation to wilderness with an estimated 8,640,000 visits to wilderness by the year 2050 (see Recreation Activity, “Visit wilderness or primitive area”, Table 3-99 in Developed and Dispersed Recreation discussion).

In addition to outdoor recreation participation in wilderness, there is a non-user component that values American wilderness. Understanding this value is important when analyzing wilderness and roadless allocations. Wilderness is valued for preserving representative natural ecosystems and local landscapes. The very

existence of wilderness is valued by the American public as part of the natural heritage of the country. In support of this, the *National Survey on Recreation and the Environment, 2000*, found that 69.8 percent of those surveyed either agreed or strongly agreed to the question:

> "How do you feel about designating more federal lands in your state as wilderness?"

Over 96 percent agreed or strongly agreed with the statement:

> "I enjoy knowing that future generations will be able to visit and experience wilderness areas."

Visits to Wildernesses in CNF make up approximately four percent total Forest visits, and have been estimated at 54,600 visits for 2002. (See Table 3-98, Baselines for Recreation Use on Cherokee NF in Developed/Dispersed Recreation section.)

17.2.2 Direct/Indirect Effects

Wilderness

Wilderness has many positive effects, including preservation of natural systems and providing visitors with places of solitude. However, there are environmental effects within wilderness from many sources. Recreational use would potentially have negative impacts to the quality, character and integrity of the wilderness resource due to overuse. Some of these negative impacts caused by heavy recreation use include soil compaction, vegetation loss disturbance and/or replacement by non-native species such as noxious weeds on trails and campsites crowding and loss of solitude, deterioration of water quality from improper disposal of human waste and waste water, and loss of or threats to biological/ecological processes and biodiversity, through human disturbance.

Other environmental effects that impact integrity of natural systems in wilderness include air pollution from outside sources, interruption of naturally-functioning ecosystems by fire suppression, and threats to native plant species from the spread of noxious weeds from sources outside wilderness.

No significant new management direction is being proposed for any of the existing 11 designated Wildernesses in CNF under any of the alternatives. There would potentially be no significant direct, indirect, or cumulative effects to the existing wilderness resource. Expansion to existing wilderness would be proposed by allocating adjacent lands to wilderness study area. See the ROADLESS discussion below.

Effects to forested community would be a continual development of older forests with no human caused disturbance. This is currently over 66,000 acres of existing wilderness with the following distribution of community types (Table 3-116):

Table 3-116. Forest types communities within existing wilderness areas.	
Bottomland Hardwood	0%

Table 3-116. Forest types communities within existing wilderness areas.	
Mesic Mixed Pine Hardwood	0.3%
Mesic Oak	25%
Mixed Mesophytic Hardwood	16%
Montane Spruce-Fir	0%
Northern Hardwood	6%
Southern Yellow Pine	17%
White Pine-Hemlock-Hardwood	9%
Xeric Mixed Pine-Hardwood	9%
Xeric Oak	10%
Other communities	8%

Roadless Areas

Either decision, whether to designate wilderness study areas or not, would potentially have environmental consequences. Both decisions, to designate wilderness study areas or not to designate them, would potentially have environmental consequences. The magnitude of the effects would vary by alternative depending upon the number of roadless areas assigned.

Three categories are used to summarize how each roadless area is allocated in the alternatives. These categories are

Recommended Wilderness Study (W)

Roadless Areas Maintaining Roadless Characteristics (R)

Roadless Areas Not Maintaining Roadless Characteristics (N).

Table 3-117 summarizes all roadless area allocations by category across the alternatives.

Table 3-117. Summary of Roadless Area Allocations by Category by Alternative

Roadless Area	Alt A	Alt B	Alt D	Alt E	Alt F*	Alt G	Alt I
Bald Mountain (PNF portion administered separately)	W 84% N 16 %	R 84%, N 16%	R 4%, N 96%	W 100%	R 35%, N 65%	W 39% R 61%	R 96%, N 4%
Bald River Gorge Addition	W 35% N 65%	N 100%	N 100%	W 100%	R 28%, N 72%	W 100%	R 100%
Beaver Dam Creek (JNF)	R 54%, N 46%	R 32%, N 68%	R 32%, N 68%	R 100%	R 49%, N 51%	W 100%	R 85%, N15%
Big Frog Addition	W 68% R 23% N 9%	N 100%	N 100%	W 100%	R 28%, N 72%	W 100%	W 100%
Big Laurel Branch Addition	W 100%	R 99%, N 1%	R 40%, N 60%	W 100%	R 77%, N 23%	W 100%	W 86% R 14%

Table 3-117. Summary of Roadless Area Allocations by Category by Alternative							
Roadless Area	Alt A	Alt B	Alt D	Alt E	Alt F*	Alt G	Alt I
Brushy Ridge	R 8%, N 92%	R 8%, N 92%	R 8%, N 92%	R 100%	R 39%, N 61%	W 100%	R 90%, N 10%
Devil's Backbone	R 90%, N 10%	R 89%, N 11%	N 100%	W 100%	R 55%, N 45%	W 100%	R 100%
Flint Mill Gap	R 96%, N 4%	R 92%, N 8%	R 35%, N 65%	W 73% R 27%	R 58%, N 42%	W 83% R 17%	R 100%
Joyce Kilmer-Slickrock Addition	W 100%	W 100%	N 100%	W 100%	R 81%, N 19%	W 100%	W 100%
Little Frog Addition NE	W 78% N 22%	N 100%	N 100%	W 100%	R 47%, N 53%	W 100%	W 100%
Little Frog Addition NW	N 100%	N 100%	N 100%	W 100%	R 36%, N 64%	W 100%	W 100%
London Bridge Branch (with JNF)	R 37%, N 63%	N 100%	N 100%	R 100%	R 65%, N 35%	W 100%	R 100%
Rogers Ridge (with JNF)	R 100%	R 99%, N 1%	R 95%, N 5%	R 100%	R 40%, N 60%	W 38% R 62%	R 100%
Sampson Mountain Addition	W 38% N 62%	R 58%, N 42%	N 100%	W 100%	R 57%, N 43%	W 100%	W 100%
Slide Hollow (with PNF)	R 100%	R 6%, N 94%	R 27%, N 73%	W 100%	R 52%, N 48%	W 100%	R 92%, N 8%
Stone Mountain	R 66%, N 34%	N 100%	N 100%	N 100%	R 52%, N 48%	W 100%	R 100%
Sycamore Creek	R 10%, N 90%	R 11%, N 89%	R 10%, N 90%	R 100%	R 52%, N 48%	W 100%	R 100%
Upper Bald River	W 96% N 4%	R 96%, N 4%	N 100%	W 100%	R 75%, N 25%	W 100%	W 97% N 3%
Totals, by alternative	W 33%, R 36%, N 31%	W 2%, R 54%, N 44%	R 16%, N 84%	W 58%, R 36%, N 6%	R 53%, N 47%	W 86% R 14%	W 23%, R 74%, N 3%
W=Recommended Wilderness Study, R=Roadless Character Maintained, N=Roadless Character Not Maintained							
*Percentages for Alternative F are based on each area's percent of Solitude Core. (See descriptions in Appendix C.) Note: Areas or portions of areas identified as having their Roadless character maintained may include prescriptions allowing temporary road construction.							

Recommended Wilderness Study Areas (1.B): Designation as *wilderness study area* would allow additional areas to be managed (1) to allow natural processes to occur, (2) to provide areas for solitude and primitive recreation, and (3) to minimize the impacts of human activities on the land. These wilderness study areas would be islands within the forest where the naturalness, uniqueness, and representative

ecosystems of the designated areas would be maintained. The highest priority for management would be for the naturalness of the area.

Roadless areas recommended for wilderness study would potentially be set aside for future designation as wilderness and would not be available for activities such as vegetative management or road construction. These areas would potentially be managed much the same as designated Wilderness until a final determination is made by Congress as to whether they would be added to the National Wilderness Preservation system. The number of roadless areas recommended for wilderness study are displayed in Table 3-118.

Table 3-118. Numbers of Areas and Acres Allocated to Recommended Wilderness Study (1.B) by Alternative

Alt	A	B	D	E	F	G	I
Number of Areas	2 + portions of 6	1	0	11 + a portion of 1	0	15 + portions of 3	6+ portion of 1
Acres	27,750	1,425	0	49,240	0	73,100	20,265

Note: The actual acreage of an individual Wilderness Study Area may include embedded Prescriptions like 4.A (A.T.), 9.F (Rare Community), etc, but these acres are not displayed here. Specific area acreages are derived from current Roadless Area descriptions (EIS Appendix C), and may not necessarily be consistent with those acreages published by SAA.

Table 3-119 displays the ecosystems represented currently by designated Wildernesses in CNF as well as those that would potentially be added after wilderness studies are completed. None of the Roadless Areas represent new ecosystem sections or subsections and no new ones are proposed in any alternative.

Table 3-119. Ecosystems represented by Wilderness or Wilderness Study Areas by Alternative

Alternatives (by number of areas)							
Alternatives	A	B	D	E	F	G	I
Section/Subsection Name	W / WS	W / WS	W / WS	W / WS	W / WS	W / WS	W / WS
Blue Ridge Section/ Southern Blue Ridge Subsection	2 / 1	2 / 0	2 / 0	2 / 3	2 / 0	2 / 7	2 / 1
Blue Ridge Section/ Metasedimentary Mountains Subsection	9 / 7	9 / 1	9 / 0	9 / 9	9 / 0	9 / 11	9 / 6
Total	11 / 8	11 / 1	11 / 0	11 / 12	11 / 0	11 / 18	11 / 7

W=Existing Designated Wilderness
WS=Wilderness Study Areas

Direct effects of managing wilderness study areas would potentially include maintaining soil, hydrologic and atmospheric conditions prevailing within the areas. Roads would potentially be closed and rehabilitated or allowed to return to natural state. Water quality and air quality would remain high and the imprint of human influence would not increase or would diminish over time.

Opportunities for solitude and remoteness would increase as would the opportunity for primitive and unconfined recreation due to closing roads and prohibiting motorized use. Non-motorized dispersed recreation activities such as hiking, horseback riding, camping, fishing, and hunting would continue and use levels would be expected to remain about the same as currently takes place or increase based on trend statistics for this type of recreation activity. Visual and experiential contrasts between roadless areas and other timbered lands would potentially increase. Additional acreage for wilderness study would potentially increase the carrying capacity and allow for user impacts to be dispersed across a larger area, providing an increase in wilderness visitor satisfaction. However, road closures would result in decreased access for some activities. A decrease in opportunities for bicycling, off-highway vehicles and other forms of recreation requiring motorized transport or mechanized equipment would result (Table 3-120). Bicycle and motorized use would be displaced to other areas.

In CNF, designated horse trails currently are open for bicycle use unless otherwise specified. Some trails are, or can be designated for bicycle use, but not for horse use. The table below shows miles of trails in Roadless Areas that currently allow bicycles, a use that would be eliminated if the area was designated as Wilderness Study Area (Rx 1.B). The most miles would be lost to this use under Alternatives G, E, and A. In Alternative I, 7.2 miles would be closed; one-half mile would be closed under Alternative B. Two ATV/motorcycle trails are currently maintained in Forest Roadless Areas. Both of these would be closed to motorized use in Alternatives A, E and G. Miles of trail overall that would be lost in Wilderness Study Areas vary in Alternatives G (the most miles lost), E, A, I, and B (the least miles lost). With no Wildernesss Study Areas, no miles would be lost in Alternative D. Maintenance and construction of trails and facilities, including the A.T., the proposed Benton McKaye Trail and any associated shelter sites, would be achieved using hand tools only. Access would be made using non-mechanized/non-motorized means. This would potentially affect up to 15.5 miles of the A.T., proposed 4.7 miles of A.T. relocation, two existing shelters, one potential shelter reconstruction, one potential shelter relocation and potentially 5.0 miles of proposed Benton McKaye in seven different Roadless Areas over a range of four alternatives (A, E, G and I). The minor amount of developed recreation use and other use associated with motor vehicles currently taking place in these areas would cease, except in those portions specifically excluded from the area boundary. (See Appendix C)

Table 3-120. Bicycle and motorized trail closures in 1.B areas by alternative							
Alternatives	A	B	D	E	F	G	I
Bicycles	14.4	0.5	0.0	16.2	0.0	22.0	7.2
Motorcycles	5.4	0.0	0.0	5.4	0.0	5.4	0
Total	19.8	0.5	0.0	21.6	0.0	27.4	7.2

Bicycles are currently allowed on closed roads in CNF, unless otherwise specified. The table below enumerates miles of road inside Roadless Areas that would be closed to motorized and bicycle use if the area was designated Wilderness Study Area. The most miles (30.3) would be closed in 13 separate areas in Alternative G; 17.7 miles would be closed in seven separate areas in Alternative E; 9.0 miles would be closed in four separate areas in Alternative A; and 5.7 miles would be closed in three separate areas in Alternative I.

Table 3-121. Miles of interior roads to be closed in 1.B Areas by Alternative							
Alternative	A	B	D	E	F	G	I
Miles	9.0	0	0	17.7	0	30.3	5.6

Research indicates that additional Wilderness would potentially increase national forest visitation in this area. This increase in tourism would increase economic benefits to surrounding local communities. However, since vegetation management activities would not be allowed (except to rare communities), there would also be a reduction in economic benefits associated with the management, harvesting, manufacturing and retail sale of timber and other products from the Wilderness Study Areas. There would potentially be reduced opportunities to recover commercial minerals and mineral exploration and development will be hindered. Little or no mineral development or its associated impacts would be expected under this alternative.

Table 3-122. Acres of Potential Timber Management and Resource Extraction affected by 1.B Areas by Alternative							
Alternative	A	B	D	E	F	G	I
Total suitable acres	11,585	175	0	18,989	0	32,924	8,341
Suitable acres of damaged/vulnerable timber	3,426	0	0	5,142	0	8,190	2,729
Mineral rights (acres)	2,614	0	0	17,136	0	17,149	2,614
Oil/gas leases	0	0	0	0	0	0	0

In the 18 Roadless areas, there are currently 32,924 acres allocated to the suitable timber base. In individual areas, this ranges from four percent to 91 percent in individual Roadless areas. Within the suitable base of the 18 Roadless areas, there are also 8,190 acres of timber either currently suffering damage from disease or pests or that are vulnerable to disease or pest within the next ten years. These include acres of oaks, pines and hemlocks. There are also acres of damaged and vulnerable timber in each area's unsuitable acreage, as well. The maximum number, approximately 48 percent of the entire Roadless area acreage, would be affected

under Alternative G. A significant number of acres would be affected in Alternatives E (approximately 28%), A (approximately 18%), and I (approximately 12%).

Inventory data indicates privately owned, outstanding or reserved mineral rights underlying Federal surface ownership in Big Laurel Branch Addition (1,989 acres), Flint Mill Gap (10,511 acres), London Bridge Branch (13 acres), Sampson Mountain Addition (625 acres), and Slide Hollow (4,011 acres). Requests for access to these interests would be recognized and reasonable access granted. There would be, however, a low potential for this occurring. There would be no existing Federal oil or gas leases or other Federal mineral leases in effect in any of the areas recommended for wilderness study. The potential for development of energy minerals and other leasable and common minerals would potentially be estimated to be low. These areas would be administratively unavailable for federal oil and gas and other federal mineral leases, pending final Congressional action. These areas would not be available for mineral materials for commercial purposes. Administrative use of mineral materials would be allowed but use and impacts would be extremely low.

Educational opportunities for the scientific study of natural ecological processes would potentially increase.

The naturalness, uniqueness, and representative ecosystems in these areas would be maintained. Natural ecological processes would continue including plant succession. Larger blocks of undeveloped land and reduction in open road density in areas recommended for wilderness study would favor area-sensitive and disturbance-sensitive species. Existing old fields, wildlife openings and other habitat improvements for fish and wildlife would not be maintained in areas recommended for wilderness study. Early successional habitat areas would succeed to forest. New permanent wildlife openings would not be created. These factors would potentially reduce habitat for early successional species. Fish stocking in areas recommended for wilderness study would be restricted to re-establishment or maintenance of indigenous, threatened, endangered, or sensitive species with Forest Supervisor authorization. Rare communities and threatened and endangered species would be managed within the limitation of activities allowed within wilderness study areas.

Several of the Roadless Areas contain wildlife openings managed by mowing, as well as active fisheries monitoring projects. Some contain programs for fisheries stocking, restoration, or habitat structures. At least seven of the 18 areas contain TES species and/or rare communities. The significance of the effects depends upon the number of areas and the kinds and intensity of activities in the areas. See Table 3-123, below.

Table 3-123. Wildlife, Fisheries and Plants Potentially Affected by 1.B Areas, by Alternative.

A	27.5 acres + 0.25 mi. linear wildlife openings; fish monitoring; stocking/structures at Clark Creek; brook trout restoration in Brookshire Creek; monitoring Southern water shrew
B	Fisheries monitoring (1 area)
D	No areas proposed for Wilderness Study
E	32.5 acres + 2.2 mi. linear wildlife openings; fish monitoring;

Table 3-123. Wildlife, Fisheries and Plants Potentially Affected by 1.B Areas, by Alternative.	
	stocking/structures at Clark Creek; brook trout restoration in Brookshire Creek; monitoring Southern water shrew, a sphagnum bog, at least 3 regionally sensitive plants and Whetstone Branch rare community; monitoring/management of Table Mountain pine
F	No areas proposed for Wilderness Study
G	45.25 acres + 2.2 mi. linear wildlife openings; fish monitoring; stocking/structures at Clark Creek; fish structures in Brookshire Creek; brook trout restoration in Brushy Ridge, Sycamore Creek and Upper Bald River areas; monitoring Carolina Northern Flying Squirrel and Southern water shrew, a sphagnum bog, at least 3 regionally sensitive plants and Whetstone Branch and North River Bog rare communities; monitoring/management of Table Mountain pine
I	5.5 acres wildlife openings; fisheries monitoring; stocking/structures at Clark Creek; fish structures in Brookshire Creek; brook trout restoration in Upper Bald River areas; monitoring Southern water shrew
Note: Some of these activities may be excluded from final Roadless Area boundaries. See Appendix C for individual descriptions, including proposed exclusions.	

Fire management would potentially be effected by designation of additional wilderness study areas. Fire suppression of all human-caused wildfires would minimize the potential effects on wilderness values. However, fires in these areas would likely become larger in size than they would under current management because of the restrictions on use of motorized equipment such as dozers. Under emergency situations, mechanized equipment and motorized transport, use of helicopters, air tankers, and other aircraft would potentially be approved by Forest Supervisors and/or Regional Forester. These actions would impact wilderness character and visitor experiences and leave evidence of humans, although rehabilitation would help to reduce those impacts afterward.

Lightning-ignited fires, if allowed to burn, enhance the natural systems that are fire dependent. These fires would benefit recreation by opening up the forest, reducing fuel loading to acceptable levels, and maintaining the vegetation. There would be a short-term negative impact to air quality, visual aesthetics and possibly water quality.

Management-ignited fires to reduce hazardous fuels would potentially have negative results in wilderness through changes in vegetation types, impacts to wilderness visitors and experiences, water quality and habitat within wilderness. These fires would, however, benefit the wilderness by reducing fuel loadings to acceptable levels such that naturally ignited fires would potentially be returned to the wilderness or wilderness study area. Fire prevention strategies applied in the urban interface area on private land would potentially reduce the need for management-ignited fires.

Several of the Roadless areas have a history of wildfire, either naturally ignited or human-caused. All or a portion of the acres in each of these areas would be included in the CNF's system of prescribed burn blocks; a Wilderness Study designation would

eliminate this management activity. Currently the high-elevation balds in Rogers Ridge Roadless area are kept open and maintained by management-ignited fire.

Additional effects to Wilderness Study Areas would be similar to those found in wilderness. These include soil compaction, vegetation loss or disturbance, non-native species, crowding and loss of solitude, deterioration of water quality from improper disposal of human waste and wastewater, and loss of or threats to biological/ecological processes and biodiversity through human disturbance.

Special uses occur in at least seven of the 18 Roadless Areas. These include telephone and fiber optic lines, power transmission lines and associated access roads, spring box permits for domestic water, a dam related to the operation of Pheasant Fields fisheries, and outfitter recreation-related permits for horse use and fishing. Some of these would potentially be allowed in Wilderness/Wilderness Study Areas; others would need to be excluded from individual area boundaries. Future permits would be restricted by allocations to 1.B. (Refer to the number of areas affected in Table 3-118.)

Roadless Areas Maintaining Roadless Character: Areas identified as Roadless Areas Maintaining Roadless Character would be assigned to prescriptions that would manage in some ways similar to those in Wilderness or Wilderness Study. These areas would also exhibit some overall effects similar to those in Wilderness or Wilderness Study. The management of these areas would strive to protect the natural process and minimize the impacts of humans. No active timber management or permanent road construction would be prescribed in any of the alternatives for these areas. However, sights and sounds of human activities would increase under these prescriptions, and some opportunity for solitude would be diminished due to a broader range of activities under the various prescriptions. Some recreation facilities would potentially be constructed to enhance the visitor's experience. Trails would be maintained with mechanized equipment. Recreation would potentially include motorized trails and bicycle trails and be at a higher density than Wilderness Study Areas. Management-ignited fire would be used to maintain fuel loadings and mechanized equipment and motorized vehicles would be used. Prescriptions that prohibit permanent road construction, commercial timber harvest, or surface occupancy for minerals development are 1.A, 1.B, 3.C, 4.A, 4.K, 6.A, 9.F, 12.B, 12.C. CNFs prescription for 4.F includes restrictions for road construction where inventoried roadless areas coincide with the prescription allocation in Management Areas 8, 12, and 15.

While timber harvesting would not be allowed, management for insects or disease and limited vegetation management for specific resource considerations would potentially be allowed. (See affected acres of damaged/vulnerable timber in Table 3-122) Depending on prescription allocation, salvage logging of dead, dying or deteriorating timber potentially would or would not be permitted, and if permitted, would only be allowed in stands easily accessed from existing roads. Existing roads would remain open only in some prescriptions, while in some such as 12.B, all roads would be closed except for limited administrative use. Most activities described in Table 3-123 relating to wildlife, fisheries and plant monitoring and management would likely be allowed to continue, including use of management-ignited fire to

maintain high elevation mountain balds and viability of Table Mountain pine. Mowing of wildlife openings, however, would not remain an emphasis under certain prescriptions like 12.B. All Scenic Area designations in these Roadless areas would be retained. The 15.5 miles of A.T. that cross these Roadless areas would be maintained with mechanized equipment, as would the three existing shelters (Double Spring, Jerry Cabin, and Vanderventer shelters). Proposed relocation/construction of 4.7 miles of trail and reconstruction of a burned shelter in Slide Hollow Roadless area would utilize mechanized equipment. Construction of Benton McKaye Trail through portions of Upper Bald River and Sycamore Creek Roadless areas would utilize mechanized equipment. Existing special uses could continue and new uses may be allowed.

Roadless Areas Not Maintaining Roadless Character: In this category, areas would be made available for management allocations involving road construction and/or timber harvest. This means that changes would potentially be allowed that would affect the area's suitability for wilderness designation or the presence of or potential for primitive or semi-primitive settings. Prescription allocations in this category do not necessarily commit an area to development. Site-specific analysis would be conducted before decisions would be made to build road or harvest timber in a roadless area.

The Roadless character in many of these areas would potentially be diminished over time. The naturalness of these undesignated areas would be reduced through interruptions to natural ecological processes. Vegetation composition and structure would be manipulated, resulting in a greater diversity of age-classes among forest types. Opportunities for solitude and remoteness would decrease. Sights and sounds of human activities would be more obvious. Additional roads and trails would be constructed. Noise levels and soil erosion would increase. Air and water quality would decrease, but water quality would meet State and Federal standards.

Roadless Area Conservation Rule: On January 12, 2001, the Forest Service issued the Final Rule for Roadless Area Conservation in the Federal Register. Since that time, numerous legal challenges have been made to this decision, including a ruling on July 14, 2003 from the United States District Court, Wyoming District, where Judge Clarence Brimmer found the Roadless Area Conservation Rule to be in violation of the National Environmental Policy Act and the Wilderness Act and enjoined its implementation. However, this issue is not settled. Appeals of the Wyoming District Court decision, other litigation, new rulemaking, or new FSM directives could result in a change in direction for inventoried roadless areas.

The Roadless Area Conservation Rule (Roadless Rule) would place restrictions on the road construction and reconstruction activities; and the timber cutting, sale, or removal activities that could occur in inventoried roadless areas. 36 CFR 294.12 and 294.13 identify the exceptions where road construction/reconstruction activities and timber cutting/removal activities would be allowed.

In this EIS, the inventoried roadless areas were evaluated for possible wilderness study area recommendations. If areas were not recommended for wilderness study designation, other land allocations were considered for these areas, depending upon

the overall emphasis of each plan alternative. In some alternatives, a particular roadless area's characteristics would be maintained, while in other alternatives, the area's roadless characteristics could be altered. Within those allocations where roadless character is not maintained, road building and/or timber harvesting activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect. The following describes by alternative, what would happen to these land allocations should the Roadless Area Conservation Rule restrictions go into effect.

Alternative A

Under this alternative, 66 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule. 36 percent of the acres in the inventoried roadless areas are allocated to management prescriptions 7.A, 7.D and 7.E.2, with an emphasis on scenic byways, concentrated recreation zones and dispersed recreation opportunities and 9.A.1, 9.A.2 or 9.A.3, with an emphasis on watershed protection or restoration. Within these allocations, a minimum level of road building and/or timber harvesting activities could be conducted. These activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect.

Alternative B

Under this alternative, 43 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule. 31 percent of the acres in the inventoried roadless areas are allocated to management prescriptions 9.A.1, 9.A.2 or 9.A.3, with an emphasis on watershed protection or restoration. Within these allocations, a minimum level of road building and/or timber harvesting activities could be conducted. Of the remaining acres in the inventoried roadless areas, 26 percent are allocated to management prescriptions 8.B, 8.C, 9.C.2 and 9.H. Within these allocations, road building and/or timber harvesting activities would be conducted to manage for Early Successional Habitat, Black Bear Habitat, Plant Community Restoration and Dry-Mesic Oak Forests. These activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect.

Alternative D

Under this alternative, 14 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule.

Ten percent of the acres in the inventoried roadless areas are allocated to management prescriptions 7.A, 7.B, 7.D, 7.E.2 and 9.B.2. Within these allocations, a minimum level of road building and/or timber harvesting activities would be

conducted for the purposes of managing scenic byways, scenic corridors/sensitive viewsheds, concentrated and developed recreation areas, dispersed recreation and high elevation balds. Of the remaining acres in the inventoried roadless areas, 76 percent are allocated to management prescriptions 8.A.2, 8.C, and 10.A and 10.B. Within these allocations, road building and/or timber harvesting activities could be conducted for the purposes of managing for a mix of successional habitats, black bear habitat, sustained yield timber and high quality forest products. These activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect.

Alternative E

Under this alternative, 94 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule.

Six percent of the acres in the inventoried roadless areas are allocated to management prescriptions 7.E.1. Within these allocations, a minimum level of road building and/or timber harvesting activities could be conducted for the purposes of managing dispersed recreation. These activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect.

Alternative F

Under this alternative, 51 percent of the acres in the inventoried roadless areas have been identified as the "solitude core," and area where wilderness potential and roadless characteristics are most predominant. 49 percent of the remaining acres in the inventoried roadless areas lie outside this "solitude core." A portion of these could be subject to management activities that include road building and timber harvesting activities not consistent with the Roadless Rule exceptions, and could, therefore, not be allowed with the Roadless Rule in effect.

Alternative G

Under this alternative, 100 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule.

Alternative I

Under this alternative, 98 percent of the acres in the inventoried roadless areas are either recommended for wilderness study designation or are allocated to management prescriptions that would maintain the area's roadless characteristics. Any activities within these areas would be consistent with the Roadless Rule.

Two percent of the acres in the inventoried roadless areas are allocated to management prescriptions 2.B.3, 7.A, 7.B and 7.E.2. Within these allocations, a minimum level of road building and/or timber harvesting activities would be

conducted for the purposes of managing recreation river corridors, scenic byways, scenic corridors/sensitive viewsheds and dispersed recreation. These activities may not be consistent with the Roadless Rule exceptions and could, therefore, not be allowed with the Roadless Rule in effect.

17.3 Scenery

17.3.1 Affected Environment

About 62 percent of CNF (approximately 397,000 acres) can be seen from adjacent or interior roads, trails or waterways, largely due to the mountainous terrain. The more scenic landscapes - those allocated as *Preservation*, *Retention* and *Partial Retention* (VMS) or as *Very High*, *High* or *Moderate* (SMS) - are generally associated with or occur adjacent to lakes, rivers and streams, designated Wilderness, National Trails or highly developed recreation areas. Elevations in CNF range from high points over 5000 feet to lower elevations of less than 1000 feet along some rivers and streams. Views beyond the immediate foreground are influenced by terrain as well as vegetation type and density. The steep to rolling ridges and valleys characterizing the CNF are covered with an almost-continuous canopy of soft- to medium-textured rounded tree forms, creating a natural-appearing landscape character. Since the late 1990s, as a result of the SPB infestation that killed large numbers of introduced and native pines, part of the canopy has opened. Groups of tall, gray, defoliated stems, varying in size from less than an acre to more than 25 acres, eventually give way to an emerging deciduous and evergreen understory. This process is speeded by active salvage operations in areas where human health and safety is critical.

Landscape Themes and existing Landscape Character

Of the Land Use Themes described for the Southern Appalachian Forests, CNF landscapes can be grouped predominantly into four: Natural Evolving, Natural Appearing, Rural-Forested and Rural – Pastoral/Agricultural. (*Landscape Aesthetics, section 1-3*)

The vast majority of the CNF (more than 570,000 acres) is characterized as Natural Appearing.

Designated Wilderness (66,637 acres), lands where ecological processes predominate, are characteristically Natural Evolving landscapes.

Rural-Forested is a very small category that includes the CNF's most highly developed recreation areas.

Rural-Pastoral/Agricultural is an equally limited category composed mainly of some managed open areas along the A.T. (e.g.: portions of the Osborne Farm tract) and the Jackson Farm.

Approximately 95 percent of CNF is located within the Blue Ridge Physiographic Province. The western portion of the CNF, approximately five percent, lies in the Ridge and Valley Physiographic Province. Portions of the CNF lie in three ecological sections, as described by Bailey and others (1994), including:

M221A – Northern Ridge and Valley Section – occurs only in the CNF's northern districts, west of the Blue Ridge Mountains Section. Elevation ranges from 300 to 4000', with parallel landforms characterized by narrow valleys and high ridges. Precipitation ranges from 30-45" annually, with mixed vegetation of Appalachian Oak and Oak/Hickory/Pine components. The northern districts' South Holston Lake lies in this section.

M221D – Blue Ridge Mountains Section – runs the entire width of the state along the eastern boundary and comprises most of CNF. Elevation ranges from 1000 to 6000': the majority (80%) of this section is characterized by low mountains, but several high peaks occur in the 5-6,000+ elevations. One-fifth of the section is characterized by open, low mountains. Precipitation ranges from 40-50" annually, with mixed vegetation of Appalachian Oak, Southeastern Spruce Fir and Northern Hardwood components.

221J – Central Ridge and Valley Section – classifies lands in the southern districts west of the Blue Ridge Mountains Section. Very little forest land lies in this section. Elevation ranges from 650 to 2000', characterized by open hills. Precipitation less than 40" annually supports vegetation of Appalachian Oak components.

Existing Visual Quality

The scenic resources of CNF are currently managed in accordance with the 1986 Land and Resources Management Plan, as amended. Scenic resource management direction in the LMP is through Visual Quality Objectives (VQOs), determined by the Visual Management System (VMS). The table (p. II-15) in the 1986 CNF LMP summarized the acres assigned to Visual Quality Objectives as follows:

Table 3-124. Visual Quality Objectives

Visual Quality Objectives	Acreage	% of Landbase
Preservation	66,637	11%
Retention	88,348	14%
Partial Retention	83,544	13%
Modification	161,169	26%
Maximum Modification	223,867	36%
Total	623,565	100%

Lands assigned with VQOs of *Preservation* included existing and proposed wildernesses: Cohutta (Tennessee portion), Big Frog, Little Frog Mountain, Gee Creek, Citico Creek, Bald River Gorge, Joyce Kilmer-Slickrock (Tennessee portion), Sampson Mountain, Unaka Mountain, Pond Mountain, Big Laurel Branch. All of these are currently designated Wildernesses, and, with revised figures, total 66,389 acres.

Lands assigned with VQOs of *Retention* included 156 developed sites, a portion of the inventoried National Forest Recreation Survey (NFRS) sites that were proposed for development within the planning horizon, mapped foreground viewshed (200-foot minimum) from the A.T. along with John Muir and Warriors Passage National

Recreation Trails and Overmountain Victory National Historic Trail; special areas, including scenic, botanical and zoological areas, corridors of rivers in the National Rivers Inventory (Ocoee, Tellico, Hiwassee, Nolichucky, French Broad, Conasauga, Watauga, Little Tennessee and Doe); Roan Mountain; 19 high elevation mountain balds on the Tellico and all northern districts; administrative sites within the forest boundary (ranger stations, work center, government quarters, Jacobs Creek Job Corps Center, and Jackson YCC Camp); four cultural resource areas, the Wasp community, Jackson Farm, Weavers Bend and Dutch Fields; and the foreground viewsheds of a number of trout streams.

Lands assigned with VQOs of *Partial Retention* generally included some inventoried NFRS sites, middleground and background viewsheds from the A.T., middleground viewsheds from some river corridors, foreground viewsheds from most recreation corridors that access developed recreation areas and most major state and federal highways that run through CNF lands.

Lands assigned with VQOs of *Modification* generally included forest acreage seen from primary and secondary travel routes and use areas, but where less than ¼ (along primary routes) or less than ¾ (along secondary routes) of Forest visitors had a major concern for scenic qualities.

Lands assigned with VQOs of *Maximum Modification* generally included forest acreage seen from secondary travel routes and use areas where less than ¼ of Forest visitors had a major concern for scenic qualities, or lands considered “unseen” by general forest users.

In 1995, the USDA Forest Service updated and refined its system for managing scenery, now called the Scenery Management System. To prepare for incorporating the new system into the Forest Planning process, Forest landscape architects conducted an inventory of CNF’s scenic resources during 1997-99 leaf-off seasons. Established distance zones and sensitivity levels from 1980s VQO maps were updated and newly acquired lands were inventoried. Scenery analysis reflected increased public interest in scenery and increased visibility of Forest lands. While Scenic Classes from 1 (highest level) to seven are allowed under the SMS, there are no Classes 6 or 7 on CNF lands in the updated inventory.

For Forest Planning purposes, Scenic Integrity Objectives were established for each prescription. These range from *Very High* (VH: unaltered) to *Low* (L: moderately altered). *Very Low* is not scenery management objective in this analysis, however VQOs of *Modification* and *Maximum Modification* were in the VMS and in the previous Forest Plan. The SIOs define the different levels of acceptable alteration to the CNF’s scenery, by Prescription.

The crosswalk between Visual Quality Objectives (Visual Management System) and Scenic Integrity Objectives (the updated Scenery Management System) is as follows:

Table 3-125. VQO/SIO Crosswalk	
Visual Quality Objective (VQO)	Scenic Integrity Objective (SIO)
Preservation (P)	Very High (VH)
Retention (R)	High (H)
Partial Retention (PR)	Moderate (M)
Modification (M)	Low (L)
Maximum Modification (MM)	Very Low (VL)

Figure 3-18 is a flow chart showing how to apply the Scenery Management System to Forest Planning and site-specific activities.

Special Places

Special Places are those specific locations and expanses in outdoor settings with attractions and features that are identified as unique, different, distinctive, and extraordinary to people. Special Places are not necessarily components of the CNF's designated "Special Areas."

A comprehensive inventory of constituents' special places has not been conducted. However, drawing from places listed with high concern levels in the CNF's Scenery Inventory, constituents' comments to project analysis, sites inventoried in the CNF's Interpretive Master Plan, sites inventoried in "Ocoee Scenic Byway Guidelines for Management and Interpretation," nature viewing sites inventoried during development of the CNF's National Geographic/Trails Illustrated trails maps, and sites listed in *Tennessee Wildlife Viewing Guide* and related publications, the following categories and numbers of sites have been developed:

Table 3-126. Numbers of Special Places			
General Category	Northern Districts	Southern Districts	Total
Natural	35	25	60
Cultural	15	12	27
Natural/Cultural	35	32	67
Total	85	69	154

Most of the sites enumerated above fall within boundaries of designated Wilderness, developed recreation areas, officially-designated scenic areas, areas established as thematic cultural landscapes or rural historic districts or administrative sites or fall within corridors of scenic byways, rivers, nationally-designated trails. As such, each of these fall within areas with established Visual Management Objectives (SIOs), by management area (prescription).

Figure 3-18. Applying the Scenery Management System in CNF's Plan Revision Process

Inventory of forest lands by Viewing distance, Concern level, Scenic attractiveness	<u>Yields</u> →	Inventoried Scenic Class	<u>Combined with</u> →	SIO by Prescription	<u>Determines</u> →	Treatments for Management Activities (Scenery Table)

Notes:

Viewing distance – foreground, middleground, background

Concern level1 – 1 (the highest), 2, 3

Scenic attractiveness – A, B, C (CNF has no C)

Inventoried Scenic Class – 1 (the highest) through 7 (CNF has no inventoried 6s or 7s at this time)

SIO – Scenic Integrity Objectives – VH (Very High), H (High), M (Moderate), L (Low)

17.3.2 Direct/Indirect Effects

The scenic resource would potentially be affected by management activities altering the appearance of what would be seen in the landscape. Short-term scenic effects that result from management activities are usually considered in terms of degree of visual contrast with existing or adjacent conditions that result from management activity. The scenic landscape can be changed over the long term or cumulatively by the alteration of the visual character. Management activities, which result in visual alterations inconsistent with the assigned SIO affect scenery, even with mitigation. Management activities that have the greatest potential of affecting scenery would be road construction, vegetation management, insect and disease control, special use utility rights-of-ways, and mineral extraction. Other management activities that also would potentially effect the scenic resource at a lesser degree are threatened and endangered (T&E) species habitat management, prescribed burning, fire suppression, land exchange, old growth forest management, recreation, and administrative site facility construction, and wildlife management. Table 3-127 describes acreage allocations to various Scenery Integrity Objectives (SIOs), by alternative.

Table 3-127. SIO Acres by Alternative

Alternative	A	B	D	E	F*	G	I
SIO							
Very High	145,365	145,650	81,602	188,869	66,389	205,123	148,757
High	160,559	131,157	171,276	172,829	88,348	236,875	145,994
Moderate	264,885	246,565	194,104	257,232	83,544	105,217	214,005
Low	56,050	103,784	180,178	3,202	161,169	79,934	117,233
Very Low					223,867		
No data**	12,820	11,708	10,390	17,584	15,547	12,522	11,732
Total	639,679	638,864	637,550	639,716	638,864	639,671	637,721

*No Action Alternative
**This acreage indicates uninventoried land acquisitions, including recent A.T. acquisitions, tract on Starr Mountain, etc.

Existing designated Wilderness consistently would be allocated to a Very High SIO in all alternatives. In Alternatives B, E, G and I, most or all of the CNF's designated Scenic Areas received allocations to VH SIOs; most Rare Communities (for example, Whetstone Branch, Bullett Creek, Horsehitch Gap) were consistently mapped as VH. Except in Alternatives I and F, portions of Conasauga and Nolichucky Rivers were mapped as VH. High elevation mountain balds on Roan Mountain received allocations to VH SIOs in all alternatives.

In all alternatives, Ocoee Scenic Byway and Cherohala Skyway corridors; Conasauga, Ocoee, Hiwassee, Tellico, French Broad, Nolichucky and Elk River corridors, Citico and Beaverdam Creek corridors; Watauga and South Holston Lake corridors; TN68 near Coker Creek; Wasp and Weavers Bend cultural resource areas; and A.T. corridor would potentially receive a High SIO (unless they occurred in areas that received an SIO of VH).

The central part of the south end Districts between Ocoee and Tellico Rivers, except Hiwassee River and Coker Creek corridors; portions of the western part of Tellico District; portions of Stone Mountain in Cocke County; Sol Messer Mountain area, portions of the western part of Chucky Mountain; Buffalo Mountain and parts of Iron Mountain would potentially receive a Low SIO in all alternatives except Alternative E, in which none of these areas except Buffalo Mountain would receive a Low SIO.

In contrast to Alternative F (the no action alternative), all other alternatives would potentially result in increases in lands assigned Very High, High and Medium SIOs. Acreage allocations in VH SIOs in Alternative G represent 32 percent of all Forest lands. Other alternatives range from 30 percent (E) to 23-24 percent (A, B and I) in VH, except Alternatives D and F at 13 and 11 percent.

Alternatives A, D and E reflect the highest percentage of allocation to H and M SIOs, all at 67 percent. Alternatives B, I and G reflect a moderate number at 59 percent, 56 percent and 54 percent, respectively. Alternatives that receive the highest acreage to High and Medium SIOs would result in more protection and enhancement to the scenic resources than alternatives having fewer acres assigned to the higher SIOs. However, those alternatives with more acres assigned to SIOs of H would provide a greater amount of protection and enhancement. In descending order, these are Alternatives G, E, D, A, I, and B. Alternative E has a very low number of acres assigned to Low SIO (3,202 acres); Alternatives A and G each have less than 100,000 acres in this category. Alternative D has the most and Alternatives F, I and B the next largest number of acres assigned to Low SIO.

Negative impacts to scenery from road construction, vegetation management, insect and disease control, special use utility rights-of-ways, and other activities would be the greatest in Alternative F, the no-action alternative that also includes an SIO of VL (Very Low) on 35 percent of the total Forest acreage, and a combined total of 385,036 acres (60%) in L and VL. VL is no longer a SIO in the updated Scenery Management System. Alternative D would potentially be second with the greatest number of potential negative impacts to scenery, at 28 percent total Forest lands assigned to at Low SIO. Many of these impacts would be avoided by implementing mitigation measures. Impacts would be the lowest in Alternative G because the emphasis is on wilderness, wilderness study areas, remote backcountry recreation and old growth with a decrease in roads and all kinds of vegetation management.

Existing designated Wilderness (1.A) are lands currently considered Natural Evolving; the acreage remains the same across alternatives. With a greater amount of acreage allocated to Wilderness Study Areas (1.B) in Alternatives G (73,655 acres) and E (49,874), there would be a shift from Natural Appearing to Natural Evolving on approximately 18 to 23 percent of the CNF. Acreage allocations in Alternatives A and I would allow a shift from Natural Appearing to Natural Evolving on approximately 14-15 percent of the CNF. By grouping acreages allocated to Prescriptions 1.A, 1.B, 4.A, 4.F, 4.I, 4.K, the 6s, 9.F, 12.A and 12.B, the potential shift in landscape character into the upper ranges of Natural Appearing to becoming Natural Evolving would range from 20 percent (Alternative D) to a high of 59 percent in Alternative G.

All alternatives propose prescribed burning. Efforts are underway to divide CNF into burn blocks; a maximum of 40,000 acres would potentially be burned each year. Drifting smoke and blackened vegetation and charred tree trunks would be the main negative effects to scenery. Visual contrast to the general forest from fireline construction would also be evident. The contrast levels and duration vary with fire frequency and intensity. Smoke would potentially only last one day; blackened vegetation usually lasts a short time, while charring of trees would potentially be evident for many years. Repetitive burning would potentially reduce overall visual diversity: it would potentially result in loss of valued mid- and understory species such as flowering dogwood, but would potentially promote herbaceous flowering species. Prescribed fire repeated over time produces stands with open, or park-like, understories that allow views farther into the landscape. Prescribed burning would be limited and/or prohibited in 20 to 32 percent of the CNF in each of the alternatives except Alternative F (11%, in designated Wilderness only). The alternatives with the most limits would be G (32%) and E (30%). Alternatives A and I provide limits in 25 percent of the CNF.

Insect infections and diseases would potentially cause strong, unattractive contrasts in the landscape. Management efforts to control insect infestations and diseases would potentially minimize or reduce effects. Control efforts that include removal of infected trees and buffer areas often appear as clearcutting to forest visitors. These impacts would occur in areas of high scenic value. Disease and insect controls would be limited and/or prohibited in 20-54 percent of the CNF in each of the alternatives except F (11%, in designated Wilderness only). The alternatives with the most limits would be G (54%), E (43%), I (34%) and A (29%). Alternatives B and D provide limits in 20-22 percent of the CNF.

Utility ROWs possess a high potential for affecting the scenery resource for a long duration. Cleared ROWs and/or utility structures contrast, and would be incongruent, with the surrounding Forest landscape. Cleared ROWs contrast in form, line, color, and texture when compared to the natural appearing landscape. By alternative, utility structures and rights-of-ways are fully allowed and/or limited in 37–84 percent of the CNF. Alternatives E and G allow these structures and openings in the least amount of the CNF, ten percent and 21 percent, respectively, but allow limited use in another 56 percent and 38 percent respectively. Alternatives D (71%) and I (58%) allow the most unlimited presence on-forest; by adding allowed but limited uses increases these two alternatives to 84 and 81 percent respectively.

Mineral management and development activities would potentially involve major alteration to landform, as well as contrasts to form, line, color, and texture, causing substantially adverse scenic impacts. No mineral extraction or drilling for gas or oil is common at this time in CNF. Allowed mineral activities would be the highest in Alternatives D (70%) and I (57%); Alternatives A and B allow 37 and 30 percent, respectively, while Alternatives E and G allow the least at eight percent and 19 percent, respectively. Areas unavailable for mineral activity range from 14 to 27 percent of total Forest lands across the alternatives. Alternatives G (27%) and E (23%) would be the most restrictive; Alternatives A and I, 19 percent, and Alternatives A, F and D would not allow mineral activity in 14-16 percent of Forest lands.

Road maintenance affects scenery, especially activities to rights-of-way. Mowing frequency and timing are factors that would potentially alter the appearance of the landscape. Road construction introduces unnatural visual elements into the landscape and causes contrasts to form, line, color, and texture. Having roads open or closed offers some control over how much of the landscape would be seen, especially the forest interior. Alternative D would allow more road construction, in approximately 48 percent of the CNF, with the others at eight percent and less. Alternative I allows increases in road construction in approximately two percent of the CNF; Alternative E would be less than two percent, and Alternatives B and G allow increases in less than one percent of the CNF.

Vegetation management has a great potential to alter the landscape and impact the scenic resource. Timber harvest practices would potentially cause long-term effects on scenery. Species conversion, reduction in species diversity, manipulation of the prominent age class, and alteration of opening size, location, and frequency would potentially alter landscape character. The potential effects would be positive or negative, depending on their consistency with the desired future condition of the landscape. Of the management applications, even-aged management would be the most impacting. Among the even-aged regeneration methods, clearcutting and seed-tree harvest produces the highest visual contrasts because they remove the most forest canopy and create openings. These openings would vary in their effects on scenery depending on size, shape, location, and nearness to other openings. Openings that repeat the size and general character of surrounding natural openings and landscape character of adjacent areas would have the least impact on scenery. Single-tree selection and group selection harvest are normally less evident because they do not cause large openings in the canopy. Uneven-aged regeneration methods would potentially affect scenery, causing contrasts in form, line, color, and texture from slash production. Impacts resulting from timber harvest would potentially be short-term in areas where vegetation growth would be relatively rapid. Allowed vegetation management would be the most prevalent in Alternatives D and I, across approximately 72 percent and 63 percent of total Forest acres, respectively. Alternatives E and A allow vegetation management over approximately 37-40 percent, while Alternatives B and G would be the least at 30 percent and 25 percent, respectively.

Site preparation activities affect scenery by exposing soil and killing other vegetation. These effects would potentially be generally short-term. Site preparation usually improves the appearance of the harvest area by removing unmerchantable trees and most of the broken stems. Stand improvement work would potentially affect scenery by browning the vegetation and reducing visual variety through elimination of target species. The allocations for prescriptions allowing this type activity would be very similar to those described in the Vegetation Management paragraph, above.

Wildlife openings are commonly created and maintained in CNF and help create rural-pastoral effects to an otherwise closed canopy. Forestwide prescribed burning and mid-story manipulation are sometimes used as wildlife management practices. These activities would reduce over-story diversity and result in loss of valued scenic resources such as flowering dogwoods. Mid-story removal and prescribed burning in

time would potentially produce stands with open under-stories that allow views into the landscape. Wildlife management activities would be allowed most commonly in Alternatives I (in over 78% of the total Forest acres), G (57%) and E (55%). Alternatives A, B and D range from 45 to 39 percent, respectively.

Recreation facilities are deviations to the natural landscape, but Forest Service recreation facilities are usually designed to blend into the landscape without major visual disruption. Alternative E provides an allowance for the greatest recreation development, in approximately 42 percent of the CNF. Alternative I allows development in approximately 30 percent, with alternative A allowing development in 22 percent. The smallest allowance is in Alternative B, at five percent, followed by Alternative D (12%) and G (14%).

Designation of wilderness would generally cause positive effects to the scenery. Old-growth forest character would potentially be created over time. A greater amount of acreage would be allocated to Wilderness Study Areas (1.B) in Alternatives G (73,655 acres) and E (49,874). Acreage allocations in Alternatives A and I increase Wilderness potential on approximately 14-15 percent of the CNF. However, the scenic resource would suffer in some areas of the CNF with the low emphasis on controlling insects and disease in Wilderness.

For the most part, Special Places are not affected across alternatives. However, the inventory list is not complete and would potentially change over time as more sites are inventoried. Buffers needed to protect the character of each individual special place would vary by site.

17.4 Special Areas

17.4.1 Affected Environment

Special interest areas are designated to protect and, where appropriate, foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, paleontological, archeological or other characteristics. Special interest areas may be designated administratively or may receive designation by law. Other uses are permitted in these areas to the extent that these uses are in harmony with the designation.

For CNF, this section concentrates on designated Scenic Areas, Scenic Byways, and the A.T. Other sections of the EIS describe special areas with historical, geological, botanical, zoological, paleontological, archeological or other characteristics. For example, special botanical areas are discussed under Rare Communities, historic districts under the Heritage section and outstandingly remarkable streams under the Wild & Scenic Rivers section.

The special areas on the CNF are:

Table 3-128. Special Areas: Scenic Areas and Scenic Byways.			
SCENIC AREA	ACRES	MILES	DISTRICT
Rock Creek Gorge	220	n/a	Ocoee/Hiwassee
Coker Creek	375	n/a	Tellico
Bald Mountain Ridge	8,653	n/a	Nolichucky/Unaka
Unaka Mountain	910	n/a	Nolichucky/Unaka
Doe River Gorge	1,783	n/a	Watauga
Stoney Creek	3,920	n/a	Watauga
Rogers Ridge	3,865	n/a	Watauga
SCENIC BYWAY			
Ocoee (USFS Scenic Byway)	6,578	26	Ocoee/Hiwassee
Cherohala Skyway (National Scenic Byway)	7,916	23	Tellico
Total	34,220	49	

The special characteristics of these areas are as follows:

Bald Mountain Ridge Scenic Area is a mountainous area with a range of gently rolling to steep, rugged slopes, with some high elevation balds along the Tennessee-North Carolina line. The area is known for its diverse population of wildflowers and for a number of waterfalls, including 60-foot fan-shaped Margaritte Falls. The A.T. runs along the state line.

Coker Creek Scenic Area is a narrow gorge approximately 4.5 miles long, on both sides of Coker Creek. The creek is characterized by a number of waterfalls, the largest of which is the 20-foot Coker Creek Falls. Diverse Appalachian plant species include hemlock, white pine, azalea, rhododendron, mountain laurel and a profusion of wildflowers. The area can be accessed by road or as a spur off the John Muir National Recreation Trail.

Doe River Gorge Scenic Area is a steep, narrow gorge along Doe River, accessed by a grade along the abandoned East Tennessee and Western North Carolina rail line. The area is known for its diversity of Appalachian plant species.

Rock Creek Gorge Scenic Area, located between Chilhowee Recreation Area and Ocoee Scenic Byway, is a steep, narrow gorge along Rock Creek. A series of waterfalls and cascades characterize the area, including 65-foot fan-shaped Benton Falls.

Rogers Ridge Scenic Area features a rich cove hardwood community, high elevation grassy balds and Gentry Creek Falls, with two 40-foot horsetails. Elevations range from 3800 feet to above 5000 feet, with moderate to steep slopes.

Stoney Creek Scenic Area is known for its rich diverse vegetation and waterfalls and cascades along the area's major streams, including North Fork Stony Creek. Holston Mountain Trail accesses the area from the A.T., near the northern side of Cross Mountain.

Unaka Mountain Scenic Area lies on the west side of Unaka Mountain Wilderness. The area is characterized by dense upland hardwood forest. The A.T. and Forest Road #230 ramble along the area's southern boundary.

An additional area, Turtletown Creek Falls, has been considered locally as a Scenic Area, but no action has been taken to designate it through this Forest Plan revision.

Two national forest scenic byways meander through CNF.

Ocoee Scenic Byway. In 1988, Ocoee Scenic Byway became the first national forest scenic byway designated in the nation. The byway's sections include 19 miles of US 64 through the Ocoee River gorge from TVA's Ocoee Dam #1 to the end of NFS land along the highway near Ducktown and seven miles on Forest Road #77 up Chilhowee Mountain to the byway's terminus at Chilhowee Recreation Area. Heavy traffic on the US 64 portion includes a mix of commercial trucks, local commuters, seasonal outfitters' transport for Ocoee River rafting, sightseers and drivers for pleasure. Views are confined through the Ocoee River gorge except along some sections of Parksville Lake and near the eastern terminus from Ocoee Whitewater Center east toward Ducktown. The climb on FDR #77 is a more serene experience, offering numerous overlooks to distant views of the Tennessee Valley and Georgia mountains. The season of heaviest use on both segments spans the months of May through October, although US 64 receives heavy use year-round.

Cherohala Skyway is a 43-mile scenic byway that connects Tellico Plains, Tennessee with Robbinsville, North Carolina, snaking through Cherokee and Nantahala National Forests along TN 165 and NC 143. While no commercial outfitters operate on Tellico River, it is popular with anglers, swimmers, campers and kayakers. Indian Boundary and Horse Cove are popular national forest recreation areas, one on the byway about 15 miles from the western portal and one near the eastern terminus. Joyce Kilmer Memorial Forest and two large Wildernesses, Citico and Joyce Kilmer/Slickrock, are popular destinations along the Skyway. More than 20 overlooks, ten of which lie on the Tennessee portion and managed by CNF, offer spectacular vistas. The highest seasonal use also occurs between May and October, with sightseeing/fall color traffic increasing during October, especially on weekends.

Driving for pleasure is always in the top ten of recreational pursuits on national forest; people enjoy touring the rural communities and national forests by car In 2000, 53 percent of the Southern population participated in this activity. ("Proposed, Southern Forest Resource Assessment", Chapter SCIO-6, Table 2, pg. 26.)

Table 3-129. Special Areas: Appalachian National Scenic Trail		
	ACRES	MILES
Appalachian National Scenic Trail	45,146*	Approx.150
*Includes the pathway and up to ½ mile foreground corridor on either side.		

Designated a National Scenic Trail by Congress in 1968, the A.T. is a way, continuous from Katahdin in Maine to Springer Mountain in Georgia, for travel on foot through the wild, scenic, wooded, pastoral and culturally significant lands of the Appalachian Mountains. The famous A.T. is an icon of dispersed recreation on NFS lands in the Southern Appalachians. It is a magnet for day hikers and is matchless in its long distance backpacking opportunities. The A.T. meanders approximately 150 miles on forested mountain ridge tops, through open balds, along rocky streams, moving from wild to pastoral settings, often along the Tennessee-North Carolina state line. There are 18 shelters for overnight camping and a number of trailheads that provide access from primary road systems. Strong communities of volunteers work with the Forest Service to plan and maintain the AT; this relationship is formalized in the Appalachian Trail Conference (ATC) and its trail clubs.

Sections of the A.T. are among the forest's major dispersed recreation "hot spots." These include the section of the A.T. at Carvers Gap on Roan Mountain, Beauty Spot on Unaka Mountain and the section in Pond Mountain Wilderness that includes Laurel Fork Falls.

17.4.2 Direct/Indirect Effects

The seven designated scenic areas (19,726 acres) and two scenic byway corridors (14,494 acres) comprise almost 19 percent (34,220 acres) of the forest. All alternatives propose new special areas for the corridors of the two Scenic Byways, designated after the 1986 plan. The mix of management prescriptions allocated to the existing scenic areas, the two newly proposed Scenic Byway corridors and the foreground corridor of the A.T. are described by the alternatives in Table 3-130. No existing scenic areas are recommended for deletion in any alternative. Alternative F is the "no action" alternative and represents current management conditions.

Table 3-130. Special Areas: Designated Scenic Areas, Scenic Byways and Appalachian National Scenic Trail, Allocations by Alternative							
Alternative	A	B	D	E	F	G	I
Scenic Area							
Rock Creek Gorge	100%P	100%P	100%P	100%P	100%P	100%P	100%P
Coker Creek	100%P	100%P	100%P	100%P	100%P	100%P	100%P
Bald Mountain Ridge	14%P 86%S	92%P 8%S	4%S 96%O	97%S 3%O	100%P	94%P 6%S	100%P
Unaka Mountain	67%P 32%S 1%O	67%P 32%S 1%O	61%P 32%S 7%O	67%P 33%S	100%P	68%P 32%S	100%P
Doe River Gorge	100%P	100%P	100%P	100%P	100%P	100%P	100%P
Stoney Creek	64%P 36%S	64%P 36%S	64%P 36%S	64%P 36%S	100%P	65%P 35%S	99%P 1%S
Rogers Ridge	95%P 5%O	95%P 5%O	95%P 5%O	95%P 5%O	100%P	95%P 5%O	100%P
Scenic Byway							
Ocoee Scenic Byway	82%P 17%S 1%O	17%S 83%O	82%P 17%S 1%O	82%P 17%S 1%O	49%S 51%O	82%P 17%S 1%O	66%P 20%S 14%O
Cherohala Skyway	77%P 12%S 11%O	26%P 11%S 63%O	78%P 10%S 12%O	60%P 40%S	86%S 14%O	65%P 33%S 2%O	44%P 39%S 17%O
National Scenic Trail							
Appalachian	71%P 25%S 4%O	76%P 17%S 7%O	75%P 17%S 8%O	68%P 28%S 4%O	56%P	64%P 32%S 4%O	71%P 25%S 4%O
P = Allocated to specific special area prescription (4.F for Scenic Area; 7.A for Scenic Byway; 4.A for A.T.) S = Scenic qualities emphasized (including Rxs 1.A, 1.B, 4.A, 4.F, 4.K, 5.A, 6.A, 6.E, 7.A, 7.B, 7.D, 7.E.1 and 2, 12.A. 12.B) O = Other qualities/resources/communities emphasized (including Rxs 8.A.1 and 2, 8.C, 8.E, 9.A.1, 9.A.2 and 9.A.3, 9.B.1 and 9.B.2, 9.C.2, 9.F, 9.H, 10.A, 10.B)							

Alternative A

Scenic Areas: 99 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (1.B, 4.A, 4.F). A large portion of Bald Mountain Ridge was allocated as Wilderness Study Area (86%). Rare communities would be managed in the Rogers Ridge area.

Scenic Byways: 98 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 5.A, 7.A, 7.D, 7.E.1 and 2, 12.A), including prescriptions for administrative sites (Ocoee Ranger Station and Ocoee Whitewater Center, for example) and developed recreation sites. The foreground of each byway includes designated wilderness. The remaining percentage of the foregrounds were allocated in prescriptions that emphasized watershed restoration, sustained yield timber production, black bear management and rare communities.

A.T.: 96 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness, five percent as Wilderness Study Area, six percent Roan Mountain and three percent with remote backcountry emphasis; four percent was allocated to an emphasis on rare communities.

Alternative I allows recreational special uses only under certain conditions. Use of the trail will be monitored and evaluated periodically to determine if these limitations are still appropriate.

Alternative B

Scenic Areas: 99 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (4.A, 4.F). Rare communities would be managed in the Rogers Ridge area.

Scenic Byways: 27 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 5.A, 7.A, 7.D), including prescriptions for administrative sites such as Ocoee Ranger Station and Ocoee Whitewater Center and developed recreation sites. The foreground of each byway includes designated wilderness. The remaining percentages of the foregrounds were allocated with the greatest emphasis on watershed restoration (65%), ecological restoration (8%), and black bear management (less than 1%).

A.T.: 93 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness and six percent Roan Mountain; four percent was allocated to an emphasis on rare communities.

Alternative D

Scenic Areas: 85 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (4.A, 4.F). Rare communities would be managed in the Rogers Ridge area. 45 percent of these scenic areas were allocated to prescriptions that emphasized sustained yield and high quality timber harvesting. This allocation was focused mainly on the largest scenic area, Bald Mountain Ridge (96% of the acreage in that area).

Scenic Byways: 94 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 5.A, 7.A, 7.D), including prescriptions for administrative sites such as Ocoee

Ranger Station and Ocoee Whitewater Center and developed recreation sites. The foreground of each byway includes designated wilderness. Sustained yield timber harvest was an emphasis on five percent of the scenic byways' foregrounds, mostly on Cherohala Skyway. Less that one percent (0.7%) fell into an allocation that emphasized black bear habitat, over approximately equal acreage for the foregrounds along both scenic byways.

A.T.: 92 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness and six percent Roan Mountain; four percent was allocated to an emphasis on rare communities.

Alternative E

Scenic Areas: 98 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (1.B, 4.A, 4.F, 7.D, 7.E.1). A large portion of Bald Mountain Ridge was allocated as Wilderness Study Area (85%); approximately 2.5 percent of the same area was allocated to an emphasis on black bear habitat (about 1% of total scenic area acreage). Rare communities would be managed in portions of Rogers Ridge and Stoney Creek.

Scenic Byways: 99.5 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 1.B, 5.A, 7.A, 7.D, 7.E.1), including prescriptions for administrative sites such as Ocoee Ranger Station and Ocoee Whitewater Center and developed recreation sites. The foreground of each byway includes designated wilderness. This alternative included a variety of management options for Cherohala Skyway: 22 percent of the seen area foreground along Cherohala Skyway was allocated to Wilderness Study Area, three percent of the foreground was allocated to new recreation development and approximately four percent fell into an allocation with a dispersed recreation emphasis.

A.T.: 96 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness, ten percent Wilderness Study Area and six percent Roan Mountain; four percent was allocated to an emphasis on rare communities.

Alternative F

Scenic Areas: The Forest Plan acreage for Scenic Areas provided the basis for comparing other alternatives.[1] In this no-action alternative, all scenic areas would be managed for their scenic qualities with an emphasis on semi-primitive non-motorized recreation opportunities. (See IV-88, 1986 Plan) Forestwide recognition of Scenic Area boundaries and significance has increased during recent Plan Revision efforts.

Scenic Byways: The current scenic inventory of the foregrounds along these byways is approximately 70 percent of the acreage generated through a GIS line-of-vision analysis of the seen area within a ½ mile on each side of the two byway corridors. As

[1] GIS-calculated acres are slightly different, showing fewer acres for Stoney Creek, Rogers Ridge and Unaka Mountain and more acres for Coker Creek and Doe River Gorge.

nationally designed scenic byways, these corridors are considered distinctive landscapes (Class A) with the highest emphasis on the importance of scenery, "Concern Level 1." The current scenic inventory should be adjusted to reflect the GIS seen area coverage.

A.T.: Acres allocated specifically to the A.T. in the 1986 Plan are about 56 percent of the current GIS-calculated acres for the seen-area foreground. The remainder of lands seen within an area up to a half-mile from the A.T. tread, allocated to 1986 Plan Management Areas in which scenic qualities are emphasized, have not been calculated. These could include some portions of designated Wilderness, Roan Mountain and other special emphasis areas, developed recreation areas, NFRS sites, semi-primitive recreation allocations and other areas. The current scenic inventory and trail coverage should be adjusted to reflect the GIS seen area.

Alternative G

Scenic Areas: 99 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (1.B, 4.A, 4.F, 12.B). In this alternative, approximately six percent of total acreage is allocated as Wilderness Study Areas, including 35 percent of Stoney Creek, 2.5 percent of Bald Mountain Ridge and one percent of Unaka Mountain. Rare communities would be managed in the Rogers Ridge area.

Scenic Byways: Nearly 99 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 1.B, 5.A, 7.A, 7.B, 7.D, 7.E.1, 12.B), including prescriptions for administrative sites such as Ocoee Ranger Station and Ocoee Whitewater Center and developed recreation sites. The foreground of each byway includes designated wilderness.

A.T.: 96 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness, five percent Wilderness Study Area, three percent Scenic Areas allocation and six percent Roan Mountain; four percent was allocated to an emphasis on rare communities.

Alternative I

Scenic Areas: 99 percent of all designated scenic areas were allocated into prescriptions in which their scenic qualities would be emphasized (4.A, 4.F, 12.A, 12.B). The majority of acres were allocated specifically for Scenic Area management. Specific allocation was dropped for Rogers Ridge rare communities.

Scenic Byways: 85 percent of the seen area foregrounds of these scenic byways were allocated into prescriptions in which their scenic qualities would be emphasized (1.A, 1.B, 5.A, 7.A, 7.B, 7.D, 12.B), including prescriptions for administrative sites such as Ocoee Ranger Station and Ocoee Whitewater Center and developed recreation sites. The foreground of each byway includes designated wilderness. 14 percent of the foreground of Cherohala Skyway was allocated to remote backcountry management, with an additional 14 percent falling into the scenic corridor/sensitive

viewshed classification. Black bear management received a greater emphasis along Ocoee Scenic Byway corridor, with 11 percent of the foreground allocated to that prescription (6% of the total seen area foregrounds of the two byways). 17 percent of the seen area foreground of Cherohala Skyway was allocated to manage vegetation with emphasis on early successional habitat (11% of the total seen area foregrounds of the two byways).

A.T.: 96 percent of the seen area foreground was allocated into prescriptions in which scenic qualities would be emphasized, including ten percent designated Wilderness, five percent Wilderness Study Area, three percent Scenic Areas allocation and six percent Roan Mountain; four percent was allocated to an emphasis on rare communities.

Summary

Scenic Areas:

Alternatives A and E recommend about 7,300 acres of Bald Mountain Ridge Scenic Area as Wilderness Study Area, while Alternative G recommends about 35 percent of Stoney Creek and three percent of Bald Mountain Ridge as Wilderness Study Areas. With this allocation, these acres would be managed to provide primitive settings and opportunities. The effects would include less opportunity for motorized access in Bald Mountain Ridge, elimination of bicycle use and trails maintained to a lower standard. For more information on the advantages and disadvantages of wilderness management, see the Wilderness section. In Alternative D, most of Bald Mountain Ridge would be managed for timber harvest. The effects would include loss of scenic characteristics; the probability of additional roads would reduce or eliminate the opportunity for semi-primitive settings. The area would lack special protection from normal management activities and generally lack management designed to enhance its unique characteristics of an area.

Scenic Byways:

Ocoee Scenic Byway: Alternatives A, D, E, and G allocate the highest number of acres to the scenic byway prescription. Alternative I includes a larger amount (11%) of emphasis to black bear management and three percent for an emphasis on ecological restoration. Alternative B emphasizes watershed and ecological restoration. The effects of these allocations would include potential short- or long-term loss of scenic characteristics.

Cherohala Scenic Skyway: Alternatives A and D allocate the highest number of acres (about 77%) to the scenic byway prescription, with Alternatives G and E at 65 and 60 percent, respectively. Alternative I allocated 44 percent to the scenic byway prescription. Both Alternatives E and I allocated percentages (22 and 14%, respectively) to management for remote backcountry recreation, the result of allocating acres of adjacent Roadless Areas. Alternative G allocated 19 percent to Wilderness Study Area, the result of allocating acres of adjacent Roadless Areas. Alternative B emphasizes watershed and ecological restoration. The effects of these allocations could include potential short- or long-term loss of scenic characteristics.

Appalachian National Scenic Trail:

In all alternatives, 92 percent or more of the total acreage is allocated to Prescriptions where scenic qualities are emphasized. Alternatives G, E, A and I contain allocations to Wilderness Study Areas (15 - 5%), the result of allocating acres of adjacent Roadless Areas. These allocations would affect management of the A.T., resulting in an increased primitive experience. Alternative A contains a three percent allocation for remote backcountry recreation, continuing the semi-primitive, scenic experience for which the A.T. is known. Alternatives E, G and I contain only a slight amount of allocated acres in remote backcountry recreation. Alternative I contains a three percent allocation to the Scenic Area prescription, with only slight allocated acres in other alternatives. Alternative D contains four percent allocations for black bear and timber management. Alternative B contains about three percent, and Alternative A less than one percent, allocations for black bear management and ecological/watershed restoration. These have the potential of negatively affecting the recreation experience along portions of the A.T., either short- or long-term. All alternatives contain four percent of the total acreage allocated to a Rare Community emphasis.

17.5 National Wild and Scenic Rivers

17.5.1 Affected Environment

The Wild and Scenic Rivers Act (Public Law 90-542: 16 USC 1271-1287, October 2, 1968) and its amendments provide for the protection of selected rivers and their immediate environments. To be eligible for designation rivers must possess one or more outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Designation preserves rivers in free-flowing condition, protects water quality and protects their immediate environments for the benefit and enjoyment of present and future generations.

Most rivers are added to the National Wild and Scenic Rivers System (National System) through federal legislation, after a study of the river's eligibility and suitability for designation. The Forest Service is required to consider and evaluate rivers on lands they manage for potential designation while preparing their broader land and resource management plans under Section 5(d)(1) of the Act.

According to the SAA, the national forests in the Southern Appalachians were established early in the 20th century primarily to protect the headwaters of major rivers from land uses that encouraged flooding, erosion, and stream sedimentation. Some would argue that clean water for the surrounding cities is the region's most important product.

The Southern Appalachians contain parts of 73 major watersheds; 29 are wholly within the SAA region, 18 have more than one-half within the region. Nine major rivers that rise in the Southern Appalachians provide drinking water to the major cities in the Southeast.

Increasing human population density and the resulting intensive human uses of the landscape put high stresses on aquatic systems in many areas through nonpoint

source pollution and habitat degradation. Population density in the Southern Appalachians increased from 80 people per square mile in 1970 to 102 people per square mile in 1990, and the area's population is expected to grow an additional 12.3 percent by the year 2010.

The SAA was not able to adequately estimate the impacts of increasing population on aquatic resources. However, they did report that land covers, which represent human activity, occupied over 50 percent of the land area at the time of publication (1996) on many large watersheds. Historically, riparian zones were largely forested, but human activities have reduced forestland cover to less than 60 percent in many large watersheds.

Development along rivers and streams is not only reducing water quality and habitat on many rivers, but limiting public access for fishing and other river related activities. Protection of rivers and streams through the forest planning process helps to assure high quality, free flowing rivers and streams, as well as river related recreation opportunities.

Rivers and stream corridors accommodate a diverse range of recreation activities on the CNF as previously discussed under *Developed and Dispersed Recreation*. Some of the most popular activities include picnicking, fishing, day hiking and walking for pleasure, primitive camping, boating (canoeing, kayaking, rafting, tubing), swimming and nature study.

Demand for WSR designation is expressed primarily through public comment and responses to agency proposals. The degree to which public input favors designation indicates the demand for a wide range of uses, activities, and resource qualities associated with WSR management. Although demand is closely related to the current population and the projected growth of the local area, WSR designation would likely produce increased levels of recreation use in designated and potential WSR corridors.

The Southern Appalachians currently have five Wild and Scenic Rivers totaling 191.1 miles. All but 45.3 miles are managed by the national forests. Of the 145.8 miles of designated river managed by the forest service, 80.8 miles are classified as wild, 34 miles as scenic and 31 miles as recreational.

Eligible Rivers on CNF

The Nationwide River Inventory (NRI) listed nine rivers on the CNF for wild and scenic study including four rivers already designated as state scenic rivers (Doe, French Broad, Watauga and Hiwassee rivers). The eight rivers found eligible were: Conasauga, Ocoee, Hiwassee, Tellico, French Broad, Doe, Watauga, and Nolichucky. The ninth river (Little Tennessee) was removed from the study list due to the construction of the Tellico dam that restricted the free flowing condition of the river.

Amendment #14 to the 1986 Forest Plan addressed segments of these rivers that were determined to be eligible or ineligible (including the removal of the Ocoee River from the eligibility list). The Forest Service determined that it was inappropriate to undertake the suitability studies of the Watauga, Doe and French Broad rivers since

little or no national forest frontage is involved with the eligible segments of the Watauga and Doe Rivers, and only six miles out of 134 miles of the French Broad. Since this determination, the state has also deferred to conduct suitability studies on these river segments. (AMS)

A suitability study for the Nolichucky River has been completed with a recommendation to designate the eligible segment as "Scenic." This recommendation was submitted to Congress in 1991 for approval, but no action has been taken to date. Suitability studies for eligible segments of the Tellico and Hiwassee Rivers have been initiated, but not completed. No formal recommendations have been made.

An eligibility study of the Conasauga River on the CNF determined that the 4.5-mile segment downstream from the confluence of Taylor's Branch was eligible for "Wild" classification. A shorter ½-mile segment upstream from Taylor's Branch was studied in context with the larger upstream segment located on the Chattahoochee-Oconee NF. This section was determined to be eligible as "Recreational" river due to the presence of the Sheeds Creek/Peavine Road (221 Road) and bridge.

A suitability study of the Conasauga River will be conducted in the future with the Chattahoochee-Oconee National Forest.

In addition to the eligible segments of the Nolichucky, Tellico, Hiwassee and Conasauga Rivers, three other streams on CNF were suggested and reviewed for WSR eligibility. These streams include the Elk River, Beaverdam Creek and Laurel Creek all located on the north end of CNF.

Streams were classified according to Section 2 of the WSR act (PL 90-542) (see Appendix D for more information). Table 3-131 lists all seven rivers that have been studied for eligibility, their recommended classifications and the status of their respective suitability studies. River classifications do not change between alternatives.

Table 3-131. River Segments Studied for Wild and Scenic River Eligibility

River (Segment)	Total Length	NFS Own	Study Location	Eligibility Classification	Suitability Study
Beaverdam Creek	16.5	6.5	Headwaters to TN/VA state line	Recreational	None
Conasauga River (B & C)	13.0	5.0*	Chattahoochee-Oconee NF/Cherokee NF boundary to private land	Recreational & Wild	None
Elk River	10.2	3.6	Watauga Reservoir to TN/NC state line	Scenic	None

Table 3-131. River Segments Studied for Wild and Scenic River Eligibility					
River (Segment)	Total Length	NFS Own	Study Location	Eligibility Classification	Suitability Study
Hiwassee River (B)	10.5	7.2	River Mile 43.0 to 53.5 Appalachia Powerhouse to proclamation boundary	Recreational	Pending
Laurel Creek	9.5	1.9	Headwaters to TN/VA state line	Not Eligible	N/A
Nolichucky River	7.2	1.3*	Headwaters to take out	Scenic	Recommended
Tellico River (C)	22.8	17.0*	River Mile 30.0 to 48.0 TN/NC state line to McDaniel Bridge	Recreational	Pending
*Segments of river located in Tennessee and Cherokee National Forest Recommended corridor width is an average of ¼-mile from each riverbank with a maximum of 320 acres per river mile.					

17.5.2 Direct/Indirect Effects

Outstandingly Remarkable Values

The identification of a river for study through the forest planning process does not trigger any protection under the Wild and Scenic River Act until designation by Congress. Identifying rivers as eligible, or eligible and suitable, does not create any new agency authority; rather, it focuses the management actions within the discretion of the Forest Service on protecting identified river values.

For agency-identified study rivers, the preliminary (inventoried) classification is to be maintained absent a suitability determination. The recommended classification is to be maintained throughout the duration of the forest plan. Under all alternatives, management emphasis for the eligible rivers and their corridors is focused on protection and enhancement of the values for which they were established, without limiting other uses that do not substantially interfere with public use and enjoyment of those values.

In general, the free flowing condition and outstandingly remarkable values (ORVs) determined for the affected eligible rivers will be protected under all alternatives regardless of recommendations from suitability studies. River corridors have been allocated to prescriptions that adequately protect or enhance the identified ORVs and free flowing condition.

Table 3-132 illustrates the prescription allocations of each alternative. Prescription 11, riparian corridors, is embedded in all prescriptions across alternatives and is not represented in the table.

Table 3-132. Prescription Allocations of Eligible/Recommended Rivers by Alternative							
River	ALT A	ALT B	ALT D	ALT E	ALT F*	ALT G	ALT I
Beaverdam Creek	9.A.2 9.F 7.D	9.A.2 9.F 7.D	8.C 9.F 7.D	12.B 12.A 9.F 7.D	6.5 River miles	1.B 12.B 12.A 9.F 7.D	2.B.3 7.D
Conasauga River	2.B.1	2.B.1	2.B.1	2.B.1	5.0 River miles	2.B.1	2.B.1 2.B.3
Elk River	12.B	8.C	8.C	7.E.1 1.B	3.6 River miles	8.A.1 1.B	2.B.3
Hiwassee River	7.E.2 7.D	9.A.3 7.D	7.E.2 7.D	7.B 7.D	7.2 River miles	7.A 7.D	7.B 7.D
Nolichucky River	9.F 4.A	9.F 4.A	9.F 4.A	9.F 4.A	1.3 River miles	9.F 4.A	2.B.2 9.F 4.A
Tellico River	1.A 9.A.3 7.A 7.D	1.A 9.A.3 7.D	1.A 12.A 7.A 7.B	1.A 12.A 7.A 7.D	17.0 River miles	1.A 1.B 7.A 7.D	1.A 7.A 7.B 7.D
*Baseline Miles of River classified as eligible. Prescription 11 is not shown.							

The ORVs to be protected or enhanced for each eligible river segments include:

<u>Beaverdam Creek</u>: Recreational, scenic, fisheries/aquatics, wildlife, geologic, and botanical/ecological values are rated outstandingly remarkable and the segment is free flowing. (Classified Recreational)

<u>Conasauga River</u>: River mile section 64 to 70 (½-mile segment upstream from Taylor's Branch along 221 Road): Fish and wildlife, and cultural and historical values are rated outstandingly remarkable and the segment is free flowing. (Classified Recreational)

River mile section 70 to 74.5 (downstream from Taylor's Branch): Fish and wildlife, and botanical values are rated outstandingly remarkable and the segment is free flowing. (Classified Wild)

<u>Elk River</u>: Recreational, scenic, fisheries/aquatics, wildlife and botanical/ecological values are rated outstandingly remarkable and the segment is free flowing. (Classified Scenic)

<u>Hiwassee River</u>: Recreational, fisheries/aquatics, wildlife and botanical/ecological values are rated outstandingly remarkable and the segment is free flowing. (Classified Recreational)

<u>Nolichucky River</u>: Recreational, scenic and geologic values were rated outstandingly remarkable and the segment is free flowing. (Classified Scenic)

Tellico River: Recreational, heritage/cultural, and botanical/ecological values are rated outstandingly remarkable and the segment is free flowing. (Classified Recreational)

Classifications

River classifications do not vary between alternatives. Sections of rivers classified as wild, will have the highest level of protection. Most impacts to wild rivers will come from upland activities outside of the river corridor. Vegetation management, road construction, and construction or removal of recreation facilities could cause erosion along the river, sedimentation from soil runoff, visual intrusions or noise from nearby activities.

Fire management within the corridor including prescribed fire and fire suppression actions may result in smoke impacts, noise from aircraft, chainsaws and engines, or lasting visual effects from charred vegetation. Search and rescue operations may cause some impact from the use of equipment in the river corridor but these are predicted to be minimal.

Increased public interest and use may result in development of additional trailheads, trails and river access points to accommodate use and minimize impacts to affected resources. Development necessary to facilitate recreational use or site protection would be emphasized in the upstream "Recreational" segment of the Conasauga River and existing railroad bed.

River sections classified as scenic or recreational will be managed with a wider variety of activities allowed within the river corridor. However forest management would be subordinate the river's outstandingly remarkable recreational or scenic values. In general, scenery will be managed at a higher level of integrity for wild versus scenic and recreational classified rivers, and scenic rivers at a higher level than recreational. Sights and sounds of man's activities would be more apparent for scenic and recreational rivers.

Management activities that have the greatest potential of affecting rivers and their potential suitability for WSR designation include road construction, vegetation management, insect and disease control and special use utility ROWs and mineral extraction. Other management activities that also can affect the river resources to a lesser degree are threatened and endangered (T&E) species habitat management, recreation and wildlife and fisheries management.

Alternative Prescription Allocations

Prescription 11, riparian corridors, is embedded in all prescriptions including 2.B. The desired conditions and standards associated with riparian corridors secure protection of aquatic and aquatic related ORVs across all alternatives. 7.D prescriptions represent existing concentrated recreation zones within the affected river corridors.

Alternative I allocates the majority of eligible rivers to 2.B prescriptions (wild, scenic or recreational rivers). However, the Hiwassee and Tellico river corridors were allocated to scenic byway corridors (7.A) and/or scenic corridors/sensitive viewsheds

(7.B) with the intent of protecting affected viewsheds and ORVs. The typical ¼-mile river corridors were enlarged to encompass foreground scenery viewed from adjacent travel routes as well as the rivers.

The 2.B prescription is retained for the Conasauga River in all alternatives.

Alternatives G and E allocate the Hiwassee and Tellico river corridors in the same manner as Alternative I. Proposed Wilderness Study Areas (1.B) and backcountry prescriptions (12.A & 12.B) coincide with several river corridors under Alternatives G and E as well. The recommended Nolichucky River is mostly allocated the A.T. (4.A) and rare communities (9.F) prescriptions in all alternatives except for Alternative I that allocates the corridor to 2.B.2.

Alternatives B, D and A allocate sections of the Elk River, Beaverdam Creek and Hiwassee River to black bear habitat (8.C), watershed (9.A), backcountry (12.B), rare communities (9.F) and/or dispersed recreation area (7.E) prescriptions. These prescriptions adequately protect ORVs within the context of the different alternative themes.

Management direction for rivers determined to be non-eligible or non-suitable will continue to be directed by the prescription allocations shown in Table 3-132 including the embedded riparian corridor prescription (11). Changes to a 2.B or other prescriptions would require a forest plan amendment and disclosure of environmental consequences.

17.6 Cumulative Effects for Recreation Related Programs

A discussion on cumulative effects of the alternatives presented in this EIS examines the how social and land use trends on public and private lands in the Southern Appalachians together influence the healthy and sound management of NFS lands.

As discussed in the EIS sections dealing with recreation and scenery, overall demand for outdoor recreation opportunities, and the settings that provide them, is increasing and it is increasing at a rate greater than population growth.

The demand for a particular type of recreation activity remains either stable with population growth, or increases more rapidly, depending on the activity. Generally, due to the aging population, the demand for less physically challenging activities, and therefore the demands for developed or improved settings, are likely to rise faster than demands for remote and primitive settings. *Southern Appalachian Assessment, Summary report, p. 37*

Trends on private lands are relevant to Forest Service lands. Currently, public holdings represent one-third of the roaded-natural appearing settings and two thirds of remote settings in the Southern Appalachians. These are the preferred settings for outdoor recreation experiences. Due to continuing development of roads and buildings, these settings on privately owned lands are being converted to rural forested settings. *Southern Appalachian Assessment, Social Cultural Economic Technical Report p.140, 157, 173.*

The ability for the public to recreate on private lands is changing. About ¼ of private landholders in the Southern Appalachians provide access for the recreating public for certain compatible activities. However, overtime, less private land is predicted to be available. *Southern Forest Resource Assessment, Proposed, Chapter Socio-6, pp. 2 and 12.*

Streams, rivers, and lakes draw people because of water's importance in high quality scenery and the recreation opportunities offered. Today, national forests are seeing congestion and overuse on many of its waterways. Use is exceeding capacity and public access provided by private lands for water for recreation diminishing.

Therefore, a general trend on private lands surrounding the CNF is the gradual loss of preferred settings for nature based recreation as well the potential to access private lands. Private lands are not expected to increase the supply for the settings preferred by outdoor recreationists for their activities. As a result, public lands will face most of increasing recreation demand. *Southern Forest Resource Assessment, Proposed Chapter SOCIO-6.*

Related to recreation demand are tourism and its importance to gateway communities and regional economies. Many communities are encouraging tourism that centers on using the attractions of national forest to stimulate their local economy. The Ocoee Whitewater Center and Cherohala Skyway are two examples of recent developments that have been promoted by local communities.

Finally, nature-based settings are key ingredients for enhancing a sense of place in the Southern Appalachian communities. Rapid development of private lands in the South appears to be taking away the sense of place of long-term residents. Local communities identify with landscape features or have cultural practices related to natural settings.

Also, traditional uses of the land by residents for hunting, fishing and gathering of natural forest products have transferred in part to Forest Service lands as private lands become unavailable. Conflicts between user groups will continue to arise between long time residents and new development related to tourism and outdoor recreation including the management of motorized versus non-motorized recreation settings. *Southern Appalachian Assessment, Summary Report, pg. 38*

The primary challenge for recreation managers is how to maintain the integrity of the ecosystems and high quality natural settings as more and more people, who bring more impacts to the natural settings and want more user conveniences, recreate on the CNF. Alternatives E, A and I emphasize the provision of a diverse range of recreation opportunities throughout the forest with Alternative A promoting the greatest expansion of developed recreation.

Alternative G proposes the largest increase in designated Wilderness creating more remote settings and challenging outdoor recreation opportunities. Alternatives D and B emphasize other values on NFS land and therefore provide less recreation opportunities.

Regardless of the alternative selected, recreation demand is increasing and effects will occur. Effects, such as user conflict and resource impacts to riparian corridors, will simply show up sooner in alternatives that do not emphasize recreation opportunities. User controls will be needed, in varying degrees, to protect the health of the natural systems and to maintain an acceptable recreation experience. These controls will begin in current problem areas.

Regardless of alternative selected, it is unknown if future Forest Service budgets will be able to support the recreation staff, law enforcement and facilities (whether for developed or dispersed settings) called for by recreation demand. This is particularly important for high maintenance and operational cost facilities or trail systems such as OHV areas where on-going maintenance and on-the-ground personnel are needed.

For those alternatives that generally emphasize recreation management, there will be a better opportunity to maintain scarce settings, provide high quality recreation experiences and manage impacts on the land. Also there will be a better opportunity to develop tourism linkages and partnerships to support local economies and sound recreation management programs.

18.0 HERITAGE RESOURCES

18.1 Affected Environment

Information accumulated from historic properties recorded to date demonstrates a long and diverse series of human occupation and land use that spans at least the last 10,000 years on the CNF. Tribal groups known to use the analysis area prehistorically and historically include tribes of the Cherokee and Creek and possibly other tribes of the Muskogee 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. 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. Forest Service acquisition for the CNF began in 1912. Remnants of all these activities and events, both historic and prehistoric, would be found throughout the analysis area. To date, over 1,700 cultural properties have been recorded on various landscapes and within all forms of the forest ecosystem represented in the analysis area. Site types range from temporary prehistoric hunting and gathering sites such as campsites, hunting sites, and lithic quarries and sites of semi-sedentary or sedentary settlement, to historic sites such as farmsteads, mining sites, lumbering camps, and Civilian Conservation Corps (CCC) camps. Connecting many of these sites and environments provides a network of prehistoric and historic Indian trails, trade and military routes, railroad beds, and wagon roads and turnpikes.

Prehistoric and historic cultural resources are a nonrenewable resource. Significant cultural resources (those resources determined to be eligible for listing on the National Historic Preservation Act (NHPA)) have many values, including their use to gather scientific information on human culture, history, interpretive and educational

value, values associated with important people and events of significance in our history, and often aesthetic value, as in an historic landscape. Accordingly, and pursuant to and in compliance with the terms and conditions stipulated in the NHPA, as stipulated in the Programmatic Memorandum of Agreement (PMOA) between the Tennessee State Historic Preservation Office (Tennessee SHPO), the CNF and the Advisory Council on Historic Preservation, Washington, inventories are conducted on the CNF in consultation with the Tennessee SHPO prior to decisions on projects that would potentially affect significant heritage resources in order to provide assessments, protection, and mitigation measures for significant heritage resources.

The documentation of significant cultural resources recorded for the CNF, as stipulated in the PMOA, illustrates that areas displaying five percent slope or less have a high probability for containing significant cultural resources, areas displaying slopes of between five and 15 percent slope have a moderate probability for containing significant cultural resources, while slopes greater than 15 percent have a low probability for retaining significant prehistoric or historic properties. Overall, approximately ten percent of the CNF displays a topography having a high probability of containing significant historic sites (less than 10 percent slope), 20 percent have a moderate probability, and 70 percent have low probability for containing significant sites. Across the CNF, 90 percent of all significant or potentially significant sites would be expected to occur in areas of high probability. Presently, over 1700 historic resources have been recorded on the CNF. Of these, over 1500 have been categorized, in agreement with the Tennessee SHPO, as Class II sites (unevaluated properties). Presently, unevaluated historic sites are evaluated for their eligibility for inclusion in the NRHP at a rate of one site per year.

18.2 Direct/Indirect Effects

Direct affects to historic properties could result from both natural and human-caused events. These include:

Soil disturbance to varying depths

Soil compaction or rutting

Burning

Alteration of a site’s immediate or proximal setting (for example, introduction of intrusive visual or auditory components)

Diminished jurisdiction, as in the case of land exchange

Indirect affects to historic properties may include looting or vandalism due to increased access, or site degradation or silting of a historic property resulting from an off-site project or construction of roads or trails.

Accordingly, four types of ground disturbing land management activities that vary in magnitude (acres or miles) have the greatest potential to affect heritage resources. These include: timber management, road construction, fire management, and recreation use. To a lesser degree, other forms of land management, such as landownership adjustment (land exchange), special use permits, structures

management, minerals management, and wildlife management can also affect historic properties.

Projects where timber is harvested or manipulated comprise the largest source of potential direct affects to the heritage resource base. Timber harvests may directly affect unknown significant heritage resources when soil is significantly disturbed by heavy machinery and vehicles, when trees are felled on historic ruins or cemeteries, when logs are skidded across sites, or indirectly when erosion is caused by removal or disruption of vegetation cover or increased surface soil exposure. In general terms, even-aged harvesting may create moderate disturbance for significant properties located on the ground surface or at shallow depths, and such disturbance may occur over most of the stand or area being harvested. An uneven-aged harvest or single tree selection would similarly disturb the properties located on the surface and in the upper soil matrix, but disturbed areas would be dispersed within the harvest area. With either management practice the skid trails, log landings, and other areas where vehicle use is concentrated would receive the greatest depth of disturbance and thus provide the most significant direct affects to significant heritage properties. Indirect affects could include deterioration of sites and artifacts from subsequent erosion and increased site vandalism from increased access and surface exposure of historic sites.

Apart from these common affects, potential maximum direct, indirect and cumulative affects to historic properties of the approximately 640 thousand acres that compose the CNF can be assessed according to the maximum extent (acres) within which ground-disturbing activities can potentially occur for each alternative. The principal proposed ground-disturbing activities include: timber, recreation and fire management. For timber management (timber production and manipulation) this includes principally prescriptions 10.A and 10.B., but also prescriptions 7.C and 7.E.2, prescriptions 6.C to 7.B, prescriptions 8.A.1 to 9.A.3, and prescription 9.H, that also are considered suitable for timber harvesting and timber manipulation, regardless of their primary prescription designation. Recreation management includes: prescriptions 7.C (OHV trails), 7.D (concentrated recreation areas), 7.E.1 (dispersed recreation areas), and 7.E.2 (recreation with vegetation management/timber harvesting). The acreage within which potentially ground-disturbance, and concomitant affects to heritage resources, can occur is presented by prescription and alternative in Table 3-133.

Table 3-133. Total acreage by prescription and alternative in which prescribed ground-disturbing activities will potentially occur.

RX Number	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
*6.C Old Growth Management	2,093	-	-	-	-	-	-
*6.E Core Areas of OG	7,892	-	-	6,094	-	6,094	18
*7.A Scenic Byway Corridors	37,081	6,652	35,423	40,931	-	58,458	1,7561
*7.B Scenic Corridors	-	1,896	11,044	14,207	-	223	50,307
*7.C Off Road Vehicle Areas	3,469	-	-	3,469	-	-	11,139

Table 3-133. Total acreage by prescription and alternative in which prescribed ground-disturbing activities will potentially occur.

RX Number	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
7.D Concen. Rec. Areas	2,125	2,773	2,142	5,942	3,511	1,966	2,093
7.E.1 Dispersed Rec. Areas	-	-	-	184,304	-	11,908	-
*7.E.2 Dispersed Rec Areas with Veg. Management	84,223	-	20,848	-	-	-	96,941
*8.A.1 Mid-Late Succession	-	-	-	-	313,761	68,094	29,000
*8.A.2 Sensitive Species Area	19,305	-	9,211	-	-	-	96,941
*8.B Early Succession Area	-	18,011	-	-	-	-	56,517
*8.C Black Bear Reserves	56,134	43,772	117,071	48,361	-	51,393	85,883
*8.E.1 Ruffed Grouse Management	2,615	2,608	-	3,029	78,085	-	-
*9.A.1 Source Water Protection Watersheds	23,847	23,847	-	-	-	-	-
*9.A.2 Ref. Watershed	18,112	18,076	-	34,453	-	-	-
*9.A.3 Watershed Restoration Areas	86,754	154,576	-	34,453	-	-	-
*9.H Restoration of Plant Assoc.	26,060	125,384	-	-	-	-	72,670
10.A Timber Manage.	45,527	-	-	93,389	-	-	-
10.B Timber Manage.	-	-	29,779	-	-	-	-
Total Acres Timber Manage.	438,752	258,595	498,239	150,544	485,235	184,262	422,129
Total Acres Recreation Manage.	89,817	2,773	22,890	193,715	3,511	13,874	110,173
Prescribed burning per year	16,000	16,000	10,000	16,000	16,000	16,000	20,000
* prescriptions determined suitable for timber management							

Alternative D, with 498,239 acres within which timber management can potentially occur, provides the highest potential for timber management activities to affect heritage resources of all alternatives. Accordingly, the potential for timber management to affect heritage resources is followed, in descending order, by Alternatives F (485,235 acres, current/no action alternative), A (438,752 acres), I (422,129 acres), B (258,595 acres), G (184,262 acres), and E (150,544 acres).

Compliance-related inventories or surveys would be conducted prior to timber harvest under any timber management program and prior to site preparation. On the CNF site preparation following timber harvest, or vegetation management performed apart from timber harvest, is usually performed with hand tools and herbicides and without the aid of heavy earth-disturbing equipment. Site preparation activities, therefore, result in few if any significant direct, indirect, or cumulative affects to archaeological sites.

New road construction may directly affect unknown sites, given variables specific to each portion of construction. Disturbance within a construction corridor may remove soil containing cultural deposits, depending on the local situation. In cases where fill is added, historic properties may be buried deeper. This may protect the site from compaction or rutting, while at the same time essentially precluding additional scientific study using conventional technology. Maintenance or reconstruction of existing roads presents less potential for direct affects to intact archeological sites because the majority of damage to an unknown site probably occurred during the original construction. Access to historic properties provided by roads, however, may result in indirect affects to significant properties by facilitating increased vandalism. Indirect affects also may include erosion of historic properties subsequent to road construction. Also, artifact exposure during construction could promote site vandalism.

The potential affects of road construction to cultural resources would be determined by the amount of acreage for timber management and recreation proposed for each alternative. Accordingly, it can be projected that Alternative I, which provides for 422,129 acres in which timber production can occur and 110,173 acres in which recreation management can occur, a total of 532,302 acres of the approximately 640,000 that compose the CNF, provides the highest potential to affect heritage resources through road construction. Alternatives A with 528,569 total acres (438,752 acres for potential timber management and 89,817 acres for potential recreation management), D with a total of 521,129 total acres (498,239 acres for potential timber management and 22,890 acres for potential recreation management), and F with a total of 488,746 total acres (485,235 acres for potential timber management and 3,511 acres for potential recreation management) provide similar potential to affect heritage resources. Alternatives E with a total of 344,259 acres (150,544 acres in which timber management can potentially occur and 193,715 acres of potential recreation management), B with a total of 261,368 acres (258,595 acres within which timber management can occur and 2,773 acres within which recreation management can potentially occur), and G with a total of 198,136 acres (184,262 acres for potential timber management and 13,874 acres for potential recreation management) provide the least potential to affect cultural resources through road construction of all alternatives.

Historic properties may be directly and indirectly affected by heat damage to artifacts and sites and erosion of sites resulting from wildfires or fires employed to suppress or control wildfires (prescribed fires). High-temperature wildfire could pose direct affects to historic properties by damaging surface or shallow archeological sites, standing structures, and cemetery markers. Sites of the historic period are most subject to direct affects from these events because many of these properties are more likely to exhibit surface artifacts. Studies show that wildfire, and in some cases higher temperature prescribed burns, may alter the character and condition of surface artifacts such as melting glass, “crazing” lithic and ceramic artifacts, and burning wood structures. Prescribed fire could also similarly directly affect surface sites or very shallow site deposits and artifacts, but because of reduced temperature, to a much lesser degree than those fires resulting from wildfire. However, wooden structures and cemetery markers could still be damaged, as could surface artifacts.

Fire lines installed with tractor-plow units, whether for wildfires or prescribed burns, could directly affect historic properties by physically displacing artifacts located at shallow levels or on the ground. The nature of displacement is primarily laterally, as the plow folds soil and artifacts to each side of the fire line. When multiple parallel fire lines are used for wildfire control, it would be possible to disturb a large portion of a small site. Fire lines established using a disc harrow would have less impact than those made with a tractor plow. In these cases lateral soil displacement would be minimal, but some fragile surface artifacts or artifacts located in shallow deposits may be broken. Fires lines installed for prescribed burns are less likely to directly or indirectly affect historic resources since proposed fire plow lines in areas of prescribed burns are inventoried and field surveyed for the presence of historic properties prior to project implementation. Under normal conditions, however, heritage surveys do not precede emergency fire line construction. Thus, there is a high potential for unknown properties to be affected by wildfire suppression. Indirect affects following the installation of fire lines and burning may include erosion losses due to the removal or burning of vegetation cover or further deterioration of artifact or feature condition following damage by high temperatures.

Alternatives A, B, E, F, G, all of which each propose 16,000 acres of prescribed burning per year, provide the same potential to affect cultural resources. Alternative D, which proposes 10,000 acres a year of prescribed burning, provides the least potential for a prescribed burning program to affect heritage resources of all alternatives. Alternative I, with a proposed annual prescribed burn program of 20 thousand acres, the largest program of annual prescribed burning of all alternatives, provides the highest potential to affect heritage resources of all alternatives. Given a ten-year planning cycle, a program of prescribed burning under Alternative I would result in 200,000 acres, or 32 percent of the forest, being burned, if burning is not repeated in areas.

Recreation management may be categorized as consisting of three types: concentrated (formal recreation areas), dispersed recreation areas, and trails (off road vehicle trails, horse trails, and foot trails), see Table 3-133. In general, direct affects to significant cultural resources can result from installation of recreation facilities and expansion of recreation facilities and recreation use areas. Indirect affects could include soil erosion and compaction of historic properties due to visitor use, and access to given locales could result in archeological site vandalism. These indirect affects could especially occur with illegal expansions off of established off road vehicle trails.

The incidence of vandalism and illicit collection is very much influenced by visitor use. Greater visitor use to some areas will lead to the increase of vandalism, illicit collection, littering and disturbance to cultural sites under all alternatives. Opening areas to timber production and timber manipulation, recreation use, and roads and trails will result in an increase in site disturbance and vandalism in previously inaccessible areas that previously were naturally protected from direct, indirect, and cumulative affects. While cultural properties situated in recreation areas and along designated trails and road corridors can be signed, monitored, patrolled and protected, the impacts outside of these areas are largely uncontrolled and the extent

of impact unknown. However, the Forest Service does have the authority to close a specific road, trail or area that has considerable adverse affects to cultural resources (36 CFR 295.5, 36 CFR 800.9, and 43 CFR 834.2) and prosecute, under 36 CFR 296.4 and other laws, those who willfully destroy or loot significant historic properties.

Based upon the potential acreage in which the range of significant ground-disturbing recreation activities can occur (prescriptions 7.C, 7.D, 7.E.1 and 7.E.2), Alternative E, with 193,715 potential acres for recreation management, followed by Alternative I with 110,173 acres, provides the highest potential to affect heritage resources. Alternative A, with 89,817 acres for potential recreation development, provides less potential to affect heritage resources. Alternatives D (22,890 potential acres) and G (13,874 potential acres) offer even less potential to affect cultural resources, while Alternatives F (3,511 potential acres for recreation development) and B (2,773 potential acres for recreation development) offer the least potential for recreation development to affect heritage resources of all the alternatives.

Exchange of federal land containing significant heritage resources to a non-federal agency or private ownership is considered a direct affect with no indirect or cumulative affects. This is because protection under federal laws and guidelines would no longer apply to the heritage resources contained within a tract that is exchanged out of federal ownership.

Analysis of affects to significant cultural resources located on lands to be exchanged out of Forest Service ownership is performed programmatically in compliance with existing laws and regulations (36 CFR 296, 800, EO 13287 and the PMOA with the Tennessee SHPO) and occurs on a case-by-case basis apart from alternatives. As such, affects to heritage resources resulting from land exchange from federal jurisdiction is not affected by alternative.

The potential direct affect to significant heritage resources located in special use areas would be low, in most cases. This is partially due to the small acreages involved in special use areas and the limitations imposed upon special uses for the purposes of resource protection. Indirect affects to significant cultural properties located in special use areas, however, can occur through erosion and vandalism of historic properties resulting from increased access and use of permit areas.

Analysis of affects to significant cultural resources located on lands placed under special use permit is performed programmatically in compliance with existing laws and regulations (36 CFR 296, 800, EO 13287 and the PMOA with the Tennessee SHPO) and occurs on a case-by-case basis apart from alternatives. As such, affects to heritage resources resulting from special use permits are not affected by alternative.

Historic iron, barite, copper and gold mining facilities, mines, tailings, and exploration davits determined to be historically significant are protected and maintained under existing federal laws and guidelines. Generally, exploration for minerals minimally impacts other significant historic sites as the nature of this activity and permits for mineral exploration throughout the CNF have historically involved small acreages. Mineral extraction, however, may produce severe, albeit localized, direct affects to

significant cultural resources as the overburden containing historic resources are removed. Indirect affects could include damage to significant cultural resources located outside the area of immediate mining resulting from erosion, the installation of road accesses and equipment staging areas, and vandalism and looting resulting from increased access to these historic properties.

Analysis of affects of minerals management to significant cultural resources is performed programmatically in compliance with existing laws and regulations (e.g., 36 CFR 296, 800, EO 13287 and the PMOA with the Tennessee SHPO) and occurs on a case-by-case basis separate from alternatives. Therefore, affects to heritage resources resulting from minerals management is not affected by alternative.

Individual and multiple structures located on the CNF that are determined to be historically significant are protected and maintained under the terms and conditions of existing federal laws and guidelines. The construction of new facilities could directly affect an unknown significant prehistoric or historic property. In most cases of concrete slab or footing construction, disturbance may extend into or below soil strata containing archeological deposits. Lighter facilities, such as boardwalks, piers, or structures located on pier foundations, would present less potential for damage. The construction of structures could also directly affect significant historic properties by introducing a visual affect that conflicts with or diminishes the setting and nature of an historic property. Indirect affects could include erosion or vandalism of significant historic properties facilitated by public access following construction of structures in the immediate vicinity.

Analysis of affects to significant historic structures and the affects of the construction of structures to heritage resources is performed programmatically in compliance with existing laws and regulations (e.g., 36 CFR 296, 800, EO 13287 and the PMOA with the Tennessee SHPO) and occurs apart from alternative. As such, affects to heritage resources resulting from land exchange from federal jurisdiction is not affected by alternative.

Areas in which wildlife food plots are traditionally installed are areas of high probability for containing significant historic sites. The construction of wildlife food plots through a program of disking may directly affect significant cultural properties, similar to that obtained by the creation of fire lines. Construction of helicopter ponds for fire fighting and wildlife management may also cause direct affects to significant cultural resources. Indirect affects could include vandalism of historic properties located in wildlife plots by exposing sites to collection and looting.

The maintenance of the existing system of wildlife plots, as provided for in prescriptions 2.B.2, 4.A, 4.E.1, 4.K, 11, 12.A, and 12.B, and their affects to heritage resources, would be the same for all alternatives. The potential acreage in which new wildlife plots may be established include prescriptions 7.A, 7.B, 7.C, 7.D, 7.E.2, 8.A.1, 8.B, and 8.C., and, for ruffed grouse management, prescription 8.E.1. The potential affects to heritage resources resulting from the construction of new wildlife plots, or the manipulation of vegetation for wildlife habitats, can be projected based upon the acreage within which these activities potentially can occur for each alternative. Alternative I, proposes 422,111 acres within which wildlife management

can potentially occur, provides the highest potential to affect heritage resources of all alternatives. Alternative F provides the second highest potential to affect heritage resources with 395,357 acres. Alternatives A, B, D, and G offer roughly the same potential to affect heritage resources with 211,707 acres, 201,096 acres, 186,528 acres, and 180,134 acres, respectively, in which ground-disturbing activities for wildlife management and the installation of wildlife plots potentially can occur. Alternative E, with 115,439 acres within which vegetation may be potentially manipulated for wildlife, provides the lowest potential to affect heritage resources of all alternatives.

18.3 Cumulative Effects

Pursuant to and in compliance with the terms and conditions of the National Historic Preservation Act, the Archaeological Resources Protection Act and other federal and Forest Service laws, guidelines, and regulations, and as stipulated by the terms and conditions in the PMOA between the Forest Service, the Tennessee SHPO and the Advisory Council on Historic Preservation, Washington, the CNF systematically and programmatically identifies, records, and protects all significant historic properties located on the CNF. This includes all significant historic properties that may be potentially affected by implementation of Forest Service project activities. However, cumulatively, the repeated implementation of all project activities would significantly affect historic resources by, over time, resulting in the degradation of sites and a reduction in the number of intact historic properties. The repeated installation of fire lines, whether for wildfires or prescribed burns, and a program of prescribed burns, would, over time, result in the degradation of sites and a reduction in the number of intact historic properties. Similarly, the increased installation and expansion of recreation facilities, particularly off road vehicle trails, could result in the increased degradation of sites and a reduction in the number of intact historic properties as a result of continued use, increased public access, erosion, and vandalism. Cumulatively, historic properties could be degraded, destroyed, or subjected to increased site vandalism with continuation of special use permits, increases in and the expansion of mineral extraction sites, the creation of new roads, and expansion and renewal of wildlife plots.

19.0 FOREST PRODUCTS

19.1 Affected Environment

The 1986 LMP for the CNF had three goals that addressed forest products. They included providing for the consumptive uses of resources so long as the uses are compatible with the management of other resources values; improve the quality and quantity of sawtimber being produced; and provide for increased output of goods and services, such as timber harvest and mineral extraction, in coordination with other resource uses.

The table below compares timber volume offered for sale with the allowable sale quantity (ASQ) for the LMP completed in 1986. Volumes are displayed in thousand cubic feet (MCF) and million board feet (MMBF).

Table 3-134. Comparison of Offered Timber Sales with 1986 LMP Goal (ASQ) of 34.5 MMBF		
FY	1986 LMP (ASQ)	ACTUAL OFFER
86	34.5MMBF/Yr / 6,250 MCF/Yr	34.3MMBF/Yr / 6,215 MCF/Yr
87	34.5MMBF/Yr / 6,250 MCF/Yr	35.6MMBF/Yr / 6,450 MCF/Yr
88	34.5MMBF/Yr / 6,250 MCF/Yr	31.8MMBF/Yr / 5,762 MCF/Yr
89	34.5MMBF/Yr / 6,250 MCF/Yr	38.4MMBF/Yr / 6,957 MCF/Yr
90	34.5MMBF/Yr / 6,250 MCF/Yr	26.1MMBF/Yr / 4,729 MCF/Yr
91	34.5MMBF/Yr / 6,250 MCF/Yr	30.1MMBF/Yr / 5,454 MCF/Yr
92	34.5MMBF/Yr / 6,250 MCF/Yr	28.9MMBF/Yr / 5,236 MCF/Yr
93	34.5MMBF/Yr / 6,250 MCF/Yr	27.7MMBF/Yr / 5,019 MCF/Yr
94	34.5MMBF/Yr / 6,250 MCF/Yr	22.2MMBF/Yr / 4,022 MCF/Yr
95	34.5MMBF/Yr / 6,250 MCF/Yr	12.8MMBF/Yr / 6,215 MCF/Yr
96	34.5MMBF/Yr / 6,250 MCF/Yr	19.4MMBF/Yr / 3,515 MCF/Yr
97	34.5MMBF/Yr / 6,250 MCF/Yr	16.4MMBF/Yr / 2,971 MCF/Yr
98	34.5MMBF/Yr / 6,250 MCF/Yr	16.0MMBF/Yr / 2,899 MCF/Yr
99	34.5MMBF/Yr / 6,250 MCF/Yr	16.5MMBF/Yr / 2,990 MCF/Yr
2000	34.5MMBF/Yr / 6,250 MCF/Yr	4.0MMBF/Yr / 725 MCF/Yr
2001	34.5MMBF/Yr / 6,250 MCF/Yr	3.5MMBF/Yr / 634 MCF/Yr

The table below displays acres sold through commercial timber sales by method of cut for FY-86-2001 for the CNF.

Table 3-135. Acres sold by method of cut form FY86-2001					
FY	Clear Cut	Seedtree	Shelterwood	Selection	Other*
1986	2874	0	0	0	588
1987	3280	0	0	0	930
1988	2724	0	0	0	710
1989	3188	66	0	0	535
1990	2982	180	27	0	97
1991	2416	121	124	22	461
1992	2011	127	81	205	385
1993	892	42	150	211	570
1994	503	74	459	364	625
1995	103	13	186	561	223
1996	245	0	365	559	264
1997	336	35	528	269	510
1998	170	7	387	71	809
1999	176	70	891	43	255
2000	0	0	458	127	128
2001	0	0	20	75	57
* Thinning, salvage, and sanitation					

The table below displays the allowable sale quantity (ASQ) and long term sustained yield in thousand cubic feet per year for the first decade, for all alternatives.

Table 3-136. Allowable Sale Quantity and Long Term Sustained Yield in MCF/Year

	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
ASQ	3,611	3,897	6,977	814	7,110	1,950	3,997
LYSY	6,438	6,786	11,134	1,541	12,704	3,776	8,149

The table below displays volume in millions of cubic feet (MMCF) for growing stock trees of all species, average annual growth of growing stock trees for all species, average annual removals (harvest) of growing stock trees of all species, and average annual mortality of growing stock trees for all species for the period 1989-1999 (Schweitzer 2000). Growing stock trees are live trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings.

Table 3-137. Forest Inventory and Analysis (FIA) inventory, growth and mortality.

Growing Stock	Growth	Removals	Mortality
1,322 MMCF	33 MMCF	11 MMCF	17 MMCF

This LMP revision does not establish specific objectives for forest products but does allow for timber harvest to achieve objectives for other resources. The establishment and maintenance of early successional habitat may be achieved through timber harvest activities. Early successional objectives are established in management prescription descriptions that have objectives for these habitat conditions. There are management prescriptions that do not have early successional objectives but do provide for harvest activities in order to meet objectives such as insect and disease control, creation of vistas in scenic areas, and recreation development.

The CNF experienced extensive SPB outbreaks from late 1999 through 2002 that left up to 35 percent of southern yellow pine and white pine communities' devastated. The infestation continued during the preparation of this plan revision and the CISC was not updated to reflect pine mortality. Additional tables have been included in the following discussion to reflect pine mortality from SPB. The adjusted outputs are based on estimated SPB mortality and SPECRUM outputs for pine.

19.2 Direct/Indirect Effects

All alternatives provide for various levels of early successional habitat depending upon management prescription objectives and allocations. Alternative F has the most acres available for early successional habitat development, about 423,668 acres, and alternative E has the least with 70,889 acres. The table below displays acres available for early successional habitat development for all alternatives.

Table 3-138. Total suitable acres and suitable acres with early successional objectives.

Alternative	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Total Suitable Acres	301,228	302,174	377,928	121,951	423,783	188,310	320,389
Acres with early successional objectives	265,268	295,830	335,124	70,889	423,668	134,035	278,849

Outputs for forest products were generated and scheduled by the SPECTRUM model. The model calculated an allowable sale quantity (ASQ) based on a non-declining yield through the planning horizon. The model also calculates a long-term sustained yield capacity (LTSYC) that includes future tree growth in calculating potential long-term yields. Again, the alternative with the highest ASQ and LTSYC is alternative F and alternative E has the lowest. The table below displays ASQ and LTSY for all alternatives.

Table 3-139. ASQ and LTSYC by Alternative

Alternative	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
ASQ MCF/Yr	3,611	3,897	6,977	814	7,110	1,950	3,968
LTSYC MCF/Yr	6,438	6,786	11,134	1,541`	12,704	3,776	8,149

Projected harvest acres and volumes for the first period are highest for alternatives D and F and the lowest for alternative E. The table below displays volumes and acres for all alternatives.

Table 3-140. Projected acres and volume harvested for first 10 year period by alternative

Alternative	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Projected Harvest Ac	18,016	19,212	35,334	5,862	34,406	10,777	19,902
% of Acres Available	6.8%	6.5%	10.5%	8.3%	8.1%	8.0%	7.1%
Harvest Vol MCF	36,113	38,969	69,967	8,143	71,096	19,500	39,968

Southern pine beetle has impacted both white pine and southern yellow pine from 1999 through 2002. Estimates of mortality are approximately 35 percent of the host type for SPB. Table 3-141 below displays harvest acres and volumes adjusted for SPB mortality.

Table 3-141. Projected acres and volume harvested for first 10-year period by alternative adjusted for SPB mortality

Alternative	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Projected Harvest Ac*	16,216	17,466	33,059	4,985	31,900	9,432	18,161
% of Acres Available*	6.1%	5.9%	9.9%	7.0%	7.5%	7.0%	6.5%
Harvest Vol MCF*	33,519	36,410	65,531	7,579	71,096	19,500	39,968
*adjusted to reflect southern pine beetle mortality							

The table below displays projected early successional acres by alternative.

Table 3-142. Percent of proposed early successional by management Prescription for first decade							
Management Prescription	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
7.C	5%			5%			5%
7.E.2	5%		6%				5%
8.A.1					5%	5%	5%
8.A.2	3%						
8.B		12%					12%
8.C	5%	5%	5%	5%		5%	5%
8.E.1	13%	13%		13%	12%		
9.A.1	5%	5%					
9.A.3	5%	5%		2%			
9.C 1.A						8%	
9.C.2		8%					
9.E		6%					
9H	5%	6%					6%
10.A	12%		12%		12%		
10.B			12%				

Projected harvests by products (high value hardwood sawtimber (HVH), moderate value hardwood sawtimber (MVH), low value hardwood sawtimber (LVH), white pine sawtimber (WP), southern yellow pine sawtimber (SYP), hemlock sawtimber, and all pulpwood), does not vary to a large degree by alternative. The range of HVH for all alternatives is from a low of 14 percent for alternative D to a high of 20 percent for alternative E; MVH ranges from 19 percent in alternative D to 22 percent in alternative G; LVH ranges from 19 percent in alternative A to 24 percent in E; WP ranges from 17 percent in alternative B to 21 percent in alternatives D and E; SYP is seven percent for all alternatives except six percent for alternatives D and F; Hemlock is three percent for all alternatives except two percent for alternatives E and G; and all species of pulpwood ranges from a low of seven percent for alternative E to 16 percent for alternatives A, B, D, F, and I. The table below displays projected product percentages for all alternatives.

Table 3-143. Projected product harvested by percent of total harvest volume by alternative							
	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
HVH	16%	16%	14%	20%	15%	17%	16%
MVH	21%	21%	19%	19%	21%	22%	21%
LVH	19%	20%	21%	24%	20%	20%	20%
WP	18%	17%	21%	21%	19%	18%	18%
SYP	7%	7%	6%	7%	6%	7%	7%
Hemlock	3%	3%	3%	2%	3%	2%	3%
Pulpwood	16%	16%	16%	7%	16%	14%	16%

Pine represents about 25 percent of the projected volume for all alternatives. As a result of recent SPB activity and resulting pine mortality actual levels of pine harvested will be less.

19.3 Cumulative Effects

Cherokee National Forest timberlands comprise about 36 percent of the total timberlands in the nine county area where NFS lands are located. During the period 1989 to 1999 harvest activities on the CNF contributed about 26 percent of the total harvested volume from the area. For sawtimber volume, the CNF contributed about 28 percent during the same period (Schweitzer, 1999).

All alternatives project a smaller percentage of harvested volume from NFS lands, for the nine county area, when compared to the earlier period. Alternatives D and F project about 16 percent of the total, based on the 1989-1999 period and alternative G is projected at about four percent of the total forestland acres for the nine county area.

Table 3-144. Comparison of total volume harvested from the 9 county area for the period 1989-1999 to projected harvest volumes

Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
8.1%	8.7%	15.7%	1.8%	15.9%	4.4%	8.9%

* not adjusted for SPB mortality

Projected average net annual growth for the period 1989-1999 for timberlands from the nine county area exceeded harvest for the same lands by just over 50 percent. For NFS lands, during the same period, growth exceeded harvest by over 67 percent. When projected harvest levels are compared to average net annual growth for that same period, 1989-1999, growth greatly exceeds harvest for all alternatives. The following table displays growth from the 1989-1999 period to projected harvest levels.

Table 3-145. Percent of projected harvest level for the first period versus growth from 1989-1999

Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
10%	11%	20%	2%	20%	5.5%	11%

Alternatives D and F are projected to harvest about 20 percent of the estimated growth and alternative E is estimated to harvest only two percent of the growth for the CNF.

Mortality will increase through time across the nine county area because estimated growth exceeds harvest levels on all ownerships. Mortality will be significantly higher on the CNF since only a fraction of the growth is being harvested.

20.0 SPECIAL USES/LANDS

20.1 Affected Environment

The CNF consists of approximately 639,880 acres of publicly owned land within a proclamation boundary of 1.2 million acres. The acres within the proclamation

boundary that are not owned by the U.S. Government and administered by the USDA, Forest Service are either privately owned or are administered by a state, local or other federal agency. With about half of the land in the proclamation boundary not administered by the Forest Service, the ownership pattern is broken with private and public lands closely intermingled. In the northern division, national forest ownership is largely confined to the sides and tops of ridges, with much of the land in the valleys privately owned. Since 1986 approximately 16,000 acres have been added to CNF through direct purchase from individuals or timber companies.

Land Adjustment – Land acquisitions will be guided by the following criteria:

Priority 1 Acquisitions: (not listed in any order of priority)

1. Lands and associated riparian ecosystems on water frontage such as lakes and major streams.
2. Critical habitat lands needed for the the protection of federally listed endangered or threatened fish, wildlife or plant species. Supports objective of protection of fish and habitats.
3. Lands needed for the protection of significant historical or cultural resources, when these resources are threatened or when management may be enhanced by public ownership.
4. Lands that enhance recreation opportunities, public access and protection of aesthetic values.
5. Lands needed for protection and management of administrative and Congressional designated areas.
6. Lands needed to enhance or protect watershed improvements that affect the management of national forest riparian areas.
7. Enviornmentally sensitive lands such as wetlands and old growth.
8. Buffer lands needed for protection of lands acquired for specific purposes listed.

Priority 2 Acquisitions: (not listed in any order of priority)

1. Key tracts of an ecosystem that are not urgently needed, but will promote more effective management of the ecossytem and will meet specific needs for vegetative management, valuable watershed management, research, public recreation or other defined management objectives. Generally, will supprot consolidation objectives.
2. Lands needed to protect resource values by eliminating or reducing fire risks, soil erosion and occupancy trespass.
3. Lands needed to reduce expenses of both the Forest Service and the public in administration and utilization.
4. Consolidation of split estates.

Priority 3 Acquisitions:

1. All other lands desirable for inclusion in the National Forest System.
2. In the case of conflict between these priorities and land acquisition actions needed to meet the overall goals and objectives established in the LMP, the Forest Supervisor may recommend variation to the Regional Forester.

Land conveyances will be guided by the following criteria:

1. Lands inside or adjacent to communities or intensively developed private land, and chiefly valuable for non-National Forest System purposes.
2. Parcels that will serve a greater public need in state, county, city, or other Federal agency ownership.
3. Inaccessible parcels isolated from other National Forest System lands. Parcels intermingled with private lands.
4. Parcels within major blocks of private land, the use of which is substantially for non-National Forest System purpose.
5. Parcels having boundaries, or portions of boundaries, with inefficient configurations (projecting necks or long, narrow strips of land, etc.) Supports more logical and efficient management.

Landlines

The CNF has not sustained an active landline refurbishment program in the past decade due to budgetary limitations. The national forest maintains approximately 1,600 miles of landlines with 70 miles of boundaries still to be located. Because landlines should be maintained on a 10-year interval, approximately 160 miles of maintenance should be accomplished each year.

Special Uses

Demands made on the national forest for special use permits for a variety of uses are growing each year. Each application for a permit is reviewed to determine if it is in the public interest and is allowed by law. No permits for occupancy of NFS lands can be issued unless authorized by a specific law. The national forest administers about 576 permits. Outfitter/guide permits for river use is an area of permit issuance that has increased as well as horseback guiding.

The CNF has 76 recreation residences within its boundaries, most of them in the southern division. Management of recreation residences under all alternatives will not change as a result of the revision process.

Lake Ocoee Inn and Marina is the single largest recreation permit. Lodging, food, marinas and boat rentals are offered.

Table 3-146. Distribution of Major Special Use Permits

Type of Permit	Amount
Recreation	163

Table 3-146. Distribution of Major Special Use Permits	
Type of Permit	Amount
Agriculture	18
Community and Public Information	23
Research, Study, and Training	2
Transportation	147
Communications	89
Water Uses	103

For communication sites, the forest will continue with sites officially designated. If single use sites (by the forest) or temporary sites are needed for permanent uses, the sites will be designated by following the formal designation process.

20.2 Direct/Indirect Effects

Wildlife and Fish

Land Adjustment

About 50 percent of the land within the proclamation boundary of the CNF is private land, thus the ownership pattern is very broken and scattered between federally and privately owned. Mammal, fish, and aquatic species would benefit from land acquisition or land exchanges that would consolidate or make the CNF more continuous. New land purchases would consolidate more habitat for controlled management and provide additional land for habitat. The highest priority for acquisition for wildlife reasons are those tracts that provide critical habitat needs. Other lands for high priority acquisition are those with wetlands or those that host species or habitat for federally endangered or threatened species.

Land Use and Rights of Way (ROW)

Utility construction and road ROW construction (access rights, or easements to private land owners) could affect various wildlife species during construction and maintenance of these corridors or access routes. Habitat alteration would potentially occur. On the other hand, many wildlife species can utilize and benefit from the early succession habitat provided by the construction and subsequently any vegetative cover for road banks or utility covers on the ROWs.

Scenery

Rights-of-way for utility corridors have a high potential to affect the scenic resources for long periods of time. The same potential exists for easements or ROW documents issued for access rights (to private land). Cleared ROWs (roads and utilities) can contrast in form, line, color, and texture compared with natural conditions.

Recreation

Land acquisition opportunities would improve the quality (and in same cases quantity) of recreation potential. Likewise, land adjustments through exchange,

would potentially afford the same improvements in recreation opportunities. Those users favoring dispersed recreation would most probably benefit the greatest when acquisition opportunities are exercised. Utility and road rights-of-way would potentially provide improved recreation access to dispersed areas, but would potentially affect scenery as these uses conflict with a natural appearing landscape.

National Scenic Rivers

The acquisition of land in these corridors would improve protection, quality and the quantity of recreation opportunities offered. Acquisition could negate the future need for rights-of-way, thusly giving further protection to river values. Utility ROWs would provide improved access to dispersed areas. Scenery values, however, would potentially be adversely impacted.

Widerness

Wilderness related special uses authorized on a case-by-case basis would potentially result in benefits to the public while wilderness values are protected. Competitive events, research, military training and exercises, and other similar activities would potentially be authorized while wilderness values are protected.

Special Use Permit Requirements

By regualtion, non-commercial group use size is not regulated. Authorized commercial gorups entering wilderness for all alternatives would be restricted to the number of persons established for individual wildernessses during the LAC process. Commerical large groups would potentially not have the opportunity to experience wilderness values as a large group, but would have the option to divide into small groups before entering a wilderness.

Transportation

Because the CNF has a fragmented ownership pattern within the proclamation boundary, there are many requests by citizens to use the forest for many purposes. National forest (federal) ownership within the proclamation boundary comprises 53 percent. The fragmented ownership pattern is conducive to ownership disputes, title claim problems, and access related issues. And, this broken pattern causes some difficulty in reaching desired management conditions. Acquisition priorities have been discussed in Chapter 2 (LMP), and there are ample opportunities to improve the ownership pattern. Land adjustments through exchange also have high potential for improving the ownership pattern. Generally, no adverse effects occur with exchanges and the greatest impact is from landowners owning property adjacent to the forest being opposed to forest land becoming private.

As a general rule, special use authorizations are discouraged especially if the same benefits can be achieved from private land. Sometimes these benefits can only be obtained form NFS land, such as recreation uses, communication sites, and access. Each request for a special use authorization will be screened and evaluated to determine if the use can be authorized after mitigation.

Lands

Land Adjustment

The fragmented ownership pattern, for all alternatives will continue to provide many opportunities to improve the ownership pattern through land purchase, exchange, or donation. Land purchase is influenced heavily by congressional support for forest acquisitions. Exchanges are also budget driven, however a landowner can assist in this process by funding a large portion of the process. The forest averages one donation about every other year. If congressional interest is strong, the forest could have a very active purchase program. Exchanges can average one to two per year, again depending on funding for this program. Purchase and exchange would be essentially the same program for all alternatives.

Special Use Authorization

With a fragmented ownership pattern, the requests for the use of NFS land will not change substantially with any of the alternatives. As time passes, requests for authorizations will increase as rural lands are developed, thus alternative A may be the highest for demand. Land use authorizations are from outside the Forest Service, therefore the number of proposals can not be accurately predicted. These proposals will be assumed to be the same for all alternatives and will be assumed to have similar effects.

Boundary Line Management, Encroachment, Trespasses, Claims

New boundary line surveys will be limited to land adjustments (purchase, exchange, Small Tracts Act cases) and critical lines lost due to a lack of maintenance. Due to the fragmented ownership pattern, it's critical that at least 160 miles of line be maintained per year. Routine maintenance is critical to prevent encroachments or to locate encroachments. Boundary line maintenance would not vary substantially by alternatives.

Road Right-of-Way Acquisitions

The CNF has access needs across private land for timber sale purposes, and other public needs such as recreation and general land management (silvicultural, fire management). Again, the fragmented ownership pattern is a strong contributing factor. These rights-of-way need to be acquired as a permanent easement for current and future needs. Alternative A would require the largest number of ROW needs due to an emphasis on commodity outputs. Alternatives B, D-G, I would require a range of ROWs lower than A.

Heritage Resources

Land Adjustment

Land exchanges containing heritage resources on federal land would be an impact. Federal land becoming non-federal would no longer be under heritage protection laws.

Land Use

In most cases, special use authorizations would have a low impact on federal land, especially if proper mitigation is addressed in all site specific environmental considerations and permit operating plans.

Commodity Production

Land Management

The variation in lands management practices would vary little between alternatives, thusly effects to timber production would be minimal.

20.3 Cumulative Effects

Cumulatively, there would be no significant effects to Special Uses and Lands. There would be benefits to wildlife and aquatic species from potential land acquisition or land exchanges. Under all alternatives, the acquisition of land would have no effect on public land. Land management would not vary in effects from alternative to alternative. Land purchases and exchanges would essentially be the same for all alternatives. Land use authorization would have similar effects for all alternatives. Boundary line maintenance would not vary substantially by alternative.

21.0 Prescribed and Wildland Fire

21.1 Affected Environment

Wildland fire in the Southern Appalachains results from two forces. One is natural, those caused by lightning and the anthropogenic, those caused by humans. Historically, fire has been used for thousands of years by Native Americans over the landscape to aid in hunting, clear land for travel, increase berry crops, improve grazing for bison and other reasons. It was this "prescribed fire" that has shaped the forest over the years. These fires were ignited with a designed purpose to achieve a specific vegetative response. A response that was a benefit to the indigenous Native American tribe. However, European settlers have populated the eastern U.S.A since the early 1700's and modern fire suppression efforts have all but removed anthropogenic fire from the landscape.

Science continues to teach us about fire's role in the historic landscape of Tennessee, and how it modified the vegetation. Biologists have documented corresponding changes in vegetation, including the decline of many fire-adapted communities, since the removal of fire from the landscape. Fire-adapted communities are dependant on a historic disturbance regime. This is evident from the increase of dense understory vegetation, that no longer resembles the overstory, as a result of fire exclusion. Without fire or other disturbances the forest composition is slowly converting to species such as maple, beech, blackgum, and white pine.

The following is a brief summary of just a few examples of Native American fire use research reports and books by various authors:

From the Forests in Peril, by Hazel R. Delcourt (2002), states that the colonists encountered indigenous peoples that used fire to clear the

understory of forests in the vicinity of their villages. The people of the Early Woodland cultural period girdled trees and set local fires to open up gaps in the forest canopy that allowed for forest succession to take place. These human-set fires burned the upper slopes, fire tolerant plant was favored and the ecological plant make-up between more moist lower slopes and dry ridge tops was transformed. Secondary forest growths that the early settlers saw in the 1700's and 1800's (after DeSoto) were perceived as "virgin" forests. Further, the location of charcoal ash particles found in the Cliff Palace study pond indicates Native Americans used fire to manage secondary shrub vegetation.

From The Southern Appalachians – A Wilderness Forest, by Charlton Ogburn (1915), references from A History of the Valley of Virginia, by Samuel Kercheval (1902), that much of the greater part of the Shenandoah was one vast prairie and afforded the finest pasturage for animals. The conclusion stated by Ogburn was that the Indians had the habit of burning the land as an accident from hunts or on purpose to enhance the land for game.

In Forests, Forest Fires, and Their Makers, by Paul and Hazel Decourt, Cecil Ison, William E. Sharp, and A. Gerynn Henderson (1999), conclusions are drawn from pollen and charcoal studies found in a mountaintop pond, Cliff Palace Pond, that fire was an historical event there for 10,000 years. This fire history is linked to local changes in human culture recorded in nearby rock shelters. During the Woodland period when Indians cultivated plants their success depended on their ability to open up spots in the forest. The pollen and core studies indicate fires were very frequent and are a result of deliberate set fires. Further, at all sites studied across Eastern Kentucky an increase in fires and fire tolerant species occurred at the same time native peoples turned to gardening as a way of life. These clearing fires were not intense fires of a major forest fire but were relatively cool fires to burn off surface materials and kill smaller trees and saplings.

Cecil Frost in his "Presettlement Fire Frequency Regimes of the United States: A First Approximation" of (1998) states that there are many records of Native American burning but there is no consensus yet on relative effects of their fires versus lightening ignitions. He further states the effects of Native American burning varied drastically, and whether their burning influenced a local fire regime depended on the background lightning fire regime associated with the landscape they lived in. During pre-settlement periods past-lightning season fires in the fall and winter would have been the result of burning by Indians. He references Byrd (1728) as stating when he surveyed that there was smoke from late fall Native American fires in the Piedmont between Virginia and North Carolina.

David H. Van Lear and Thomas A. Waldrop discuss "Native American Use of Fire in History, Uses, and Effects of Fire in the Appalachians (1989)." They state that in the Appalachians Native Americans did not begin to practice agriculture until about 800 to 100 A.D.

Reasons for burning were sometimes for other than hunting. Indians burned the forests to reduce the threat of dangerous forest fires, they burned to clear underbrush, to improve habitat for deer and buffalo and to make the forest open for gathering acorns and chestnuts. Stewart (1963) states where there were Indians there was fire. In the mid-1700's the Shennadoah Valley was a vast prairie between the Blue Ridge and Allegheny Mountains. Leyburn (1962) states the area was fired annually by the Indians to keep it from reverting to forest. Van Lear and Waldrop go on to state the reason DeSoto was able to drive herds of livestock through the Appalachians and open understory was due to fire.

In "Fire in Southern Forest Landscapes" by Stanturf, Wade, Waldrop, Kennard, and Achtemeier (2002), the writers describe Pyne's (1997) research. Pyne cites that cereal grasses were fired annually by Native Americans, basket grasses and nut trees every three years and grass savannas every year. Forests were burned for visibility and game every seven to ten years.

From the international symposium Fire and the Environment: Ecological and Cultural Perspectives, held in Knoxville, Tennessee March 20-24, 1990, the following are excerpts presented:

<u>Fire and Oak Regeneration in the Southern Appalachians</u>, David H. Van Lear, professor, Clemson University – "At the turn of the century, summer fires were quite common as farmers burned the land to facilitate grazing. They had learned from early settlers, who in turn had learned from their Indian predecessors, that growing season fires best maintained an open forest with a rich herbaceous layer (Komarek 1974)."

<u>Forty Years of Prescribed Burning on the Santee Fire Plots: Effects on Overstory and Midstory Vegetation</u>, Thomas A. Waldrop and F. Thomas Lloyd, Southeastern Forest Experiment Station – "Archeological evidence has established the presence of Palco – Indians in the region as early as 12,000 years ago (Chapman 1985). The movement of Indian tribes for game and cropland created variable patterns of fire frequency across the landscape, thus producing a mosaic of vegetation types and stands ages (Buckner 1989). Southeastern forests described by the first white settlers of the 1600's and 1700's were often open pine and hardwood stands with grasses underneath. Early writers suggested these open forests owed their existence to frequent burning (Bartram 1791; Harper 1962; Van Lear and Waldrop 1989)."

<u>Indian Use of Fire and Land Clearance in the Southern Appalachians</u>, Michael S. DeVivo, Oregon Institute of Technology – Abstract – "Accounts of 16th, 17th, and 18th century explorers, however, document vast amounts of cleared land held by aboriginal inhabitants, who likely populated the continent in much higher numbers than have been traditionally accepted. Fire was the principal tool used by the Indians to clear vegetation"; and "…the role of fire has been largely underplayed. Fire was implemented for forest management, driving game, and preparing land for agriculture."

> Also, “Indians used fire to clear land for agriculture, and it is likely that some fires burned larger areas than intended. On deep soils and open slopes hardwoods persisted or invaded after a fire.” For this article, 37 references are cited.

There is an ongoing debate over the use of fire to restore vegetative communities to the Pre-European settlement or “Natural” assemblage. Some publics argue that human-ignited fires are not “natural” and therefore should not be used in the management of national forests. This argument implies that the use of fire by Native Americans were not part of the “natural” system. However, converting the forest to vegetation that was here during the Native American dominance is no longer a viable option. The climate and vegetative species dominance has changed as well as the influence and abundance of the modern population.

Patterson and Sassaman (1988) compared amounts of sedimentary charcoal to archaeological sites and found that fires were common near larger Indian populations and where their land-use practices were greatest. Charcoal records prior to European settlement and post-settlement show little difference, except during the slash fires associated with the logging boom at the turn of the century. These records clearly suggest that fires have been important in that area for the past 4,000 years, during a period of low lightning incidence. Human use of fire has been important in determining plant community composition (see also Sutherland, and others, 1993).

In the past, fire was likely the most common natural disturbance on the landscape that is now the CNF. Fire plays an important role in maintaining southern yellow pine ecosystems and appears to be a major factor in the development of oak forest. The current existence of oak-dominated forests is probably a result of periodic fire. Without periodic fire, many of these stands would eventually be replaced by more shade tolerant species such as red maple that are fire-intolerant.

The CNF was established in 1936 and the national direction of the Forest Service was quite clear (Pyne, 1982)..."Forest fires have no place in any forest but as a result of ignorance, carelessness, and indifference (Anonymous, 1936)". The practitioners of "controlled burning" battled against an enormous campaign set at the national level to stop all fire. With that new direction of suppressing all fires, that major force of selection that had been present since the ice age was suddenly altered. The consequences of that well-intentioned but misguided policy would not be obvious for several decades. The selection process that influenced plant and animal communities now changed with the absence of fire.

Perhaps, though, in defense of the dedicated firefighters during these times, this is the way it had to happen. Fire fighting equipment, intelligence, weather forecasts, budgets and fire behavior prediction have only recently enabled prescribed burning on a substantial level. Recent scientific literature regarding plant and animal reactions and effects are now better known. We have better data on pre-eurosettlement conditions. And now we are beginning to understand some of the more dramatic long-term impacts of fire exclusion, as plant and animal populations and conditions of forest ecosystems are altered.

Research suggests many reasons for the use of prescribed fire as a vegetation management tool. Foresters, wildlife managers, recreation managers, and fire managers all have valid uses for fire. The following is list for possible uses of fire on the CNF:

Hazardous fuel reduction to reduce catastrophic fire

Enhancement of wildlife browse and soft mast

Regenerate fire dependant species, such as yellow pine, endangered and sensitive species

Increase the regeneration of oaks, reducing competition from maple and poplar

Reduce non-native species

Improve over-all forest health by reducing diseases and insects

Maintain successional stages, and unique habitats, such as balds, by inhibiting succession

Maintain open stands for scenery enhancement and recreation use.

Encompassing many of these uses is the utilization of fire to achieve ecosystem-based management goals for ecological communities where fire has played a major role in natural stand replacement or maintenance.

This is not a complete list and many of the uses overlap. Occasionally burning for one purpose precludes another benefit, but usually burning for one reason creates many other benefits. For instance, a hazardous fuel reduction burn will usually enhance browse, open up the stands for recreation use, and reduce competition of fire intolerant species, which improves the growing conditions for mast-producing oaks.

The CNF has an active prescribed fire program. The CNF uses fire for several reasons including ecosystem restoration and management, site preparation in timber harvest areas, and fuel reduction in urban interface areas as well as areas that have had a large number of arson fires. The following table shows historically what the CNF has prescribed burned.

Table 3-147 Historical Accomplishments for the Cherokee NF

Year	Fuels	Seed Bed Site Prep	CUS*	Wildlife	Other	Total Acres
2003	16,260	240	0	152	0	16,652
2002	10,053	200	0	0	0	10,253
2001	17,249	1,133	1,011	159	0	19,552
2000	15,367	60	3,000	60	0	18,487
1999	23,405	134	0	680	84	24,303
1998	14,564	206	0	812	0	15,582

Table 3-147 Historical Accomplishments for the Cherokee NF						
Year	Fuels	Seed Bed Site Prep	CUS*	Wildlife	Other	Total Acres
1997	2,727	419	0	1,084	0	4,230
1996	539	336	0	85	0	960
1995	0	0	0	0	0	0
1994	0	650	0	0	0	650
1993	0	761	0	0	0	761
1992	0	777	0	235	0	1,012
1991	0	1,015	0	1,088	0	2,103
1990	0	1,246	0	75	0	1,321
1989	96	1,787	0	25	0	1,908
1988	0	922	0	0	0	922
1987	351	568	75	145	24	1,163
1986	0	1,808	0	145	0	1,953
* Control Undesirable Species						

Prescribed fire is an economical tool to manage large areas where other forms of management are not likely to be used. Commercial timber harvest has been greatly reduced in recent years. The amount of the CNF that could reasonably be managed by mechanical and manual methods is limited by personnel and funding restrictions. There is extensive acreage on the CNF where fire is the only form of management activity that could ever be reasonably accomplished.

Prescribed fire, despite concerns about its use, remains an important, ecologically appropriate management tool. Both natural fuels and artificially produced management-activity fuels must be managed over time to meet long-term resource management objectives. Artificially produced fuels have been of little concern, because of the small volume generated, but may have to be managed in the future. The EPA states, in their 1998 policy document entitled Interim Air Quality Policy on Wildland and Prescribed Fires, that while future air quality concerns from prescribed fire may arise, the EPA is on record stating that fire should function, as nearly as possible, in its natural role in maintaining healthy wildland ecosystems and to protect human health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility.

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarsescale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. These five regimes include:

I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);

II – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);

IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

V – 200+ year frequency and high (stand replacement) severity.

As scale of application becomes finer these five classes may be defined with more detail, or any one class may be split into finer classes, but the hierarchy to the coarse scale definitions should be retained.

The following table represents the acreage of fire dependent and adapted communities on the CNF with fire regime designation.

Table 3-148 Fire Adapted Communities with Fire Regime Designation

Community Type	Forest Type(s) & CISC Codes	Acres	Fire Regime
Dry to Mesic Oak Forest	Post Oak-Black Oak (51), White Oak-Red Oak-Hickory (53), White Oak (54), Northern Red Oak-Hickory (55)	125,189	I
Dry and Dry to Mesic Oak-Pine Forest	Upland Hardwoods-White Pine (42), Southern Red Oak-Yellow Pine (44), Chestnut Oak-Scarlet Oak-Yellow Pine (45), Bottomlands Hardwood-Yellow Pine (46), White Oak-Black Oak-Yellow Pine (47), Northern Red Oak-Hickory-Yellow Pine (48)	56,465	I
Dry and Xeric Oak Forest	Chestnut Oak (52), Scarlet Oak (59), Chestnut Oak-Scarlet Oak (60)	69,984	I
Xeric Pine and Pine-Oak Forest	Shortleaf Pine-Oaks (12), Loblolly Pine-Hardwood (13), Pitch Pine-Oak (15), Virginia Pine-Oak (16), Shortleaf Pine(32), Loblolly Pine (31), Virginia Pine (33), Pitch Pine (38)	130,981	I
	Table Mountain Pine (39), Table Mountain Pine-Hardwood (20)	9,891	II

Prescribed fire and mechanical fuels treatments are designed to reduce the risk of catastrophic wildfires by decreasing the amount of available fuel that the fire is able to consume and thus carry the fire. Both methods are utilized to restore fire regimes within or near an historical range. Condition Classes are a function of the departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, stand structure, successional stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, grazing, introduction and establishment

of exotic plant species, insects and disease (introduced or native), or other past management activities. Fire Condition Class is a measure of general wildland fire risk and ecosystem condition defined as follows:

Condition Class 1:

Fire regimes are within or near an historical range.

The risk of losing key ecosystem components is low.

Fire frequencies have departed from historical frequencies by no more than one return interval.

Vegetation attributes (species composition and structure) are intact and functioning within an historical range.

Condition Class 2:

Fire regimes have been moderately altered from their historical range.

The risk of losing key ecosystem components has increased to moderate.

Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.

Vegetation attributes have been moderately altered from their historical range.

Condition Class 3:

Fire regimes have been significantly altered from their historical range.

The risk of losing key ecosystem components is high.

Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.

Vegetation attributes have been significantly altered from their historical range.

The CNF uses both prescribed fire and mechanical treatments to reduce fuel loading, and to break-up fuel continuity, both vertically and horizontally, to reduce rates of spread and therefore fire size, intensity, and severity. Nationally, the direction is to increase hazardous fuels treatment in the wildland urban interface areas. Those areas are the most expensive areas to suppress wildland fires and pose the greatest threat to public and firefighter safety. Though there is not a one-to-one correlation between acres treated and suppression dollars saved, or fewer acres burned, there is sufficient evidence to show that areas that have been treated typically exhibit lower rates of spread, less intensity, less severity, and a smaller final fire size under normal conditions.

21.2 Direct/Indirect Effects

Management activities and natural processes both affect fire and its environment, commonly known as the fire environment. In order for a fire to burn it needs three things: heat (ignition), fuel, and oxygen. Management activities affect all three of these components, while manipulation of forest vegetation and fuels has the greatest influence. Activities in alternatives will differentially affect amount of wildfire and need for or ability to use fire, either management ignited fire or wildland fire use.

Risk of Wildfire (Ignition Source)

The primary ignition source for fires on the CNF is arson. As human activities increase, the potential for ignition increase as well. Access into and throughout the forest, whether motorized or not, will increase the potential of an arson fire. However, many of the management activities that reduce risk of human-caused ignition, also hamper suppression efforts by increasing both report and response times, and allowing fires to grow in size and intensity before suppression begins.

Alternative E poses the greatest risk for human-caused fire to occur.

Motorized and non-motorized roads and trails increase human activity on the forest and result in an increase risk of human-caused ignition of wildland fires. Motorized vehicles pose an additional risk of vehicle fire ignition. Decommissioning roads and reducing dispersed recreation can reduce human access and risk of ignition source.

As recreation user density increases human activity on the forest, the risk of human-caused ignition increases. Campfires are a common source of wildfires across the NFS lands, dispersed sites pose a greater risk of escaped campfires, than do developed recreation.

Fuels

Fire like many processes depends on certain conditions to exist. Whether or not a fire burns and how it behaves is dependant on fuels, weather, and topography. While we cannot readily change weather or topography, we have a tremendous impact on fuels. Fuel characteristics affecting fire behavior include: horizontal and vertical arrangement (both live and dead fuels), loading, moisture, and temperature.

Alternative E reduces the greatest amount of fuel, from logging (and prescribed fire).

Dispersed and developed recreation temporarily rearrange fuels which may burn during a fire, generally reducing risk of damaging fire to the site by decreasing fuel loads.

Timber harvest activities affect both the risk of ignition and fuel conditions. There is an increase ignition risk during harvest activity from machinery and humans. Timber harvesting temporarily increases fuel loads from slash and activity fuels, depending on utilization of cut material. However, both increase risks are mitigated in administration of the timber sale contract and provisions contained within. Contract provisions that require reduction or removal of slash mitigate activity fuels.

The general increase in fuel loads immediately following a timber harvest results in a temporary increased risk of destructive wildfire due to increasing fire intensity and rates or spread, making fires more difficult to control. These effects usually diminish within a few years as logging slash decay and deteriorate. In general the long-term benefits reduce natural fuel loadings and a breakup in fuel continuity, resulting in decreased fire intensity, reduced risk of catastrophic fire, and fires that are easier to control. Harvest prescriptions which reduce canopy closure and stems per acre, also reduce the potential for crown fires that are independent of surface fire. While it is difficult to predict the specific effects from each harvest treatment and amount of slash disposal required, in general the following can be expected:

Clearcuts- in combination with slash treatment leaves less available fuel. But thinning is commonly required in subsequent years to reduce tree spacing. Fuels are more susceptible to drying from the sun and wind. While rates of spread are greater in open stands, intensities are often reduced and suppression more successful because line production rates are increased substantially.

Precommercial and Commercial thinning- create additional fuel if left on ground until decay rates of slash result in a decreased fuel hazard. Thinning trees also reduces continuity and independent crown fire potential, as well as increasing growth rates on remaining trees, reducing chance of mortality caused by fire.

Individual or selection cuts- Depending on actual prescription, can be similar to a mix between clearcuts and commercial thinning.

Salvage Harvests- remove large fuels and potentially hazardous snags, increasing suppression control effectiveness.

Alternatives D and F decrease crown densities, ladder fuels, and late successional structure on a greater number of acres.

Timber harvests are lowest in alternatives E and G. This allows a greater potential of stands to grow into late successional vegetation stages. Increasing fire intensity and the probability of stand replacement fire due to accumulating dead and latter fuels. This in effect limits appropriate management response to suppression, greatly reducing the chance of using naturally-ignited fire for resource benefit.

Suppression

The factors listed above influence fuels and thus fire behavior. Fire behavior is a major concern to fire managers as it affects fire size, intensity, rate of spread, spotting and crowning. These factors in turn determine fire managers response to fire, suppression tactics versus wildland fire use for resource benefit. Restrictions on suppression tactics can decrease firefighter and public safety, and increase fire size and behavior. While it is important to allow natural processes to take place when and where appropriate, it needs to be addressed.

Conversely, when roads are present, risk of ignition increases, but access can improve response time and effectiveness in suppression efforts. Roads and trails also redistribute fuels limiting the spread of wildfire or act as fire barriers by serving as control lines for wildlfire control.

Risk to Wildland Urban Interface (Prescribed Fire) or Risk to Resource Loss and WUI

Management ignited fire (prescribed burning) is an important tool to mitigate negative impacts on fuels and ignition risk caused by management activities. Prescribed burning, more than any other management activity, has the greatest effect on reducing risk of destructive wildfires. It reduces fuel loads, reducing fire intensity, increases fire control efficiency, and results in less resource damage caused when a fire does occur. Most importantly, it offers the fire manager more options for appropriate management response to wildland fire, especially concerning wildland fire use for resource benefit.

Table 3-149 Estimated annual prescribed fire activity by alternative:

Alternative A	Alternative B	Alternative D	Alternative E	Alternative F	Alternative G	Alternative I
16,000 Ac.	16,000 Ac.	16,000 Ac.	10,000 Ac.	16,000 Ac.	16,000 Ac.	25,000 Ac.

According to the National Fire Plan, management-ignited fire will focus on treating the environment, with priority given to Wildland Urban Interface and then those in condition class 2 or 3.

21.3 Cumulative Effects

The risk of human-caused fires will increase in alternatives with projected increases in forest visitor use.

In alternatives with less motorized access to the CNF, the risk of large fires increases due to a decrease in fire crew response time.

Rural development will occur in areas bordering the CNF. As this occurs, emphasis will need to be placed on reducing hazardous fuels adjacent to these developments.

22.0 Infrastructure

22.1 Affected Environment

Administrative sites along with National Forest System Roads (NFSRs) comprise the Infrastructure on the CNF. The NFSRs are addressed in section Roads and Access. There are approximately 38 administrative sites that include offices, work centers, the facilities of Jacobs Creek Job Corps Center, electronic communication sites, the Ocoee Whitewater Center and other scattered sites. Relatively new structures exist at the Tellico/Hiwassee Office and the Ocoee Whitewater Center. The Ocoee/Hiwassee Office is schedule for renovation and expansion. There are new lease facilities at the Nolichucky/Unaka Office and at the Watauga Office.

22.2 Direct/Indirect Effects

By the third decade, facilities costs would increase due to the aging of the three relative new sites described above. However, there would be no significant changes in Infrastructure among the alternatives. In all cases, offices, work centers and other various administrative sites would still be needed to manage the CNF under any alternative.

22.3 Cumulative Effects

There are no known cumulative effects on infrastructure.

23.0 Roads and Access

23.1 Affected Environment

The NFSRs total approximately 1,550 miles that vary from single-lane, unsurfaced, primitive roads suitable for only four-wheel drive or high clearance vehicle to double-lane, paved roads. Approximately 25 percent of these miles are arterial/collector roads serving large to medium land areas and connecting to public highways. The remaining 75 percent are local roads that serve specific resource activities and connect to the arterial/collector roads or to public highways.

Table 3-150 table summarizes the total NFSRs.

Table 3-150. Total NFSR Mileage

Classification	North	South	Total	Percent
Arterial	0	0	0	0
Collector	117	290	407	26
Local	558	585	1,143	74
TOTAL	675	875	1,550	100

23.2 Direct/Indirect Effects

Table 3-151. Four road options would be used in the various prescription allocations ranging from unroaded interior to increase in open road density. Acres to which the four road options would be 1 among the alternatives.

Alternative	General Access Statement	Percentage of CNF Land			
		Road Option 1	Road Option 2	Road Option 3	Road Option 4
A	Public access would be increased in high-use areas and/or improved to provide for more recreation opportunities.	18	28	53	1
B	Access would be reduced as needed to restore and protect aquatic systems, soils, and plan/animal communities.	11	27	61	1
D	Access would be developed, maintained and used as needed to meet the goal of balanced age classes, wildlife habitats and production of timber products.	11	23	66	<1

Table 3-151. Four road options would be used in the various prescription allocations ranging from unroaded interior to increase in open road density. Acres to which the four road options would be 1 among the alternatives.					
Alternative	General Access Statement	Percentage of CNF Land			
		Road Option 1	Road Option 2	Road Option 3	Road Option 4
E	Public access would be increased in high-use areas and/or improved to provide for more recreation opportunities.	25	21	52	2
F	Access would continue as provided under the current Plan.	16	0	7	13
G	Road network mileage would be reduced through closure and obliteration of roads not needed for ecosystem stewardship or restoration.	26	34	40	<1
I	A minimum transportation system would be available that improves access for forest road users while protecting forest resources. Generally, access will be limited to those areas that can be accessed by maintaining or reconstructing existing system roads, or through the construction of temporary roads. New permanent roads would only be constructed in a few situations. The pace of decommissioning unneeded roads would be accelerated. Highly used roads and roads adversely affecting surrounding resource values and conditions would be upgraded.	20	19	59	2

Road Options would be defined as follows:

1. Although roads would serve as boundaries to the area, the interior would be unroaded throughout the year.
2. Open road density decreases over the planning period through closure of roads [and motorized vehicle trails] that would be unneeded or would cause undesirable resource impacts.

3. Density of open roads [and motorized vehicle trails] remains near the current level throughout the planning period, with only small increases or decreases.
4. Density of open roads [and motorized vehicle trails] would increase to provide improved access to national forest resources.

Currently, there are no estimates of miles of road for construction and reconstruction used for other than timber purposes. However, the following table (Table 3-152) summarizes miles of timber road construction and reconstruction by decade for each alternative as generated by the Spectrum model.

Table 3-152. Miles of Timber Road Construction/Reconstruction

Alternative	Construction Reconstruction	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5	Total
A	C	1	2	3	1	3	2,354
	R	311	395	541	441	655	
B	C	1	1	4	5	0	2,697
	R	342	438	669	557	682	
C	C	0	0	0	0	0	31
	R	2	6	8	8	8	
D	C	11	12	20	21	28	4,678
	R	636	848	1,014	978	1,110	
E	C	0	0	0	0	0	517
	R	84	65	100	116	150	
F	C	6	3	7	10	6	4,776
	R	655	730	951	1,107	1,300	
G	C	0	1	2	0	1	1,404
	R	174	232	297	307	388	
I	C	1	1	1	5	7	2,984
	R	357	491	639	659	824	

NOTE: Totals may not match due to rounding of original figures.

Road reconstruction activity under the 1986 LMP (Alternative F) on the arterial/collector road system for other than timber purposes has been at a low rate of eight miles/year average for the past seven years. Using that as a base, an estimated change for each alternative is shown in the following table (Table 3-153). All changes are less than +/-7 percent of the base. Road construction could exist but would be rare under any alternative.

Table 3-153 Arterial/Collector Reconstruction Non-timber Roads	
Alternative	Estimated Change from Alternative F
A	Higher
B	Lower
D	Approximately Same
E	Higher
F	Base 8 miles/year
G	Lower
I	Higher

23.3 Cumulative Effects

Cumulative effects upon transportation would be indeterminate and therefore would not be listed.

SOCIAL AND ECONOMIC ENVIRONMENT

24.1 Affected Environment

The CNF is located in the Southern Appalachian Mountains within the Southern Appalachian Province, which includes the Appalachian Mountains and the Shenandoah Valley and extends southward from the Upper Potomac River Basin to northern Georgia and the northeastern corner of Alabama. It includes seven states, 135 counties and covers approximately 37 million acres.

One of the components of the SAA is the *Social, Cultural, and Economic Technical Report*, where a social and economic assessment of the southern Appalachian lands was performed. The following assessment of the CNF is tied to some of the more significant SAA findings, wherein comparisons of the forest's environment are made with similar findings from Southern Appalachian lands.

Social attitudes, values and beliefs are elements used to describe and understand the human dimension of resource management. This information is used to predict possible effects on local communities. These effects may include acceptance of or resistance to the decisions made. Social analysis coupled with economic and demographic information forms the human dimension of ecosystem management. This information is used with the biological and physical analysis to best understand potential effects on the land as well as the human environment.

24.1.1 Demographic Changes

One characteristic used to determine the dynamics of change for an area, is the growth of population and changes in its various racial and ethnic components. A static area will imply few possible issues affecting change. Conversely, a dynamic growing population may produce many conflicting or new issues for land managers to consider. Certain areas of the NFS and surrounding lands, which are seen to be attractive to urban dwellers for recreation and second or retirement home residence, may produce issues which conflict with traditional residents of the area.

Demographic changes for the region studied in the *SAA* are given first in the analysis followed by that of the CNF's; then a contrast is given between the SAA region, the forest, and the primary state in which the forest resides. Many of the time frames used in the SAA were not available for the CNF and data more current than for 1990 were not available in the Assessment. Therefore, direct comparisons between the two are not always possible. Some limited Census data is available from the 2000 Census (mostly population, households and housing data from the "short form" most families completed).

Population increased by 7.3 percent from 1980 to 1990 in the Southern Appalachian region. This compared with a 1.7 percent increase for the CNF, and a 6.2 percent for Tennessee, the primary state in which the CNF resides. More currently, the change from 1990 to 2000 was 12.8 percent increase for the counties of the CNF and a 16.7 percent increase for Tennessee. Table B-125, Table B-126, Table B-127, and Table B-128 in Appendix B show population characteristics and their rates of change for each county within the forest proclamation boundary, while the table below (Table 3-154) illustrates significant population variable changes from 1980 to 1990 and from 1990 to 2000 for all the counties within the forest boundary:

Table 3-154. Minority and Percent Population Change

	Population			
	1990 % Minority	% Change '80-'90	2000 % Minority	% Change '90-00
Forest Counties	2.7	1.7	3.4	12.8
Tennessee	17.0	6.2	18.7	16.7
SAA	8.1	7.3	*	*

* No SAA number for 2000

Source: U.S. Census Bureau

Within the forest boundaries, minority population increased by 42.9 percent between 1990 and 2000, a change from the 11.1 percent decrease that occurred during the 1980's (see Table B-128 in Appendix B). The minority population within Tennessee represented 18.7 percent of the entire population, a 28.2 percent increase from 1990. Opportunities for minority participation resulting from local minority visits to the forest have increased very much over the decade of the 1990's. The SAA had a minority population of 8.1 percent in 1990, which was about five percent more than that of the CNF at that time.

Table 3-155. Population Density

	1980 Population Density Persons/Square Mile	1990 Population Density Persons/Square Mile	2000 Population Density Persons/Square Mile
Forest Counties	110.6	112.5	127
Tennessee	111.4	118.3	138
SAA	94	102	*

Table 3-155. Population Density			
	1980 Population Density Persons/Square Mile	1990 Population Density Persons/Square Mile	2000 Population Density Persons/Square Mile
* No SAA number for 2000 Source: U.S. Census Bureau			

Population density was 102 people per square mile in the SAA in 1990, while the population density for the forest counties was 113 people per square mile, and 118 people per square mile for the state of Tennessee. Population density in 2000 increased to 138 persons per square mile in the state while the forest counties increased to 127 per square mile. These rates of change in density are the same as the population rates of change over the past decade. While population density changed from about 94 persons per square mile during 1980 in the SAA, it changed from 111 persons per square mile in the forest analysis area and the state (see Table 3-155 above and Table B-129 in Appendix B).

The significance of these population changes is that the forest boundary population grew at a slower rate for the 1980 to 1990 decade than did the population of the SAA or the state of Tennessee. However, population in the CNF counties grew rapidly from 1990 to 2000 (12.8 percent), only four percent less than the rate of growth for Tennessee.

The minority population's share of the total population still lags behind that of the SAA and the state of Tennessee. This is to be expected because of the larger urban populations found in the latter two areas. However, the rate of growth between 1990 and 2000 was much greater in the CNF boundary counties than Tennessee.

The rural nature of the area is contrasted with the state and SAA below in Table 3-156 For a breakout of all counties within the forest boundaries, see Table B-130 in Appendix B.

Table 3-156. Percentage Rural		
	1980 % Rural	1990 % Rural
Forest Counties	51.8	53.0
Tennessee	39.6	39.1
SAA	*	53.0
* No SAA number for 1980 Source: U.S. Census Bureau		

The CNF analysis area is predominately rural and this rural characteristic has increased slightly since 1980. The percentage of persons living in rural areas for the aggregated counties that make up this area has risen from 51.8 percent in 1980 to 53 percent in 1990. This compares favorably with the rural character of the SAA (53 percent). The fact that the CNF counties did become slightly more rural during the decade from 1980 to 1990 may be explained by a net decrease in population in urban Sullivan County (see Table B-128 in Appendix B).

In short, there appears to have been an increase in population in the CNF analysis area in the 1990 decade—a characteristic that was absent during the 1980's. This population appears to be moving not to urban areas within these counties but to the rural areas.

Per capita income is a relative measure of the wealth of an area. It constitutes the personal income from all sources divided by the population of that area. For the SAA the per capita income average was $10,950 in 1990; for the forest analysis area it averaged $9,993 and for the state of Tennessee it was $12,255.

Table 3-157. Per capita Income

	1980 Per Cap. Income	1990 Per Cap. Income	Real Avg. Annual % Change '80-'90 Per Cap. Income
Tennessee	$6,212	$12,255	2.2
Forest Counties	$5,167	$9,993	2.0
SAA	$6,377	$10,950	0.8

Source: U.S. Census Bureau

Income for both the forest area and Tennessee grew faster on a real basis (inflation adjusted) than the SAA during the 1980's. The CNF area grew at a two percent rate; Tennessee grew at a 2.2 percent rate, while the SAA grew only by 0.8 percent (see Table 3-157 above and Table B-131 in Appendix B). Thus, a person's financial well being increased at a greater rate in the CNF analysis area than for the SAA during the 1980's decade. The growth in earning power increased almost at the same rate as that of Tennessee.

Table B-135 in Appendix B has income data for the CNF and state based on Bureau of Economic Analysis (BEA) measurements. This data is *per capita personal income*, which is not directly comparable with the Bureau of the Census *per capita income* data shown above and in Table B-131 in Appendix B. The two data sets are not the same because census data is obtained directly from households, whereas the BEA income series is estimated largely on the basis of data from administrative records of business and governmental sources. Also the definitions of income are different. Additionally, caution must be used in comparing growth rates of Table B-131 and Table B-135 because growth in the former is based on real or inflation adjusted dollars while growth in the latter is based on nominal dollars (unadjusted for inflation).

Thus, from the Per Capita Income table above, it is evident that the CNF area is still relatively poorer than either Tennessee or the SAA, but, economically, it did grow parallel with the State during the 1980's.

Another indicator of relative economic prosperity is the percent of the workforce out of work. Unemployment rates change dramatically over time, depending in large part on the national economy. Some areas, however, have experienced protracted unemployment problems because of educational attainment and lack of skills.

As shown in Table 3-158, in 1990 the CNF analysis area had a higher unemployment rate (7.5%) than either the state (5.1%) or the SAA (6.5%).

Table 3-158. Unemployment Rate		
	Unemployment Rate 1990	Unemployment Rate 1997
Tennessee	5.1	5.4
Forest Counties Avg.	7.5	6.4
SAA	6.5	*
*No SAA data for 1997 Source: U.S. Census Bureau		

During the 1990's the unemployment rate decreased by more than a percentage point for the CNF analysis area while the rate decreased by 0.3 percent for Tennessee. However, the unemployment rate within the CNF analysis area is still a full percentage point higher than that of the State. More resolution in unemployment rates for the CNF (by county) can be found in Table B-137 in Appendix B.

People in poverty are represented in Table 3-159 (more specific forest information can be identified inTable B-132 in Appendix B):

Table 3-159. Poverty Rate		
	1989-Percent of People of All Ages in Poverty	1995-Percent of People of All Ages in Poverty
Tennessee	15.7	14.7
Forest Average	18.8	16.8
SAA-1990 rate	11.0	*
No SAA number for 1995 Source: U.S. Census Bureau		

Many of the counties in the CNF analysis area had very high rates of poverty in 1989. The average was much higher for the CNF analysis area than either Tennessee or the SAA. In 1995 it is estimated that the State of Tennessee had a one percent lower poverty rate, and the CNF analysis area had a two percent lower rate than that found in 1989. The SAA was based on data through 1990 therefore more current data is not shown for this area.

Another factor indicating relative poverty and social disunity for an area is the percent of households headed by a female member. The greater this percentage is, the more likely that these households may be on some form of government assistance. Table 3-160 below contrasts the experience for our three areas of comparison:

Table 3-160. Female Head of Households		
	1980 Female Head of Households	1990 Female Head of Households
Tennessee	6.2	6.7
Forest Avg.	4.2	4.5
SAA	*	10.5
* No SAA number for 1980 Source: U.S. Census Bureau		

The increase in female-headed households rose slightly from 1980 to 1990 for the CNF analysis area and for Tennessee overall. Both, however, were much lower than the SAA average (10.5%) for 1990. A lower female head of household for the CNF analysis area may indicate greater social cohesion of extended families in this area than in other areas of the SAA region.

The number of persons per household also indicates economic status in a region. The greater the average number of persons per household in an area, the less prosperous that area tends to be.

Table 3-161. Density of Households

	1980 Persons Per Household	1990 Persons Per Household	2000 Persons Per Household
Tennessee	2.8	2.6	2.5
Forest Avg.	2.8	2.5	2.4
SAA	*	2.6	*

* No SAA number for 1980 or 2000
Source: U.S. Census Bureau

The change in household size from 1980 to 1990 and from 1990 to 2000 decreased slightly for the CNF analysis area and the State. Household size for both of the former areas compares favorably with that of larger SAA area. Notably large households do not seem to be a characteristic of the CNF analysis area (see Table 3-161).

As shown in Table 3-162, the decade of the 1970's appears to be a decade of more rapid growth than the decade of the 1980's. Housing unit growth from 1970 to 1980 was 33.2 percent for the CNF analysis area, while Tennessee showed a similar growth rate of 34.3 percent. Growth between 1990 and 2000 showed an increase from the 1980's decade---an increase of 21.1 for the forest boundary counties and 20.4 for the state. In the last three decades the growth in housing has been slightly higher in the forest analysis area than for the state. Housing unit change was not measured in the SAA.

Table 3-162. Housing Units

	Housing Units % Change 1970-1980	Housing Units % Change 1980-1990	Housing Units % Change 1990-2000
Tennessee	33.2	11.9	20.4
Forest Area Avg.	34.3	15.9	21.1

Source: U.S. Census Bureau

Median housing value is contrasted in Table 3-163 below. Housing values within the CNF analysis area tend to be substantially below that of Tennessee and the SAA. Housing values are determined principally by the extent of demand. The greater the demand the higher prices are bid up. Population increases and increases in jobs play a factor in the extent of demand for housing. In the forest analysis area, population only began to increase at a significant rate in the 1990's. During the prior decade population grew at a slower pace. Housing stock increased at a significant rate in the decade of the 1970's and 1980's. However, value is still low compared

with the State, which has the influence of urban areas that can support higher priced housing. It therefore appears that the CNF analysis area is fairly dynamic in regards to the creation of new housing but population and wage growth will have to increase significantly to warrant significant increases in housing values.

Table 3-163. Housing Value		
	Housing Units Median Value 1980	Housing Units Median Value 1990
Tennessee	$35,600	$58,400
Forest Area Avg.	$29,636	$46,555
SAA	*	$59,700
* No SAA number for 1980 Source: U.S. Census Bureau		

Table B-134 in Appendix B shows more specific data for the CNF analysis area for both housing units and median value of housing units.

24.1.2 Economic Trends

Analysis of the major sectors of an economy provides insight into how diverse the economy is and what industries may be driving its growth. Table B-137 in Appendix B shows the entire economy broken out by major Standard Industrial Codes (SIC) and by important industry sub-sectors for wood products and for an estimate of the contribution of certain industries to tourism.

Table 3-164 below shows the Manufacturing sector, the sub-sectors for wood based industries, and an estimate of the tourism industry according to the percentage of industry output and employment for 1985 and 1996. Tourism is not a manufacturing or industrial sector of an economy but comprises several of the services and retail industries. The percentage of each of these industries attributed to tourism was taken from the work of Gordon McClung at West Virginia University.

Table 3-164. Economic Diversity				
	1985 %Total	1996 % Total	1985 % Total	1996 % Total
Manufac Turing -	56.4%	44.1%	36.8%	44.1%
Mfg. Lumber & Wood Prods	0.9%	1.1%	1.2%	1.1%
Wood Furn & fix.	1.3%	2.2%	1.9%	2.2%
Paper & Pulp Products	4.4%	3.5%	2.0%	3.5%
Tourism	1.2%	1.2%	2.0%	1.2%
Total Economy*	$14,562.1	$21,924.2	204,538	287,987
*in Millions of dollars. Source: IMPLAN 1985 and 1996 Data				

From this table it is evident that the economy of the CNF analysis area is becoming less reliant on the manufacturing sector and is becoming more diverse. From 1985

to 1996, the importance of manufacturing declined by almost a 12.5 percent share of total output. Manufacturing, however, is still a very large proportion of the economy of the analysis area, representing 44.1 percent of the economy in 1996.

Similarly, manufacturing constituted 42 percent of the economy of the SAA in 1991. At these levels, the SAA and the CNF analysis area show a concentration in manufacturing that is much higher than that of the U.S. economy in which manufacturing is less than 20 percent of the overall economy.

For the manufacturing sector, wood products constituted 6.8 percent of the local economy's total output in 1996. This is a slight increase from the 6.6 percent share it had in 1985. Employment grew from a 5.1 percent share in 1985 to 6.8 percent share in 1996. Employment in the wood products industries resulted in a 3.4 percent share of the SAA economy in 1991. Industrial production had a 5.2 percent share. The wood products industries were relatively more important in the CNF's economy than that of the SAA.

Tourism is defined as any non-business related travel of 100 miles or more from home. Recreation would be a subset of tourism estimates; therefore its share of the economy would be something less than the overall tourism numbers. The estimate of tourism's share of the economy was approximately the same output between 1985 and 1996. Employment, on the other hand, decreased from a two percent to a 1.2 percent share of the local economy's total. Table B-137 of Appendix B compares the CNF analysis area's economy for 1985 and 1996 for all nine major sectors of the economy.

Besides the manufacturing change mentioned above between these two years, other significant changes include an increase in construction from 4.6 percent of output in 1985 to 7.4 percent in 1996. Finance, insurance and real estate increased from 3.9 percent share of the output to 7.3 percent in 1996 and the non-tourism related services sector increased from 8.2 percent to 15.1 percent in 1996. This illustrates that the local economy is becoming more diverse, but it is still heavily reliant upon the manufacturing sector for the majority of its activity.

For the purpose of economic analysis, the years of contrast in the SAA were 1977 and 1991 from the IMPLAN input-output model. The forest, meanwhile, used more current data, contrasting the 1985 and the 1996 regional economies. Because these years are dissimilar, many of the percentage changes are not directly comparable. Placing the comparison on an average annual rate of change does allow for measure of comparison. The following chart (Table 3-165) compares the rate of change between the SAA's economy and that of the CNF analysis area:

Table 3-165. Economy Dynamics		
	Employment Avg. Annual Change	Industrial Output Avg. Annual Change
Forest Area*	3.2	3.8
SAA **	1.9	2.6
* Change from 1985 to 1996 ** Change from 1977 to 1991 Source: IMPLAN 1985 and 1996 Data		

Output has grown faster for the CNF local economy (3.8 percent) than the SAA (2.6 percent per year). Growth in employment has been greater. This disparity suggests that the industries within the CNF boundary counties have invested in capital equipment that has resulted in increased productivity, allowing the area to achieve a higher level of output growth relative to employee growth.

A principle way an economy grows is by export of goods and services. Most typically, manufacturing activity is thought of as providing most of this export related activity. However, services and retail trade can be considered "export" industries if significant visitors come in from outside in travel related activities to bring in new dollars. Tourism is classified as an export driven activity. A manufacturing industry can be a net importer if it imports more of a commodity that it exports.

Table B-137 in Appendix B illustrates all the major sectors and industries contributing to the tourism industry within the CNF analysis area. The table below (Table 3-166) compares the exporting characteristics of the CNF's analysis area for 1985 and 1996.

Table 3-166. Exporting Industries				
Commodity	Net Exports-Exports Less Imports		Net Exporting Industries as a Percentage of Total Positive Exporting Industries	
	1985	1996	1985	1996
Mfg. Lumber and Wood Products	-$10.6	$46.5	0.0%	1.1%
Mfg. Wood Furniture and Fixtures	$142.6	-$264.7	4.9%	0.0%
Mfg. Paper & Pulp Products	$249.5	-$351.4	8.6%	0.0%
Total Mfg.	$2,288.1	-$1,702.2	78.9%	0.0%
Estimate of Trade	-$23.3	$37.0	0.0%	0.9%
Total Net Trade (exports)	-$39.2	$1,858.6	100.0%	100.0%
Total Positive Export Industries	$2,898.4	$4,065.5	---	---
Source: IMPLAN 1985 and 1996 Data				

Table 3-166 shows that this local economy went from a net importing economy in 1985 to a net exporting economy in 1996. Large changes occurred in the wood products industries whereby those industries became net importers. Total manufacturing also changed from an exporting sector in 1985 to that of an importing sector in 1996, changing from exporting $2,288.1 million to importing $1,702.2 million.

"Total positive export industries" dollars provide the basis for expressing the percentage of an industry, which is a net exporter, to determine its share of total exports. In 1985, manufacturing had exports totaling $2,228.1 million, which was 78.9 percent of the $2,898.4 million of all net exporting industries in the area.

The local economy changed from a net importer of $39.2 million in 1985 to a net exporter in 1996 ($1,858.6 million). While manufacturing turned into a net exporting industry, services and trade turned from net importing industries in 1985 to net exporting industries in 1996. The largest contributor to this change was the finance, insurance, and real estate sector, which went from an importer of services in 1985 ($1,045.3 million) to an exporter of services in 1996 ($1,472.2). Many of the service and trade industries also turned from importers to exporters over this period of time (see Table B-138 in Appendix B). Tourism is estimated to be an importer of $23.3 million in 1985 to an exporter in 1996 ($37.0 million). Thus, travelers were coming from outside the analysis area at a greater rate in 1996 to spend money in the local economy than in 1985.

This is contrasted with the SAA area, which was a net exporter in 1991 of goods and services of $15.8 billion. Manufacturing was the largest net exporting sector, representing $24.6 billion. Manufacturing represented 156 percent of the net exporting sectors. Construction ($6.7 billion) and services ($4.3 billion) were the largest net importers and contributed to a drain of money from the economy.

In sum, the economy of the CNF analysis area changed from a net importer in 1985 to a net exporter in 1996. This has provided additional money that has enabled the growth of the economy. Manufacturing's importance as a net exporter declined from 1985 to 1996 when this sector imported more than it exported. The wood products sector showed a similar trend over this time. Meanwhile, the estimated trade effect of tourism turned from a net importer (more people leaving the region for travel) to a net exporter (more people coming to the region for travel). Again, this has provided more money for the economy of the analysis area.

Another means of determining the diversity of an economy is the Shannon-Weaver Entropy Indices of diversity. This process provides a relative measure of how diverse a county is with a single number. The entropy method measures diversity of a region against a uniform distribution of employment where the norm is equi-proportional employment in all industries. All indices range between 0 (no diversity) and 1.0 (perfect diversity). These two extremes would occur when there is only one industry in the economy (no diversity) and when all industries contribute equally to the region's employment (perfect diversity). In most cases diversity would be registered somewhere between 0 and 1.0. Another factor affecting the magnitude of the index

is the number of industries in a local economy; the greater number the larger the index.

The following table (Table 3-167), contrasts the change in diversity from 1977 to 1993 at the four digit SIC, or at the industry level. For a point of reference Tennessee and the Untied States serve as comparison guides.

Table 3-167. SHANNON-WEAVER ENTROPHY INDICIES		
Forest Boundary Counties	1977 Four Digit SIC	1993 Four Digit SIC
Tennessee Counties		
Carter	0.50839	0.59960
Cocke	0.57273	0.62677
Greene	0.60760	0.63824
Johnson	0.37700	0.55403
Mcminn	0.56874	0.64269
Monroe	0.51297	0.62226
Polk	0.39216	0.53718
Sullivan	0.56289	0.66452
Unicoi	0.50283	0.60532
Washington	0.56447	0.66557
North Carolina Counties		
Ashe	0.50801	0.59654
Forest Boundary Area Weighted Average	0.55210	0.64380
TENNESSEE	0.66887	0.74161
UNITED STATES	0.66483	0.73973
Source: USDA Forest Service, IMI		

In 1977 Johnson County, Tennessee was the least diversified county within the CNF boundary. It was 44 percent less diversified than Tennessee. The most diversified county in 1977 was Greene County, Tennessee, which was nine percent less diversified than Tennessee.

Between 1977 and 1993 all forest counties became much more diversified. The least diversified county in 1993 was Polk County, Tennessee, which was 28 percent less diversified than that of the state. Johnson County in 1993 was next to the last in diversity. The most diverse county was Washington County, which was about ten percent less diversified than that of the state. Greene County did not improve its diversity standing much between these two years, increasing only five percent.

On a weighted average aggregate employment basis, the CNF economy was about 17 percent less diversified than the state in 1977 and about 13 percent less diversified than the state in 1993.

In summary, the CNF area economy is less diverse than the regional Tennessee economy, but these rural counties have become more diversified over the 16 years of analysis data presented above. Johnson and Polk Counties have especially made

great strides to improve their economic infrastructures in that they have added additional industries to their mix. In aggregate the total economy has improved its diversity only marginally over this time span.

Payments in Lieu of Taxes (PILT) are funds that the federal government transfers to counties to help offset the non-tax status of federal lands within their boundaries. PILT is a payment from the Bureau of Land Management that covers shortfalls from natural resource consumption on the national forest. That is, if the Forest Service's Twenty Five Percent funds (25% Funds) from timber harvesting, mining and recreation do not cover at least $1.75 per acre, PILT will make up the shortfall.

Trends in 25 percent Funds and PILT are important to show a possible erosion of an area's tax base. Table B-139 in Appendix B breaks out revenues for each of the eleven forest counties. Table 3-168 below shows forest counties in the aggregate changes from various years for data that was common between the two sources.

Table 3-168. PILT Funds			
	% Change 1990	% Change 1997	% Change 1990-1997
Forest Counties PILT	$501,796	$621,175	23.8%
25% Funds	$483,892	$440,372	9.0
Total	$985,688	$1,061,574	7.7
Source: U.S. Dept. of Interior			

County revenues from the federal government have been variable since 1986, the first year of available data for 25 percent funds. The trend has been down, however, because of a reduction in timber harvesting. At the same time PILT funds increased as a replacement of lost revenues from timber harvesting. Taking the two payments together, there was a 7.7 percent increase for the CNF analysis area from 1990 to 1997. Still, this was only a 1.1 percent average increase per year, which is less than the rate of inflation.

Land use and its change over time is an indicator of the dynamism of an area. Areas converting from rural uses to urban uses have implications of change that affect residents. The chart below (Table 3-169). shows the land use of weighted average acres of the counties, which comprise the CNF analysis area for 1982- 1992, for all uses except urban. Urban comprises a small share and can be found along with characteristics of all counties in the analysis area in Table B-141 in Appendix B.

Table 3-169. Land Use						
	Forest '82	Forest '92	Farm '82	Farm '92	Residual '82	Residual '92
	% Share	% Share	% Share	% Share	% Share	% Share
Weighted Average Acres for Counties in Forest boundary	34.4	33.3	33.3	32.6	28.2	28.6

Table 3-169. Land Use						
	Forest '82	Forest '92	Farm '82	Farm '92	Residual '82	Residual '92
Source: USDA Natural Resource Conservation Service						

This data set from the Natural Resource Conservation Service includes federal land within their residual category. Residual also includes highways and power line access ROW. This category has remained stable over the last ten years. Therefore, the forest category contains lands of private timber owners.

Approximately two-thirds of this private area was either in farm or forest cover in 1982. By 1992 this percentage had decreased slightly to about 65.8 percent. Thirty four percent (34.4%) was forested in 1992, and 33.3 percent was forested in 1992. The urban share of the land had increased from 4.1 percent in 1982 to 5.4 percent in 1992 (see Table B-141 in Appendix B). This land use has lost about one percent of its acreage in the last ten years.

The SAA found that little forest land was lost between 1970 and 1990 in that region. However, urban, road and housing development growth caused by increased population in the area took farmland, pastures and open space. Retirees and commuters from nearby urban centers were responsible for part of that demand for development.

The CNF, meanwhile, experienced small declines in the rural character of the landscape from 1982 to 1992 (about a two percent decline in share over this period). Urban areas gained about 1.5 percent of the total share of land use during this time.

State and Private Forestry – Rural Community Assistance

The CNF affects, and is influenced by, citizens and communities of nine east Tennessee counties containing NFS land. These are the counties of McMinn, Monroe, Polk, Greene, Unicoi, Washington, Sullivan, Cocke and Johnson. The CNF occupies a low of four percent to about 60 percent of the land in these counties. There are other counties that are influenced by the CNF and are Bradley, Blount and Sevier. These eleven counties form a contiguous area in far east Tennessee that reflect a rural economy generally thought of as being dependent on natural resources, with natural resources including tourism.

Manufacturing, tourism, farming, and the wood products industry are all sensitive to national economic recessions. Activities on the CNF and related to the CNF are tied to these industries. The Forest Service has long been a vital part of local and state communities. In addition to payments made to counties from receipts generated by the CNF, Forest employees and their families constitute an important facet of local economies and civic interactions.

A new avenue of Forest Service/community involvement came about with the passage of the Food, Agriculture, Conservation, and Trade Act of 1990. This is Public Law 101-624, usually referred to as the 1990 Farm Bill. A primary focus of this bill was assistance to diversify the economies of economically disadvantaged rural

communities in or near national forests. It allows for federal grants, channeled through state foresters' offices or directly through the NFS, to upgrade existing industries or to diversify economies and eliminate dependency on forest resources. Grants are available to communities through competition based on eligibility criteria. Grant information is routinely distributed to state and federally recognized Native American tribes, minority and non-minority rural communities, and nonprofit organizations. This law initiated the Rural Community Assistance (RCA) program in the State and Private Forestry arm of the Forest Service.

Since 1990 the CNF and Tennessee Division of Forestry have administered 60 grants – derived from rural development, economic recovery, economic diversification studies, or Americorps grants – to more than 30 rural communities in 25 Tennessee counties. These federal RCA grant monies are intended as “seed money” to initiate worthy projects rather than to provide outright full federal funding for the work. The total amount of federal grants distributed to date is nearly $1,000,000. Communities receiving these funds have contributed almost $400,000 worth of matching funds or services.

The range of approved grant assistance includes such direct forestry-related projects, such as remodeling a sawmill, improving the utilization of waste wood, growing shiitake mushrooms on hardwood logs, formulating business plans, cultural tourism development, economic diversification studies, and programs for minority children and their future careers, and projects with the Eastern Band of Cherokee Indians, principally tourism and planning efforts.

Community response has been universally favorable, with measurable results such as increased employment opportunities in disadvantaged communities and initiation of new businesses. Other less tangible but nevertheless real outcomes are enhanced community pride, cohesion, and stability.

The CNF also works very closely with ten Resource Conservation and Development Councils (RC&D) in Tennessee. RC&D Councils are non-profit councils, hosted also by the USDA Natural Resources Conservation Service, formed to promote economic development and wise conservation practices for member counties. All previously listed national forest influenced counties are covered by RC&D strategic plans. Many communities in these counties also have strategic plans and the CNF assists other communities, upon request, with the development of their plans. In other Forest planning activities, and community plans, the CNF will consult with communities and review their strategic plans in order to strike an economic balance between commodity-related jobs, tourism-based development, and other community issues.

24.1.3 Summary of Demographic and Economic Changes

Population and economic dynamics are changing at a moderate rate within the CNF analysis area. While population grew very slowly from 1980 to 1990, growth increased substantially during the first seven years of the 1990's. During this period, the rate of increase was 12.8 percent, which, while significant, is still almost four percentage points behind the growth rate of Tennessee. Increased population suggests the analysis area may have new residents from outside the area that will

follow non-traditional life ways different from those of long-standing residents and quite possibly these life ways will not be commodity based.

The minority portion of the total population has changed slightly within the analysis area from 1990 to 1997, increasing about one percent from 2.7 percent to 3.4 percent over this period. While these numbers are still less than the minority increase found in the overall State in 1997 (18.7 percent) and the nation (approximately 13 percent), there is indication that minority population is not leaving the area, and there are increased opportunities for minority participation in local recreation endeavors.

The analysis area has become slightly more rural from 1980 to 1990. The reason for this event is that a substantial population loss occurred in urban Sullivan County. The rural character is still dominant in the CNF analysis area. Urban encroachment does not seem to be a significant factor in the analysis area at this time.

The area's economic health as measured by per captia income grew at a robust rate during the 1980's—0.2 percent per year, greater than that of the Southern Appalachian region. Still, per capita income in 1990 was about $2,500 less than that of the State's. The area's unemployment rate has decreased by over one percent from 1990 to 1997; however, it was still one percent greater than Tennessee's, which was at 5.4 percent in 1997. Income growth rate in this area has progressed steadily, indicating that the area is economically strong. People with strong incomes and jobs are more likely to have free time and need an outlet for recreation. The national forest is a prime outlet for these people.

Accordingly, the area's poverty rate has declined by two percent from 1989 to 1995, a rate faster than Tennessee's. Percentage of female head of households was low and holding steady while persons per household was lower than the State's average. These are all good signs of an area without protracted economic problems.

Housing unit growth was greater than the State overall for the decade of the 1980's and is an indicator of relative prosperity. Median housing value, however, is still about $12,000 less than the State average of $58,400, a condition that can be expected with a larger urban component.

The economy of the CNF analysis area has become more diverse and less concentrated in the manufacturing sector. As measured by total output, manufacturing is about 44 percent of the economy. This is still a high share, but services and retail activity have gained increasing shares since 1985. Wood products manufacturing in 1996 constituted approximately a 6.8 percent share of the total CNF economy—an increase of 1.2 percent share from 1985. Tourism maintained a 1.2 percent share in both measurement periods.

Since 1985, the area has grown from a net importing regional economy where money flows to other areas to a net exporting economy. However, wood products have turned from net exporting to net importing, indicating that money is leaving the economy from these industries. Economies that export more than they import are able to grow faster than those that are net importers.

Land use has changed very little since 1982. The analysis area has lost about one percent of its forest cover in private lands. It is assumed that public lands forest cover has remained constant.

Thus, the economy and demography of this area appears to be healthy for a rural area. Population has grown steadily in the 1990's, poverty has declined and housing construction is vigorous. The economy continues to restructure itself and relies less on the economically sensitive manufacturing sector. Finally, the economy is growing from having a surplus of net importing sectors to one with a surplus of net exporting sectors. All of these indicators suggest growing communities that will demand increasing leisure time activities.

24.1.4 Demographic Changes and the Effects on Natural Resource Management

The SAA found that little forest land has been lost since 1970 in the region, while urban, road and housing development growth, caused by increased population, has taken farmland, pastures and open space. Retirees and commuters from nearby urban centers are responsible for part of this demand for development.

Newcomers to the region feel differently than long-time residents about natural resource preservation. Often, the latter's livelihood depended upon manufacturing from natural resources. Managers of natural resources have had to respond to new sets of values and preferences, particularly increased demand from land and water resources for scenery, recreation and tourism.

Population in the region is projected to grow by 12.3 percent by 2010, slightly less than the growth rate expected for the nation (13.1 percent). Most of the growth is expected to be in northern Georgia, western North Carolina, and portions of eastern Tennessee and northwestern Virginia.

The increase in population density across all counties in the southern Appalachian region has impacted farms, forests, and pastures and has removed habitat for most species of wildlife and fish. More people entering the area has resulted in greater amounts of land conversion and impacts to water quantities, quality, and use. At higher elevations, development has impacted visual qualities.

As certain areas of the southern Appalachians have been developed, more urban pressures have impacted the land. Additionally, more private lands have become posted as "off limits." As a result of these greater restrictions on private land, there is more pressure on public land to accommodate increased demand for tourism and recreation.

The following analysis details the CNF's market area and presents estimates of the percentages of persons 16 or older fitting various personal and household profiles that live in the forest impact area. In essence, it describes how long residents have lived in the area and why they have chosen to do so. The results were taken from the *Public Survey Report, Public Use and Preferred Objectives for Southern Appalachian National Forests* (Cordell et. al, 2002). As defined in this survey, a forest market area includes all counties within a 75-mile radius of the boundary of the forest. A sub-

region market area includes all the counties within the combined 75-mile radius of the forests covered by this report

As with a number of other studies done to look at characteristics of persons living in regions such as the Southern Appalachians, it is notable that little difference exists between market areas of different forests or between the forests and the region. As shown in Table 3-170, there are considerable similarities between the CNF and the Southern Appalachian region..

Most people age 16 and over (97% to 98%), live year round in the CNF market area leaving only two to three percent as seasonal residents. Almost one third of the sample respondents for the CNF lived in Tennessee while 29 percent lived in Georgia and 20 percent lived in North Carolina.

Almost 38 percent of the residents surveyed had lived in the areas within the Southern Appalachian Region their entire lives and 51 percent had lived in those areas more than 20 years. The main reason most (53.8 percent) of the people surveyed have remained in the area is because of family ties. Almost 15 percent of the survey respondents remain in the area because of an attachment to the area itself, while 25 percent remain for other reasons. Very few, around six percent, remain because of their job.

Although a majority of the survey respondents had lived in the area for a relatively long period of time, there was a fairly sizeable percentage (29%) that had lived there less than ten years. This indicates that the population has been mobile and that there is a substantial contingent of recent immigrants.

Around 16 percent of responding residents were owners of five or more acres of rural land. About 26 percent were under age 30; about 28 percent were over age 55. Most of the surveyed population was between the ages of 30 and 55. About 83 percent was non-Hispanic White, 12 percent was Black, and around three percent was Hispanic. Between one and two percent were foreign born. Around nine percent have less than a high school education and around 20 percent have a college degree. Over 80 percent have at least attended some high school. About 59 percent work a job while over 41 percent are retired. More and more, the national forests with their natural and scenic amenities are seen as popular retirement locations.

Table 3-170. Percentage of local residents 16 or older by personal or household characteristic for the CNF and the Southern Appalachian Region, 2002.

Personal and Household Characterstics	CNF (N=2352)	Southern Appalachian Region
Year-round resident	97.6	97.2
Part-time resident	2.4	2.8
Percentage of residents in market area by state	TN 31.0	GA 24.2
	GA 28.8	AL 21.4
	NC 19.8	TN 14.3
Lived in SA entire life	37.6	38.1
Lived in SA 20+ years	51.2	51.7

Table 3-170. Percentage of local residents 16 or older by personal or household characteristic for the CNF and the Southern Appalachian Region, 2002.		
Personal and Household Characterstics	CNF (N=2352)	Southern Appalachian Region
Lived in SA 10-19 years	19.7	19.0
Lived in SA <10 years	29.0	29.3
Remain for job	6.3	7.4
Remain for family	53.8	54.8
Remain for area	14.8	14.6
Remain for other reasons	25.0	23.2
Own 5+ acres of land	15.8	13.1
Age under 30	25.7	27.2
Age over 55	27.9	27.3
Anglo, non-Hispanic	82.8	74.5
Black	12.1	19.7
Hispanic	3.3	3.6
Foreign born	1.8	1.8
Education - 8^{th} grade or less	8.6	7.3
Education - Bachelor's degree/more	20.0	21.0
Work a job	58.5	59.9
Retired	41.2	39.5
Source: Public Survey Report, July 2002		

24.1.5 Impact of Natural Resource Management on the Economic and Social Status of Local Communities

The SAA found that residents of communities near public land are sensitive to land management choices. Further, it found the region's communities are still in a lower economic status than surrounding state populations. Their economies are more heavily dependent on the resources of the forest than are the overall economies of the states in which they are located. Of particular concern to residents of the SAA area, is the need to balance local interests to those interests of tourism and retirees to the area.

The CNF provides a core set of resources that can provide a variety of economic stimuli to local communities. The significance of this potential is limited by the local community infrastructure. Roads, drinking water, sewage treatment, garbage disposal, health services, retail outlets all have an impact on the ability of local communities to fully utilize the resources available on the National Forest. As the infrastructure of the local area, particularly the roads, improves, the utilization of the forest should increase.

A prevailing perception of the local residents of the CNF analysis area, especially within and adjacent the forest boundary, seems to be that significant changes in the management of the forest will affect their traditional uses of the forest. Perhaps just as important, there is a general perception among the native inhabitants that with the increase of retirees and influx of non-local people to the area, there will be a

diminishment of local influence in management and traditional uses of the forest as well as an overall loss of a sense of place for the native population.

24.1.6 Values and Attitudes of Southern Appalachia Residents Toward Natural Resources and Ecosystem Management

Natural resources, public lands and national forests in particular are very important to the American people. As a result, it is extremely important for land managers to take into consideration the attitudes and values toward natural resource management held by Southern Appalachian residents. Research done during the SAA showed that most people felt it was possible for environmental protection and economic growth to be compatible. However, when people had to choose between the two, their first choice was the environment. Most people felt that environmental protection has not gone far enough and even indicated a willingness to put more personal funds toward collective environmental protection. It should be noted that as more retirees, urban transfers and other new residents move into the Southern Appalachian region, concerns for the health and aesthetic appearance of the region's ecosystems would most likely increase.

Although the SAA attempted to determine the values and attitudes of Southern Appalachian residents toward natural resources and ecosystem management, it was primarily regional information. In order to gain more specific information about people's attitudes, beliefs and lifestyles at the local level, a public survey was conducted through the Southern Research Station in conjunction with the Human Dimensions Research Lab at the University of Tennessee (Cordell et. al., 2002).

Providing insight into the values the public holds relating to natural resources, this public survey found that almost 95 percent of the sample in the market area thought protection of watersheds and sources of clean water was an important management goal for national forests. The next highest percentages in regards to importance were maintaining the forests in good condition for future generations (93 percent), providing protection for wildlife and habitat (almost 89 percent), maintenance of a healthy forest (88 percent), maintenance of a "natural appearing" forest (88 percent) and protection of endangered species (83 percent).

In the middle to bottom half of the list of values that the public considered important were providing educational services to the public (80 percent), providing places of personal renewal (77 percent), providing outdoor recreation (73 percent), providing an abundant timber supply (71 percent), helping local tourism businesses (54 percent), permitting grazing of livestock (42.5 percent) and providing raw materials and products for local industries (35 percent). It is interesting to note that the values most often emphasized in the management of national forests, such as outdoor recreation and timber, are in the second or lower half of the list of values. In sum, respondents in the survey area of the CNF put wildlife, ecosystems and naturalness above utilitarian objectives in the management of the forest.

Not only were the findings for the CNF comparable to those of the Southern Appalachian Region, but they also were quite comparable to national attitudes and values regarding natural resource management (see Table 3-171). According to an

article published in the Journal of Forestry (October/November 2002, pp. 31-32), which summarized a study done in the South,

> The magnitude of upward trends in population, changes in demographic makeup, and rising demand for recreation suggest there likely are other significant social changes in the South. Among such possible changes are the values and attitudes people hold toward the natural environment in general and forests in particular. In rapidly urbanizing areas of the South, there have been dramatic decreases in the amount of and access to forested or other natural lands. A changing population and decreasing forest resources have led to changes in the values and attitudes Southerners hold toward forests. Below is a discussion of values, attitudes, and demographics found in the Southern Forest Resource Assessment (SFRA).
>
> Values-- Published literature and survey results from the SFRA both indicate that private forest owners and the public as well rank “conservation” higher now than in past decades. Recently there has seemed to be growing concern in the public’s view that environmental quality is more important than commodity benefits from forests and other natural lands. In the survey designed specifically for the SFRA, Southerners confirmed that environmental benefits from forests are valued higher than commodity benefits. Wood as a production commodity was rated as least important of four listed values (wood products, clean air, scenic beauty, and heritage) associated with forests. Clean air was listed as most important. When survey respondents were asked about values of public forests as distinct from private forests, some differences were noted. Producing wood products was valued higher if it were to come from private forests while clean air was valued higher if coming from public forests. These results indicate that Southerners hold measurably stronger environmental values and more restrictive commodity values about public forests than they hold for private forests.
>
> Respondents to the SFRA survey were asked if they or their spouse owned any rural land of ten acres or more. When a comparison was made between those reporting owning land and those who did not, little to no significant differences regarding forest values were evident. The single exception was that landowners rated wood products as a more important use for private forests than did non-landowners. Furthermore, there were no significant differences between the two groups in attitudes toward the environment. Overall, results suggest that land ownership has relatively little bearing on southern residents' values of forests or attitudes toward the environment.
>
> Attitudes--While values indicate the relative good or worth of forests, attitudes represent levels of agreement with particular forest conditions or environmental issues, such as regulatory laws or policies. Based on results from the survey done for the SFRA, a majority of Southerners felt that “too little” was being spent on protecting the environment (62.5 percent). Only 9.2 percent reported they felt “too much” was being spent. Similarly regarding environmental laws, 45.5 percent indicated environmental laws had “not gone

far enough", while only 13.1 percent thought environmental laws had gone "too far." An overall mean score of 23.8 on the modified New Ecological Paradigm used in the SFRA survey (midpoint of 30 with a range of 10, highly favorable, to 50, highly unfavorable) suggests a moderately strong pro-environmental attitude among people of the South.

Demographic Differences in Values and Attitudes--A number of comparisons of values were made between different social groups in the South. They included urban-rural, age, length of residency, and gender. These comparisons revealed that where people live in the South (urban or rural) is not related to their values or attitudes toward forests and the environment. However, age did influence public values toward forests and environmental attitudes. For private forests, younger people placed significantly less importance on wood products and significantly more on heritage than did the older generation. For public forests, the younger generation valued scenic beauty significantly higher than did the older generation. Younger people were significantly more likely than older people to believe we are spending too little to protect the environment, and that environmental laws have not gone far enough. Generally, younger people tend to have more bio-centric values of forests than older people. There were no significant correlations between length of residency in the South and values of public or private forests or environmental attitudes. Females exhibited significantly stronger pro-environmental attitudes than males, and were more likely than males to believe that we have spent too little on the environment; and to believe that environmental laws and regulations have not gone far enough (Cordell and Tarrant, 2002).

Table 3-171. Percentage of local and regional residents 16 or older indicating the stated value is important (left of /) and percentage indicating extremely important (right of /) to emphasize in management of national forest lands, by CNF, Southern Appalachian Region and the U.S.A

	CherokeeNF (N=2352)	Southern Appalachian Region	United States
Protect sources of clean water	94.8/87.3	94.0/86.3	94.1/82.7
Maintain for future generations	93.1/85.1	92.7/83.7	92.5/80.4
Provide protection for wildlife	88.9/74.1	88.8/72.4	88.0/69.4
Emphasize healthy forests	88.3/71.7	87.7/70.5	n/a
Leave them natural in appearance	88.6/71.2	85.9/68.6	85.6/64.3
Protect rare or endangered species	83.6/71.1	83.1/69.7	84.7/67.1
Provide information and educational services	80.0/56.7	80.1/55.9	79.1/52.5

Table 3-171. Percentage of local and regional residents 16 or older indicating the stated value is important (left of /) and percentage indicating extremely important (right of /) to emphasize in management of national forest lands, by CNF, Southern Appalachian Region and the U.S.A

	CherokeeNF (N=2352)	Southern Appalachian Region	United States
Protect sources of clean water	94.8/87.3	94.0/86.3	94.1/82.7
Provide natural places for personal renewal	77.1/55.4	75.8/54.2	73.9/49.1
Provide outdoor recreation	73.2/47.0	74.1/47.8	73.4/44.8
Provide abundant timber supply	71.5/53.0	72.3/54.8	77.7/57.6
Help local tourism businesses	54.1/33.1	57.3/36.0	56.0/31.1
Permit grazing of livestock	42.5/25.1	45.2/26.5	49.8/28.0
Provide raw materials and products for local industries	35.1/20.2	38.7/22.3	45.1/24.9

Sources: Public Survey Report, July 2002 and National Survey on Recreation and the Environment, Versions 6, 7 and 12.

24.1.7 Priorities for Management of Private Land by Non-industrial Owners

The SAA found that approximately 75 percent of the 37 million acres of the SAA region are privately owned. Of these 37 million acres approximately 19 million are forested acres. Three-fourths of the forest land in the region is privately owned.

Agriculture and timber harvesting are the overwhelming primary commodity uses of private undeveloped land. Recreation is the dominant non-commodity use. Raising livestock, recreation, enjoyment of a rural lifestyle, and having green space are most often listed as important reasons for owning land in the Southern Appalachians.

Private land dominates the South. Typically, corporate private owners provide recreation access by leasing their land to clubs, counties or others. Individual owners, however, usually open very little, if any, of their land to the public. Whether corporate or private, the number of landowners allowing public recreational access to their land has been decreasing over the years. It is expected that public access to private land will continue to decrease as more and more individuals and families purchase land for their own personal recreational pursuits. According to Cordell and Tarrant (2002).

> A highly significant and growing issue nationally and in the South is that of conflict. Conflicts limit supply and increase the costs of management. Conflicts addressed in the SFRA included those between similar uses because of

crowding; conflicts between non-similar uses because of incompatible norms, values and goals; and conflicts between users and providers.

Perhaps the most worrisome type of recreation conflict is that between users and owners of private tracts. These conflicts can and often do lead to posting and other ways of denying access, which act to limit supply. Because most of the forest-land in the South is privately owned, conflicts between recreational users and private forest-land owners are especially significant. Results from the 1995 National Private Landowner Survey, NPLOS 95…. suggest a number of possibilities for owner-user conflict. For example, about 59 percent of individual southern landowners indicate that improving wildlife, water, aesthetics and other natural components of their land is an important emphasis in their land management. Because landowners sometimes encounter use problems they may perceive to be incompatible with their conservation goals, land closure can result. The more prominent of such problems include dumping garbage, littering, illegal hunting and fishing, damage to fences and gates, damage to roads, disturbance of wildlife, and careless shooting.

Not all, maybe not even most, of these problems are the result of recreation use, although owners perceive them to be. As of 1995, about 41 percent of owners in the South posted their land. Among owners who already post some or all of their land, 16 percent anticipate posting more in the future. Very few anticipate posting less. Increasing demands for off-road vehicle use, hunting, fishing, and other of the more consumptive recreational activities are likely to bring about more recreation participant-land owner conflicts. In part as a response, many of the higher-income residents of the South are purchasing their own land for personal recreational pursuits. Very often these purchased lands end up being posted.

24.2.0 Direct/Indirect/Cumulative Effects

24.2.1 Social Impacts

During the forest planning process, numerous public meetings were held to give interested people and parties an opportunity to express their wants, needs and demands in regards to use of, access to and management of the resources of the CNF. Many of these views were incorporated into the range of alternatives. These public meetings, however, represented only a portion of the interests of the overall publics. The so-called “silent majority,” those who could not or did not attend these meetings, were not represented. In order to gain input from this broader public, Region 8 commissioned the Southern Research Station to undertake a random telephone survey of the population within a 75-mile radius of the national forests that are under forest plan revision. This survey provided input from people that might not otherwise be heard concerning what they would like to see emphasized in national forest management (Cordell et. al, 2002).

As noted previously, people that reside in areas near the CNF clearly put ecosystems and naturalness above utilitarian objectives in the management of the forest. Table

B-144 in Appendix B lists 26 objectives of which all or any portion of which could be emphasized in the management of the CNF. The top seven management objectives, which over half of the respondents indicated to be extremely important, were as follows:

Protect areas that are sources of water, such as streams, lakes and watersheds (79.2% indicated it is extremely important).

Protect areas that are important wildlife habitats (74.5%).

Protect old growth forest and allow natural processes to continue into the future (67.4%).

Manage the forest to provide habitat for wildlife and birds for people to view and photograph (61.4%).

Use controlled fire to reduce the threat of wildfires or to improve wildlife habitat conditions (53.4%).

Allow different groups such as Native Americans to continue cultural uses of the forest (53.3%).

Restrict mining, oil drilling, and other mineral removal (51.6%).

The lowest seven objectives by percentage that voted them extremely important are as follows in order from least to greatest importance:

Allow commercial leasing of oil and gas rights (11.2% rated it extremely important).

Allow recreational gold prospecting and dredging (12%).

Expand access for motorized off-highway vehicles (12.4%).

Allow harvesting and mining to support local communities (18.5%).

Expand commercial recreation opportunities (19.1%).

Provide new paved roads for cars (19.5%).

Allow trading of public for private land (23.2%).

All of the bottom-ranked objectives are utilitarian in nature and three of the seven are extractive. Two of these lowest ranked objectives pertain to motorized uses of both on and off highway vehicles. Four of the seven are predominately commercial uses.

The following section summarizes the alternatives and rates, relative to all alternatives, their potential for meeting the management objectives deemed most important in the Public Survey:

Alternative F (current alternative): This alternative primarily promotes a program of timber management, with the continued management of concentrated recreation areas, as well as management of streams and riparian areas, wildlife, and threatened and endangered species. Of all alternatives, Alternative F provides medium to low potential to fulfill the seven highest

management objectives deemed extremely important by the public in the Public Survey.

Alternative A: This alternative emphasizes timber management for the sustained yield of wood products and an increase in commercial recreation and increased public access to forest, including off-highway vehicle trails, to provide more recreation opportunities to the public. Watersheds, water quality, and aquatic habitats would be restored or improved. A “natural” looking forest landscape would be provided for the public. Areas adjacent to existing wilderness would be recommended for wilderness designation. Relative to the other alternatives, Alternative A provides medium to low potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

Alternative B: This alternative emphasizes restoring the natural resources of the forest and maintaining a mixture of wildlife habitats through management activity, for which timber production would be a tool. Recreation settings would occur in areas in which they would be compatible with forest restoration activities. Riparian areas would be managed to maintain water quality and restore watersheds. Scenic integrity in this alternative would be low to moderate with the implementation of this program. Roadless areas would not be recommended for wilderness. Invasive species and diseases would be actively managed under this alternative. Alternative B, as compared to all alternatives, provides medium to high potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

Alternative D: This alternative emphasizes timber management of the forest on a rotation basis. Of all the alternatives, this alternative proposes the least “naturalness” of the forest. Recreation, stream restoration, water quality, threatened and endangered species are not emphasized. “Old growth,” semi-primitive areas, and roadless areas would be only those areas determined unsuitable for timber production. Insects, diseases and exotic plants and animals would be actively managed. Among all the alternatives, Alternative D has the lowest potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

Alternative E: This alternative emphasizes a combination of hunting, wildlife, and timber management. A natural setting and an increase in concentrated and dispersed recreation facilities and off-highway vehicle trails would be provided that could attract a variety of recreation users. The forest would be managed for a variety of wildlife habitats, including ruffled grouse. Riparian areas would be designated and protected. A “natural” forest viewshed would be maintained for the public. Among all the alternatives, Alternative E has medium potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

Alternative G: Of all the alternatives, this alternative proposes the least overall management activity on the forest. Large contiguous areas of the forest would be maintained for movement corridors, threatened and endangered species and watershed restoration. Most roadless areas would be recommended for wilderness. Emphasis would be on the recovery of proposed, threatened, endangered, sensitive, and rare species. Recreation activities would occur within the context of ecosystem needs and function. Semi-primitive, wildlife and nature-oriented recreation activities would be emphasized. Developed recreation facilities would occur only where they did not conflict with ecosystem function. Exotic pests and diseases would be controlled. A “natural” appearing forest landscape would be maintained. Watersheds would be managed for water quality. Relative to the other alternatives, Alternative G has the highest potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

Alternative I: This alternative proposes the most management activity on the forest of all the alternatives. This includes a program of active timber production over large areas of the forest, the most off-highway vehicle trails, and the largest amount of dispersed recreation areas. Under this program of timber/wildlife/vegetation management the forest would include a variety of “early, middle, and late succession” forest habitats, as well as large areas in which restoration of plant associations would occur. Areas of the forest would be managed for sensitive, threatened, and endangered species. There would be a decrease in concentrated recreation areas, but a marked increase in scenic byways and scenic corridors, the view sheds of which would provide a general “natural” appearing forest landscape. In comparison to the other alternatives, Alternative I has medium to low potential to fulfill the seven highest management objectives deemed extremely important by the public in the Public Survey.

24.2.2 Economic Impacts

Economic impacts of each proposed alternative are given in the tables below. Table 3-172 illustrates how the proposed alternatives differ from the current management direction (Alternative F) by jobs. Due to substitution effects from competing non-government sources, these jobs are characterized as being associated with local economic activity initiated by Forest Service programs and activities, rather than caused by these activities.

Table 3-172. Employment by Program by Alternative (Average Annual, Decade 1)

	Total Number of Jobs Contributed						
Resource	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Recreation	1,167	1,318	1,170	1,185	1,327	1,202	1,274
Wildlife and Fish	112	129	112	113	127	114	122
Grazing	0	0	0	0	0	0	0
Timber	2,442	1,252	1,350	2,361	320	702	1,398

Table 3-172. Employment by Program by Alternative (Average Annual, Decade 1)							
	Total Number of Jobs Contributed						
Minerals	0	0	0	0	0	0	0
Payments to States/Counties	262	136	146	252	36	77	151
Forest Service Expenditures	437	528	439	444	503	468	476
Total Forest Management	4,420	3,363	3,218	4,355	2,314	2,562	3,420
Percent Change from Current	---	-23.9%	-27.2%	-1.5%	-47.7%	-42.0%	-22.6%

Employment changes from the current situation range from a decrease of 47.7 percent for Alternative E to a decrease of 1.5 percent for Alternative D. Jobs vary from a low of 2,314 for Alternative E to a maximum of 4,420 under Alternative F, the current alternative. Timber and recreation provide the most jobs in the economy in all alternatives, except for Alternative E where Forest Service Expenditures provides more jobs than timber. In all alternatives, minerals and grazing provided no jobs. Either Wildlife and Fish or Payments to States and Counties provided the next least employment..

Labor income by alternative is given in Table 3-173 below. The current direction alternative has $108.9 million of labor income associated with it, which is the greatest amount of any alternative. Alternative D follows closely behind with $108.0 million. Alternative E, with $49.1 million, has the lowest amount of income connected to it. The percent changes in income from current direction are decreases for all alternatives and are, in descending order, 54.9 percent for Alternative E, 47.1 percent for Alternative G, 29.3 percent for Alternative B, 28.4 percent for Alternative A, 25.9 percent for Alternative I, and 0.9 percent for Alternative D. Timber contributes more income to the CNF total in five of the seven alternatives (Current, B, A, D, I) while Recreation contributes the most in the remining two (E and G).

Table 3-173. Labor Income by Program by Alternative (Average Annual, Decade 1; $1,000,000)							
	Millions of dollars						
Resource	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Recreation	$24.2	$27.3	$24.3	$24.6	$27.5	$24.9	$26.4
Wildlife and Fish	$2.4	$2.8	$2.4	$2.5	$2.8	$2.5	$2.7
Grazing	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Timber	$65.1	$33.3	$36.0	$62.9	$8.5	$18.7	$37.3
Minerals	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Payments to States/Counties	$8.4	$4.3	$4.7	$8.0	$1.1	$2.4	$4.8
Forest Service Expenditures	$8.9	$10.2	$9.7	$9.9	$9.2	$9.0	$9.6
Total Forest	$108.9	$78.0	$77.0	$108.0	$49.1	$57.6	$80.7

Table 3-173. Labor Income by Program by Alternative (Average Annual, Decade 1; $1,000,000)							
	Millions of dollars						
Resource	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Management							
Percent Change from Current	---	-28.4%	-29.3%	-0.9%	-54.9%	-47.1%	-25.9%

Employment and income found in Table 3-172 and Table 3-173 respectively, are divided into the major sectors of the CNF economy in Table 3-174 and Table 3-175. Although there is some variance in the order, Manufacturing, Services, Retail Trade and Government are the four sectors most affected by Forest Service programs and expeditures for all alternatives. Except for Alternative E and G, manufacturing is the sector most affected by Forest Service programs and expenditures and Services is the second most affected sector. For Alternatives E and G, Services occupies the top positon with Retail Trade in second. Government is the fourth most affected sector in all alternatives. Agriculture, Mining and miscellaneous are the sectors the least affected by the Forest Service programs and expenditures. Labor income in the form of wages and proprietors' earnings, has a similar effect as employment on the Manufacturing, Services, Retail Trade and Government sectors of this economy.

Table 3-174. Employment by Major Industry by Alternative (Average Annual, Decade 1)							
	Total Number of Jobs Contributed						
Industry	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Agriculture	117	87	85	116	59	66	90
Mining	8	9	8	9	9	8	9
Construction	111	68	70	108	33	45	73
Manufacturing	1,548	838	889	1,500	275	498	924
Transportation, Communication, & Utilities	145	98	98	142	57	70	103
Wholesale trade	143	105	102	141	70	79	108
Retail trade	790	743	684	793	649	631	735
Finance, Insurance, & Real Estate	113	82	80	112	52	61	84
Services	920	804	753	921	652	659	803
Government (Federal, State, & Local)	511	519	440	501	453	437	483
Miscellaneous	13	9	9	12	6	7	9
Total Forest Management	4,420	3,363	3,218	4,355	2,314	2,562	3,420

Table 3-174. Employment by Major Industry by Alternative (Average Annual, Decade 1)							
	Total Number of Jobs Contributed						
Industry	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Percent Change from Current	---	-23.9%	-27.2%	-1.5%	-47.7%	-42.0%	-22.6%

Table 3-175. Labor Income by Major Industry by Alternative (Average Annual, Decade 1; $1,000,000)							
	Millions of dollars						
Industry	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Agriculture	$2.2	$1.3	$1.3	$2.1	$0.6	$0.8	$1.4
Mining	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Construction	$3.8	$2.3	$2.4	$3.7	$1.1	$1.5	$2.5
Manufacturing	$40.3	$22.6	$23.7	$39.1	$8.5	$13.9	$24.7
Transportation, Communication, & Utilities	$5.9	$4.0	$4.0	$5.8	$2.3	$2.9	$4.2
Wholesale trade	$5.1	$3.8	$3.7	$5.1	$2.5	$2.8	$3.9
Retail trade	$14.0	$13.0	$12.0	$14.0	$11.2	$11.0	$12.9
Finance, Insurance, & Real Estate	$3.2	$2.3	$2.3	$3.2	$1.4	$1.7	$2.4
Services	$22.1	$17.9	$17.1	$22.1	$13.3	$14.1	$18.1
Government (Federal, State, & Local)	$12.2	$10.7	$10.4	$12.7	$8.0	$8.7	$10.5
Miscellaneous	$0.1	$0.1	$0.1	$0.1	$0.0	$0.1	$0.1
Total Forest Management	$108.9	$78.0	$77.0	$108.0	$49.1	$57.6	$80.7
Percent Change from Current	---	-28.4%	-29.3%	-0.9%	-54.9%	-47.1%	-25.9%

Forest Service revenues from program activities that result in payments to States and Counties are expected to decrease from the current direction for all proposed alternatives. The magnitude of payments to counties expected in the first decade is shown in Table 3-176 below. Payments to the counties within the CNF boundaries would range from a high of $10.7 million for the current alternative to a low of $1.5 million for Alternative E. For the other alternatives, the payments to counties are as follows: $10.3 million for Alternative D to $6.1 million for Alternative I to $5.9 million for Alternative B, $5.5 million for Alternative A and $3.1 million for Alternative G.

Table 3-176. Forest Service Revenues and Payments to Counties (Annual Avg, Decade 1; $1,000,000)							
Forest Service Program	Current	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Recreation	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Wildlife and Fish	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Grazing	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Timber	$42.4	$21.8	$23.5	$40.8	$5.6	$12.2	$24.3
Minerals	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Soil, Water & Air	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Protection	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Total Revenues	$42.6	$22.1	$23.8	$41.0	$5.8	$12.5	$24.5
Payment to States/Counties	$10.7	$5.5	$5.9	$10.3	$1.5	$3.1	$6.1

Finally, Table 3-177 below illustrates the percentage contribution of the CNF's current management program (Alternative F) to the area's economy. The CNF is associated with 1.5 percent of the total local economy's jobs, and 1.3 percent of the labor income. Manufacturing, Services, Retail Trade and Government are the sectors of the economy that show the most benefit from the forest's activities.

Table 3-177. Current Role of Forest Service-Related Contributions to the Area Economy				
	Employment (jobs)		Labor Income ($ million)	
Industry	Area Totals	FS-Related	Area Totals	FS-Related
Agriculture	18,056	117	$107.2	$2.2
Mining	476	8	$16.8	$0.1
Construction	22,997	111	$677.9	$3.8
Manufacturing	65,107	1,548	$2,684.5	$40.3
Transportation, Communication, & Utilities	10,588	145	$405.8	$5.9
Wholesale trade	9,520	143	$301.6	$5.1
Retail trade	52,977	790	$897.7	$14.0
Finance, Insurance, & Real Estate	12,507	113	$316.7	$3.2
Services	72,745	920	$2,094.9	$22.1
Government (Federal, State, & Local)	33,655	511	$1,047.5	$12.2
Miscellaneous	1,633	13	$12.5	$0.1
Total	300,260	4,420	$8,563.0	$108.9
Percent of Total	100.0%	1.5%	100.0%	1.3%

Timber and recreation are the CNF's main contributors to the local economy in terms of employment and labor income except for Alternative E where timber is surpassed by Forest Service Expenditures. Timber provides at least 14 percent and as much as 60 percent of the employment and labor income from the resources provided by the Cherokee National Forest while Recreation provides at least 22 percent and as much as 57 percent. In short, commodity-oriented alternatives have a greater effect on the economy of the analysis area. However, substitutions may occur in certain sectors, such as those related to the timber program, where non-government owners could supply the timber demanded in the local economy. Therefore, there would likely be no loss of jobs or income from a reduced federal timber program. The private sector can also provide recreational opportunites but they could not do so to the same degree or with the same scope as a Federal land management agency. Indeed, it is a goal of the Cherokee National Forest to provide a spectrum of recreation in a setting that is not available in the private sector.

Present Net Value of the Alternatives

Table 3-178 shows estimated benefits, costs, net benefits, and cumulative present net value (PNV) by alternative. All figures are in 2000 dollars. The benefits in Table 3-178 include market values and non-market estimated values. Market values include those values where the Forest Service receives money such as for timber, range, special uses, etc. Non-market values are estimated values for amenities such as wildlife and recreation, which, for all alternatives, provide the greatest amount of benefits.

Table 3-178. Cumulative Decadal Present Values of Costs and Benefits in Thousands of Year 2000 Dollars							
	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G	Alt I
Cumulative Total Present Net Value	$2,331,442	$2,004,959	$2,032,321	$2,299,340	$1,990,286	$2,057,615	$2,180,025
Present Value benefits by Program:							
Range	$0	$0	$0	$0	$0	$0	$0
Timber	$63,903	$71,137	$118,169	$16,247	$49,300	$38,318	$77,042
Minerals	$25	$25	$25	$25	$25	$25	$25
Recreation	$972,889	$856,441	$864,753	$962,600	$851,461	$883,380	$918,599
Wildlife	$1,588,631	$1,374,639	$1,388,242	$1,560,003	$1,374,639	$1,394,988	$1,490,919
PV of Benefits	$2,625,447	$2,302,241	$2,371,189	$2,538,874	$2,275,425	$2,316,711	$2,486,586
Present Value costs by Program:							
Range	$0	$0	$0	$0	$0	$0	$0
Timber	$30,352	$34,085	$57,576	$6,801	$22,398	$17,493	$36,757
Roads/Engineering	$62,567	$64,425	$84,045	$50,251	$83,264	$52,653	$69,244
Minerals	$1,413	$1,413	$1,413	$1,413	$1,413	$1,413	$1,413
Recreation	$42,038	$37,676	$37,676	$41,989	$37,676	$37,676	$41,989
Wildlife	$74,225	$77,318	$74,225	$55,669	$61,854	$68,040	$77,318
Soil, Water, Air	$5,290	$4,245	$5,812	$5,290	$5,290	$3,701	$5,290
Protection/Forest Health	$46,771	$46,771	$46,771	$46,771	$46,771	$46,771	$46,771
Lands	$13,521	$13,521	$13,521	$13,521	$13,521	$13,521	$13,521
Planning, Inv., Monitoring	$17,829	$17,829	$17,829	$17,829	$12,953	$17,829	$14,259
PV Costs	$294,006	$297,283	$338,868	$239,534	$285,139	$259,095	$306,561

Alternative F (current alternative): This alternative has the lowest PNV because it has the lowest PV benefits. This is primarily the result of having the lowest recreation benefits of all the alternatives and the lowest wildlife benefits of all alternatives with the exception of Alternative B, which has the same amount of benefits.

Alternative A: This alternative has the highest PNV. With its emphasis on the production of goods and services beneficial to local economies and communities and the concomitant higher recreation and wildlife benefits, this alternative provides the highest total PV benefits.

Alternative B: With an emphasis on natural resources and creating and maintaining wildlife habitats, this alternative has the highest wildlife costs of all alternatives with the exception of Alternative I, which has the same amount of wildife costs. Overall, this alternative ranks sixth in terms of Total PNV, sixth in terms of total PV benefits and third in terms of PV costs.

Alternative D: This alternative provides the fifth highest Total PNV. While in terms of total benefits this alternative ranks fourth, it has the greatest total costs. This high cost is primarily due to this alternative's emphasis on increased timber production.

Alternative E: This alternative with its emphasis on a variety of recreation uses, has both relatively high PV benefits and PV costs in regards to recreation. However, the overall PV costs are the lowest of all the alternatives primarily due to a substantially lowered cost of the timber program. Since timber output would be reduced there would not be as great a need for road construction and as a result, roads and engineering costs would also be lower than for the other alternatives.

Alternative G: This alternative provides more PNV than Alternatives B, D and F but less than Alternatives A, E and I. It ranks fifth in terms of total PV benefits and sixth in regards to PV costs.

Alternative I: This alternative provides more Total PNV than Alternatives B, D, F and G but less than Alternatives A and E. With regard to PV benefits it ranks third and with regard to costs it ranks second.

By maintaining a forest ecosystem, the CNF also provides the public with many valuable, non-market/non-priced resource benefits that are not considered in the PNV analysis. These benefits are not available, or are of limited availability, on other lands, particularly private lands. These include: a forested landscape with high visual quality; clean water resources; and habitat for a wide range of forest plant and animal species. These values also are most beneficial to recreation and wildlife, the resources that provide the most benefit to the Forest Service. In assessing these non-market/non-priced resource benefits according to acreage proposed for management of these benefits (i.e., recreation and wildlife - concentrated and dispersed recreation, watershed restoration and protection, scenic corridors, and wildlife management) by alternative, Alternative I provides the most overall benefits, Alternative B the least benefits, and the remaining alternatives, approximately the same benefits.

Cumulative Effects

Cumulative effects analysis is designed to reveal the context of alternative impacts within the planning area and over time. This is done by comparing total changes in the planning area with each alternative to total changes with no action. Such a comparison is done by estimating employment and income at the expected end of the forest planning horizon (15 years) and calculating the share of the total economy that each alternative represents of the entire economy. Estimates for employment and income growth were derived by calculating the average annual increase in employment and the real average annual income growth for counties in the analysis area from 1969 to 2000 using U.S. Bureau of Economic Analysis county-level data (www.bea.doc.gov).

The analysis assumes that the underlying economic relationships are held constant at the year 2000 levels. Forest Service data related to Forest Service programs are for the fifteen year planning horizon. Also, the assumption made is our analysis is that the same rate of growth experienced during the 1969 to 2000 time period will continue over the fifteen years of the forest plan.

Table 3-179 displays the cumulative effects results using employment and labor income for the planning area. The first two columns present the 2000 base year data for the planning area and the portion of the base year attributable to use and management of the national forest. The next column shows projections made for 2015. Included in the projections are employment and income effects attributed to the current direction (or no action) alternative. The remaining columns of the table show the cumulative effects for each alternative over the planning horizon, which ends in 2015. Forest program outputs for each alternative are for the 15-year planning horizon.

In 2000 management of the national forest accounted for 1.8 percent of all employment under the no action alternative and 1.5 percent in 2015 for the no action alternative. For the proposed alternatives in the EIS, expected shares of the economy will range from 0.8 percent of the economy for Alternative E to 1.4 for Alternative D. The selected alternative, Alternative I, shows a 1.13 share of the local economy in 2015.

Employment changes in 2015 from the no action alternative range from -1.47 percent for Alternative D to -47.7 percent for Alternative E. The selected alternative I shows a -22.6 percent change.-

In 2000 management of the national forest accounted for 1.7 percent of all labor income under the no action alternative and 1.2 percent in 2015 for the no action alternative. For the proposed alternatives in the EIS, expected shares of the economy will range from 0.6 percent of the economy for Alternative E to 1.2 for Alternative D. Alternative I, which is the selected alternative, shows a 0.91 percent share of the local economy in 2015.

Income changes in 2015 from the no action alternative range from -0.9 percent for Alternative D to -54.9 percent for Alternative E. There is a -25.90 percent change for Alternative I.

The cumulative effects analysis shows that over time employment and income proportionate share of the economy that is attributable to national forest program management will decline for all alternatives. Alternative F, the no-action or current direction alternative will be the largest contributor to the economy.

Table 3-179. Cumulative Economic Impacts in 2015

Economic Indicator	2000		2015							
	Area Totals	Forest Portion	Area Totals	Forest Portion						
				Alt F	Alt A	Alt B	Alt D	Alt E	Alt G	Alt I
Employment										
Total (jobs)	245,279	4,420	303,499	4,420	3,363	3,218	4,355	2,314	2,562	3,420
% or Area Totals	100%	1.8%	100%	1.5%	1.1%	1.1%	1.4%	0.8%	0.8%	1.1%
% Change from No Action	---	---	---	0.0%	23.9%	27.2%	1.5%	47.7%	42.0%	22.6%
Labor Income										
Total ($ million)	$6,438.0	$108.9	$8,843.0	$108.9	$78.0	$77.0	$108.0	$49.1	$57.6	$80.7
% of Base	100%	1.7%	100%	1.2%	0.9%	0.9%	1.2%	0.6%	0.7%	0.9%
% Change from No Action				0.0%	-28.4%	-29.3%	-0.9%	-1.2%	-47.1%	-25.9%

UNAVOIDABLE ADVERSE EFFECTS

Implementation of any alternative would result in some adverse environmental effects that cannot be avoided. The application of the management prescriptions, standards, best management practices (BMP's), and monitoring and evaluation are intended to limit the extent, severity, and duration of these effects. Although the formulation of the alternatives included avoidance of potential adverse environmental effects, some adverse impacts to the environment that cannot be completely mitigated are expected to occur.

Some adverse effects are of a transitory type. For example, air quality could be diminished on a recurring, though temporary, basis due to the use of prescribed fire used to restore plant communities or enhance wildlife habitat. Even though standards require prescribed burning to be scheduled for times when weather conditions would provide for smoke dispersion, the presence of smoke and haze over or adjacent to the CNF would detract from people's expectation of clean air. Recreation traffic, timber hauling, and the operation of other internal combustion engines, could have localized and temporary adverse effects on air quality where these activities occur.

The natural landscape would appear altered by management activities, particularly where activity is highly visible from travel routes. Prescribed burning in forest communities and their blackened appearance would also be apparent. These temporary adverse effects would eventually be reduced by regrowth of vegetation and weathering. Other impacts on the natural appearance of the landscape include

roads and certain recreational structures that are highly visible despite efforts to blend them with landforms and mitigate the effect by landscaping.

In inventoried roadless areas, management activities that would maintain roadless character such as wildlife habitat manipulations and some associated temporary road construction, recreational trails, or other purposes could have an adverse effect on the potential future management of these areas as designated wilderness, as research natural areas, or for other purposes requiring natural characteristics.

Disturbance, displacement, or loss of fish and wildlife may occur as a consequence of habitat loss and increased human recreational activity in areas. Roads and their associated use can impact fish and wildlife due to human activities associated with new access. Improved access into areas that previously had low-standard roads would have similar effects. Other wildlife use could increase by increased management.

Both the amount and distribution of mature stands would be changed through implementation of any alternative. The rate and severity of adverse impacts varies by alternative. Some wildlife species rely on habitat conditions provided by late successional habitats, a reduction or shift in the populations (range) of some wildlife species can be expected.

Although standards, BMPS, and monitoring plans are designed to prevent significant impacts to soil and water, the potential for impacts does exist. Sediment production could exceed natural rates in locations as long as roads are being built or maintained, management activities that include harvesting and removal of timber, dispersed and developed recreation continues along riparian corridors, and forest communities/habitats are restored. Sediment would result from surface erosion, channel erosion, and mass movement.

Fire hazard and resistance to control would increase subsequently to designating more areas to either wilderness or allocations that would not be favorable to management activities, this would result in increased accumulation of forest residues. The potential for these adverse impacts increases relative to the lack of emphasis on management activities in the alternatives being considered. Wildfire risk would increase where access results in more people being drawn into an area. Some risk would be mitigated by early detection, suppression, and prevention methods. Long-term increases in fuel hazard would be mitigated through fuels management activities that are responsive to forest health management objectives.

Relationship between Short-term Uses and Long-term Productivity

NEPA requires consideration of the “relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including the financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The relationship between the short-term uses of man's environment and the maintenance and enhancement of long-term productivity is complex.

Short-term uses are those that generally occur annually on parts of the CNF, such as prescribed burning and dispersed recreational camping.

Long-term refers to longer than a 10-year period, and productivity is the capability of the land to provide market and amenity outputs and values for future generations. Soil and water are the primary factors of productivity and represent the relationship between short-term uses and long-term productivity. The quality of life for future generations would be determined by the capability of the land to maintain its productivity. By law, the Forest Service must ensure that land allocations and permitted activities do not significantly impair the long-term productivity of the land.

The alternatives considered in detail, including the selected alternative, incorporate the concept of sustained yield of resource outputs while maintaining the productivity of all resources. The specific direction and mitigation measures included in the Forestwide management standards ensure that long-term productivity would not be impaired by the application of short-term management practices.

Each alternative Forest Plan was analyzed using the Spectrum linear programming model (See Appendix B – Description of the Analysis Process), to ensure that the minimum standards could be met. The alternative was changed if some aspect did not meet any of the minimum standards. Through this analysis, long-term productivity of the CNF's ecosystems is assured for all alternatives.

As stated earlier, the effects of short-term or long-term uses are extremely complex, and depend on management objectives and the resources that are emphasized. No alternative would be detrimental to the long-range productivity of the CNF.

The management prescriptions and the effects of implementing the revised LMP would be monitored to provide data that ensures satisfying standards for long-term productivity. Monitoring requirements and standards would apply to all alternatives, and are included in Chapter 5 of the revised Forest Plan.

Irreversible/Irretrievable Commitment of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line ROW or road.

An irreversible commitment of resources results from a decision to use or modify resources that is renewable only over a long period of time, such as soil productivity; or nonrenewable resources, such as cultural resources or minerals. The revised Forest Plan and the alternatives examined were all based on the principles of multiple use and long-term productivity for all resources. Measures to protect natural resources that could be irreversibly affected by management activities were incorporated into Forestwide standards.

Irretrievable commitment of resources is the production of renewable resources lost due to allocation decisions that forgoes the production or use of renewable resources. Allocation decisions that do not allow for the production or use of most renewable resources for relatively long periods of time include those that establish wilderness, roadless, scenic areas, wild and scenic rivers, recreation sites, and the construction of new roads. The total number of acres committed to these uses remains essentially the same for all alternatives, although the types of allocated uses vary. By contrast, non-wilderness allocation for areas is considered an irretrievable loss of increased wilderness opportunities. Tradeoffs between wilderness, roadless, and other uses are discussed previously in Chapter 3.

Under a given alternative, differences between output levels and the higher levels that otherwise could be produced also represent irretrievable commitment of resources. For example, a low level of forage use for livestock grazing or a low level of timber yield could be increased in the future, based on different management prescriptions, but the outputs between now and then would be “lost ” or not available for use. The production thus lost would be irretrievable, but the action is not irreversible.

Archeological resources are part of an absolutely nonrenewable and irreplaceable resource base. Once disturbed, for whatever reason, the impacted portion of a property cannot be replaced or repaired, even though controlled data recording techniques may recover part of the information contained in the damaged site.

Archeological surveys and evaluations routinely use small shovel tests or larger excavations to address research designs or potential. These excavations represent the controlled destruction of a portion of an archeological site. The results of such excavations are an irreversible effect. This is balanced by using conventional, accepted archeological techniques and methods with a commitment to high standards.

Any other resource management action or result, whether planned or inadvertent, that diminishes the character or integrity of a heritage property, has irreversibly committed a portion of that site’s value.

INCOMPLETE OR UNAVAILABLE INFORMATION

The CNF has used the most current scientific information available and state-of-the-art analytical tools to evaluate management activities and to estimate their environmental effects.

However, gaps exist in our knowledge. The Council on Environmental Quality regulations discuss the process for evaluating incomplete and unavailable information (*40 CFR 1502.22 (a) and (b)*). Incomplete or unavailable information is noted in this chapter for each resource, where applicable.

Forest Plan monitoring is designed to evaluate assumptions and predicted effects. Should new information become available, the need to change management direction or amend the LMP would be determined through the monitoring and evaluation process.

ENVIRONMENTAL JUSTICE

A specific consideration of equity and fairness in resource decision-making is encompassed with the concerns of environmental justice. As required by Executive Order 12898, all federal actions must consider potentially disproportionate effects on minority or low-income communities. Principles for considering environmental justice are outlined in Environmental Justice Guidance under the National Environmental Policy Act (Council on Environmental Quality 1997). Those principles were considered in this analysis.

The Economic and Social Environment section identified the demographics of minorities and low-income populations and the environmental effects of the alternatives. There are no disporoportionately adverse environmental or health effects to low-income or minority populations. Public involvement during plan revision was inclusive (refer to Appendix A – Summary of Public Involvement).

Environmental Justice issues are typically found in connection with proposals having adverse environmental effects that may affect public health. Those kinds of effects are less likely in a forest plan decision because a plan revision does not normally include site-specific projects or effects.

Chapter 4: Preparers

Core Interdisciplinary Team

Interdisciplinary Team Members

J.R. Anderson : Team Leader, B.S. Forestry, M.F. Forest Management, 22 years experience in recreation, special uses, land management planning.

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Doug Byerly: Recreation Program Manager/Landscape Architect, B.S. Ornamental Horticulture & Landscape Design, Master of Landscape architecture, 10 years experience in landscape design/planning and facility construction.

Jack Coleman: Recreation Specialist; Retired

Delce Dyer: Landscape Architect/Recreation Planner, acting Recreation Program Manager; B.S., History/Historic Preservation; M.L.A., Landscape Architecture; 27 years experience in landscape design/planning/management, historic preservation, interpretation and recreation.

James Ehrlich: Data analyst, B.A., Mathematics/History, M.A., History, M.A.T., Physics, Kootenai National Forest: Computer Specialist, (Engineering), 8.5 years. Cherokee National Forest: Computer Specialist, (Engineering/Recreation), 1.5 years. Responsible for data management and analysis relative to the development and operation of the Spectrum model.

Roger Fryar: Silviculturist, BS Forestry, Region 8 Certified Sivliculturist, 25 years experience in timber and fire management.

Steve Hendricks: Recreation and Wilderness Program Manager (transferred 03/02). Bach. Architecture, Master of Landscape Architecture, 27 years experience in land planning, recreation planning, facility construction, and special areas management.

Jim Herrig: Fishery Biologist, B.S. Wildlife and Fisheries Science, M.S. Fisheries Science, 26 years experience in aquatics, Threatened and Endangered species, and administration.

Tim Kolnik: Data Analyst, B. S. Forest Management; 24 years experience in timber management; 3 years experience in GIS and GIS related work such as data analysis.

Laura (Mitchell) Lewis: Wildlife Biologist, B.S Zoology, M.S. Forest Wildlife Biology, 20 years experience in natural resource inventory, research, management.

Charlton Lewis: Engineering Specialist, BCE, MS in Engineering, 31 years experience in engineering and transportation planning.

Bob Lewis: Silviculturist, B.S. Forest Resource Management, 15 years experience in forest resource inventory, silviculture and planning.

Doris Mertz: Fuels Specialist, Assistant Fire Management Officer, Resigned

Mike Nicolo: Hydrologist, B.S. Forest Resources (Hydrology), 25 years experience in forest hydrology and timber management.
Mark Pistrang: Botanist/Ecologist, B.A. Biology, M.E.M Resource Ecology, 16 years experience in natural resource management.
John Romanowski: Wilderness, Wild & Scenic River Program Manager, 25 years of Forest Service experience and special area management, land planning management, and Appeal Reviewing Officer for the Eastern Region.
Bobby Scott: Soil Scientist, B.S. Agronomy, 27 years experience as soil scientist on three National Forest plus three years experience with Natural Resource Conservation Service.
Dale Wine: Zone Fire Planner, B.S. Forestry, 17 years experience in recreation, fire management, timber, silviculture, fire planning.

Leadership Team

Candace Allen: Leadership Team, B.S. Natural Resource Management, 12 years experience as service forester at all levels of Virginia Department of Forestry, with emphasis on fire, reforestation and urban forestry. 11 years experience in all aspects of national forest management on four national forests in CO, LA, AZ and TN (including 10 years as line officer).
Alan Alsobrook: Leadership Team, Retired
Terry Bowerman: Leadership Team, B.S. Soil and Water Science, 20 years experience as a Soil Scientist, 12 years experience in Ecosystems and Ecosystem management, 5 years experience in recreation, special uses, and planning.
Sam Brocato: Leadership Team, Staff Officer Timber, Wildlife, Fisheries, T&E, B.S. Forest Management, 2 years graduate work in Forest Ecology, 31 years experience with Forest Service, Retired.
Jack Callahan: Engineering & Recreation Staff, Leadership Team, Retired
Larry Fleming: District Ranger, Leadership Team, Retired
Lewis Kearney: Leadership Team/Forester, B.S. Forest Management, 37 years experience in Forest and Ecosystem Management. Past assignments include 6 national forests in R8 plus the Regional office. Worked 13 years as district ranger on 2 ranger districts.
Frank Lewis: Leadership Team
Sheryl Maddux: Leadership Team, B.S. Forest Management, 21 years experience in Resource Management-emphasis timber and fire.
George Martin: Deputy Forest Supervisor, Leadership Team, Retired
Olin Mason: District Ranger, Leadership Team, Retired
Terry Pierce: Leadership Team
John Ramey: Leadership Team
Steve Rickerson: Leadership Team
Mike Sanders: District Ranger, Leadership Team
Keith Sandifer: Leadership Team
Reese Scull: Recreation Staff Officer, Leadership Team, Retired
Mike Williams: Leadership Team
Anne Zimmermann: Leadership Team

OTHER SPECIALISTS

Anita Bailey: B.S. Biology with a minor in geography; MS biology; 15 years experience in GIS.

Quentin Bass: Heritage Resource Specialist

Christine Bassett: Archaeologist, B.A. Cultural Anthropology, M.A. Applied Cultural Anthropology 12 years with Forest Service in Heritage Resources and Recreation.

Larry Byam: Timber Management Specialist, B.S. Forestry, 30 years experience in silviculture, recreation, fire, lands, special uses, timber, etc.

Dave Carroll: Planning Specialist; B.S. Forest Management, 20 years experience in forest management and planning. Master's of Ministry.

Tom Coppinger: Recreation Specialist

Amy Fore: Recreation Specialist, BS Forest Management, 18 years experience timber, planning, recreation.

Mary Frye: Recreation Specialist

Steve Goldman: Recreation Specialist, B.S. Forest-Watershed Management, 12 years of experience with the USFS in Regions 3 and 8, with emphasis in recreation, fire management, watershed, and Wildlife & Fisheries programs.

ReNee Haney: Resource Assistant, 2 year Secretarial Science Degree, 25 years with Forest Service.

Janan Hay: Planning Specialist, B.S. Forestry, 15 years experience in planning, special uses.

Kristy Kelly: Resource Typist

Vern Maddux: Planning Specialist, B.S. Forestry, 25 years experience in Silviculture, Timber, Recreation, Fire, and Special Uses.

Stephanie Medlin: Fishery Biologist, B.S. in Wildlife and Fisheries Science, M.S. in Biology with fisheries emphasis; 11 years experiences in fisheries, aquatics, and planning.

Tom Rowe: Timber Specialist

Jim Stelick: Forester

Tracy Stiles: Lands Specialists, Senior Review Appraiser, B.S. Forestry, 20 years experience in lands.

Chapter 5: Distribution List

Individuals

Bobby Joe Albright
Robert W. & Ruth J. Amburn
Deborah & Pat Bahr & Storm
Nancy Anne Bailey
Getahun Bakele
Mr. & Mrs. Roy E Barnett
Duke Barr
Earl Birmingham
Jacqueline M. Blackburn
Eula S. Blalock
Gerhard Blombach
Pat Bonham
David Borum
R. Dan & Kathy Bowden
Steven Bowers
David Broemel
Rosie Brown
James E. Brown Jr.
Bill Burchfiel
Jennie T. Burrell
Bill Burris
Michael E. Callaway
Louis H. Camisa
Ingrid Capparelli
Sarah Francisco & Davis W. Carr Jr
Waylon Carswell
J.H. Carter III
DiAnn B. Casteel
Franklin Delano Cathey
Billy Chism
Harriet Ciagne
Chip Cirillo
Mary Helen Cline
Carol T. Coffey
Gary & Linda Combs
Andrew S. Combs
Walter L. Cook, Jr.
Joyce A. Coombs
Charles M. Corn
Amber Cornett
Scott Correll
Charlie & Vinetta Croft
Jude Crowell
Ricky Darnell
Tye Daugherty
Katy A. Davenport
Alfred Denny
Terry Denny
John F. Derting
Hal DeSelm
Denis Dobosh
R. B, Donaldson
H.M. Draper
Carol Dulaney
Ms. Judith L. Duvall
Dana Eglinton
Robert H. Eklund MD
Emily Fletcher
H W. Fletcher
Sharon Foster
Kathleen Gehr
Alvin & Sally Gerhardt
Guy Gibbs
Enrique Gomezdelcampo
Mary F. Gore
Polly & Peter Gott
Alicia Gray
Bob Green
Dr. Clarence E. Greever
Randall Grimsley
Jerry Hamby
Kevin Hamed
Jeff Harris
Charles Fields Harrison
Leonard C. Harwood
Sarah Hawkins
Mary Allison Haynie
Allen Hedden
Kenny & Elizabeth Higgins
Mark L. Hill
Nyle R. Hillson
Eric Hirst
Tom Hodge
Michael L. Hodges
Jim Holbrook
Roy Hutsell
Cathy L. Hye
Albert Iannacone
P. James
R. Taber Jenkins
Ed Johnson
Bryan Jones
Larry Jones
Will Jorgensen
Lloyd Kaminski
Matt and Traci Kaufman
Hilda Kernodle
Steven Kiger
Vikki Kingslien
Frank Kinser Jr.
Joe Kirkpatrick
Chris & Amy Knox
Rich Kolehmainen
Hugh & Sherry Lamb
Frances Lamberts
Judith A. LaRocke
Fern M. Lavinder
Grant Law
Bill Leiper
Aaron & Mindy Levering
Susan Lewis
Audrey J. Little-Crawford
Don Lusk
Laura Maddux
Chris Mane
John Mason
J. B. Massingale
Thomas Massingale
Jim & Connie McCall
Eileen J. McCay
Mike McClelland
A. S. McConell
Owen McConnell
Howard McDonald
Tim McDowell
Mrs. Thelma McRee
Mr. & Mrs. Greg Merrell
James O. Mills
Linda C. Modica
Pete Moditz
Louise K. Morgan
J.D. Morrell
Bryan Morris
Keith Muller
M C. Murphy
Gary T. Myers
Colleen R. Nordstrom
E.G. Novotny
Frank Oakberg
Ken Ohmer

Diana Osborne
Leslie O'Toole
Clayton Pannell
Gary Parsons
Ernest Phillips
Jacqueline Pine
Mr. & Mrs. Dudley Porter
Richard K. Powell
Dwight & Carlene Presnell
David Ramsey
Elizabeth B. Reaves
Dana Reynolds
Michael Ritter
Chris Roberts
Frank Robey
Harb Rodriguez
Larry Rose
Eugene G. Rymer
Donald Sanders
Ron Saunders
Jeff Saylor
Lucy Scanlan
John E. Seward Jr.
Irine H. Shanks
Wendy Shaver
Pat Sherrer
Lisa Shoemaker
Jane Silver
Duane Simmons
Michael Sledjeski
Heather Smith
Jeffrey K. Smith
John Smith
Clyde E. Smith Jr
Cat Armstrong Soule
Marilyn Spoon
Howard A. Stacy
Elsie Stacy
Gottwald Starke
Shelton Stone
Gary K. Sturgill
Harry D. Switzer
Bert Thomas
Gerald A. Thornton
Jerald W. Tindell
Ambre Torbett
Ruth Tuft
Dick Urban
John Vann
Ray Vess
Charles & Charlene F. Wagner
Mike Walcher
Ethel Waldroup
Michael Walker
Mose L. Waller
Jo Walters
Annetta Watson
W. Allen & Carolyn Watson
Philip Watts
William Webb
Elizabeth Wells
Rupert O. Westfield Jr.
Jeffery A. White
Theodore Williams
Caroline Williams
R.C. Williams
T.A. Wingo
Jonathin G. Woods
B. Wright
Tim Yates
Traveis Eddie Yearwood
Pat York
Mark Young
Wade Young

Associations, Businesses, Federal Agencies, State, City, and County Agencies, and Organizations

NFs in North Carolina
Appalachian State University Libraries
Appalachian Timber Council
Senator Lamar Alexander
Senator Bill Frist
Congressman Bill Jenkins
Congressman John Duncan
Congressman Zach Wamp
Bass; Berry & Sims PLC
Benton Public Library
Black Bear Society
Blount County Public Library
Caddo Ranger Distrct
Caribbean NF
Carter County Executive
Chattanooga-Hamilton County Bicentennial
Cherokee Family Riders
Cherokee Nation of Oklahoma
Choctaw Ranger Station
Cleveland Public Library
Cocke County Executive
Cold Springs Ranger District
County Executive
Daniel Boone NF
Division of Natural Heritage; TDEC
E.G. Fisher Public Library
Eastern Band of Cherokee Indians
Eastern Forest Action Center, The Wilderness Society
Elizabethton Carter County Public Library
Environmental Div P-14
Environmental Review Division
ETSU - Charles C. Sherrod Library
Federal Aviation Administration
Federal Highway Administration
Fourche Ranger District
Francis Marion/Sumter NFs
Greene County Executive
Greeneville-Greene County Public Library
GSMNP
GW/Jefferson NFs
Jessieville Ranger District
Johnson City Press
Johnson County Executive
Johnson County Public Library
Kialegee Tribal Town
Kiamichi Ranger District
Kisatchie NF
KT SAF
Lawson McGhee Library
Madisonville Public Library
McMinn County Executive

Mena Ranger District
Monroe County Executive
Muscogee (Creek) Nation
Nashville Public Library
National Park Service
Natural Resouces Conservation Service
NFs in Alabama
NFs in Florida
NFs in Mississippi
NFs in Texas
Nolichucky/Unaka Ranger District
Ocoee/Hiwassee Ranger District
Ouachita NF
Ozark/St.Francis NFs
Partners of Cherokee National Forest
Poarch Creek Indians
Polk County Executive
Poteau Ranger District
Publications Control Officer
Region IV Environmental Protection Agency
Room 326-W, Whitten Bldg
Rural Utilities Service (RUS)
SABP
SAF
SAFC
Cherokee Forest Voices
Sevier County Public Library
Southern 4-Wheel Drive Association
Southern Research Station
State Capital Building
Stokely Memorial Library
Sullivan County Executive
Sullivan County Public Library
TDEC
TDOA
Tellico Ranger District
Tennesse Forestry Commission
Tennessee Conservation League
Tennessee Department of Agriculture
Tennessee Division of Forestry
Tennessee Forestry Association
Tennessee Historical Commission
Tennessee Valley Authority
Tennessee Valley Authority
Tennessee Valley Sportsman Club
Tennessee Wildlife Resources Agency
Tennessee Wildlife Resources Agency;
Region IV
TFC
Thlopthlocco Tribal Town
Tennessee Comm. Of Indian Affairs
Tennessee State Planning Office
TVA
U.S. Department of Energy
Un. Keetoowah Band of Cherokees
UNC - Asheville; D. Hiden Ramsey Library
Unicoi County Executive
Unicoi County Public Library
University of Tennessee
University of the South, DuPont Library
US Department of Housing and Urban
Development
US Department of Interior
US Federal Railroad Admin, Office of
Transportation & Reg.
US. Army Corps of Engineers
USDA APHIS PPD/EAD
USDA National Agriculture Library
USDA Office of Civil Rights, Policy &
Planning Division
USDA, National Agricultural Library
USDI; Fish & Wildlife Service
USEPA REGION 4
UTC - Lupton Library
UTK - Hodges Library
Vanderbilt-Jean & Alexander Heard Library
Washington County Executive
Washington County-Jonesborough Library
Watauga Ranger District
Water Pollution Control, Tn. Environmental
Assist Ctr.
Wilderness Society, Eastern Forest Action
Committee
Wildlaw Alabama Office

CHAPTER 6: GLOSSARY

Acronyms and Abbreviations

AA - analysis area
ACP – Agriculture Conservation Program
AD - Administratively Determined
ADA - Americans with Disabilities Act
AGL – above ground level
AMS - Analysis of the Management Situation
APHIS - Animal and Plant Health Inspection Service
AQRV – Air Quality Related Values
ASQ - allowable sale quantity
AT - Appalachian Trail
ATC - Appalachian Trail Conference
ATV – all-terrain vehicle
AUM - animal unit month

BA - basal area
BBS – Breeding Bird Survey
BF - board foot
BMP - best management practice
BIO – biological oxygen demand
BSS - base sale schedule

C2 – Category 2
CAA - Clean Air Act
CCC – Civilian Conservation Corps
CCF - hundred cubic feet
CEQ - Council on Environmental Quality
CF - cubic foot
Cfs – Cubic Feet per Second
CFL - commercial forest land
CFR - Code of Federal Regulations
CFS - cubic feet per second
CIP - Capital Investment Program
CISC - Continuous Inventory of Stand Conditions database
CMAI - culmination of mean annual increment
CNF – Cheroee National Forest
CompPATS - Computerized Project Analysis of Timber Sales
CSU – Controlled Surface Use
CVHW - cove hardwood.
CWA - Clean Water Act
CWS – coarse woody debris

DBH - diameter at breast height

DBRU - Drainage Basin Response Unit
DEIS - Draft Environmental Impact Statement
DFC - desired future condition

EA – Environmental Assessment
ECOMAP - Ecological Classification and Mapping Task Team
ECS - Ecological Classification System
EIS - Environmental Impact Statement
EMU - ecological management unit
EPA - Environmental Protection Agency
ESA - Endangered Species Act
EWPP- Emergency Watershed Protection Plan

F – Fahrenheit
FDR - forest development road
FRP - Forest Road Program
FEIS - Final Environmental Impact Statement
FH - Forest Highway
FIA - Forest Inventory and Analysis
FMAP - Fire Management Action Plan
FR - Forest Road
FSH - Forest Service Handbook
FSM - Forest Service Manual
FTE - full-time employee

FVS – Forest Vegetation Simulator
FWRBE – Fish, Wildlife, Range, Botany and Ecology Team
FY - fiscal year

GAO - Government Accounting Office
GFA – General Forest Area
GIS - Geographic Information System
GMV – Gypsy Moth Vulnerability rating
GPD - gross domestic product
GSMNP – Great Smoky Mountain National Park

Ha - hectare
HRP - Human Resource Program
HUC – Hydrologic Units
HVH – High Value Hardwood
HWA Hemlock Woolly Adelgid

IDT - Interdisciplinary Team
IPM - integrated pest management
IS - Interpretive Services

Km - kilometer

LAC – Limits of Acceptable Change
LAR - Land Area Report
LE - law enforcement
LMP – Land Management Plan
LOAP - Landownership Adjustment Plan
LTA - landtype association
LTP - landtype phase
LTSYC - long-term sustained-yield capacity
LUG - land-use group
LVH – Low Value Hardwood
L&WCF - Land and Water Conservation Fund

LWD – large woody debris

M – thousand (Roman Numeral)
M$ - thousands of dollars
MA - management area
MAR - Management Attainment Report
MAUM - thousand animal unit month
MBF - thousand board feet
MCF - thousand cubic feet
MIL - management intensity level
MIS - management indicator species
MM - million
MM$ - millions of dollars
MMBF - million board feet
MMCF - million cubic feet
MMR - minimum management requirement
MMRVD - million recreation visitor-day
MOU - memorandum of understanding
MRVD - thousand recreation visitor-day
MVH – Moderate Value Hardwood
MWFUD - thousand wildlife and fish user-day

NAAQS - National Ambient Air Quality Standards
NAPAP – National Acid Precipitation Assessment Program
NEPA - National Environmental Policy Act
NF - National Forest
NFMA - National Forest Management Act
NFRS – National Forest Recreation Survey
NFS – National Forest System
NFSR – National Forest System Road
NHPA – National Historic Preservation Act
NLFCA – National Listing of Fish Consumption Advisories
NOI – Notice of Intent
NPL – National Priorities List
NPS – National Park Service
NRCS - Natural Resources Conservation Service
NRI – Natural Resource Inventory
NSO – No Surface Occupancy
NSRE - National Survey on Recreation and the environment
NTMB - neotropical migratory birds
NVUM – National Visitor Use Monitoring
NWPS - National Wilderness Preservation System
NWTF – National Wild Turkey Federation

OHV - off-highway vehicle

OMP - operation maintenance and protection
ORV – Outstandingly Remarkable Value
ORV - off-road vehicle

P – Primitive
PAOT - persons-at-one-time
PETS - proposed, endangered, threatened, or sensitive
PILT – Payment in Lieu of Taxes
PIF – Partners in Flight
PIN - yellow pine
PNWR - Piedmont National Wildlife Refuge
PL - public law
PM - particulate matter
PMOA – Programmatic Memorandum of Agreement
PNV - present net value
PNW - present net worth
PRLRMP – Proposed Revised Land and Resource Management Plan
PRODCL - productivity class
PSD - prevention of significant deterioration
PSI - pounds per square inch

R – Rural
RAP – Roads Analysis Process or Procedure
RARE - Roadless Area Review and Evaluation
RARE II - the second Roadless Area Review and Evaluation
RBP – Rapid Bioassessment Protocol
RCA – Rural Community Assistance
RC&D – Resource Conservation and Development
RD - Ranger District
RIM - Recreation Information Management
RMO – Road Management Objectives
RN1 – Roaded Natural
RN2 – Remote Roaded Natural
RNA - research natural area
RNAT - roaded natural
ROD - record of decision
ROS - Recreation Opportunity Spectrum
ROW - right-of-way
RPA - Resources Planning Act
RVD - recreation visitor-day
Rx – Prescription

SAA - Southern Appalachian Assessment
SAMAB – Southern Appalachian Man and Biosphere
SAP – Southern Appalachian Planners

SAMI – Southern Appalachian Mountains Initiatives
SARRWAG – Southern Appalachian Recreation, Rivers, Wilderness Advisory Group (Rec Team)
SCORP - State Comprehensive Outdoor Recreation Plan
S&G - standard and guideline
SH - state highway
SHPO – State Historic Preservation Officer
SIO – Scenic Integrity Objective
SIP - State Implementation Plan
SMS – Scenery Management System
SPB - southern pine beetle
SPMO - semiprimitive motorized
SPNM - semiprimitive non-motorized
STS - Slow the Spread
SMZ – Streamside Management Zone

T&E - threatened and endangered
TES-LR - Threatened, Endangered, Forest Service Sensitive and Locally Rare Species
TDEC – Tennessee Department of Environment and Conservation
TNC - The Nature Conservancy
TSI - timber stand improvement
TSPIRS - Timber Sale Program Information Reporting System
TVA - Tennessee Valley Authority

TWRA – Tennesse Wildlife Resource Agency

UPLD - upland hardwood/mixed
U.S.A. – United States of America
USC - United States Code

USDA - U.S. Department of Agriculture
USDI - U.S. Department of Interior
USFWS - U.S. Fish and Wildlife Service
USGS - U.S. Geological Survey

VIS - Visitor Information Services
VMS – Visual Management System
VQO - visual quality objective

WFUD - wildlife and fish user-day
WHI - wildlife habitat improvement
WHI – Watershed Health Index
WIN - Watershed Improvement Inventory
WMA – Wildife Management Area
WO - Washington Office
WPIN - white pine
WRD - Wildlife Resources Division
WRP – Wetlands Reserve Program
WSA - wilderness study area
WSR – Wild and Scenic River
WUI – Wildland Urban Interface
WURR – Water Use Rights and Requirements

Definitions

Definitions were taken from the following sources:

Code of Federal Regulations (CFR) Title 36, *Parks, Forests, and Public Property,* Chapter II, Forest Service, Department of Agriculture; Part 219, Planning, Section A—National Forest System Land and Resource Management Planning; Section 219.3, Definitions and Terminology, Revised July 1, 1998. (Referred to as 36 CFR 219.3)

Society of American Foresters. 1998. *The Dictionary of Forestry*. Edited by John A. Helms. 210 p. (Referred to as SAF)

Forest Service Handbook (FSH) 2090.11, *Ecological Classification and Inventory Handbook*, WO Amendment 2090.11-91-1, Effective 4/26/91, 05 - Definitions. (Referred to as FSH 2090.11-05)

FSH 2409.13, *Timber Resource Planning Handbook*, WO Amendment 2409.13-92-1, Effective 8/3/92, 05 - Definitions. (Referred to as FSH 2409.13-05)

FSH 2409.15, *Timber Sale Administration Handbook*, Amendment No. 2409.15-96-2, Effective Sept. 19, 1996, 05 - Definitions. (Referred to as FSH 2409.15-05)

FSH 2409.17, Silvicultural Practices Handbook, 1/85 WO, Chapter 9 - Timber Stocking Guides and Growth Predictions, 9.05 - Definitions. (Referred to as FSH 2409.17-9.05)

FSH 2609.13, *Wildlife and Fisheries Program Management Handbook*, WO Amendment 2609.13-92-1, Effective 8/3/92, Chapter 70 - Analysis of Economic Efficiency of Wildlife and Fisheries Projects, 70.5 - Definitions. (Referred to as FSH 2609.70.5)

FSH 2709.12, *Road Rights-of-Way Grants Handbook*, 9/85 WO, Zero Code, 05 - Definitions. (Referred to as FSH 2709.12-05)

Forest Service Manual (FSM) 1900 - Planning, Amendment No. 1900-91-3, Effective March 15, 1991, 1905 - Definitions. (FSM 1905)

FSM 2163, *Hazardous Waste Management*, Chapter 2163.05, Definitions. (Referred to as FSM 2163)

FSM 2200, *Range Management*, WO Amendment 2200-91-1 Effective 3/1/91, Chapter 2230, Grazing and Livestock Use Permit System, 2230.5 - Definitions. (Referred to as FSM 2230)

FSM 2300, *Recreation, Wilderness, and Related Resource Management*, Amendment No. 2300-91-3 Effective March 12, 1991. Chapter 2355, Off-Road Vehicle Use Management, Executive Order 116-44, as amended by Executive Order 11989, Use of Off-Road Vehicles on the Public Lands 37 FR 2877 (Feb. 9, 1972), 42 FR 26959 (May 25, 1977). (Referred to as FSM 2355)

FSM 2300, *Recreation, Wilderness, and Related Resource Management*, WO AFSM 2300 - Recreation, Wilderness, and Related Resource Management, WO Amendment 2300-90-1, Effective 6/1/90, Chapter 2310 - Planning and Data Management - 2312 - Recreation Information Management (RIM). (Referred to as (FSM 2312)

FSM 2400, Timber Management, WO Amendment 2400-96-6 Effective 9/24/96. Chapter 2435 - Salvage Sales. 2435.05, Definitions. (FSM 2435)

FSM 2500, *Watershed and Air Management*, Amendment No. 2500-94-4, Effective Dec. 20, 1994. Chapter 2520, Watershed Protection and Management. 2521 - Watershed Condition Assessment. 2521.05 - Definitions. (Referred to as FSM 2521)

FSM 2500, *Watershed and Air Management*, Amendment No. 2500-94-4, Effective Dec. 20, 1994. Chapter 2520, Watershed Protection and Management. FSM 2526 - Riparian Area Management. 2526.05 - Definitions. (Referred to as FSM 2526)

FSM 2600, *Wildlife, Fish, and Sensitive Plant Habitat Management*, Amendment No. 2600-91-8 Effective Oct. 22, 1991, Chapter 2605, Definitions. (Referred to as FSM 2605)

FSM 2600, *Wildlife, Fish, and Sensitive Plant Habitat Management*, WO Amendment 2600-95-7, Effective 6/23/95, Chapter 2670, Threatened, Endangered, and Sensitive Plants and Animals, 2670.5 - Definitions. (Referred to as FSM 2670)

A User's Guide to Forest Information Retrieval (FIR), Southeastern Forest Experiment Station, Forest Inventory and Analysis Unit, Asheville, NC, 1988. (Referred to as FIR)

Interim Resource Inventory Glossary, File 1900, Washington, DC, 96 p., June 14, 1989. (Referred to IRIG)

A

accessibility – The relative ease or difficulty of getting from or to someplace, especially the ability of a site, facility or opportunity to be utilized by persons of varying physical and mental abilities.

accessible facility - A single or contiguous group of improvements, that exists to shelter or support Forest Service Programs that is in compliance with the highest standard of current Federal or Forest Service accessibility guidelines, at the time of construction.

acid deposition - Rain, snow, or particulate matter containing high concentrations of acid anions (e.g. nitric and sulfate), usually produced by atmospheric transformation of the byproducts of fossil fuel combustion. Precipitation with a pH lower than 5.0 is generally considered to be acidic.

acid neutralizing capacity - The total capacity of a water sample to neutralize acids, as determined by titration with a strong acid. Acid neutralizing capacity includes alkalinity (e.g. carbonate) plus base cations.

acidification – To convert into an acid or become acid.

acquisition of land - Obtaining full landownership rights by donation, purchase, exchange, or condemnation.

acre-equivalents - The number of acres of forest habitat improved or affected by the installation of various wildlife habitat improvements in an area. Determined by multiplying by various coefficients.

acre-foot - A measurement of water volume, equal to the amount of water that would cover an area of 1 acre to a depth of 1 foot (specifically 43,560 cubic feet or 325,851 gallons).

activity - A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain forest and rangeland outputs or achieve administrative or environmental quality objectives.

adaptive management – A dynamic approach to forest management in which the effects of treatments and decisions are continually monitored and used, along with research results, to modify management on a continuing basis to ensure objectives are being met.

administrative unit - All the National Forest System lands where one forest supervisor has responsibility. The basic geographic management area within a Forest Service Region, station, or area.

advance regeneration (reproduction) - Seedlings or saplings that develop, or are present, in the understory.

aerial logging – A yarding system employing aerial means, (e.g., helicopters, balloons), to lift logs.

afforestation - Establishment of a forest or stand in an area not recently forested.

age class - A grouping of living things based on their age.

age class (cohort) - A distinct aggregation of trees originating from a single natural disturbance or regeneration cutting.

Age dependent relationships – Complex yield composite relationships between independent and dependent variables that vary by the age of the understory and/or the overstory.

Agriculture Conservation Program – USDA cost-share program for steambank improvement.

agricultural land - Areas used primarily for production of food and/or fiber (excludes wood fiber). Examples include cropland, pasture, orchards, vineyards, nurseries, confined feeding areas, farmsteads, and ranch headquarters.

air pollution - Any substance or energy form (heat, light, noise, etc.) that alters the state of the air from what would naturally occur.

air quality class - Three broad classifications used to prevent significant deterioration of air quality for all areas of the country.

> **Class I -** All areas where essentially any degradation of air quality would be considered significant deterioration.
>
> **Class II -** All areas where moderate degradation over baseline concentrations are allowed
>
> **Class III -** All others

air quality (PSD) class – Three broad classifications established by the CAA to help prevent significant deterioration of air quality for all areas of the country that are known (or assumed) to be attaining NAAQS.

> **Class I –** Select wilderness areas and national parks where identified air quality related values might become (or currently are) adversely affected by even a small increment of additional air pollution. To date, there are 156 such areas, nationwide.
>
> **Class II -** All other areas, by default, where a moderate level of additional air pollution is deemed acceptable. The bulk of the U.S.

Class III – Areas the states may designate to receive such additional amount of air pollution (even up to 30 times the Class I area increment) that air quality may deteriorate from baseline to (but not below) NAAQS. To date, there are no such areas, nationwide.

air quality related values – Terminology used in the PSD portion of the CAA describing values associated with certain resources that may become impaired by air pollution. Typically, these include aquatic habitats, terrestrial habitats and visibility.

all aged stand – A stand with trees of all, or almost all age classes, including those of exploitable age.

allocated fund - Funds transferred from one agency or bureau to another for carrying out the purpose of the parent appropriation and agency.

allocation - The assignment of management prescriptions or combination of management practices to a particular land area to achieve the goals and objectives of the alternative.

allopatric – Condition where one species lives in a section of stream without other closely related species. The species have disjunct distributions. Opposite of sympatric.

allotment management plan - The basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.

allowable sale quantity - The quantity of timber that may be sold from the area of suitable land covered by the LMP for a time period specified by the LMP. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity."

all-terrain vehicle - Any motorized, off-highway vehicle 50 inches or less in width, having a dry weight of 600 pounds or less that travels straddled by the operator. Low-pressure tires are six inches or more in width and designed for use on wheel rim diameters of 12 inches or less, utilizing an operating pressure of 10 pounds per square inch (psi) or less as recommended by the vehicle manufacturer.

alternative - In forest planning, a mix of resource outputs designed to achieve a desired management emphasis as expressed in goals and objectives, and in response to public issues or management concerns.

amendment - A formal alteration of the LMP by modification, addition, or deletion. Forest Plan amendment requires an environmental analysis. Significant findings require an environmental impact statement and the amendment will follow the same procedure used for plan preparation. Insignificant findings allow the changes to be implemented following public notification. Amendments can take place at any time following plan approval.

amenity values - Features or qualities which are pleasurable or aesthetic, as contrasted with the utilitarian features of a plan, project, location, or resource.

analysis area - A collection of lands, not necessary contiguous, sufficiently similar in character, that they may be treated as if they were identical.

analysis area identifier - A resource characteristic used to stratify the land into capability areas and analysis areas.

Analysis of the Management Situation - A determination of the ability of the planning area to supply goods and services in response to society's demand. The Forest Plan includes a summary of the AMS. Information from it is contained throughout the EIS/Plan.

animal unit month - The quantity of forage required by one mature cow and her calf (or the equivalent, in sheep or horses), for one month; 682 pounds of air-dry forage.

annual forest program - The summary or aggregation of all projects that make up an integrated (multifunctional) course of action for a given level of funding of a forest planning area that is consistent with the LMP.

annual work planning process - Preparation of technical plans that serve to implement land and resource management, and program decisions contained in the integrated land, resource plans, and budget allocations.

appropriated fund - Funds available for obligation or outlay by Congress to a given agency.

appropriate management response – The response to a wildland fire based on an evaluation of risks to firefighter and public safety. Circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected. The evaluation must also include an analysis of the context of the specific fire within the overall logic, geographic area, or national wildland fire situation.

aquatic ecosystem - Component includes: the stream channel; lake and estuary beds; water; biotic community, and associated habitat features. Included are streams and lakes with intermittently, semi-permanently and seasonally flooded channels or streambeds. In the absence of flowing water, intermittent streams may have pools or surface water may be absent altogether.

aquatic habitat types - The classification of instream habitat based on location within channel, patterns of water flow, and nature of flow controlling structures. Habitat is classified into a number of types according to location within the channel, patterns of water flow, and nature of flow controlling structure. Riffles are divided into three habitat types: low gradient riffles, rapids, and cascades. Pools are divided into seven types: secondary channel pools, backward pools, trench pools, plunge pools, lateral scour pools, dammed pools, and beaver ponds. Glides, the third habitat type, are intermediate in many characteristics between riffles and pools. It is recognized that as aquatic habitat types occur in various parts of the country, additional habitat types may have to be described. If necessary, the regional fishery biologist will describe and define the additional habitat types.

arterial roads - Roads that provide service to large land areas and usually connect with public highways or other forest arterial roads to form an integrated network of primary travel routes. The location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource-management service. They are usually developed and operated for long-term land and resource management purposes and constant service. These roads generally serve areas more than 40,000 acres.

artificial regeneration (reproduction) - Creation of a new age class by renewal of a tree crop by direct seeding, or by planting seedlings or cuttings.

ATV – (All Terrain Vehicle) Any motorized, off-highway vehicle 50 inches or less in width, having a dry weight of 600 pounds or less that travels straddled by the operator. Low-pressure tires are 6 inches or more in width and designed for use on wheel rim diameters of 12 inches or less, utilizing an operating pressure of 10 pounds per square inch (psi) or less as recommended by the vehicle manufacturer.

authorized use - Specific activity or occupancy, including a ski area, historical marker, or oil and gas lease, for which a special authorization is issued.

B

bald - An early successional opening generally above 4,000 feet, characterized by grassy or heath vegetation.

basal area - The area of the cross-section of a tree inclusive of bark at breast height (4.5 feet or 1.37 meters above the ground) most commonly expressed as square feet per acre or square meters per hectare. Used to measure the density of a stand of trees. For shrubs and herbs it is used to determine phytomass. Grasses, forbs, and shrubs usually measured at or less then 1 inch above soil level. Trees—the cross-section area of a tree stem in square feet commonly measured at breast height (4.5' above ground) and inclusive of bark, usually computed by using diameter at breast height (DBH), or tallied through the use of basal area factor angle gauge.

basal spray – The application of a pesticide, usually a herbicide for controlling brush or weed trees, directed at the base of the stem.

base sale schedule - A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to, or greater than, the planned sale and harvest for the preceding decade. The planned sale and harvest for any decade must not be greater than the long-term sustained yield capacity.

BEIG - Built Environment Image Guide, is a guide for design of administrative and recreation buildings, landscape structures, site furnishings, wayside structures, and signs installed or operated by the Forest Service, its cooperators and permittees.

best management practice (BMP) - A practice, or a combination of practices determined to be the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

biodiversity - The variety of life in an area, including the variety of gene pools, species, plant and animal communities, ecosystems, and the processes through which individual organisms interact with one another, and their environments.

biological assessment - A "biological evaluation" conducted for major federal construction projects requiring an environmental impact statement, in accordance with legal requirements under Section 7 of the Endangered Species Act (16 U.S.C. 1536(c)). The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species.

biological evaluation - A documented Forest Service review of its programs or activities in sufficient detail to determine how an action or proposed action may affect any proposed, endangered, threatened, or sensitive species.

biological growth potential - The average net growth attainable on a fully-stocked natural forest land.

biological oxygen demand - Dissolved oxygen required by organisms for the aerobic biochemical decomposition of organic matter present in water.

bladed skid road - A travel way through the woods formed by loggers to facilitate dragging (skidding) logs from the stump to a log landing. Skid roads are generally used in steep terrain and are cut into mountainsides with a bulldozer.

board foot - A unit of timber measurement equaling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide. Commonly, 1,000 board feet is written as 1 MBF, and 1,000,000 board feet is written as 1MMBF ("M" is Roman numeral for 1,000).

browse - Young twigs, leaves and tender shoots of plants, shrubs or trees that animals eat.

burning (prescribed) - The application of fire, usually under existing stands and under specified conditions of weather and fuel moisture, in order to attain silvicultural or other management objectives.

C

cable logging – A term for any system involving transport of logs along, or by means of steel cables with the load being lifted partly or wholly off the ground.

canopy cover - The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter. Small openings in the crown are included. Used to express the relative importance of individual species within a vegetation community, or to express the canopy cover of woody species. Canopy cover may be used as a measure of land cover change or trend. Often used for wildlife habitat evaluations.

capability – The potential of a land area to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and a given level of management intensity. Note: capability depends upon the

current condition and site conditions including climate, slope, land form, soil and geology, and the application of management practices and protection from fire, insects, and disease.

carrying capacity - The number of organisms of a given species and quality that can survive in, without causing deterioration of, a given ecosystem through the least favorable environmental conditions that occur within a stated interval of time.

channel ephemeral streams - Ephemeral streams that have a defined channel of flow where surface water converges with enough energy to remove soil, organic matter, and leaf litter. Ones that exhibit an ordinary high watermark and show signs of annual scour or sediment transport are considered navigable waters of the United States (USACE, Part 330- Nationwide Permit program, 2000).

channelization – Artificial change of a stream channel profile.

Clean Air Act of 1970 – A congressional act, along with the amendments passed in 1977 and 1990, that provides authority for the Environmental Protection Agency to develop specific regulations controlling air pollution.

cleaning - A release treatment made in an age class, not past the sapling stage, in order to free the favored trees from less desirable individuals of the same age class which can overtop them.

clearcutting - The harvesting in one cut of all trees on an area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning for sustained yield under area regulation. A method of regenerating an even-aged stand. Regeneration is from natural seeding, direct seeding, planted seedlings, and/or advance reproduction. Harvesting may be done in groups or patches (group or patch clearcutting), or in strips (strip clearcutting). In the clearcutting system, the management unit or stand in which regeneration, growth, and yield are regulated consists of the individual clearcut stand.

clearcutting with reserves - A two-aged regeneration method in which varying numbers of reserve trees are not harvested to attain goals other than regeneration.

climax - The culminating stage in plant succession for a given environment with the vegetation having reached a highly stable condition.

closed road/trail - A road that is closed for public use.

co-dominant crown class - Trees with crowns forming the general level of the main canopy in even-aged groups of trees. They receive full light from above, and comparatively little from the sides.

co-dominant trees - Trees or shrubs with crowns receiving full light from above, but comparatively little from the sides. Crowns usually form the general level of the canopy.

cohort – a group of trees developing after a single disturbance, commonly consisting of trees of similar age, although it can include a considerable range of tree ages of seeding or sprout origin and trees that predate the disturbance.

cold water fishery - Aquatic habitats that predominately support fish species that have temperature tolerances up to about 70ºF, and exhibit their greatest reproductive success at temperatures below 65ºF (18.3ºC).

collector road - Roads that serve smaller land areas and are usually connected to a forest arterial or public highway. They collect traffic from forest local roads or terminal facilities. The location and standard are influenced by long-term multi-resource service needs, and travel efficiency. Forest collector roads may be operated for constant or intermittent service, depending on land-use and resource management objectives for the area served by the facility. These roads generally have two or more local roads feeding into them and generally serve an area exceeding 10,000 acres.

commercial forest land - Forest land that can produce crops of industrial wood, and has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service. Existing technology and knowledge must be available to ensure timber production without irreversible damage to soils productivity, or watershed conditions. Adequate restocking can be attained within five years after final harvesting.

commercial thinning – Any type of thinning producing merchantable material at least equal to the value of the direct cost of harvesting.

commercial tree species – (1) Tree species suitable for industrial wood produces. (2) Conifer and hardwood species used to calculate the commercial forest land allowable sale quality.

commodity outputs - A resource output with commercial value. All resource products that are articles of commerce.

compartment – A portion of a forest under one ownership, usually contiguous and composed of a variety of forest stand types, defined for purposes of locational reference.

composition (stand) - The proportion of each tree species in a stand expressed as a percentage of the total number, basal area, or volume of all tree species in the stand.

Concentrated Use Area (CUA) - An undeveloped site or area located within a general forest area, generally not in the Infrastructure system, but receiving investments of management time and/or dollars because recreation use leaves evident impacts such as litter, vandalism or soil compaction. Any amenities in a CUA are placed and managed for resource protection rather than user convenience.

Concern Level - A particular degree or measure of viewer interest in the scenic qualities of the landscape, rated level (highest concern) to 3 (lowest concern).

constraint - A restriction or limit that must be met.

Continuous Inventory of Stand Condition (CISC) - A system that continuously reflects an up-to-date description of timber stands. It tells what and when actions are planned for stands and gives some information about actions that have taken place. It is also the name of the data base management computer system used for the storage and retrieval of data.

conventional logging - A term used to identify methods commonly used in an area to move logs from stump to mill.

conversion (forest management) – A change from one forest type to another in a stand on land that has the capability of both forest types.

coppice - A method of regenerating a stand in which all trees in the previous stand are harvested and the majority of regeneration is from stump sprouts or root suckers.

coppice with reserve - A two-aged regeneration method in which reserve trees are retained to goals other than regeneration. This method normally creates a two-aged stand.

cord - A unit of gross volume measurement for stacked, round wood based on external dimensions, generally implies a stack of 4 x 4 feet vertical cross section and 8 feet long. Contains 128 stacked cubic feet.

corridor - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. It can also be identified for wildlife habitat connecting, or protecting forest resources.

Council on Environmental Quality - An advisory council to the president established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

creel survey – A survey of anglers.

critical habitat – Habitat, determined by the Secretary of Interior, essential to the conservation of the endangered or threatened species.

crown class - A class of tree based on crown position relative to the crowns of adjacent trees.

cubic foot - A unit of measure reflecting a piece of wood 12 inches long, 12 inches wide, and 12 inches thick.

culmination of mean annual increment - Age at which average rate of annual tree growth stops increasing and begins to decline. Mean annual increment is expressed in cubic feet measure and is based on expected growth, according to the management intensities and utilization standards assumed in accordance with 36 CFR 219.16(a)(2)(i) and (ii). Culmination of mean annual increment includes regeneration harvest yields, and any additional yields from planned intermediate harvests.

cultural resources - Physical remains of districts, sites, structures, buildings, networks or objects used by humans in the past. They may be historic, prehistoric, archaeological, architectural or spiritual in nature. Cultural resources are non-renewable.

cunit - Equivalent to 100 cubic feet of solid wood. Commonly, 100 cubic feet is expressed as 1 CCF.

cut-offs - Analysis constraints that prevent the valuation of non-timber outputs produced in excess of demand plus x percent. It ensures that the assumptions of a horizontal demand curve are not violated.

cutting cycle – The planned interval between partial harvest in a stand being managed with an uneven-aged regeneration method.

D

daylighting - The practices of cutting back edges of roads or trails by removing shrub and tree growth.

decision criteria - Rules or standards used to evaluate and rank alternatives.

demand - The amount of an output that users are willing to take at specified price, time period, and condition of sale.

den trees - Trees having rainproof, weather- tight cavities used by wildlife.

desired future condition - An expression of resource goals that have been set for a unit of land. It is written as a narrative description of the landscape as it will appear when the goals have been achieved. The condition also includes a description of physical and biological processes, the environmental setting, and the human experience.

desired landscape character - Appearance of the landscape character to be retained or created over time, recognizing that a landscape is a dynamic and constantly changing community of plants and animals. It includes the combination of landscape design attributes and opportunities, as well as biological opportunities and constraints.

developed recreation - Recreation use or opportunities occurring at developed sites.

developed site - A discrete place containing a concentration of facilities and services used to provide recreation opportunities to the public and evidencing a significant investment in facilities and management under the direction of an administrative unit in the National Forest System. (Chpt 5 and infra 97)

Development Level - An indication of site modification based on classes in the Recreation Opportunity Spectrum. Development Level 1 equates to Primitive, with minimum site modification; 2 equates to Semi-Primitive Motorized/Nonmotorized, with little site modification; 3 equates to Roaded, with moderate modification; 4

equates to Rural, with heavy site modification; and 5 relates to Urban, with a high degree of site modification. See *Facilities level*, below, and FSM 2330.3, Exhibit 1.

diameter at breast height – A tree's diameter measured at about 4.5 feet (1.37m) above the forest floor on the uphill side of the tree. For the purposes of determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

diameter class – Any of the intervals into which a range of diameters of tree stems may be divided for classification and use, (e.g., 10-inch class includes diameters from 9.5 inches to 10.49 inches.

dispersed recreation – Recreation opportunities or use occurring in the general forest area. Not taking place in developed sites

disturbance (ecology) – Any relative discrete event in time that disrupts the ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment.

disturbance-recovery regime – A natural pattern of periodic disturbance followed by a period of recovery. Examples include fire or flooding.

diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

dominant crown class - Trees with crowns extending above the general level of the main canopy of even-aged groups of trees. They receive full light from above, and partly from the sides.

drainage area/basin - The total area above a given point on a stream that contributes to the flow at that point. Term is often used interchangeably with watershed.

drum chopping - Method used to prepare areas for reforestation. Large drums with cutting blades attached are pulled over areas by vehicles that include crawler-type tractors and rubber-tired skidders.

E

early successional forest – The biotic community that develops immediately following the removal or mortality of most or all of forest canopy, resulting in a predominance of woody species regeneration. As used in the Environmental Impact Statement and LMP, a stand age of 0 to 10 years is used to define this condition. See successional stage.

early-successional habitat – A vegetative condition typically characterized by low density to no tree canopy cover and an abundance of herbaceous and/or woody ground cover. This condition may include early-successional forest, maintained openings, pastures, balds, and open woodlands.

early successional species - Plant or animal species characteristic of early forest successional stages.

ecological classification system - A hierarchical system used to help organize and coordinate the classification of ecological types, units, and to make comparisons. Classification is ecologically based and integrates existing resource data including climate, topography, geology, soil, hydrology, and vegetation. The system includes many levels (from the top-down approach): domain, division, province, section, subsection, land type, land type association, land type phase, and site.

ecological management unit - A grouping of one or more soil series that have similar characteristics including texture, structure, or water retention capacity. EMUs are used in soil mapping.

ecosystem - A complete interacting system of organisms and their environment.

ecosystem/cover type - The native vegetation ecological community considered together with non-living factors of the environment as a unit. The general cover type occupying the greatest percent of the stand location. Based on tree or plant species forming a plurality of the stocking within the stand. May be observed in the field, or computed from plot measurements.

electronic sites - Areas designated for the operation of equipment which transmits and receives radio signals.

endangered species - Any species that is in danger of extinction throughout all or a significant portion of its range, other than members of the class Insecta that have been determined by the Department of Interior to constitute a pest whose protection under the provisions of this (Endangered Species Act of 1973) act would present an overwhelming and overriding risk to humans. It must be designated in the *Federal Register* by the appropriate secretary.

Endangered Species Act of 1973 - An act that enables endangered and threatened species to be conserved. It provides a program for the conservation of such species, and takes appropriate steps to achieve the purposes of the (relevant) treaties and conventions.

endemic – Species restricted to a particular geographic area. Usually limited to one or a few small streams or a single drainage.

ending inventory - The standing volume at the end of the planning horizon. It must be adequate for the maintenance of long-term sustained yield.

environment - All the conditions, circumstances, and influences surrounding and affecting the development of an organism, or group of organisms.

environmental consequence - The result or effect of an action upon the environment.

environmental impact statement - A disclosure document revealing the environmental effects of a proposed action, which is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to

the public and other agencies for comment and review. Final Environmental Impact Statement (FEIS) is the final version of the statement disclosing environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act.

environmental impact - Used interchangeably with environmental consequence or effect.

ephemeral streams - Streams having flows that occur for short periods of time in direct response to storm precipitation or snowmelt runoff. Their bottoms are always above the water table and do not contain fish or aquatic insects that have larvae with multiple-year life cycles. Ephemeral streams may have a defined channel, but may be manifested as a natural swale or depression with vegetation and organic material covering the bottom. They also may serve as a conduit for much of the sediment that enters the stream system. Large woody debris associated with ephemeral streams may also contribute significantly to the stability of a stream system.

Ephemeral streams that exhibit an ordinary high watermark, show signs of annual scour or sediment transport, are considered navigable waters of the United States.

erosion - The wearing away of the land surface by the action of wind, water, or gravity.

essential habitat - Habitat in which threatened and endangered species occur, but which has not been declared as critical habitat. Occupied habitat or suitable unoccupied habitat necessary for the protection and recovery of a federally designated threatened or endangered species.

eutrophication – Condition of a lake where deleterious effects are caused by increased nutrients (nitrogen and phosphorous), and a decrease in oxygen.

evapo-transpiration - The transfer of water vapor to the atmosphere from soil and water surfaces (evaporation), and from living plant cells (transpiration).

even-aged methods – Regeneration methods designed to maintain and regenerate a stand with a single age class.

even-aged silvicultural system - A planned sequence of treatments designed to maintain and regenerate a stand with one age class.

even-aged stand - A stand of trees containing a single age class in which the range of tree ages is usually less than 20 percent of rotation.

existing wilderness - Those areas already designated as wilderness by Congress. There are two such areas on the forests—the Cohutta Wilderness Area, and Ellicott Rock Wilderness Area.

extirpation – Extinction of a species from all or part of its range.

F

facilities level - A term that refers to campgrounds, expressed as Development Level 1-5. Customers in levels 1 and 2 campgrounds generally seek a relatively

primitive experience with a minimum of facilities for comfort or convenience. Tent camping dominates and spurs are too short to accommodate most RVs. Utilities are not provided and access is most difficult. Level 3 developments are called "Recreational Vehicle/Travel Trailer Parks" in national electrical and plumbing codes. The focus is on tent campers and small RVs that do not contain a water closet or bathing facilities. Spur length is usually limited to 35'; low amperage electrical service may be provided. Water hydrants are centrally located to serve 3-5 sites, and flush toilets are typical. Traditionally, a moderate degree of accessibility is provided. Level 4 and 5 developments serve users with RVs of all types. Showers, flush toilets and other amenities are available; individual water, sewer and electrical hookups are commonly provided; service buildings are located within 200 - 300 feet of all sites.

facility - A single or contiguous group of improvements that exists to shelter or support Forest Service Programs. The term may be used in either a broad or narrow context; for example, a facility may be a ranger station compound, lookout tower, leased office, work center, separate housing area, visitor center, research laboratory, recreation complex, utility system, or telecommunications site.

farmer-owned land - Owned by farm operators, excluding incorporated farm ownerships.

feathering - A treatment used along the edges of openings in the forest canopy to reduce shadow contrasts by manipulating the density and size of vegetation.

featured species - The selected wildlife species whose habitat requirements guide wildlife management including coordination, multiple use planning, direct habitat improvements, and cooperative programs for a unit of land. In context of land management planning, featured species are similar to management indicator species.

Federal Register - The designated document that notifies the public of federal actions and includes Notice of Intent, calls for public involvement, etc. It also publishes the regulations needed to implement those federal actions.

felling – The cutting down of trees.

final crop – That portion of the growing stock (to be) kept until final commercial harvest, (i.e., final product objective).

fire condition class – Based on coarse scale national data, classes measure general wildfire risk:

> **Class One –** Fire regimes are usually within historical ranges. Vegetation composition and structure are intact. The risk of losing key ecosystem components from the occurrence of fire is relatively low.
>
> **Class Two –** Fire regimes on these lands have been moderately altered from their historical range by increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified.
>
> **Class Three –** Fire regimes on these lands have been significantly altered from their historical return interval. The risk of losing key ecosystem

components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure and diversity have been significantly altered.

fire management effectiveness index - A measure of the effectiveness of annual fire management operational programs. Measured in dollars per thousand acres protected, the objective is to minimize the index value.

fire management plan – Strategic plans that define a program to manage wildland fires based on an area's approved land management plan. They must address a full range of fire management activities that support ecosystem sustainability, values to be protected, protection of firefighter and public safety, public health and environmental issues, and must be consistent with resource management objectives and activities of the area.

fire regime – A generalized description of the role a fire plays in the ecosystem. It is characterized by fire frequency, predictability, seasonality, intensity, duration, scale (patch size), and regularity or variability. Five combinations of fire frequency exist.

Groups One and Two include fire return intervals in the 0-35 range. One includes Ponderosa Pine, other long needle pine species, and dry site Douglas Fir. Group Two includes the drier grassland types - tall grass prairie, and some Pacific chaparral ecosystems.

Groups Three and Four include fire return intervals in the 35-100+ year range. Three includes interior dry site shrub communities including sagebrush and chaparral ecosystems. Group Four includes Lodgepole and Jack Pine.

Group Five is the long interval (infrequent), stand replacement fire regime and includes temperate rain forest, boreal forest, and high elevation conifer species.

fire use – The combination of wildland fire use and prescribed fire application to meet resource objectives.

fisheries classification - Water bodies and streams classed as having a cold- or warm-water fishery. This designation is dependent upon the dominant species of fish occupying the water.

fisheries habitat - Streams, lakes, and reservoirs that support fish.

floodplains - Lowland or relatively flat areas joining inland and coastal water including, at a minimum, that area subject to a 1-percent (100-year return period) or greater chance of flooding in any given year. Although floodplains and wetlands fall within the riparian area, they are defined here separately as described in the Forest Service Manual.

floor on first period production - The minimum harvest volume in the first period that should be produced to prevent a significant impact on the local economy.

forage - All browse and non-woody plants that are available to livestock or game animals used for grazing or harvested for feeding.

forage production - The weight of forage that is produced within a designated period of time on a given area. The weight may be expressed as green, air dry, or oven dry. The term may also be modified as to time of production including annual, current years, or seasonal forage production.

foreground - The area between the viewer and the middle ground in a landscape; generally from 0 to ½ mile distance.

forest - An area managed for the production of timber and other forest products, or maintained under woody vegetation for indirect benefits as protection of a watershed, recreation, or wildlife habitat.

forest type - A category of forest defined by its vegetation (particularly its dominant composition) as based on a percentage cover of trees.

forest development road - A road wholly or partly within, or adjacent to, and serving a part of the National Forest System. It also has been included in the Forest Development Road System Plan.

forest health – The perceived condition of a forest derived from concerns about factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance.

forest land - Land at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover, and not currently developed for non-forest use. Lands developed for non-forest use including areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, adjoining road clearing, and power line clearing of any width.

Forest and Rangeland Renewable Resources Planning Act of 1974 - An act of Congress requiring the preparation of a program for the management of the national forests' renewable resources, and of land and resource management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources.

Forest Service Handbook (FSH) - A handbook that provides detailed instructions for proceeding with specialized phases of programs or activities for Forest Service use.

Forest Service Manual (FSM) - Agency manuals that provide direction for Forest Service activities.

forest trail system - Trails that are part of the CNF transportation system. It is a designated path commonly used and maintained for hikers, horse riders, bicycles, or two-wheeled motorized vehicles.

forest type - A descriptive term used to group stands of similar composition and development because of given ecological factors, by which they may be differentiated from other groups of stands.

forest supervisor - The official responsible for administering the National Forest System lands in a Forest Service administrative unit. It may consist of two or more

national forests or all the forests within a state. The supervisor reports to the regional forester.

forest-wide standard - A performance criterion indicating acceptable norms, specification, or quality that actions must meet to maintain the minimum considerations for a particular resource. This type of standard applies to all areas of the forest regardless of the other management prescriptions applied.

free-to-grow – A seedling or small tree free from direct competition from other trees, shrubs, grasses, or herbaceous plants.

fuel break - Any natural or constructed barrier used to segregate, stop, and control the spread of fire, or to provide a control line from which to work.

fuel treatment - The rearrangement or disposal of fuels to reduce fire hazard. Fuels are defined as living and dead vegetative materials consumable by fire.

fuels management - The planned treatment of fuels to achieve or maintain desired fuels conditions.

fuelwood - Wood used for conversion to some form of energy.

G

game species - Any species of wildlife or fish for which seasons and bag limits have been prescribed, and which are normally harvested by hunters, trappers, and fishermen under state or federal laws, codes, and regulations.

General Forest Area (GFA) - National Forest lands not categorized as developed recreation sites, trails or wilderness. A GFA can be a logical working area, like a drainage, geographic area, forest district, etc. Typically containing a wide spectrum of settings and opportunities, facilities and sites located inside the boundary of a GFA are sometimes considered *concentrated use areas* (CUA) that may include dispersed front- and/or backcountry campsites, parking areas, pullouts and landings, river and road corridors, lake surfaces and day use areas such as OHV areas, climbing areas, target shooting areas, etc. Amenities or constructed features inside GFAs are primarily for resource protection.

geologic features - Landforms or other features of significant geologic interest that may require special management to protect the special qualities, or provide interpretation to the public.

geologic formation - A mappable body of rock identified by distinctive characteristics, some degree of internal homogeneity, and stratigraphic position. The name normally consists of two parts. The first is the name of the geographic locality where the formation was first identified and described. This is followed by a descriptive geologic term, usually the dominant rock type.

Geographic Information System - An information processing technology to input, store, manipulate, analyze, and display spatial resource data to support the decision-making processes of an organization. Generally, an electronic medium for processing

map information, typically used with manual processes to affect specific decisions about land base and its resources.

geological area - A unit of land that has been designated by the Forest Service as containing outstanding formations or unique geological features of the earth's development, including caves and fossils. Areas of this type and all other special interest areas are identified and formally classified primarily because of their recreational and educational values. Areas with similar types of values of scientific importance are formally classified as research natural areas.

global ranks – Ranks assigned by the Nature Conservancy and state heritage programs based on number of occurrences.

grassland - Areas on which vegetation is dominated by grasses, grass-like plants, forbs, and/or cryptogams (mosses, lichens, and ferns), provided these areas do not qualify as built-up land or cultivated cropland. Examples include tall grass and short grass prairies, meadows, cordgrass marshes, sphagnum moss areas, pasturelands, and areas cut for hay.

grazing - Consumption of range or pasture forage by animals.

grazing capacity - The maximum stocking rate possible without inducing damage to vegetation or related resources.

grazing permit - Official, written permission to graze a specified number, kind, and class of livestock for a specific period on a defined range allotment.

gross receipts - A total of all funds received by the U.S. Treasury as a result of Forest Service activities.

groundwater - Water in a saturated zone in a geologic stratum. Water stored below the water table where the soil (or other geologic material) is saturated.

group selection – An uneven-aged regeneration method in which trees are removed periodically in small groups. Uneven age classes for trees are established in small groups. The width of groups is about twice the height of the mature trees, with small openings providing microenvironments suitable for tolerant regeneration, and the larger openings providing conditions suitable for more intolerant regeneration.

growing stock trees - Live trees, meeting specified standards of quality or vigor, included in growth and yield projections to arrive at the allowable sale quantity.

growing stock volume - Volume (cubic feet) of solid wood in growing stock trees 5 inches DBH and larger, from a 1-foot stump to a minimum 4-inch top diameter, outside bark, on the central stem. Volume of solid wood in primary forks from the point of occurrence to a minimum 4-inch top diameter outside bark is included.

H

habitat - The native environment of an animal or plant.

harvest cutting – An intermediate for final cutting that extracts salable trees.

harvesting method - A procedure by which a stand is logged. Emphasis is on meeting logging requirements rather than silvicultural objectives.

herbicide – A pesticide used for killing or controlling the growth of undesirable plants.

Heritage Sites/Assets - Remnants of past cultures that remind us of the centuries-old relationship between people and the land (from National Heritage Strategy); property, plant or equipment that are unique for one or more of the following reasons: (1) historical or natural significance; (2) cultural, educational or artistic/aesthetic significance; or (3) significant architectural characteristics.

high-grading - The removal from the most commercially valuable trees, often leaving a residual stand composed of trees of poor condition or species composition.

historic landscapes - Industrial, agricultural, pastoral or domestic landscapes that have evolved over many years from human alteration. They are commonly functional and often vernacular, and may not always be visually pleasing, often responding to specific functions or topography, not formally planned or designed. They may be informal to the degree that they appear to be natural occurrences, or the spatial organization of built and natural elements may be quite traditional or formal. They are identifiable and can be mapped, either as point-specific features or enclaves within a larger landscape, as entire landscapes themselves, or as a combination of both.

human resource programs - Any of the federal labor programs providing work experience for local people.

hydric soils – Soils developed in conditions where soil oxygen is limited by the presence of saturated soil for long periods during the growing season.

I

immediate foreground - The area in the landscape from the viewer out to 300 feet distance.

improved pasture - Fenced, fertilized pastures intensively managed for livestock grazing.

improvement cutting – The removal of less desirable trees in a stand of poles or larger trees, primarily to improve composition and quality.

industrial fuelwood - Wood to be used specifically by industry for production of energy.

industrial wood - All commercial round wood products, except fuelwood.

infestation – The attack by macroscopic organisms in considerable concentration. Examples are infestations of tree crowns by budworm, timber by termites, soil or other substrates by nematodes or weeds.

INFRA infrastructure - An integrated database for collection/storage/use of information about features, land units, facilities and utilities, accessibility and real

property. For recreation management, INFRA holds information on O&M costs, recreation funding shortfalls, recreation use data, information on accessibility, and inventories of facilities. INFRA brings together Oracle, Arc Info and Arc View GIS technology, and supplements recreation management systems including SMS, ROS and Benefits Based Management.

initial attack – The aggressive response to a wildland fire based on values to be protected, benefits of response, and reasonable cost of response.

in-stream flow - The presence of adequate stream flow in channels necessary to maintain the integrity of the stream channel, and protection of downstream beneficial uses including fish and wildlife needs, outdoor recreation uses of water, and livestock watering needs.

integrated pest management (IPM) – The maintenance of destructive agents, including insects at tolerable levels, by the planned use of a variety of preventive, suppressive, or regulatory tactics and strategies that are ecologically and economically efficient and socially acceptable.

Interdisciplinary Team - A group of resource specialists (e.g.: forester, wildlife biologist, hydrologist, etc.) responsible for developing the LMP/Environmental Statement, and for making recommendations to the forest supervisor.

intermediate crown class - Trees with crowns extending into the lower portion of the main canopy of even-aged groups of trees, but shorter in height than the co-dominants. They receive little direct light from above, and none from the sides.

intermediate treatments - A collective term for any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment of regeneration and prior to final harvest.

intermittent streams – Streams that flow in response to a seasonally-fluctuating water table in a well-defined channel. The channel will exhibit signs of annual scour, sediment transport, and other stream channel characteristics, absent perennial flows. Intermittent streams typically flow during times of elevated water table levels, and may be dry during significant periods of the year, depending on precipitation cycles.

interpretive association - A nonprofit, tax-exempt corporation or organization whose purpose is extending and enhancing the ability of the Forest Service to provide customer service to National Forest visitors. Interpretive Associations work cooperatively with the Forest Service in educating the public about natural and cultural issues on public lands.

interpretive services - Visitor information services designed to present inspirational, educational, and recreational values to forest visitors in an effort to promote understanding, appreciation, and enjoyment of their forest experience.

intolerant – A plant requiring sunlight and exposure for establishment and growth.

L

land exchange - The conveyance of non-federal land or interests in the land in exchange for National Forest System land or interests in land.

landing – A cleared area in the forest to which logs are yarded or skidded for loading onto trucks for transport.

landline location - Legal identification and accurate location of national forest property boundaries.

land management planning – A formal process of management planning involving four interactive steps: monitoring, assessment, decision making, and implementations as described in the Federal Code of Regulations.

landscape - An area composed of interacting ecosystems that are repeated because of geology, land form, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern that are determined by interacting ecosystems.

landscape character - Particular attributes, qualities, and traits of landscape that give it an image and make it identifiable or unique.

land type - An intermediate level in the ecological classification system hierarchy that addresses land areas ranging in size from hundreds of acres up to ten thousands of acres. These units typically have similarities in landform, natural vegetative communities, and soils.

land type association - A group of landtypes. The landtypes in the association are sufficiently homogeneous to be considered as a whole for modeling the future outputs and effects of planned management activities. Landtype associations may not follow watershed boundaries, and are defined on the basis of general similarities in climate, geology, landform, and vegetation.

Landtype Phase – The most detailed level in the ecological classification system hierarchy that addresses local geology, soils, streams, and vegetation types. Land areas are generally less than 100 acres in size.

large woody debris (LWD) (coarse woody debris) (CWD) – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses, on the ground in forest stands, or in streams.

late- seral (successional) stage - .The stage of forest development at which overstory trees have attained most of expected height growth and have reached ecological maturity. As used in the Environmental Impact Statement and LMP, a stand age of greater than 80 years is generally used to define this condition. Old-growth forests occur during the later periods of this seral stage at ages that vary by forest type and in response to a variety of environmental conditions. See successional stage.

lease - A contract between the landowner and another granting the latter the right to search for and produce oil, gas, or other mineral substances (as specified in the

document) on payment of an agreed rental, bonus, or royalty. This right is subject to the terms, conditions, and limitations specified in the document.

leave tree – A tree (marked to be) left standing for wildlife, seed production, etc, in an area where it might otherwise be felled.

Limits Of Acceptable Change (LAC) - A nine step planning process used to establish acceptable wilderness resource and social conditions and prescribe appropriate management actions.

Locally rare – Species for which representation on the CNF is a concern. Development of a locally rare species list is at the discretion of the CNF and may be completed in cooperation with state and other federal agencies as well as other interested groups, organizations, or individuals.

local road - Roads that connect terminal facilities with forest collector or forest arterial roads, or public highways. Forest local roads may be developed and operated for either long- or short-term service. These roads are generally single lane.

logging - The felling, skidding, on-site processing, and loading of trees or logs onto trucks.

long-term facilities - Facilities that are developed and operated for long-term land management and resource utilization needs. They may be operated for constant or intermittent service.

1. **constant service -** Facilities developed and operated for continuous or annual recurrent service.
2. **intermittent service -** Facilities developed and operated for periodic service and closed for more than one year between periods of use. Closure is by means other than a gate.

long-term sustained-yield capacity - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity, consistent with multiple-use objectives.

low PSI skidder - A term used to identify any one of several types of vehicles used to move logs from stump to log loading area. Low PSI (pounds per square inch) identifies those vehicles that, because of design of tracks, wheels, or suspension system, exert much lower pressure on ground surface than other types of ground-based skidding vehicles.

M

M&E - Monitoring and Evaluation, determining on a sample basis how well the objectives of Forest Plan management practices have been met and what effects those practices had on the land and environment.

machine planting - A method by which tree seedlings are planted by mechanical means rather than by hand.

management action – A set of management activities applied to a land area to produced a desired output.

management action controls – Specifies the acreage or the proportion of an analysis unit assigned to a set of management actions. The controls can be specified in terms of greater than or equal to, equal to, or less than equal to some amount, or proportion of the analysis unit acreage.

management area - A selected grouping of capability or analysis areas selected through evaluation procedures used to locate decisions, and resolve issues and concerns. An area with similar management objectives, and a common management prescription.

management attainment report (MAR) - A process used in determining whether work is progressing as planned. It provides the manager with information for measuring progress against objectives, information for measuring self and subordinates' performance, and an indication of a reporting unit's performance.

management concern - An issue, problem, or condition which constrains the range of management practices identified by the Forest Service in the planning process.

management direction - A statement of multiple-use and other goals and objectives. The associated management prescriptions, and standards and guidelines for attaining them.

management emphasis - The multiple-use values to be featured or enhanced.

management indicator species – An animal or plant selected for use as a planning tool in accordance with 1982 NFMA regulations (36 CFR 219.19). These species are used to help set objectives, analyze effects of alternatives, and monitor plan implementation. They are chosen because their population changes are believed to indicate the effects of management on selected biological components.

management intensity - A management practice or combination of management practices and associated costs designed to obtain different levels of goods and services.

management opportunity - A statement of general actions, measures, or treatments that address a public issue or management concern in a favorable way.

management practice - A specific action, measure, course of action, or treatment undertaken on a forest.

management prescription - Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

management situation - A comprehensive statement of the planning area resources, its history as it may influence planning, past and present uses, and a review of the public issus directly concerned with the area.

management team – A decision-making group consisting of the forest supervisor, staff officers, and district rangers.

management type - The tree species or species group that should be grown on a specific site, whether or not it presently occupies the site that best suits the particular site soil, aspect, elevation, and moisture provided by the area and the forest plan's objectives.

mast tree - Generally hardwood trees of the heavy seeded variety including oaks, hickories, walnut, beech—25 years and older capable of producing frequent seed crops to feed a variety of wildlife species.

mature timber - The stage at which a crop or stand of trees best fulfills the main purpose for which it was grown.

maximum modification - A visual quality objective in which man's activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

mean annual increment of growth - The total increase in girth, diameter, basal area, height, or volume of individual trees or a stand up to a given age divided by that age.

meaningful measures - A moniker for the Forest Service's National Recreation Business Management System, MM is a six-step management system for professional, accountable and visitor-responsive site and project-level management. Accomplishment is measured by established standards of quality for recreation services; the system determines costs to attain those standards, sets priorities for work to be accomplished and budget allocations, and measures the actual success at attaining these quality standards.

mechanical site preparation - Soil disturbance by mechanical chopping, furrowing, dozing, or disking to prepare areas for reforestation. Objective is to reduce plant competition for trees to be planted.

mechanical transport - Any contrivance for moving people or material in or over land, water, or air, having moving parts, that provides a mechanical advantage to the user, and that is powered by a living or non-living power source. This includes but is not limited to, sailboats, hang gliders, parachutes, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include skis, snowshoes, rafts, canoes, sleds, travois, or similar primitive devices without moving parts.

mesic – Sites or habitats characterized by intermediate moisture conditions, i.e., neither decidedly wet or dry.

middle ground - The space between the foreground and the background in a landscape; generally ½ mile to 4 miles distance from the viewer.

mid-seral (successional) stage – The stage of forest development during which distinct overstory, midstory, and understory canopies are developed. As used in the

Environmental Impact Statement and LMP, a stand age of 41 to 80 years is generally used to define this condition. See successional stage.

mineral exploration - The search for valuable minerals on lands open to mineral entry.

mineral soil - Weathered rock materials without any vegetative cover.

mineral resource - A known or undiscovered concentration of naturally occurring solid, liquid, or gaseous material in or on the earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

minerals (leasable) - Coal, oil, gas, phosphate, sodium, potassium, oil shale, sulphur, and geothermal steam. All hard-rock minerals that occur on acquired lands, as opposed to public domain lands, are leasable.

minerals (salable) - Common variety deposits that—although they may have value or use in trade, manufacture, the sciences, or in the mechanical or ornamental arts—do not possess a distinct, special economic value for such use over and above the normal uses of the general sum of such deposits. These may include sand, stone, gravel, pumicite, cinders, pumice (except that occurring in pieces more than two inches on a side), clay, and petrified wood.

minimum management requirement - Any constraint imposed to comply with 36 CFR 219.27 and other legal restrictions that must be met by benchmark solutions as noted in 36 CFR 219.11(e)(1). These include requirements including conserving soil productivity, maintaining minimum viable populations of wildlife, preserving the habitat of endangered species' habitat, dispersing openings, and limiting cut size. It also includes any other standards and guidelines, including best management practices that serve to define management prescriptions and resource response.

mitigation - Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

modification - A visual quality objective in which human activity may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture appearing as a natural occurrence when viewed in foreground or middle ground.

monitoring - Techniques used to validate standards, determine visitor expectations, needs and preferences and to assess resource conditions.

montane – Relating to the zone of relatively moist, cool upland ;slopes characterized by the presence of large evergreen trees as a dominant life form.

mortality - Dead or dying trees resulting from forest fire, insect, diseases, or climatic factors.

motorized equipment - Machines that use a motor, engine, or other non-living power source. This includes but is not limited to such machines as chain saws, aircraft, snowmobiles, generators, motor boats, and motor vehicles. It does not

include small battery or gas powered hand carried devices such as shavers, wristwatches, flashlights, cameras, stoves, or other similar small equipment.

multiple use - The management of all the various renewable surface resources of the National Forest System so that they are used in a manner that will best meet the needs of the American people. Making the most judicious use of the land for these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions.

multipliers - The ratio of a total impact to a component of the impact in input/output analysis. An example would be the ratio of the sum of direct, indirect, and induced impacts to direct impacts.

N

National Environmental Policy Act (NEPA) of 1969 - An act to declare a national policy that will encourage productive and enjoyable harmony between humankind and the environment. It was created to promote efforts that will prevent or eliminate damage to the environment, biosphere, and stimulate the health and welfare of humanity. In addition, the act was crafted to enrich the understanding of the ecological systems and natural resources important to the nation, and establish a Council of Environmental Quality.

National Forest Land and Resource Management Plan (Forest Plan) - A plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, that guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands of a given national forest.

National Forest Management Act (NFMA) of 1976 - Act passed as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of regional guides and forest plans, and the preparation of regulations to guide them.

National Forest System (NFS) - All national forest lands reserved or withdrawn from public domain of the United States and acquired through purchase, exchange, donation, or other means. National Grasslands and land utilization projects administered under Title III of the Bankhead–Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010–1012), and other lands, waters, or interests that are administered by the Forest Service, or are designated for administration through the Forest Service as a part of the system.

National Forest System Land - Federal land that has been legally designated as national forests or purchase units, and other land under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III land.

National Recreation Trails - Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National recreation trails provide a variety of outdoor recreation uses, in or reasonably accessible, to urban areas.

National Register of Historic Places - The National Register of Historic Places is the Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

National Recreation Trails - Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National recreation trails provide a variety of outdoor recreation uses in or reasonably accessible to urban areas.

National Visitor Use Monitoring (NVUM) - A systematic process to estimate annual recreation and other uses of National Forest lands through user surveys.

National Wild and Scenic Rivers System - Rivers with outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act of October 2, 1968 for preservation of their free-flowing condition.

National Wilderness Preservation System - All lands covered by the Wilderness Act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.

natural regeneration - An age class created from natural seeding, sprouting, suckering, or layering.

net annual growth - The net change in merchantable volume expressed as an annual average between surveys in the absence of cutting (gross growth minus mortality).

net public benefits - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued. Net public benefits are measured by quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

no-action alternative - The most likely condition expected to exist in the future if current management direction would continue unchanged.

non-chargable volume - All volume not included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity.

non-commodity output - A resource output that cannot be bought and sold.

non-declining yield - A level of timber production planned so that the planned sale and harvest for any future decade is equal to, or greater than the planned sale and harvest for the preceding decade.

non-forest land - Land that has never supported forests and lands formerly forested where use for timber utilization is precluded by development for other use. Lands that never have had, or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for non-forest use.

non-game species - Any species of wildlife or fish which is ordinarily not managed or otherwise controlled by hunting, fishing, or trapping regulations. The designation may vary by state.

non-point source pollution – A diffuse source of pollution not regulated as a point source. May include atmospheric, deposition, agricultural runoff, and sediment from land-distributing activities.

non-stocked stands - Stands less than 16.7 percent stocked with growing stock trees.

non-timber forest products - All forest products except timber, including resins, oils, leaves, bark, plants other than trees, fungi, and animals or animal products.

O

objective - A concise, time-specific statement of measurable planned results that respond to pre-established goals. It forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

off-highway vehicle (OHV) - Any vehicle capable of being operated off established roads; e.g., motorbikes, four-wheel drives, and snowmobiles. (Also referred to as OHV or off-highway vehicle)

off-road vehicle (ORV) - Any motorized vehicle designed for or capable of cross county travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain; except that term excludes (A) any registered motorboat, (B) any fire, military, emergency or law enforcement vehicle when used for emergency purposes, and any combat or combat support vehicle\when used for national defense purposes, and (C) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.

offstream use – Water withdrawn or diverted from a ground or surface-water source for public water supply, industry, irrigation, livestock, thermoelectric power generation, and other uses.

old growth forests – An ecosystem distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics including tree size, accumulation of large dead woody material, number of canopy layers, species composition, and ecosystem function. Old growth is not necessarily virgin or primeval. It can develop over time following human disturbances, just as it does following

natural disturbances. Old growth encompasses older forests dominated by early seral species, and forests in later successional stages dominated by shade tolerant species.

on-site - A term referring to species normally found on a site under natural conditions. The same or contiguous property that may be divided by a public or private right-of-way, provided that the entrance and exit between the properties is at a crossroads intersection, and that access is by crossing, as opposed to going along the right-of-way.

operating plan - A written plan, prepared by those engaged in mining activity on the forests, and approved by a forest officer for prospecting, exploration, or extraction activities that are slated to take place on National Forest System land.

ordinary high water mark - The line on the shore established by the fluctuation of water, and is indicated by physical characteristics including a clear, natural line impressed on the bank; shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter, debris, or other appropriate means that consider the characteristics of the surrounding area.

output - The goods, end products, or services that are purchased, consumed, or used directly by people. Goods, services, products, and concerns produced by activities that are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. A broad term for describing any result, product, or service that a process or activity actually produces.

output, minimum level - The amount of an output that will occur regardless of management activity.

outstanding mineral rights - Instances in which the minerals in federally- owned lands were severed prior to the transaction in which government acquired the land. Such rights are not subject to the Secretary of Agriculture's rules and regulations. Removal or extraction of these minerals must be allowed in accordance with the instrument severing the minerals from the surface and under applicable state and local laws and regulations.

overnight use developed sites (OUDS) - National Forest sites with facilities for overnight use, including campgrounds, cabins/fire lookouts, lodges, horse camps, etc. Recreation residences are not included in this definition.

overstory - That portion of trees in a two- or multi-layered forest stand that provides the upper crown cover.

overstory removal - The cutting of trees comprising an upper canopy layer in order to release trees or other vegetation in an understory.

overtopped (suppressed) crown class - Trees of varying levels of vigor that have their crowns completely covered by the crowns of one or more neighboring trees.

P

PAOT - Persons-at-one-time; a measure of recreation carrying capacity, especially for developed sites. National conventions include 5 persons per family picnic/camp unit, 3.5 persons per parking lot stall at a trailhead or visitor center, 1.5 persons per motorcycle parking stall and 40 persons per tour bus parking stall.

partial retention - A visual quality objective which in human activities may be evident, but must remain subordinate to the characteristic landscape.

partnership - Voluntary, mutually beneficial and desired arrangement between the Forest Service and another or others to accomplish mutually agreed-on objectives consistent with the agency's mission and serving the public's interest.

payments in lieu of taxes - Payments to local or state governments based on ownership of federal land, and not directly dependent on production of outputs or receipt sharing.

per capita use - The average amount of water used per person during a standard time period, generally per day.

perennial stream - Any watercourse that generally flows most of the year in a well-defined channel and is below the water table. Droughts and other precipitation patterns may influence the actual duration of flow. It contains fish or aquatic insects that have larvae with multi-year life cycles. Water-dependent vegetation is typically associated with perennial streams.

person-year - About 2,000 working hours that may be filled by one person working during the course of one year or several people working a total of 2,000 hours.

petrographic – The description and systematic classification of rocks.

physiographic region - A region of similar geologic structure and climate that has had a unified geomorphic history.

planning area - The area of the National Forest System covered by a regional guide or forest plan.

planning criteria - Standards, tests, rules, and guidelines by which the planning process is conducted, and upon which judgments and decisions are based.

planning horizon - The overall time period considered in the planning process that spans all activities covered in the analysis or plan. All future conditions and effects of proposed actions which would influence the planning decisions.

planning period - One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits.

Potential Natural Vegetation – the biotic community that would become established if all successional sequences were completed without additional human interference under the present environmental conditions. Classifications of Potential Natural Vegetation are based on existing vegetation, successional relationships, and

environment factors (e.g., climate, geology, soil, natural disturbances, etc.) considered together.

PNV Sources: FSM 2060, Tuxen 1956 as cited in Mueller-Dombois and Ellenberg 1974, USDA Forest Service Ecosystem Management Coordination, Resource Information Group, <http://www.fs.fed.us/emc/rig/includes/section1.pdf>

pre-commercial thinning - The selective felling, deadening, or removal of tree in a young stand not for immediate financial return, but primarily to accelerate diameter increment on the remaining stems. To maintain a specific stocking or stand density range, or to improve the vigor and quality of the remaining trees.

prescribed fire – Any fire ignited by management actions to meet specific objectives including disposal of fuels, and controlling unwanted vegetation. The fires are conducted in accordance with prescribed fire plans, and are also designed to stimulate grasses, forbs, shrubs, or trees for range, wildlife, recreation, or timber management purposes.

present net value - The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.

preservation - A visual quality objective that provides for ecological change only.

presuppression - Activities required in advance of fire occurrence to ensure effective suppression action, including: (1) recruiting and training fire forces, (2) planning and organizing attack methods, (3) procuring and maintaining fire equipment, and (4) maintaining structural improvements necessary for the fire program.

primary trout stream - Streams that contain naturally-reproducing populations of brook, rainbow, and/or brown trout.

Primitive ROS – SEE Recreation Opportunity Spectrum (ROS)

primitive road - Roads constructed with no regard for grade control or designed drainage, sometimes by merely repeated driving over an area. These roads are single lane, usually with native surfacing and sometimes passable with four-wheel drive vehicles only, especially in wet weather.

process records - A system that records decisions and activities that result from the process of developing a forest plan, revision, or significant amendment.

proclamation boundary - The boundary contained within the presidential proclamation that established the national forest.

productive deferred - Productive (capable) forest land which has been legislatively designated or administratively designated by the Secretary of Agriculture or Chief of the Forest Service for wilderness study or possible additions to the Wilderness System. This classification includes RARE II area designated as wilderness, but does not include RARE II areas designated as “further planning.”

productivity class - A classification of the capacity of a given piece of land for timber growth is expressed in cubic feet per acre a year.

> **Class I -** Lands capable of producing 120 cubic feet or more per acre a year.
> **Class II -** Lands capable of producing 85 to 119 cubic feet per acre a year.
> **Class III -** Lands capable of producing 50 to 84 cubic feet per acre a year.
> **Class IV -** Lands capable of producing 20 to 49 cubic feet per acre a year.

program - Sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishments.

program budget - The schedule of projects and activities to be carried out on the forest for a year for which funds have been appropriated.

program development and budgeting - The process by which activities for the forest are proposed and funded.

project - A work schedule prescribed for a project area to accomplish management prescriptions. An organized effort to achieve an objective identified by location, activities, outputs, effects, time period, and responsibilities for execution.

propagule - Any part of an organism that can be detached and disseminated that will grow to produce a new individual.

proposed action - In terms of the National Environmental Policy Act, the project, activity, or decision that a federal agency intends to implement or undertake. The proposed action described in the Environmental Impact Statement is the LMP.

proposed wilderness – Areas recommended for wilderness by the Forest Service as a result of the RARE II study, but which have yet to be acted on by Congress.

prospecting permit - A written instrument or contract between the landowner and another conveying to the latter the right to enter the former's property and search for mineral materials. Two types of permits are used: (1) a BLM Prospecting Permit is issued by the Bureau of Land Management upon recommendation of the Forest Service. In most cases, these are preference right permits in which the prospector has the first opportunity, to the exclusion of all others, to lease any minerals discovered, and (2) a Forest Service Prospecting Permit issued by the Forest Service. No preference rights are conveyed under Forest Service permits, except in some cases of common varieties on acquired lands.

public domain land - Original holdings of the United States that were never granted or conveyed to other jurisdictions or reacquired by exchange for other public domain lands.

public issue - A subject or question of widespread public interest relating to management of the National Forest System.

public participation activities - Meetings, conferences, seminars, workshops, tours, written comments, survey questionnaires, and similar activities designed or held to obtain comments from the general public and specific publics.

public roads - Roads across national forest land which were in place as public ways when these lands were acquired. These roads may be a part of the forest, state, or county system, and may be maintained by any of these agencies.

public supply – Water withdrawn by public and private water suppliers and delivered to users.

pulpwood - Wood cut and prepared primarily for manufacture into wood pulp.

pure stand - A stand composed of essentially a single tree species, conventionally at least 85 percent based on numbers, basal areas, or volumes.

Q

qualifiers – Measurable characteristics of outputs and activities. They characterize properties or attributes of activities or outputs.

R

raking - A term used in land clearing whereby crawler tractors, or other types of similar heavy equipment, with a large rake device attached to the front end, are used to push clearing debris into piles or windrows.

range allotment - A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range.

range management - The art and science of planning and directing range use to obtain sustained maximum animal production, consistent with perpetuation of the natural resources. Two types of range management are:

1. **extensive -** To control livestock numbers within present capacity of the range, but little or no attempt is made to achieve uniform distribution of livestock. Range management investments are minimal and only to the extent needed to maintain stewardship of the range in the presence of grazing. Past resource damage is corrected and resources are protected from natural catastrophes.

2. **intensive -** To maintain full plant vigor and to achieve full livestock utilization of available forage. This goal is achieved through implementation of improved grazing systems and construction and installation of range improvements. Cultural practices, (seeding and fertilizing), to improve forage quality and quantity may be used.

ranger district - Administrative subdivisions of the forest supervised by a District Ranger who reports to the Forest Supervisor.

rare species – Any native or once-native species of wild animal which exists in small numbers, and has been determined to need monitoring. May include peripheral species.

real dollar value - A monetary value, which compensates for the effects of inflation.

receipt shares - The portion of receipts derived from Forest Service resource management that is distributed to state and county governments, including the Forest Service, 25 percent fund payments.

reconstruction - Work that includes, but is not limited to, widening of roads, improving alignment, providing additional turnouts, and improving sight distance that improve the standard to which the road was originally constructed. Also undertaken to increase the capacity of the road or to provide greater traffic safety.

Record of Decision - A document separate from, but associated with an environmental impact statement that publicly and officially discloses the responsible official's decision on the alternative assessed in the environmental impact statement chosen to implement.

recreation - Leisure time activity including swimming, picnicking, camping, boating, hiking, hunting, and fishing.

Recreation Capacity - A measure of the number of people a site can reasonably accommodate at one time; sometimes measured as PAOT or RVDs.

Recreation Information Management (RIM) - A computerized system for gathering and storing national forest recreation information for purposes of resource planning, management, and research.

Recreation Opportunity Spectrum (ROS) - A method for classifying types of recreation experiences available or for specifying recreation experience objectives desired in certain areas. Classes are: Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, Rural, and Urban.

Primitive ROS - An area characterized by having essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

The recreation experience opportunity level provided would be characterized by the extremely high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsmen and outdoor skills in an environment that offers a high degree of challenge and risk.

Semi-Primitive Non-Motorized (ROS) - An area characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users (or concentration of users) is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but are subtle.

The recreation experience opportunity level provided would be characterized by the high, but not extremely high (or moderate) probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an

environment that offers challenge and risk. (The opportunity to have a high degree of interaction with the natural environment.) Motorized use is not permitted.

Semi-Primitive Motorized (ROS) - An area characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users (or concentration of users) is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but are subtle.

The recreation experience opportunity level provided would be characterized by the high, but not extremely high (or moderate) probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk. (The opportunity to have a high degree of interaction with the natural environment.) Motorized use is permitted.

Roaded Natural (ROS) - An area characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

The recreation opportunity experience level provided would be characterized by the probability for equal experiencing of affiliation with individuals and groups and for isolation from sights and sounds of humans. Opportunities for both motorized and non-motorized forms of recreation may be provided.

> ***Remote Roaded Natural (RN2)** - A sub classification of Roaded Natural and accounts for areas on the National Forest that either buffer SPNM areas or stand alone as tracts of land 1,500 acres or larger with a low road density of 1.5 miles of road/1,000 acres. Inventoried RN2 areas are managed to provide additional semi-primitive recreation settings either motorized or non-motorized. Interaction between users is low, but with evidence of other users prevalent.
>
> **Roaded Natural (RN1) -** A sub classification of Roaded Natural settings and are located within a half mile of an open road. These settings include the majority of developed recreation sites such as campgrounds, picnic areas and river access points. RN1 also accounts for undeveloped, but highly roaded settings popular for dispersed recreation activities such as hunting, fishing, camping and horseback riding. Interaction between users is moderate, but with evidence of other users prevalent. Opportunities for motorized forms of recreation may predominate.

Rural (ROS) - A classification for areas characterized by a substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil, but harmonize with the natural environment. A considerable number of facilities are designed for

use by a large number of people. Moderate densities are provided away from developed sites. Facilities for intensified motorized use and parking are provided.

The recreation opportunity experience level provided would be characterized by the probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. These factors are generally more important than the setting. Opportunities for wildland challenge, risk taking, and testing of outdoor skills are generally unimportant.

Urban (ROS) - An area characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resources modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sound of humans, on-site, are predominant. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

The recreation opportunity experience level provided would be characterized by the probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. Experiencing natural environments, having challenges and risk afforded by the natural environment, and the use of outdoor skills are relatively unimportant. Opportunities for competitive and spectator sports and for passive uses of highly human-influenced parks and open spaces are common.

recreation opportunity class - An assessment of the general potential of the site for outdoor recreation.

Recreation Residence - A privately owned residence located on National Forest lands through special use authorization.

recreation visit - The entry of one person upon a National Forest to participate in recreation activities for an unspecified period of time. A NF visit can be composed of multiple site visits.

recreation visitor day (RVD) - Recreational use of National Forest sites, or areas of land or water, that aggregates 12 visitor-hours; may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups. This was the basic use-reporting unit in the Recreation Information Management (RIM) System.

reforestation – The re-establishment of forest cover either naturally (by natural seeding, coppice or root suckers) or artificially by direct by seeding, or planting.

regeneration - Seedlings or saplings existing in a stand. The act of renewing tree cover by establishing young trees naturally or artificially.- Syn. Reforestation.

regeneration cutting - Any removal of trees intended to assist regeneration already present or to make regeneration possible.

regeneration (reproduction) method - A cutting procedure by which a new age class is created. The major methods are clearcutting, seed-tree, shelterwood, selection, and coppice.

regeneration (reproduction) period - The time between the initial regeneration cutting and the successful re-establishment of a new age class by natural means, planting, or direct seeding.

Region 8 - The states that make up the Southern Region of the USDA Forest Service.

Regional Forester - The official responsible for management of National Forest land within a USDA Forest Service region.

regulated harvest – Includes any volume scheduled in calculations of the allowable sale quantity which is harvested from suitable forest land.

release and weeding – A silvercultural treatment designed to free desirable trees from competition with overstory trees, less desirable trees, or grasses and other forms of vegetative growth. It includes release of natural and artificial regeneration.

removal cut - The cut which removes the last seed bearers of a seed tree or shelterwood regeneration method after the new seedling stand is considered to be established.

research natural area - An area set aside by the Forest Service specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. Commercial exploitation is not allowed and general public use is discouraged.

reserve trees - Trees, pole-sized or larger, retained after the regeneration period under the clearcutting, seed-tree, shelterwood, or coppice methods.

reserved mineral rights - Refers to those cases wherein the minerals were severed from the surface during the transaction whereby the government acquired the land. These rights are subject to the Secretary of Agriculture's rules and regulations that were applicable at the time of the transaction.

resource - An aspect of human environment which renders possible, or facilitates the satisfaction of, human wants, and the attainment of social objectives.

resource allocation model - A mathematical model using linear programming that will allocate land to prescriptions and schedule implementation of those prescriptions simultaneously. The end purpose of the model is to find a schedule and allocation that meets the goals of the forest and optimizes some objective function including minimizing costs. The model used for this planning is called spectrum.

resource use and development opportunities - A possible action, measure, or treatment and corresponding goods and services identified and introduced during the scoping process. It may subsequently be incorporated into and addressed by the land and resource management plan in terms of a management prescription.

responsible line officer - The Forest Service employee who has the authority to select and/or carry out a specific planning action.

retention - A visual quality objective in which man's activities are not evident to the casual forest visitor.

revegetation - The re-establishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through the direct action of humans (e.g.: afforestation and range reseeding).

revision - To make the plan new or up-to-date. Plan revision must be considered and approved in accordance with the requirements for the development and approval of a forest plan. Revisions take place every 10-15 years, but may occur more frequently if conditions or public demands change significantly.

right-of-way - A right of use across the lands of others. It generally does not apply to absolute purchase of ownership. Land authorized to be used or occupied for the construction, operation, maintenance, and termination of a project or facility passing over, upon, under, or through such land.

riparian – Land areas directly influenced by water. They usually have visible vegetative or physical characteristics showing this water influence. Streamside, lake borders, and marshes are typical riparian areas.

riparian areas - Areas with three-dimensional ecotones of interaction that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the watercourse at a variable width.

riparian corridor - An administrative zone applied to both sides of a stream or along side a pond, lake, wetland, seep or spring. It is a fixed width by stream type that may fall within or beyond the true riparian area.

riparian dependent species - Species that are dependent on riparian areas during at least one stage of their life cycle.

riparian ecosystem – A transition area between the aquatic ecosystem and the terrestrial ecosystems; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

riparian functions - Activities that occur in a riparian area without the influence of management activities. Functions include erosion and deposition by the streams, nutrient cycling, movement and storage of water, vegetative succession, etc.

ripping - A process where the soil is mechanically sliced or broken to improve tilth, aeration, and permeability.

river classifications - (1)*Wild river areas* – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) *Scenic river areas* – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) *Recreational river areas* – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

road – A motor vehicle path more than 50 inches wide, unless classified and managed as a trail. It may be classed as a system or non-system road.

road - constant service - A facility on the transportation system developed and operated for long-term land management and resource utilization needs. It is also operated for continuous or annual recurrent service. System-open roads generally remain open for public use except for seasonal closures to prevent road damage due to bad weather conditions.

road - intermittent service - A facility on the transportation system that is developed and operated for long-term land management and resource utilization needs. It is operated for periodic service and closed for more than one year between periods of use. System-closed roads are generally built to access logging sites and are closed once logging activities are completed. They can be re-opened several years later, however, when access is once again needed to the site.

road closure - A technique used by management to regulate and control the use of facilities to achieve transportation economy, user safety, protection of the public investment, and accomplishment of forest resource objectives. It may be intermittent or long term.

road density - A measure of the total length of road in any given unit of area (e.g.: 4 miles/square mile.)

road maintenance levels - A formally established set of objectives that describes the conditions necessary to achieve the planned operation of a road. The levels vary from Level I, basic custodial care, to Level V, which is assigned high use roads in which user safety and comfort are important considerations.

Roaded Natural (ROS) - SEE Recreation Opportunity Spectrum (ROS)

roadless area - Undeveloped federal land where there are no improved roads or roads maintained for travel by means of motorized vehicles intended for highway use.

Roadless Area Review and Evaluation (RARE) II - The assessment of "primitive" areas within the national forests as potential wilderness areas as required by the Wilderness Act. This refers to the second such assessment that was documented in the final environmental impact statement of the Roadless Area Review and Evaluation, January 1979.

RARE II area - An area of land identified during the RARE II and the re-evaluation process as having potential for inclusion in the National Wilderness Preservation System.

RARE II inventory boundary - A boundary established with public input surrounding large areas of primarily Forest Service lands for the purpose of evaluation during the RARE II process. These lands meet minimum Forest Service criteria for potential wilderness.

rollover - A maximum PNV solution with an individual good or service production constrained at its maximum potential level. It provides an economically efficient basis for comparing all benchmark levels.

rotation - The number of years required to establish, including the regeneration period and grow timber crops, to a specified condition or maturity for harvest. Even- and two-aged management prescriptions in the LMP use a rotation.

roundwood - Timber and fuelwood prepared in the round state - from felled trees to material trimmed, barked, and crosscut (e.g.: logs and transmission poles).

RPA Program - The recommended direction for long-range management of renewable resources of National Forest System lands. This direction serves as the basis for the regional targets assigned to the forest. The development of this direction is required by the Forest and Rangeland Renewable Resources Planning Act.

runoff - The total stream discharge of water from a watershed including surface and subsurface flow, but not groundwater. Usually expressed in acre-feet.

Rural (ROS) - SEE Recreation Opportunity Spectrum (ROS)

rural water use – Term used in previous water-use circulars to describe water used in suburban or farm areas for domestic and livestock needs. The water is generally self-supplied.

S

SAA - Southern Appalachian Assessment

sacred sites - Any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion had informed the agency of the existence of such a site.

sale schedule - The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan. The first period (usually a decade) of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained.

salmonids – Fish of the family salmon idea, the chars, trouts, salmons, and white fishes.

salvage cutting - The removal of dead trees or trees being damaged or killed by injurious agents other than competition. To recover value that would otherwise be lost.

sanitation cutting - The removal of trees to improve stand health and to reduce actual or anticipated spread of insects and disease.

sapling - A usually young tree that is larger than a seedling, but smaller than a pole. Size varies by region.

sawtimber - Trees suitable in size and quality for producing logs that can be processed into dimension lumber.

scalloping - The undulating vegetative edge treatment given to a travel way or opening for aesthetic purposes.

Scenery Management System - A system for the inventory and analysis of the aesthetic values of the National Forest Lands. It replaces the Visual Management System (VMS) as defined in Agriculture Handbook #462.

Scenic Attractiveness - The scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. Classified as A (Distinctive), B (Typical or Common), or C (Undistinguished).

Scenic Class - A system of classification describing the importance or value of a particular landscape or portions of that landscape. Values range from 1 (highest value) to 7 (lowest value).

Scenic integrity – A measure of the degree to which a landscape is visually perceived to be "complete." The highest scenic integrity ratings are given to those landscapes which have little or no deviation from the character valued for its aesthetic appeal. Scenic integrity is used to describe an existing situation, standard for management, or desired future conditions.

scenic integrity objective (SIO) - A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations to the valued attributes of the characteristic landscape. Objectives include Very High, High, Moderate, and Low.

> Very High (VH) - Generally provides for only ecological changes in natural landscapes and complete intactness of landscape character in cultural landscapes.
>
> High (H) - Human activities are not visually evident to the casual observer. Activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.

Moderate (M) - Landscapes appear slightly altered. Noticeable human created deviations must remain visually subordinate to the landscape character being viewed.

Low (L) - Landscapes appear moderately altered. Human created deviations begin to dominate the valued landscape character being viewed but borrow from valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.

scoured channel - A definable channel of flow where surface water converges with enough energy to remove soil, organic matter, and leaf litter.

secondary processor - A mill that processes partially manufactured wood (a wood product such as chips or lumber), into a finished product. Examples include paper and furniture.

secondary trout streams - Streams that do not contain naturally-reproducing trout populations, but will sustain trout throughout the year. Populations must be maintained by stocking.

sediment - Solid mineral and organic material that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice.

seedling/sapling stands - Stands at least 16.7 percent stocked with growing stock trees, of which more than one-half of total stocking is seedlings and saplings.

seed tree – An even-aged regeneration method where in a single cut, the removal of all merchantable trees in a stand, except for a small number of widely dispersed trees retained for seed production, and to produce a new age class in a fully-exposed microenvironment.

seed-tree with reserves method - A two-aged regeneration method in which some or all of the seed trees are retained after regeneration has become established to attain goals other than regeneration.

seep - A wet area where a seasonal high water table intersects with the ground surface. Seeps that meet the definition of a wetland are included in the Riparian Corridor.

selected species - Species selected as indicators of the effects of management. Term is the same as management indicator species.

selection cutting - The removal of selected trees, particularly mature trees at planned intervals (cutting cycle), individually or in small groups, from an uneven-aged forest to realize the yield, and establish a new crop of desired tree species. Additionally, the tending of immature stand components is accomplished at each cutting cycle.

Semi-Primitive Motorized (ROS) - SEE Recreation Opportunity Spectrum (ROS)

Semi-Primitive Non-Motorized (ROS) - SEE Recreation Opportunity Spectrum (ROS)

sensitive species - Those species that (1) have appeared in the *Federal Register* as proposals for classification, and are under consideration for official listing as endangered or threatened species; (2) are on an official state list, or (3) are recognized by the Regional Forester to need special management to prevent the need for their placement on federal or state lists.

sensitivity analysis - A determination of the consequences of varying the level of one or several factors while holding other factors constant.

sensitivity level - A particular degree or measure of viewer interest in the scenic qualities of the landscape.

sequential lower bounds - The maximum percent decrease in harvest volume in any decade as compared to the preceding decade. This prevents the forest from significantly decreasing its share of the market, which would violate the assumptions of the horizontal demand curve.

sequential upper bounds - The maximum percent increase in harvest volume in any decade as compared to the preceding decade. This prevents the forest from significantly increasing its share of the market, which would violate the assumptions of the horizontal demand curve.

shearing - A method used in land clearing whereby tree stems are severed at ground line by large bladed mechanisms mounted on crawler tractors (e.g.: serrated tooth V-blade or KG blade).

shelterwood - A regeneration method of regenerating an even-aged stand in which a new age class develops beneath the partially shaped microenvironment provided by the residual trees. The sequence of treatments can include three distinct types of cuttings: (1) an optional preparatory harvest to enhance conditions for seed production; (2) an establishment harvest to prepare the seed bed, and to create a new age class; and 3) a removal harvest to release established regeneration from competition with the overwood.

shelterwood with reserves - A two-aged regeneration method in which some or all of the shelter trees are retained, well beyond the normal period of retention, to attain goals other than regeneration.

short-term facilities - Facilities developed and operated for limited resource activity or other project needs. It will cease to exist as a transportation facility after the purpose for which it was constructed is completed, and the occupied land is reclaimed and managed for natural resource purposes.

silvicultural system - A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop, and provide for regeneration and according to the type of forest thereby produced.

silviculture - The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.

silvics – The study of the life history and general characteristics of forest trees and stands, with particular reference to environmental factors, as a basis for the practice of silviculture.

single-tree selection - A regeneration method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed uniformly throughout the stand to achieve desired stand structural characteristics.

site - An area in which a plant or stand grows, considered in terms of its environment, particularly as this determines the type and quality of the vegetation the area can carry.

site class - A classification of site quality, usually expressed in terms of ranges of dominant tree height at a given age or potential mean annual increment at culmination.

site preparation - The preparation of the ground surface prior to reforestation. Various treatments are applied as needed to control vegetation that will interfere with the establishment of the new crop of trees or to expose the mineral soil sufficiently for the establishment of the species to be reproduced.

site index – A series-specific measure of actual or potential forest productivity (site quality, usually for even-aged stands), expressed in terms of the average height of trees included in a specified stand component (defined as a certain number of dominants, codominants, or the largest and tallest trees per unit area) at a specified index or base age.

site productivity class - A species-specific classification of forest land in terms of inherent capacity to grow crops of industrial, commercial wood. Usually derived from the site index.

site quality (productivity) - The productive capacity of a site, usually expressed as volume production of a given species.

site visit - See Recreation visit.

skid trails - A travel way through the woods formed by loggers dragging (skidding) logs from the stump to a log landing without dropping a blade and without purposefully changing the geometric configuration of the ground over which they travel.

skidding - A term for moving logs by dragging from stump to roadside, deck, or other landing.

slash - The residue left on the ground after felling, silvicultural operations, or as a result of storm, fire, girdling, or poisoning. All vegetative debris resulting from the purchaser's operations. Slash associated with construction of roads is subject to

treatment according to construction specifications, all other is subject to the terms of contract provision B/BT6.7.

SMS - Scenery Management System, a system for the inventory and analysis of the aesthetic values of the National Forest Lands. The SMS replaces the Visual Management System (VMS) as defined in Agricultural Handbook #462.

snag - A dead or partially dead (more than 50 percent) hardwood or pine tree which is used by many bird species for perching, feeding, or nesting.

social analysis - An analysis of the social (as distinct from the economic and environmental) effects of a given plan or proposal for action. It includes identification and evaluation of all pertinent desirable and undesirable consequences to all segments of society, stated in some comparable quantitative terms, including persons or percent of population in each affected social segment. In addition, social analysis also includes a subjective analysis of social factors not expressible in quantitative terms.

soil enhancement - Application of methods or materials to the soil to increase its productivity and stimulate growth of vegetation.

soil productivity - The inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

soil survey - A term for the systematic examination of soils in the field and in laboratories; their description and classification; the mapping of kinds of soil; the interpretation of soils according to their adaptability for various crops, grasses, and trees; their behavior under use of treatment for plant production or for other purposes; and their productivity under different management systems.

soil and water resource improvement - The application of preplanned treatment measures designed to favorably change conditions of water flow, water quality, rates of soil erosion, and enhancement of soil productivity.

southern pine beetle - One of the many species of pine bark beetles that are present in the forest at all times. When environmental and forest conditions become favorable, the beetle populations can increase and cause substantial timber losses over extensive areas in a relatively short period of time.

spatial feasibility testing - A process for verifying on a sample basis that land allocation and scheduling is actually implementable on the ground.

special concern species – Species that is federally listed as Category 2 or ranked as globally rare by state heritage programs and The Nature Conservancy. Also used by some states for any species of wild animal native or once-native to the state which is determined by the state to require monitoring.

special places - Those specific locations and expanses in outdoor settings that have attractions and features that are identified as unique, different, distinctive, and

extraordinary to people. Special places can range in size from small areas to very large areas.

special-use authorization - A permit, term permit, or easement that allows occupancy, use, rights, or privileges of National Forest System land.

special use permit – A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.

splash dams – Dams, usually temporary, built of wood across mountain streams to pond up large amounts of water.

spring - A water source located where water begins to flow from the ground due to the intersection of the water table with the ground surface. Generally flows throughout the year. Springs that are the source of perennial or intermittent streams are included in the riparian corridor.

stand - A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

stand density - A quantitative measure of stocking expressed either absolutely per unit of land in terms of number of trees, basal area, volume per unit area, or relative to some standard condition.

stand improvement - A term comprising all intermediate cuttings made to improve the composition, structure, condition, health, and growth of even-aged, two-aged, or uneven-aged stands.

Standard - Requirement that precludes or imposes limitations on resource management practices and uses. Usually for resource protection, public safety, or addressing an issue.

state, county, and municipal land - Land owned by states, counties, and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

stocking - The degree of occupancy of land by growing stock trees, measured by basal area or number of trees per unit area and spacing compared with a minimum standard - which varies by tree size and species or species group - to the occupancy that is required to fully utilize the growth potential of the land.

stratified mixture - A stand in which different tree species occupy different strata of the total crown canopy.

stratigraphic – Pertaining to strata or layers, as in a description of layers of rock types.

stratum (canopy layer) - A distinct layer of vegetation within a forest community.

streamside management zones - Land areas adjacent to natural streams, lakes, ponds, and seeps. These zones are typically designed to reduce, minimize or prevent

non-point source pollution from entering a stream system (e.g.: sediment from a road or timber harvesting activity). Specific SMZ buffer widths are often defined in State Best Management Practice handbooks.

stressors – Pressure or change brought upon an ecosystem by pollution sources including sediment, contaminants, and toxins.

successional stage – A period, marked by distinctiveness of structure, in the development of a forest community from establishment of tree regeneration to advanced age. In general, successional stages used in the LMP and Environmental Impact Statement are defined in terms of forest age as a surrogate measure of the distinct structure at each stage as follows:

early: 0 to 10 years old
seedling/sapling: 11 to approximately 40 years old
mid: approximately 41 to 80 years old
late: over approximately 80 years old; includes old growth

suitability - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

suitable forest land - National Forest System land allocated by a Forest Plan decision to be managed for timber production on a regulated basis. *Regulated basis* means a systematic relationship between tree growth and timber harvest such that a specific timber volume objective level can be sustained indefinitely.

supply - The amount of a good or service that producers are willing to provide at a specified price, time period, and conditions of sale.

surficial water - Water on or at the ground surface. Does not include ditches, canals, spillways, or other human-created flow channels.

sustained yield of the products and services - The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land.

sympatric – Condition where two or more closely related species live together in the same section of stream. The species have overlapping distributions. Opposite of allopatric.

T

targets - Objectives assigned to the forest by the Regional Plan.

taxomic – Classification of organisms into categories according to their natural relationships.

tentatively suitable forest land - National Forest System land that meets specific criteria in the implementing regulations of the National Forest Management Act (36

CFR 219.14 for further consideration during the planning process for timber production on a regulated basis. Note that “tentatively suitable land” is not the same as the allocation of the existing Forest Plan, as amended since 1985, but is identified by a reanalysis. (Also called “Phase 1 suitability” or “Stage 1 suitability” because its designation as Part “A” of a three-part process described by the text of the National Forest Management Act.) (Timber Supply/Demand).

term permit - A special-use authorization to occupy and use National Forest System land, other than rights-of-way, for a specified period. It is revocable and compensable according to its terms.

theming – A land and/or management scheme created with the list of land and/or management.

thermoelectric power water use – Water used in the process of the generation of thermoelectric power.

thinning - A cutting made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality.

thinning interval - The period of time between successive thinning entries, usually used in connection with even-aged stands.

threatened species - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Designated as a threatened species in the *Federal Register* by the Secretary of Interior.

tiering – A National Environmental Policy Act term used to reference the coverage of general matters in broader environmental impact statements (including national program or policy statements), with subsequent narrower statements or environmental analyses (including regional or basinwide program statements or ultimately site-specific statements), incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

timber - Wood retaining many of the recognizable characteristics of a tree: round, bark covered, and tapering, but without the limbs and leaves. In wood-industry usage, it may be “standing timber”- that portion of living trees with characteristics of value to the wood-using industry, or cut trees not yet processed beyond removing limbs and tops.

timber demand - A relationship between stumpage or delivered log price and the quantity of timber produced.

timber product market area - The geographic area enclosed within a polygon drawn by connecting those mills buying forest timber that are the farthest away from the forest.

timber production - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for

industrial or consumer use. For purposes of forest planning, timber production does not include the production of fuelwood or harvests from unsuitable lands.

timber removals (drain) - The merchantable volume of trees removed from the inventory by harvesting, cultural operations including stand improvement, land clearing, or changes in land use expressed as an annual average between surveys. Within national forests, removals are almost all timber harvest except that the inventory on lands withdrawn by legislative action is also normally accounted for as "removals."

timber sale program quantity - The volume of timber planned for sale during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume), and any additional material (non-chargeable volume), planned for sale. The timber sale program quantity is usually expressed as an annual average for the first decade.

timber stand improvement - A term comprising all intermediate cuttings made to improve the composition, constitution, condition, and increment of a timber stand.

timber supply - The amount of wood raw material available to be harvested within specified parameters of time and geographic area.

timberland - Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of industrial wood crops under natural conditions. Not withdrawn from timber utilization, and not associated with urban or rural development. Currently, inaccessible and inoperable areas are included.

tolerance - The ability of a tree to grow satisfactorily in the shade of, and in competition with, other trees.

topography - The configuration of a land surface including its relief, elevation, and the position of its natural and human-made features.

toxicity index profile – Estimate of cumulative potential for toxic impacts in water.

traditional cultural property - A historic property that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

trailheads - The parking, signing, and other facilities available at the terminus of a trail.

traffic service levels – Describe a road's significant traffic characteristics and operating conditions.

transfer age – The age a stand will transfer from one Model 2 management class to another.

transfer class – A Model 2 management class that receives transferred acres. A regeneration transfer class has a transfer age of zero. All other transfer classes have an age greater than zero.

transfer columns – A column constructed the matrix generator to create special LP structures. They accumulate information from several decision variables into one column.

two-aged silvicultural system - A planned sequence of treatments designed to maintain and regenerate a stand with two age classes.

two-aged stand - A stand composed of two distinct age classes that are separated in age by more than 20 percent of rotation.

type conversion - A change from tree species or species group to another. An example is a change from hardwoods to pine.

U

unacceptable alteration - A scenic integrity level (never an objective) where human activities of vegetative and landform alterations are excessive and totally dominate the natural, natural-appearing or valued cultural landscape character.

undercutting (root pruning) - The root pruning of seedlings in a nursery bed.

understory - The trees and other vegetation growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion (overstory) of adjacent trees and other woody growth.

uneven-aged regeneration methods - Methods of regenerating a forest stand, and maintaining an uneven-aged structure by removing some trees in all size classes either singly, in small groups, or strips. The methods are single-tree or group selection.

uneven-aged silvicultural system - A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

universal soil loss equation - An equation used to estimate soil erosion rates and for the design of water erosion control systems. A = RKLSPC wherein A = average annual soil loss in tons per acre per year; R = rainfall factor; K = soil erodibility factor, L = length of slope; S = percent of slope; P = conservation practice factor; and C = cropping and management factor.

unregulated forest - Commercial forest land that will not be organized for timber production under sustained-yield principles.

unsuitable forest land (not suited) - Forest land not managed for timber production because: (a) Congress, the Secretary [of Agriculture], or the Chief [of the Forest Service] has withdrawn it; (b) it is not producing or capable of producing crops of industrial wood; (c) technology is not available to prevent irreversible damage to soils productivity, or watershed conditions; (d) there is no reasonable assurance based on existing technology and knowledge, that it is possible to restock lands within five years after final harvest, as reflected in current research and experience; (e) there is, at present, a lack of adequate information about responses to timber management activities; or (f) timber management is inconsistent with, or not cost

efficient in meeting the management requirements and multiple-use objectives specified in the LMP.

Urban (ROS) - SEE Recreation Opportunity Spectrum (ROS)

utilization standards - Measurements for standing trees that describe the minimum size tree that will be designated for sale for various products including sawtimber or small roundwood.

V

values, market - Prices of market goods and services measured in real dollars in terms of what people are willing to pay as evidenced by market transactions.

values, non-market - Prices of non-market goods and services imputed from other economic values.

variety class - A classification system for establishing three visual landscape categories according to the relative importance of the visual features. This classification system is based on the premise that all landscapes have some visual values, but those with the most variety or diversity of visual features have the greatest potential for high scenic value.

vector – A matrix composed of only one row or column.

Very Low Scenic Integrity (VL) – An existing scenic inventory classification in which landscapes appear heavily altered. Human created deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes of size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain so that elements such as edges, roads, landings, and structures do not dominate the composition.

viable population - Population of plants or animals that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area.

viewshed - The total landscape seen, or potentially seen from all or a logical part of a travel\ route, use area, or water body.

visibility – As an air quality related value, this term refers to the ability of an air mass to cnvey the landscape image. Similar to "turbidity" except is's a measure of air quality.

visual quality objective (VQO) - A desired level of excellence based on physical and sociological characteristics of an area under the Visual Management System (VMS). Refers to the degree of acceptable alterations of the characteristic landscape. Objectives include Preservation, Retention, Partial Retention, Modification, and Maximum Modification. The Visual Management System (VMS) as defined in Agricultural Handbook #462 and was replaced by the SMS.

Preservation - A visual quality objective that provides for ecological change only.

Retention - A visual quality objective in which human activities are not evident to the casual forest visitor.

Partial Retention - A visual quality objective in which human activities may be evident, but must remain subordinate to the characteristic landscape.

Modification - A visual quality objective in which human activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture appearing, but should appear as a natural occurrence when viewed as background.

Maximum Modification - A visual quality objective in which human activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

visual resource - The composite of basic terrain, geological features, water features, vegetative patterns, and land-use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

warm water fishery - Aquatic habitats that support fish species which have their best reproductive success and summer water temperature tolerance between 75 and 85 degrees Fahrenheit (23-29 C), or about 80 degrees Fahrenheit. Examples include sunfish species, and largemouth bass.

water supply area - Areas that serve present and future municipal water supply and trout hatching or rearing operations.

water yield - The measured output of the forest's streams expressed in acre-feet. The amount or volume of water that flows in a given period of time from a watershed.

waterbars - A change in the grade of a roadbed, trail surface, or fire line used to divert water off the surface to prevent it from eroding ruts and possibly carrying sediment to a stream.

watershed - The total area above a given point on a stream that contributes water to the flow at that point.

Weeks Act – Implemented in 1911, it authorized the acquisition of lands on the watershed of navigable streams for the purposes of conserving their navigability, or for the purpose of timber.

wetlands - (pursuant to the Federal Clean Water Act) - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances, support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas, and are found primarily within palustrine systems; but may also be within riverine, lacustrine, estruarine, and marine systems.

wild and scenic river - A river selected for nomination and/or designation through the Wild and Scenic Rivers Act of 1968 for possessing outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values.

wilderness - A Congressionally-designated area that is part of the National Wilderness Preservation System established through Wilderness Act of 1964; Also defined in the Act as a wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this chapter an area of underdeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Wilderness Act of 1964 – Act which gave Congress authority to designate certain areas of public land as wilderness. It established the National Wilderness Preservation System to secure an enduring resource of wilderness.

wilderness study area (WSA) - Lands possessing the basic characteristics of wilderness and designated by Congress for further wilderness study.

One of the areas selected by the Chief of the Forest Service from an inventory of unroaded and undeveloped National Forest System lands as having apparent high qualities for wilderness. They will be studied to determine whether they should be recommended for addition to the National Wilderness Preservation System.

wildland fire - Any non-structural fire on wildlands other than one intentionally set for management purposes. Confined to a predetermined area. Not to be confused with “fire use,” which includes prescribed fire.

wildland urban interface – The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

wildlife - All non-domesticated mammals, birds, reptiles, and amphibians living in a natural environment, including game species and non-game species. Animals, or their progeny (i.e., feral animals - including horses, burros, and hogs), that once were domesticated, but escaped captivity, are not considered wildlife.

wildlife and fish user-day – A 12-hour participation in the use of wildlife and fish primarily for consumptive or non-consumptive use including hunting, fishing, or wildlife viewing. Such use is the result of habitat management, and the populations supported by that habitat. A WFUD is counted as one day or any part of a day that

the user participated in these activities. Does not include sport or commercial uses of anadromous fish.

wildlife habitat diversity - The distribution and abundance of different plant and animal communities and species within a specific area.

wildlife habitat improvement - The manipulation or maintenance of vegetation to yield desired results in terms of habitat suitable for designated wildlife species or groups of species.

wildlife tree - A den tree, snag, or mast or food tree.

with-without comparison - An evaluation that compares outputs, benefits, costs, and other effects with a base alternative.

withdrawl – Water removed from the ground or diverted from a surface water source for use.

withdrawal of land - An order removing specific land areas from availability for certain uses.

withdrawn national forest lands - National Forest System lands segregated or otherwise withheld from settlement, sale, location, or entry under some or all of the general land laws.

woodland grazing - Grazing livestock on the grass-forbs existing under forested stands, mainly southern yellow pine types.

wrenching - The disturbance of seedling roots in a nursery bed (e.g.: with a tractor-drawn blade), with the objective of stimulating the development of a fibrous root system.

X

xeric – Pertaining to sites or habitats characterized by decidedly dry conditions.

Y

yarding - A term used to describe operations used to move logs from stump to point where logs are loaded for transport to mill. Most commonly used in cable logging operations.

yield composite – Activity and output relationships which estimate yields. They allow the development of a yield stream from a related yield stream without entering each yield coefficient independently. Yield composite relationships can be time, age, or sequence based.

yield stream – A subset of a yield table containing specific information for an activity or output. A timber output may have a yield stream for amount, diameter, basal area, or trees.

yield table - A tabular statement of outputs expected to be produced under a specific set of conditions.

Z

zone – Large, contiguous areas of land that include watersheds or management areas. It can be comprised of several complete analysis units. The land within a zone is generally a heterogenous mixture of environmental types.

zone management actions – Management actions available to zones. They contain the ability to coordinate the management activities that occur within a zone.

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