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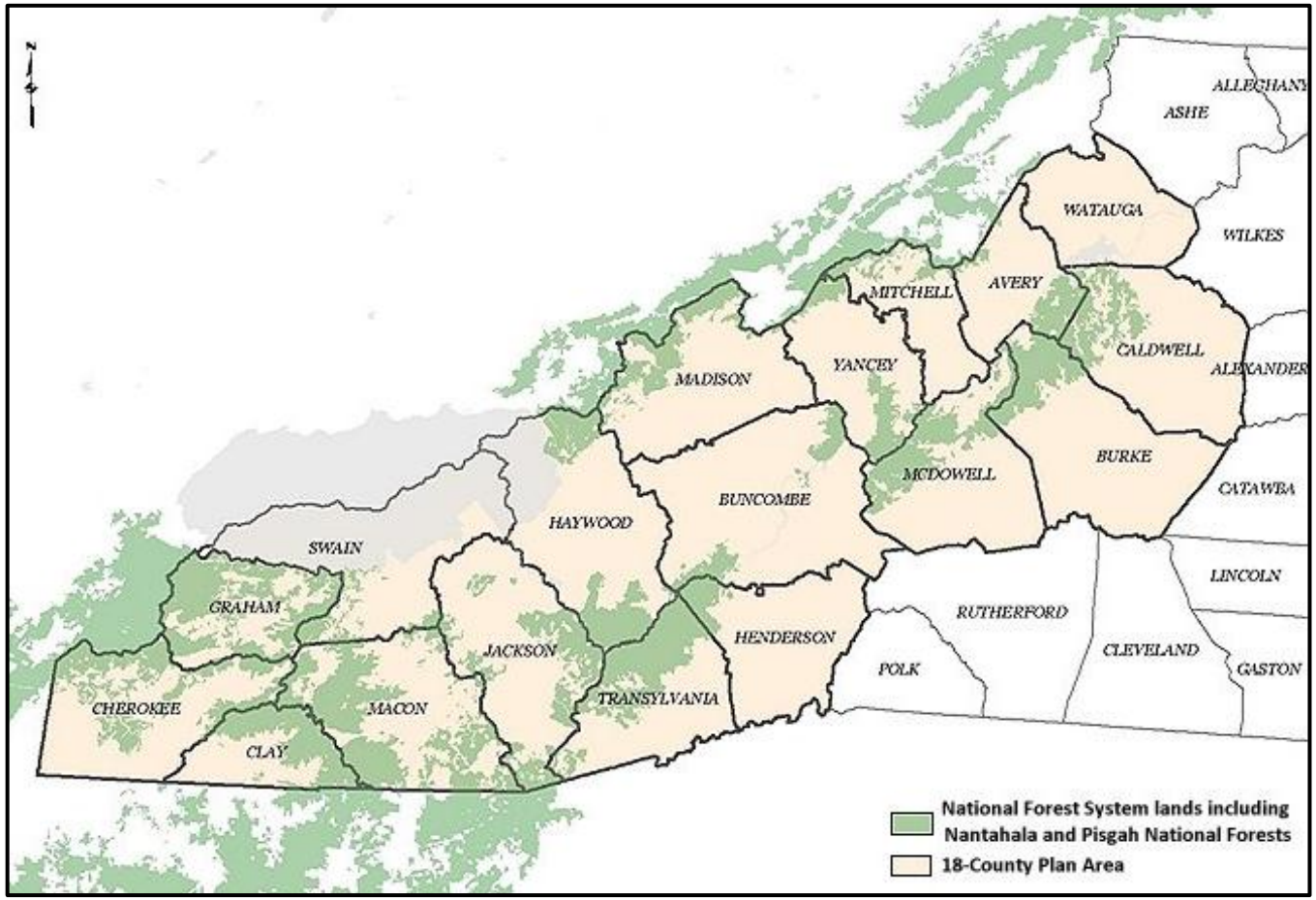
Nantahala and Pisgah National Forests Assessment



Nantahala and Pisgah National Forests Assessment

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ABSTRACT: The Assessment presents and evaluates existing information about relevant ecological, economic, and social conditions, trends, and sustainability and their relationship to the land management plan, within the context of the broader landscape.

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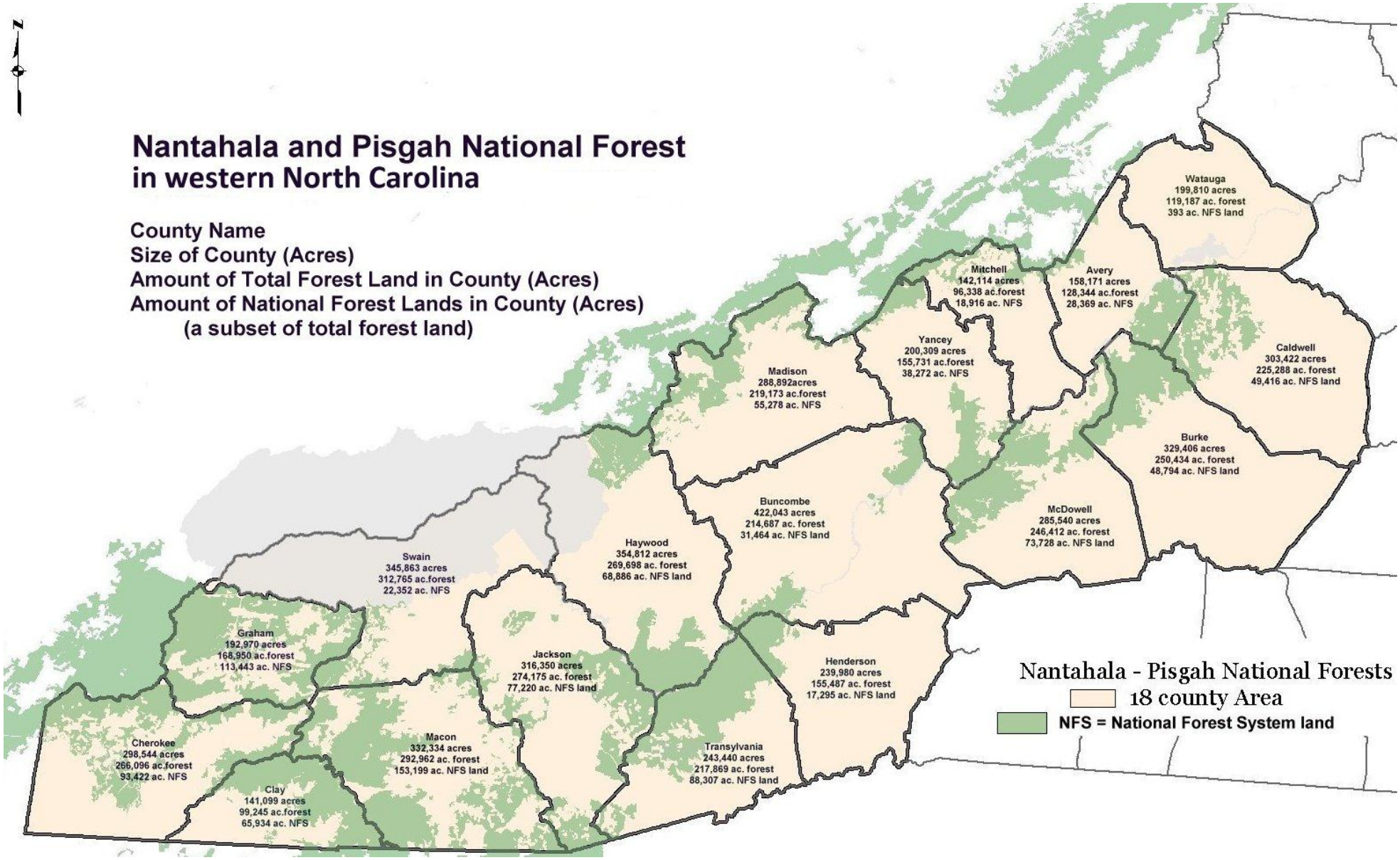


Figure 1. Assessment Area, Size, Amount of Forest Land and Amount of National Forest System Land (Miles 2012)

Introduction

Purpose of the Assessment

The Nantahala and Pisgah National Forests (NFs) in North Carolina will be developing a Land and Resource Management Plan. The existing Land and Resource Management Plan for the Nantahala and Pisgah National Forests was completed in 1987, and significantly amended in 1994 (Amendment 5). The National Forest Management Act of 1976 calls for plans to be revised at least every 15 years.

In preparation for plan revision, in accordance with the 2012 Planning Rule, 36 CFR 219, Nantahala and Pisgah NFs have begun compiling this Assessment report to evaluate the Forests' ecological, economic and social conditions, trends and sustainability, and the relationship of these conditions and trends to the current land resource management plan. This Assessment is done for the Nantahala and Pisgah NF plan area, in the context of the broader landscape. This assessment provides current information that can be used in developing the revised forest plan. It is not a decision making document.

The Assessment document is also intended as a vehicle for sharing existing information and trends with the public and other interested parties in order to facilitate participation in the planning process, and develop mutual understanding of the complex topics related to forest planning.

All acreages and percentages cited throughout this document are approximations. Queries from different electronic databases, queries constructed in different ways, and conversion from paper base maps to electronic GIS (geographic information system) data may all result in variation in the number of acres.

Location of the Plan Area

The Nantahala and Pisgah NFs are located in 18 counties in western North Carolina (WNC). Pisgah National Forest (NF) was established in 1916 and Nantahala NF in 1920. The two national forests together now total approximately 1,044,393 acres in size (USDA Forest Service 2013c). This total includes 17,659 acres acquired through purchase or exchange over the last 21 years. The total land area of the 18-county assessment area is 4,795,098 acres, with over 77% forest land (Miles 2012). The national forests are within a much larger matrix of forest land, predominantly privately owned forest land. Figure 1 displays the 18-county assessment area with the size of each county as well as the amount of forest land and National Forest System (NFS) land.

Resource Management for Nantahala and Pisgah NFs is organized into six ranger districts.

Nantahala NF:

- Cheoah District based in Robbinsville, NC
- Tusquitee District base in Murphy, NC
- Nantahala District based in Franklin, NC

Pisgah NF:

- Pisgah District based in Pisgah Forest, NC
- Appalachian District based in Mars Hill, NC
- Grandfather District based in Nebo, NC

Each district manages the resources within a set territory. Each district manages recreation uses, timber and other vegetation, wildlife habitat, rare species conservation, prescribed burning and fire control, roads and trails maintenance, non-native invasive

species treatment, riparian areas and aquatic resources, and special use permitting.

The two national forests have a single land management plan. Both are in the mountainous western part of North Carolina and share most of the same species of plants and animals, as well as similar geophysical features. Both share a similar history in regard to land use and cultural influences. Some sections of this report discuss and display information as it applies to both national forests together, while other sections separate the information by national forest or in some cases ranger district or county. Determination of how to best convey information on current condition and trends is left to the discretion of the individual contributing subject matter specialist.

Ecological Influences on the Plan Area

The Nantahala and Pisgah NFs lie within a geological area known as the Blue Ridge province of the Appalachian Mountains. These mountains form a southwest to northeast range through WNC and contain many peaks over one mile in elevation. Rainfall averages 47 inches at Asheville but is much higher in the Lake Toxaway-Highlands area; many of the wettest and snowiest areas are at the higher elevations (Cool Weather 2013).

While streams and rivers are abundant, natural lakes are virtually non-existent. However there are thousands of acres of manmade reservoirs used for flood control and hydroelectric power generation. The lakes, streams and rivers are a focus of water-based recreation for hundreds of thousands of visitors each year.

The forests of the assessment area, while often referred to simply as a combination of hardwoods (predominantly oaks) and pines, are home to over 130 tree species, over 200 species of shrubs and vines, and over 1500 grasses and herbaceous plant species (USDA Forest Service 1994).

Much of the forest land in the 18-county area has been harvested and regenerated at least once. The current age structure of these forests is displayed below, based on Forest Inventory and Analysis data collection protocols.

Table 1. The Age of the Forests. Percent of NFS Forest Land and Percent of All Other Forest Land

	0-15 Years*	16-40 Years	41-60 Years	61-80 Years	81-100 Years	>100 Years
Nantahala and Pisgah NF	1.8%	7.9%	12%	37%	24%	16%
All Other Forest Land in the 18-Counties	5.2%	13%	24%	36%	17%	3.6%

* Young forest.[Error from rounding and unknown: +/- 1.2%]
Source: (Miles 2012).

Close to 70 mammals can be found in these forests, along with approximately 80 reptiles and amphibians, 130 species of birds and over 100 species of fish (USDA Forest Service 1994). Coyotes have become well established in recent years, and elk, reintroduced to the Great Smoky Mountains National Park, are expanding their range onto nearby National Forest System (NFS) lands.

While the area generally escapes the worst of impacts from disturbance events such as hurricanes, catastrophic wildfire, tornadoes, earthquakes, wind, snow and ice, it does experience all of these disturbances to one degree or another. Flooding and occasional landslides from large rain events and hurricane remnants are not uncommon. Perhaps the most long-lasting disturbances, other than loss of private forestland to another use, have come from insects and diseases. For example, the American chestnut, once the most common tree of these forests, was virtually wiped out by an imported fungus in the early 1900's. The hemlock woolly adelgid has killed millions of hemlocks, and the southern pine beetle periodically

attacks stands of pines. Typically, other species will take over the space left when a species is lost, but the replacement often does not have the same ecological attributes as its predecessor.

Social and Economic Influences on the Plan Area

The Cherokee were the predominant tribe present in the assessment area at the time of European settlement, and remain so today. Members of the Eastern Band of Cherokee Indians, with 56,747 acres of mostly forest land in the assessment area, are important neighbors and friends in managing the natural ecosystems of the area.

Two important features of the 18-county area that directly influence adjacent national forest management are the Blue Ridge Parkway and the Appalachian Trail (AT). The Blue Ridge Parkway winds its way through Nantahala and Pisgah NFs, while the AT traverses the high country of the Appalachian District and all three Nantahala NF districts.

In 2003, 25 counties of WNC, including the 18 counties that contain the Nantahala and Pisgah NFs, were designated by Congress and the President as the Blue Ridge National Heritage Area (BRNHA). National Heritage Areas are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. This designation was in recognition of the unique character, culture, and natural beauty of Appalachia and the Blue Ridge Mountains in western North Carolina.

The BRNHA website describes WNC as a land of living traditions (BRNHA 2011):

> *The rich cultural mosaic of the Blue Ridge mountains and foothills of North Carolina has its origins in three separate continents—North America, Europe, and Africa. The cultural traditions of the Cherokee, Scots-Irish, and Africans have blended into a culture unique to the Southern Appalachian mountains. The mountains themselves have helped to protect and nurture this cultural mosaic by providing a degree of relative isolation from the rest of the state and nation.*

It identifies five formative factors in the cultural heritage of the area:

1. Agricultural Heritage (including farming and forestry)
2. Cherokee Heritage (including crafts, history, and lands)
3. Music Heritage (including bluegrass, old time, and ballad singing)
4. Craft Heritage (including traditional and contemporary crafts)
5. Natural Heritage (including biodiversity)

Western North Carolina is also home to at least 115 spiritual retreats, predominantly with traditional religious affiliations (Western North Carolina Vitality Index 2011). This is in part a reflection of the historically important role of the church in southern culture in general, paired with the role of the WNC mountains as a vacation spot for escape from the summer heat and humidity of some other southeastern locales.

Three major state universities, as well as several private colleges and community colleges offer excellent and comparatively affordable higher education and continuing education opportunities across the planning area.

The following table displays the racial diversity of the area, the state, and the nation.

Table 2. Racial Makeup of the Population

	18-County Area	North Carolina	USA
White alone	89.9%	69.6%	74.0%
Black or African American alone	3.9%	21.4%	12.5%
American Indian alone	1.2%	1.1%	0.8%
Asian alone	1.0%	2.1%	4.7%
Native Hawaiian & Other Pacific	0.0%	0.1%	0.2%

Islander alone			
Some other race alone	2.1%	3.8%	5.5%
Two or more races	1.7%	1.9%	2.4%

Data Sources: U.S. Department of Commerce. 2012. Census Bureau, American Community Survey Office, Washington, D.C.

Census data indicates the population of the 18-county area is somewhat older, has a lower per capita income, and a higher percentage of non-labor income than the state and nation as a whole. The educational attainment of area residents is increasing. The percentage of homes that are second homes is much greater than the state or nation as a whole (U.S. Department of Commerce 2012). Several of these factors could be associated with a large population of retirees: older, less earned income, but also second home owners.

Timber, agriculture, and tourism employ a slightly higher percentage of the area population than the state and nation as whole. Those percentages are small compared to the largest employment sectors: health care and education. In the past, manufacturing (textiles, paper, and furniture) played a much larger role in the area economy than it does today.

Important contributions of the plan area to ecological, social, and economic sustainability and multiple uses.

Nantahala and Pisgah NFs make up 27% of all forest land in the 18-county plan area. Many ecological benefits of forests in general are provided to a greater degree from non-NFS lands due to their higher percentage across WNC. NFS lands take the lead in providing the greatest amount of forested and other natural environments open for the public to use and enjoy. While there are state, national, city and county parks, and state managed forest lands available for public use, many of these lands do not offer the wide range of public access and public use opportunities available on NFS land. The sections of this document that discuss recreation and multiple uses offer a more complete picture of the range of these uses.

Nantahala and Pisgah NFs play an important role in sustaining the diversity of plant and animal communities present in the plan area. They contain a higher proportion of high-elevation forests and other high-elevation ecosystems, than the plan area as a whole. These include high-elevation red oak, northern hardwood, and spruce-fir forests, beech gap/ boulderfield forests, and southern Appalachian balds. These communities are habitat for many rare or uncommon species of plants and animals such as Gray's lily, spruce-fir moss spider, and northern flying squirrel. Also reflective of this preponderance of high elevation areas are the headwaters of many coldwater streams that support fish species of high public interest such as brook trout.

The Changing Climate is a Management Challenge

Forestlands across the Southeast are experiencing increased threats from fire, insects and non-native plant invasions, disease, extreme weather events including flooding, and at other times, drought.

A summary of how climate change may impact various forest resources and uses is available to supplement to this report. Additional information is available at the website for the Template for Assessing Climate Change Impacts and Management Options (TACCIMO 2013). TACCIMO is a collaborative endeavor of the Eastern and Western Threat Centers and Regional Forest Planning units of the USDA Forest Service. The Threat Assessment Centers provide forest landowners, managers, and scientists with the latest research and expertise concerning environmental threats to forests.

Other Management Challenges

While there are never enough personnel or funds to accomplish all the work that could be done, recent trends in budgets and personnel limit the extent to which the 1987 Plan can be implemented. Changing policies at regional and national levels also influence management objectives and priorities. In many ways, the 1987 Plan was overly optimistic as to what is feasible when declining capacity meets with increasingly complex environmental analysis needs and

the associated increasing costs of management. Forest management must balance massive recreation use from tourists and local residents, a continuing desire for commodity production, and an overwhelming backlog of maintenance and restoration needs. Given current trends, it would be unrealistic to expect the forests to have the long-term capacity to provide facilities and services at the levels previously planned.

The figures that follow display the changes over time in funding and personnel over the past two decades. In addition to U.S. Forest Service employees, in the past the National Forests in North Carolina (NFsNC) were able to benefit from 200 Senior Community Service Employment Program enrollees to do maintenance, visitor information and clerical support jobs. The number of enrollees currently available (due to program changes) to the NFsNC is 26.

Figure 2. National Forests in North Carolina Allocated Funds 1994-2013

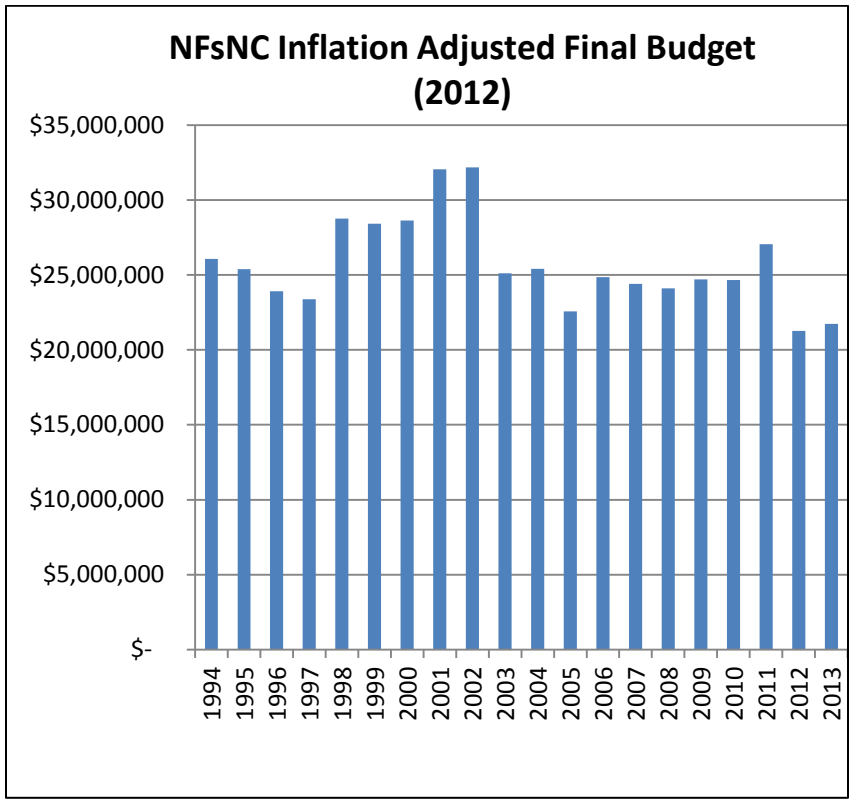
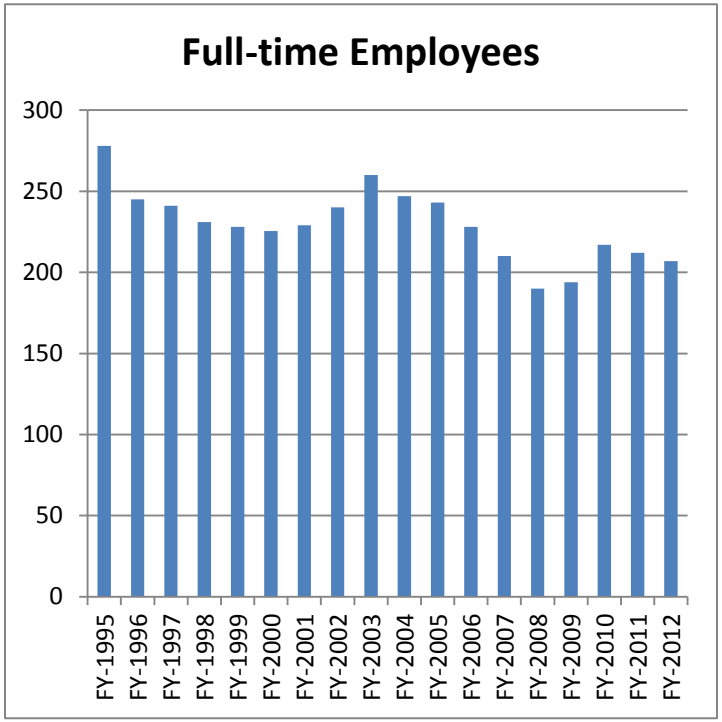


Figure 3. Number of Employees of the National Forests in North Carolina



Process of Assessment Development

The 2012 Planning Rule outlines the process and structure used to create Land and Resource Management Plans for the national forests across the country. The planning process has three phases: the assessment phase, the plan development or revision phase, and the monitoring phase. This Assessment document and supplemental resource reports (Appendix B) fulfill the requirement for the assessment phase of forest plan revision.

The Nantahala and Pisgah National Forests began preparing information for this Assessment in the fall of 2012. An interdisciplinary team (ID team) of specialists formed to gather information on all of the resource topics.

To gather information for the assessment and ideas for assessment content, eight public meetings were held with approximately 800 people in attendance. Information and data was submitted by several members of the public, organizations, and partners for consideration in the Assessment process. The forest managers involved scientists at the USDA Forest Service Southern Research Station, and requested input from other Federal, State and local governments, and federally recognized Tribes.

The first round of six public meetings took place in February and March of 2013. These meetings provided an overview of the plan revision process, shared information about existing condition of resources and received input from the public on the benefits provided by the forests. Attendees included local residents, members of organized recreation groups, tribal members, county and city planners, government officials, local business owners, outfitter guides, and environmental advocates.

Two additional public meetings took place in late May to expand on three issues that were the focus of much discussion in the first round of meetings: wildlife habitat, recreation access and designated areas.

In late September 2013, a draft of the Assessment report was shared with the public and posted on the plan revision website as a first snapshot of current condition and trend information.

Best Available Scientific Information

The following hierarchy of information sources was deemed appropriate for evaluating scientific information:

- Information in peer-reviewed scientific journals
- Published and unpublished information from sources such as state and federal agencies, such as the U.S. Census Bureau and the Southern Research Station, if collected using standardized protocols
- Federal and state agency inventory and monitoring data, both current and historic
- Published and unpublished information from universities and colleges in the form of theses, dissertations, or technical reports
- Expert opinion where specific facts are not known to be established through any of the above sources.

Information from all sources was evaluated to determine if it was relevant to the scope and scale of the question at hand, if it appeared to be high quality and valid. Scientific information was used if characterized by clearly defined and well-developed methodology, logical conclusions, and reasonable inferences.

Participants in the plan revision process were asked to submit suggestions for information sources or submit information directly. Information submitted by participants is listed in an appendix to this document. These suggested sources were considered to determine if any relevant information had been overlooked or

previously unknown to the assessment writers. If so, those sources, if evaluated as suitable, were included in documentation for the assessment.

To be relevant, the information must pertain to the 15 topics under consideration at spatial and temporal scales appropriate to the plan area and to a land management plan. Relevance in the assessment phase means scientific information that is relevant to the condition and trends of the 15 topics in 36 CFR 219(b), or to the sustainability of social, economic, or ecological systems (36 CFR 219.5(a) (1)).

Information about the fifteen assessment topics was organized initially by formulating a series of questions to be addressed. Those information sources that most clearly applied to the specific questions were considered the most relevant, and were used by assessment writers to structure the document sections. Other information sources may have been used to provide context or explanation of data, findings, relationships or causes.

Where information is uncertain or there are known data gaps, this is disclosed. The Planning Rule is clear that the assessment should evaluate existing information that is currently available in the form useful for the planning process, without further data collection, modification or validation. The Assessment does not require the development of new information.

Assessment Structure

The specific content of the report is based on the requirements of the 2012 Planning Rule, with consideration of the 2012 Planning Rule Proposed Directives (Forest Service Handbook 1909.12), and with consideration of input from the public meetings and other interactions described above.

This Nantahala and Pisgah National Forest Assessment is a summary of information compiled by the ID team. More detail is contained in additional supplementary documents which are referenced by name in Appendix B. Those additional documents are available on our Forest Plan Revision Website, www.fs.usda.gov/goto/nfsnc/nprevision, and by request.

This report explores the 15 content areas identified as Assessment topics in the 2012 Planning Rule. They include:

- Land status and ownership, use, and access patterns;
- Terrestrial ecosystems, aquatic ecosystems, and watersheds;
- Air, soil, and water resources and quality;
- System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change;
- Baseline assessment of carbon stocks;
- Threatened, endangered, proposed and candidate species, and potential species of conservation concern present in the plan area;
- Social, cultural, and economic conditions;
- Benefits people obtain from the NFS planning area (ecosystem services);
- Multiple uses and their contributions to local, regional, and national economies;
- Recreation settings, opportunities and access, and scenic character;
- Renewable and nonrenewable energy and mineral resources;
- Infrastructure, such as recreational facilities and transportation and utility corridors;

- Areas of tribal importance;
- Cultural and historic resources and uses; and
- Existing designated areas located in the plan area including wilderness and wild and scenic rivers and potential need and opportunity for additional designated areas.

The Assessment begins with Land Status Ownership, Use and Access Patterns, because this provides context for the remaining sections that follow. All of the topics are inherently interrelated, and sections refer to other sections for additional information.

Land Status and Ownership, Use, and Access Patterns

Key questions addressed by this Section:

- How much land is in each of the 18 counties of WNC where Nantahala and Pisgah NFs occur? What proportion is NFS land? Considering all lands in the 18 counties, what are the amounts and proportions of forest land, farmland, and urban area?
- What are the apparent patterns of land ownership and use?
- What types of zoning or other land use regulations exist in the 18 counties?
- What types of management occur on the NFS lands?
- What lands have been acquired over the past 20 years?
- In the 1987 Plan (as amended), what is direction regarding land adjustment? Considering a continuation of the 1987 Plan direction and funding trends, what are the likely future trends for land adjustment?

How much land is in each of the 18 counties of WNC where Nantahala and Pisgah NFs occur? What proportion is NFS land? Considering all lands in the 18 counties, what are the amounts and proportions of forest land, farmland, and urban area?

Nantahala and Pisgah NFs land is comprised of 1,044,393 acres in parcels spread across 18 counties in western North Carolina (WNC). The table that follows displays the total acres in each county; the amount if NFS land in each county, and; the percent of the county land that is NFS land.

Table 3. Total and NFS acres for each county in the plan area; Percent of the county that is NFS land

County – Nantahala NF	Total Acres	NFS Acres	% NFS
Cherokee	298,544	93,422	31
Clay	141,099	65,934	47
Graham	192,970	113,443	59
Haywood	354,812	68,886	19
Jackson	316,350	77,220	24
Macon	332,334	153,199	46
Swain	345,863	22,352	6.5
NANTAHALA NF AREA	1,981,972	594,456	30
County – Pisgah NF	**Total Acres**	**NFS Acres**	**% NFS**
Avery	158,171	28,369	18
Buncombe	422,043	31,464	7.5
Burke	329,406	48,794	15
Caldwell	303,422	49,416	16
Henderson	239,980	17,295	7.2
McDowell	285,540	73,728	26
Madison	288,892	55,278	19
Mitchell	142,114	18,916	13
Transylvania*	243,440	88,307	36
Watauga	199,810	393	0.2
Yancey	200,309	38,272	19
PISGAH NF AREA	2,813,127	450,232	16

*Includes some Nantahala NFs acres; 295 acre margin of error

Approximately 22% of the 18-county area is part of Nantahala or Pisgah NF. The percent of each county that is NFS land ranges from a low of less than one percent to more than 50%, with generally higher percentage for Nantahala NF than Pisgah NF. The Nantahala NF area tends to be more remote and less populated than the Pisgah NF area, which has implications for the types and amounts of resource management and access that may be desired by the local communities.

The tables below display the amounts and proportions of different land uses as of 2006 across the 18-county area, North Carolina as a whole, and the USA as a whole (NASA 2006). Of those acres identified as forest lands, approximately 27% is national forest, whereas the majority of forest land is owned by private individuals or other private entities. The percent of forested land in the 18 counties according to this data source ranges from a low of 64% in Henderson County to a high of 95% in Swain County, with the percentages generally higher among the western-most and least populous counties.

Table 4. Nantahala National Forest Area Land Uses: Acres and Proportions by County

	Cherokee County, NC	Clay County, NC	Graham County, NC	Haywood County, NC	Jackson County, NC	Macon County, NC	Swain County, NC	North Carolina	U.S.
Total Acres	**298,544**	**141,099**	**192,970**	**354,812**	**316,350**	**332,334**	**345,863**	**34,396,042**	**2,369,948,100**
Forest	259,733	103,002	179,462	298,042	284,715	279,161	328,570	14,446,338	592,487,025
Grassland	2,985	11,288	1,930	17,741	9,491	16,617	2,717	2,063,763	402,891,177
Shrubland	20,898	12,699	1,930	24,837	15,818	23,263	3,459	5,159,406	284,393,772
Mixed Cropland	2,211	5,644	247	7,096	741	6,647	0	9,974,852	924,279,759
Water	5,971	2,822	5,789	0	1,236	740	6,917	343,960	23,699,481
Urban	0	0	0	247	0	0	0	687,921	71,098,443
Other	491	246	0	741	0	247	0	166,085	15,081,840

Percentages	**Cherokee County, NC**	**Clay County, NC**	**Graham County, NC**	**Haywood County, NC**	**Jackson County, NC**	**Macon County, NC**	**Swain County, NC**	**North Carolina**	**U.S.**
Forest	87.0%	73.0%	93.0%	84.0%	90.0%	84.0%	95.0%	42.0%	25.0%
Grassland	1.0%	8.0%	1.0%	5.0%	3.0%	5.0%	0.8%	6.0%	17.0%
Shrubland	7.0%	9.0%	1.0%	7.0%	5.0%	7.0%	1.0%	15.0%	12.0%
Mixed Cropland	0.7%	4.0%	0.1%	2.0%	0.2%	2.0%	0.0%	29.0%	39.0%
Water	2.0%	2.0%	3.0%	0.0%	0.4%	0.2%	2.0%	1.0%	1.0%
Urban	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	2.0%	3.0%
Other	0.2%	0.2%	0.0%	0.2%	0.0%	0.1%	0.0%	0.5%	0.6%

Table 5. Pisgah National Forest Area Land Uses: Acres and Proportions by County

	Avery County, NC	Buncombe County, NC	Burke County, NC	Caldwell County, NC	Henderson County, NC	McDowell County, NC	Madison County, NC	Mitchell County, NC	Transylvania County, NC	Watauga County, NC	Yancey County, NC	North Carolina	U.S.
Total Acres	**158,171**	**422,043**	**329,406**	**303,422**	**239,980**	**285,540**	**288,892**	**142,114**	**243,440**	**199,810**	**200,309**	**34,396,042**	**2,369,948,100**
Forest	137,609	303,871	223,996	209,361	153,587	231,287	239,781	125,060	214,227	157,850	176,271	14,446,338	592,487,025
Grassland	3,163	25,323	19,764	18,205	11,999	14,277	11,556	5,685	7,303	17,983	4,006	2,063,763	402,891,177
Shrubland	14,235	59,086	59,293	45,513	38,397	34,265	28,889	8,527	14,606	15,985	16,025	5,159,406	284,393,772
Mixed Cropland	246	12,661	9,882	18,205	26,398	2,855	2,889	987	2,434	1,998	1,243	9,974,852	924,279,759
Water	0	0	3,294	1,477	0	247	0	0	496	0	0	343,960	23,699,481
Urban	0	12,661	3,294	1,723	2,222	494	0	0	0	1,235	0	687,921	71,098,443
Other	246	495	247	1,723	741	0	246	0	0	1,235	0	166,085	15,081,840
Percentage	**Avery County, NC**	**Buncombe County, NC**	**Burke County, NC**	**Caldwell County, NC**	**Henderson County, NC**	**McDowell County, NC**	**Madison County, NC**	**Mitchell County, NC**	**Transylvania County, NC**	**Watauga County, NC**	**Yancey County, NC**	**North Carolina**	**U.S.**
Forest	87.0%	72.0%	68.0%	69.0%	64.0%	81.0%	83.0%	88.0%	88.0%	79.0%	88.0%	42.0%	25.0%
Grassland	2.0%	6.0%	6.0%	6.0%	5.0%	5.0%	4.0%	4.0%	3.0%	9.0%	2.0%	6.0%	17.0%
Shrubland	9.0%	14.0%	18.0%	15.0%	16.0%	12.0%	10.0%	6.0%	6.0%	8.0%	8.0%	15.0%	12.0%
Mixed Cropland	0.2%	3.0%	3.0%	6.0%	11.0%	1.0%	1.0%	0.7%	1.0%	1.0%	0.6%	29.0%	39.0%
Water	0.0%	0.0%	1.0%	0.5%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	1.0%	1.0%
Urban	0.0%	3.0%	1.0%	0.6%	0.9%	0.2%	0.0%	0.0%	0.0%	0.6%	0.0%	2.0%	3.0%
Other	0.2%	0.1%	0.1%	0.6%	0.3%	0.0%	0.1%	0.0%	0.0%	0.6%	0.0%	0.5%	0.6%

What are the apparent patterns of land ownership and use?

The flattest land near rivers was the first to be homesteaded in the late 1700s through the early 1900s, and towns sprang up followed by railroads and highways. As everywhere, transportation corridors facilitated growth of population and commerce, and development spreads from there. In the case of WNC, narrow gauge railroads often preceded roads, and facilitated timber extraction from areas of high country. In many places rivers, railroads, and highways run parallel to one another.

In the twenty-first century, residential developments are creeping up slopes and may occur literally at the boundary of NFS land. While WNC is still predominantly forest land, there are many areas where the forest is dotted with individual residences or multi-family dwellings, often second homes, and associated lawns, outbuildings, driveways, and access roads. While there are many large blocks of contiguous NFS land contained within the boundaries of Nantahala and Pisgah NFs, there are also many isolated parcels with limited or no access for either management or public use except by adjacent land owners. Many parcels are interspersed with privately owned land, and there are many private inholdings within the NFS boundaries.

What types of zoning or other land use regulations exist in the 18 counties?

Most of the 18 counties have a land use plan, and the state has some regulations regarding ridge top developments and water quality. Online details may be found through the links listed below (based on active Web addresses from September 2013):

Burke County
www.co.burke.nc.us/index.asp?Type=B_BASIC&SEC={6A1BF62F-43AA-425D-84DD-F88B15EE28F0}

Caldwell County
www.caldwellcountync.org/caldwell-county-nc-departments/planning-and-development/ordinances/

Haywood County
www.haywoodnc.net/index.php?option=com_content&view=article&id=110:planning-department&catid=55:Planning&Itemid=95

Henderson County
www.hendersoncountync.org/planning/countyplans.html

Jackson County
http://jacksonnc.hazelinteractive.com/planning-ordinances.html

Madison County
www.madisoncountync.org/zoning_forms.php

McDowell County
www.mcdowellgov.com/index.asp?Type=B_BASIC&SEC={F1C2D7D0-EE35-4CFA-8390-730A168368AB}

Watauga County
www.wataugacounty.org/main/App_Pages/Dept/Planning/ordinances.aspx

Mountain Ridge Protection Act of 1983
www.cals.ncsu.edu/wq/lpn/statutes/nc/mountainridgeprotection.htm

Water Quality related statutes
http://portal.ncdenr.org/web/wq/ps/csu/rules

What types of management occur on NFS lands?

Most of the multiple uses found on NFS lands occur on Nantahala and Pisgah NFs, including outdoor recreation, timber, wildlife and fish habitat, water, and wilderness, among many others. A close working relationship with state agency partners is critical in the management of wildlife and fish habitat areas.

Some uses are quite limited due to geographic location. For example, winter sports-related uses are limited in that there is no consistent snowpack even at the highest elevations of these mountains. There are no ski areas and no snowmobile areas, although cross-country skiing does occur. Another use that occurs rarely on these national forests is grazing. While grazing livestock is occasionally used as a vegetation control device, for example to keep the mountain balds from being encroached by trees, there is no capacity and no demand for rangeland.

The 1987 Plan for Nantahala and Pisgah NFs is based on the "management area" concept. Twenty-one different management areas (MAs) exist, each with a different focus and different mix of multiple uses. These management areas are usually not contiguous blocks of lands, but are assigned to areas depending on factors such as accessibility, terrain, historic use, and special features. The management areas are described in Appendix C, and are listed in the following table along with the amount of acres in each and the main management focus.

Maps displaying the locations of management areas are also in Appendix C and larger maps are available online at:
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5411892.pdf
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5411893.pf

Figure 4. Linville Gorge Wilderness

Linville Gorge Wilderness (Figure 4, MA 7) and Cradle of Forestry in America interpretive center (Figure 5, MA 11) show the ends of the development spectrum from no development to permanent high-use design.

Figure 5. Cradle of Forestry in America

Table 6. Management Areas (MA) – 1987 Nantahala/Pisgah Land Management Plan (Approximate acres as of 1994 Amendment 5)

MA	N/P Acres	Abbreviated Description
1B	38,498 acres	Manage for a sustainable supply of timber and provide motorized access into the forest for traditional uses.
2A	40,642 acres	Manage to provide pleasant scenery along roads or lakeshores for people driving or boating for pleasure. Design timber management activities to maintain pleasant scenery.
2C	37,680 acres	...Same as above, but without timber management.
3B	232,873 acres	Manage for a sustainable supply of timber with limited motorized access.
4A	55,604 acres	Remote forest setting mostly closed to motor vehicles. Manage for high quality scenery. Design timber management activities for these conditions.
4C	179,992 acres	Remote forest setting mostly closed to motor vehicles. No timber mgmt.
4D	160,080 acres	Remote forest setting; high quality wildlife habitat; mostly closed to motor vehicles. Design timber management activities for these conditions.
5	119,685 acres	Forest Backcountry with little evidence of human activities. No timber management.
6	8,419 acres	Wilderness Study Areas
7	66,550 acres	Wilderness
8	12,250 acres	Experimental Forests
9	7,900 acres	Roan Mountain
10	1,460 acres	Research Natural Areas
11	6,540 acres	Cradle of Forestry
12	3,030 acres	Developed Recreation Areas
13	10,370 acres	Special Interest Areas
14	12,450 acres	Appalachian Trail and corridor
15	5,616 acres	Wild and Scenic River Corridor (*Wilson Creek WSR and Corridor has been added since 1994)
16	1,260 acres	Administrative facility sites
17	3,880 acres	Balds
18	101,530 acres (Partially Embedded)	Riparian areas (streamside zones) throughout all management areas

Figure 4. A timber management area, post regeneration harvest

Figure 5. Timber harvest and regeneration is implemented in management areas that include timber production as part of their description.

What lands have been acquired over the past 20 years?

Almost all of the Nantahala and Pisgah NFs was acquired under the Weeks Law of 1911 or related acts, rather than from the public domain as were national forests in the West. Many of the tracts acquired were small and intermingled with private ownership. Fragmentation of ownership contributes to the complexity of activities such as location and maintenance of landlines, administration of rights-of-way, and resolution of boundary disputes. Encroachments and claims are frequent, difficult and expensive to resolve. Consolidation of fragmented NFS lands can:

- facilitate property line maintenance,
- reduce encroachments and claims,
- decrease the need for rights-of-ways,
- reduce the number of special use applications, and administration of permits.

Managing National Forest System (NFS) lands includes: (1) acquisition, exchange, and transfer of NFS land; (2) acquiring, granting, and exchanging rights-of-way; (3) locating and maintaining property boundary lines; (4) resolving land claims and encroachments; (5) determining the suitability of available lands for satisfying the National Forest mission, as well as following the Land Ownership Adjustment Plan; and (6) maintaining lands records, including the status of minerals reservations. These activities are the foundation of providing a national forest available to all.

During the period 1992 through 2012, approximately 17,659 acres were added to the Nantahala and Pisgah NFs as a result of land exchanges, purchases, donations, and conveyances.

Table 7. Land Added to Nantahala or Pisgah National Forest 1992 - 2012

District	# Tracts Added	Acres Added
Appalachian	75	3,570
Cheoah	16	524
Grandfather	10	4,017
Nantahala	134	8,017
Pisgah	8	736
Tusquitee	11	795
TOTAL	254	17,659

Many people like the amenities of living adjacent to national forest and preferentially locate there, but are often unaware of Forest Service management requirements. Conflicts occur between adjacent landowners and visitors; some linger as long-term disputes. Obtaining easements for public access to National Forest System lands is increasingly difficult. These challenges are expected to continue into the future.

The main focus of land acquisitions during the 1990s and early 2000s was to purchase tracts along the Appalachian Trail corridor. Also of note during the last 20 years are acquisitions associated with Chattooga and Horsepasture Wild and Scenic Rivers, Lake Logan and Lake James, and Catawba Falls. These additions to the national forests will help ensure public access to these special places.

Title Claims, Encroachments and Trespass on the Nantahala and Pisgah National Forests

The Nantahala and Pisgah NFs have over 4,100 miles of boundary line locating 1,044,393 acres of NFS lands. Fifty-eight percent of these boundary lines have been painted and posted at some time, whereas 42%, or 1,722 miles, of these boundaries lines do not have

known records of maintenance. Currently, existing boundary lines are maintained on a 10- to 20-year cycle.

Development on private lands continues to threaten public lands and resources through unauthorized and illegal occupation and use of the adjoining public lands. This may be the result of willful and knowing action, erroneous land survey, title flaws, deed and abstract errors, unrecorded deeds, adverse possession, reliance on estimated boundaries, erroneous fences and failure to have a proper land survey made before improvements on adjoining lands. When estimating the number of NFS acres encroached upon, one encroachment per mile has been consistent when surveying along developed private lands adjoining National Forest land.

At present, though the number is certainly higher, there are over 150 known title claim, encroachment and trespass cases on the Nantahala and Pisgah NFs that are either active, inactive, or suspected. Approximately eight cases are resolved per year. Cases range from quick resolution to more lengthy cases that can take years to reach conclusion through court proceedings. For every case resolved, new cases emerge. The current backlog may be estimated at 20 years.

In the 1987 Plan (as amended), what is the direction regarding land adjustment? Considering a continuation of the 1987 Plan direction and funding trends, what are the likely future trends for land adjustment?

The following is the general forest-wide direction for land adjustment (USDA Forest Service 1995B, LMP, Amendment 5, pg. III-45):

1. *Acquire or exchange lands within proclamation boundaries to provide or improve:*
   - *Protection within Wilderness;*
   - *Protection of Wild and Scenic River Corridors;*
   - *Protection of the Appalachian Trail;*
   - *Access opportunities (administrative and public);*
   - *Wildlife and fish management opportunities;*
   - *Efficiency of management;*
   - *Timber resource management;*
   - *Protection of ecologically significant areas.*
2. *Acquire rights-of-way to provide access opportunities to NFS lands for public and administrative needs.*

There are always more tracts available for acquisition – sellers actively pursuing a sale – than there are funds available to purchase tracts. Often a land trust will act as a third party to acquire and hold desirable tracts until funds become available for government purchase. Fund availability is largely unpredictable.

Figure 6. Catawba Falls, Grandfather RD

Terrestrial Ecosystems, Aquatic Ecosystems, and Watersheds

Key Questions Addressed in this Section:

- What are the predominant terrestrial ecosystems and rare habitats present on the Nantahala and Pisgah National Forests? What are the trends in species richness and selected habitat elements?
- For each ecosystem:
  - What are the key characteristics relevant to informing the land management plan?
  - What is the ecosystem structure?
  - What are the system drivers and stressors?
  - What are the current trends under the 1987 plan?

What are the predominant terrestrial ecosystems present on the Nantahala and Pisgah National Forests? What are the trends in species richness and selected habitat elements?

The landscape of western NC is classified into 11 predominant ecological zones based on a model that considers factors such as landform, geology, and elevation. These 11 ecological zones will be the terrestrial ecosystems identified for the purposes of this report. In addition, numerous rare habitats occur within the Nantahala and Pisgah NFs. Tables 8 and 9 list the predominant ecological zones and rare habitats, along with the potential or known amount on all lands in the 18-county area, and the amount on NFS land. It is important to note that the acres allotted to each ecological zone is based on modeled data and may or may not be what is actually found on the ground, due to the disturbance history and current land use.

Table 8. Potential acres of each Ecological Zone

Modeled Ecological Zones	Potential Acres[1] within NFS*& Percent of Total		Potential Acres[2] All Lands
Spruce-Fir	16,604	33%	49,971
Northern Hardwood	53,924	34%	158,320
High Elevation Red Oak	38,637	45%	85,551
Acidic Cove	240,938	24%	1,021,447
Rich Cove	189,143	25%	766,008
Mesic Oak	186,131	18%	1,043,181
Dry-Mesic Oak	105,991	23%	468,866
Dry Oak	59,677	23%	260,286
Pine-Oak Heath	101,275	33%	307,172
Shortleaf Pine-Oak Heath	44,541	12%	370,138
Floodplain Forest	2,640	1.7%	151,615
Unassigned	4,892	n.a.	112,543
TOTAL	1,044,393	22%[3]	4,795,098

[1] Acres are considered "potential" in that there are acres that currently have a different type of vegetation in place due to past events.
[2] "Potential acres" on all lands include the 23% that is a land use other than "forest," such as pastureland, cropland, residential or urban.
[3] NFS land is 22% of all land in the 18-county plan area. Percentages higher than 22% reflect a greater than proportional amount of "potential" on NFS land, while percentage lower than 22% reflect a lower than proportional amount of "potential" on NFS land

Table 9. Known Sites of Rare Habitats

Rare Habitats	# Occurrences (sites)/ acres if known – NFS land	% of known sites on NFS land	TOTAL # Occurrences/acres – All Lands
Grassy Bald	11 sites	65%	17 sites
Heath Bald	14 sites/ 35 acres	42%	33 sites/ 83 acres
Beech Gap/Boulderfield Forest	34 sites/247 acres	72%	47 sites/ 345 acres
High Elevation Rock Outcrop	45 sites	51%	88 sites
Montane Cliff	39 sites	40%	97 sites
Low Elevation Rock Outcrop	19 sites/ 190 acres	46%	41 sites/ 410 acres
Carolina Hemlock Forest	10 sites	28%	36 sites
White Pine Forest	7 sites/ 70 acres	88%	8 sites/ 80 acres
Calcareous Oak-Walnut Forest	1site/ 25 acres	33%	3 sites/ 133 acres
Serpentine Barrens	1 site/ 300 acres	50%	2 sites/ 307 acres
Low Elevation Glade	14 sites/ 77 acres	31%	45 sites/ 248 acres
Red Cedar-Hardwood Woodland	8 sites/ 36 acres	40%	20 sites/ 90 acres
Shale Slope Woodland	8 sites/ 80 acres	89%	9 sites/ 90 acres
Upland/Vernal Pool	3 sites/ 4 acres	100%	3 sites/ 4 acres
Southern Appalachian Bog	32 sites/ 204 acres	29%	112 sites/ 674 acres
Seep	48 sites/ 22 acres	44%	108 acres/53 acres
Spray Cliff	16 sites	33%	48 sites
Floodplain Pool	1 site/0.3acres	10%	10 sites/ 3 acres
Rocky Bar and Shore	12 sites	34%	35 sites
Cave/Mine	29 sites	63%	46 sites

*NFS land = Nantahala and Pisgah National Forests

**All Lands = the 18-counties of WNC that contain portions of Nantahala and Pisgah NFs

Figure 7. Boulderfield Forest.

NFS lands contain a greater proportion of the high-elevation vegetation types and much less of the very lowest elevation ecozones. This reflects the history of land use in which lower elevations and floodplains remained largely in private ownership, because they were easier to cultivate and build on. The less accessible high country was more easily acquired by the federal government under the Weeks Act, as it was deemed less valuable and was often sold for incredibly low prices in the early 1900s.

The situation for rare habitats is quite different in that in every case - except floodplain pool - the percentage of known occurrences on NFS land exceeds what would be a proportional share based on the percentage of land in the plan area that is national forest – 22%. Since only a tiny percent of bottomland is NFS land, the low percentage of floodplain pools is expected.

Within the 11 ecological zones, vascular plant species richness varies with spruce-fir and pine-oak-heath being relatively less rich and rich coves and mesic-oak typically displaying the greatest richness of the ecozones. Figure 10 displays the expected species richness among the zones.

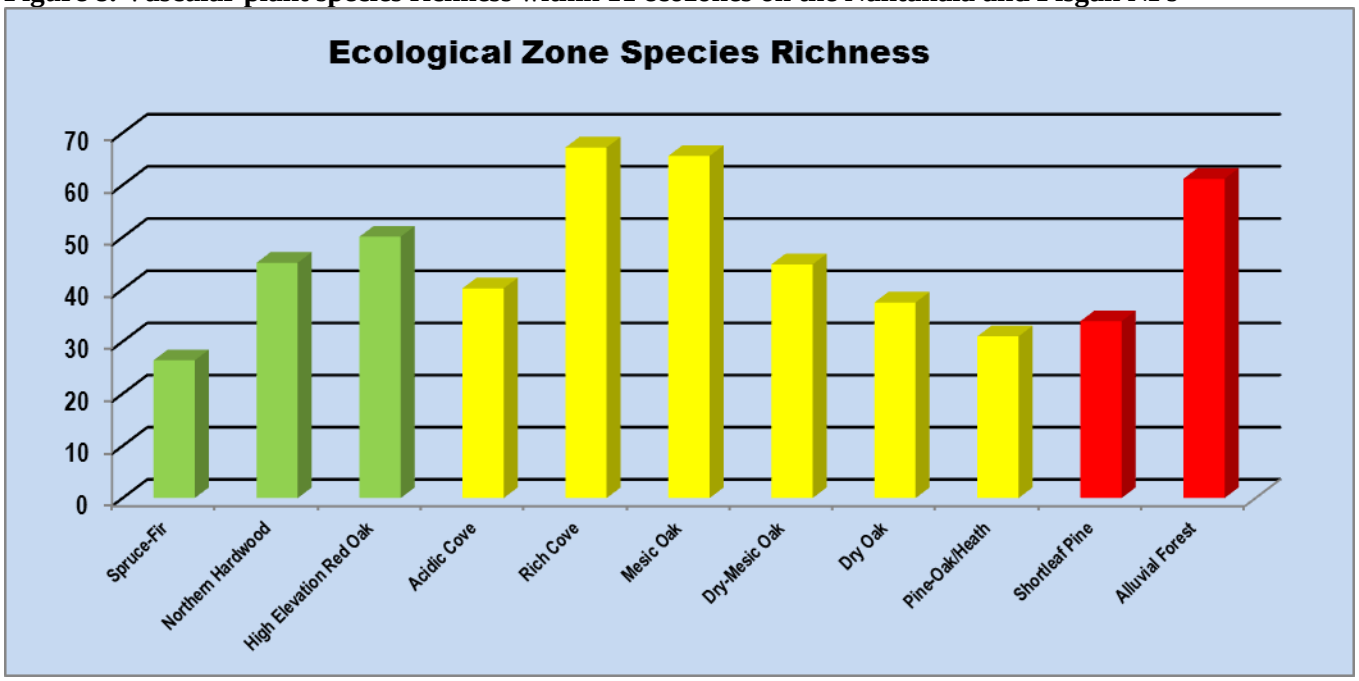
The 11 zones are distinguished by disturbance regimes, structural diversity, and species composition. A summary description of each ecological zone follows. More complete descriptions for each ecological zone and rare habitats are available in separate documents, as described in Appendix B.

Across all ecozones, trends in certain habitat elements are noteworthy. For example, young forest is underrepresented within the majority of ecozones on both NFS and other lands. Over the last fifteen years on the national forests the amount of mature and old forest has increased, while the amount of very young forest – also known as early successional habitat and calculated based on 0-10 year old regenerated stands - has decreased from 3.0% to 0.6% of the national forests, from 31,026 acres to 6,244 acres (USDA Forest Service 2013a).

On non-NFS lands in the 18-county area, the amount of 0-10 year old forest is approximately 2.8% or 106,405 acres out of 3,750,408 total non-NFS acres (Miles 2012).

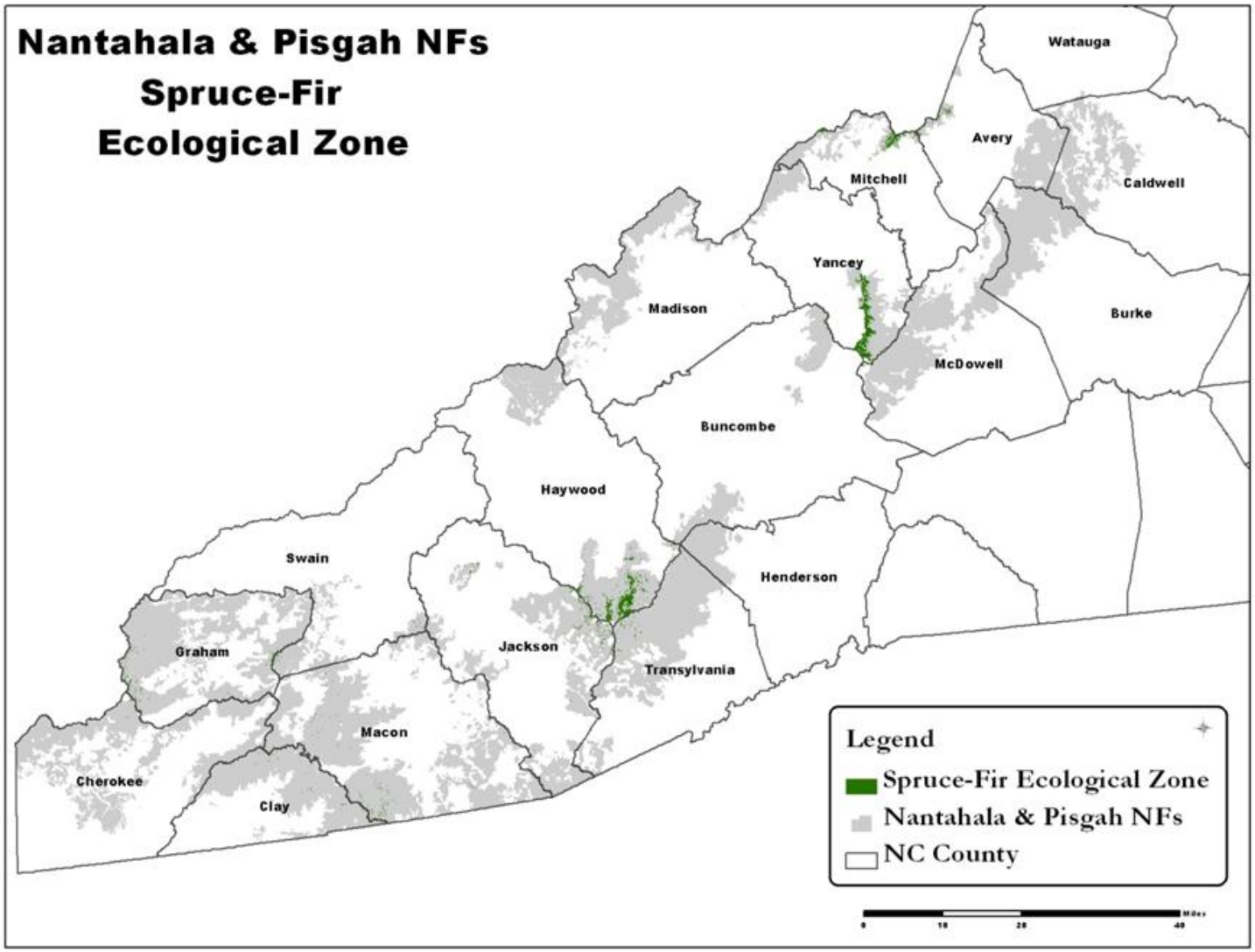
The approximate amount of forest over 100 years in age on NFS lands in the 18-county area is 166,000 acres, or 16% of the Nantahala and Pisgah NFs (USDA Forest Service 2013a). On non-NFS land in the 18-county area there is approximately 252,500 acres of forest over 100 years of age, or 6.7% of non-NFS land (Miles 2012).

Figure 8. Vascular plant species richness within 11 ecozones on the Nantahala and Pisgah NFs



Ecozones in green columns are most frequent at high elevations (> 4200 feet), yellow columns dominate at mid elevations (2300-4200 feet), and ecozones in red columns are most frequent at low elevations (< 2300 feet).

Figure 9. Spruce-Fir Ecological Zone.



Spruce-Fir

Key Characteristics: The overstory is predominantly red spruce and Fraser fir, with a low diversity of other canopy trees; low to moderately diverse herb layer; and high bryophyte, moss, liverwort diversity. There should be evidence of red spruce and Fraser fir reproduction sufficient to maintain the stand. A distinct bird community exists including red crossbill. Northern flying squirrel, spruce-fir moss spider and rock gnome lichen may be present.

Composition and Structure:

This zone occurs on the highest mountains at all exposures and topographic positions from 5,200 to over 6,000 feet in elevation, with some red spruce occurring as low as 4,500 feet. Large patches of this ecozone occur, but often at a distance from other patches due to their position only at the highest elevations. Due to mortality of Fraser fir trees by balsam woolly adelgids, former Fraser fir dominated forests are less abundant and have been replaced with red spruce. The cyclic nature of adelgid induced mortality creates a patchy, uneven-aged structure as groups of fir trees mature, are attacked, and die.

Sixty-nine bird species have been documented in spruce-fir forests in the Nantahala and Pisgah NFs between 1997 and 2012.

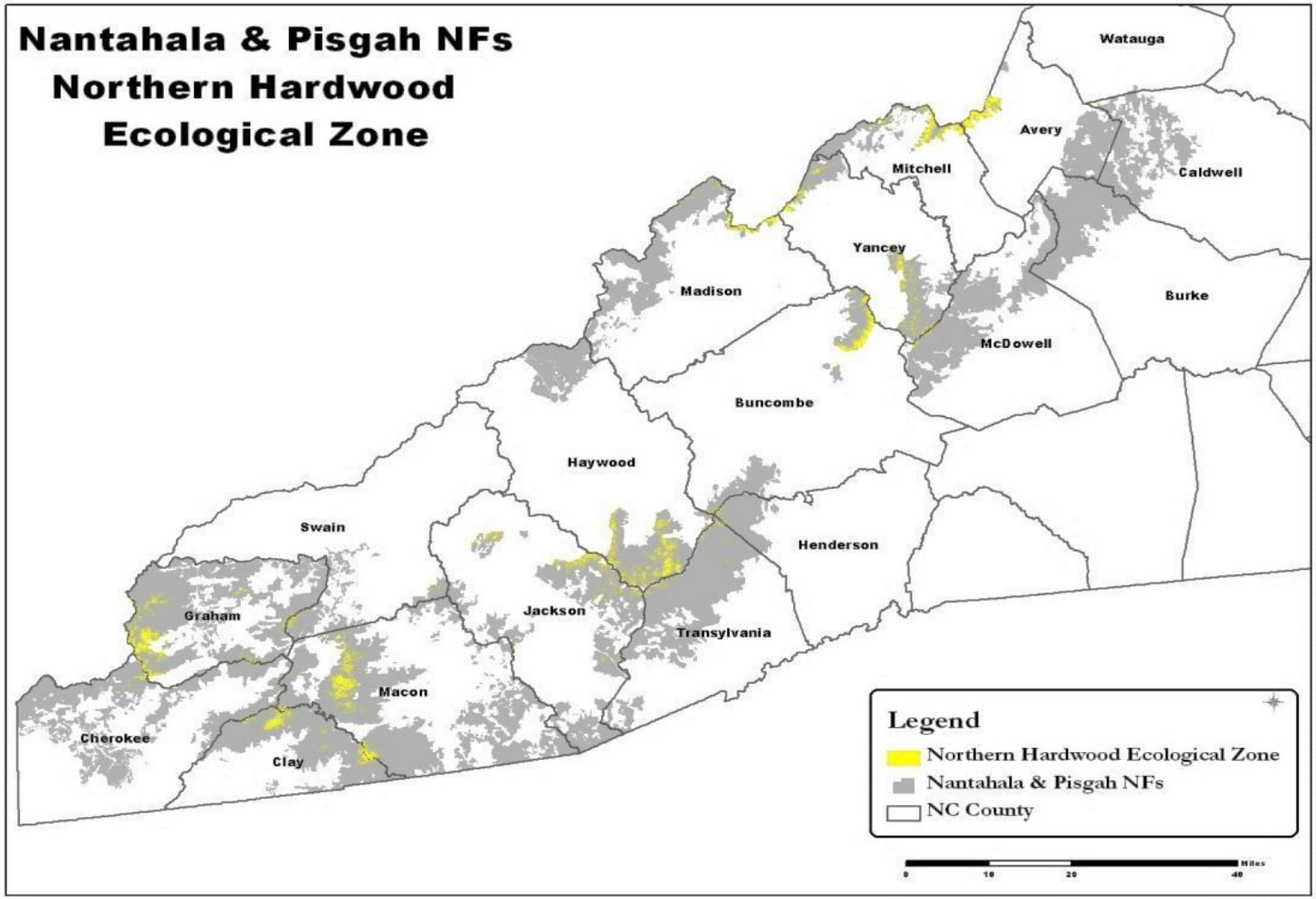
Drivers and Stressors:

The Balsam woolly adelgid continues to be a major system stressor. Moisture is abundant from fog deposition and rainfall. Low temperatures, high winds, hoar frost, and rime ice are all important natural disturbance events influencing this zone.

Trends with the 1987 Plan:

Approximately 92 percent of the existing spruce-fir forest is contained within management areas with special management provisions, such as Special Interest Areas. These are managed to maintain identified special features, which may or may not take the spruce-fir forest into account. There is no practical treatment for balsam woolly adelgid – a major threat to Fraser fir. No efforts are currently underway to attempt restoration of the spruce-fir forest on appropriate sites currently occupied by other canopy species.

Figure 10. Northern Hardwood Ecological Zone.



Northern Hardwood

Key Characteristics: Typical canopy species include yellow birch, sugar maple, and beech mixed with other species; hobblebush and red elderberry are distinctive in the shrub layer; rhododendron common on some sites; herb layer can be diverse, often with ramp patches; Gray's lily may occur. This is generally a closed canopy habitat with wind and ice as major disturbance factors. Northern flying squirrel, ruffed grouse, and golden-winged warbler may be present.

Composition and Structure:

In western North Carolina, the habitat is patchy but relatively evenly distributed occurring at greater than 4000 feet elevation. Overstory composition can have much variation depending on whether it occurs as a transition type from spruce-fir, as a type on high exposed ridge tops, or in somewhat sheltered high coves and concave slopes. The distinguishing feature in all cases would be predominance of the mesophytic species yellow birch, beech, and sugar maple over the numerous oak species more common in many other ecozones. Vascular plant and bryophyte diversity is high within the more mesic open understory portions of this zone. Over 60% of the zone has a shrub density with less than 50% cover. Rare plant species are diverse with one federally listed species.

Seventy-nine bird species have been documented from northern hardwood forests in the Nantahala and Pisgah NFs between 1997 and 2012 (USDA Forest Service 2013b). Additionally, northern hardwoods provide essential habitat for several animal species found nowhere else in North Carolina, including the federally-endangered Carolina northern flying squirrel and a suite of terrestrial salamanders.

Drivers and Stressors:

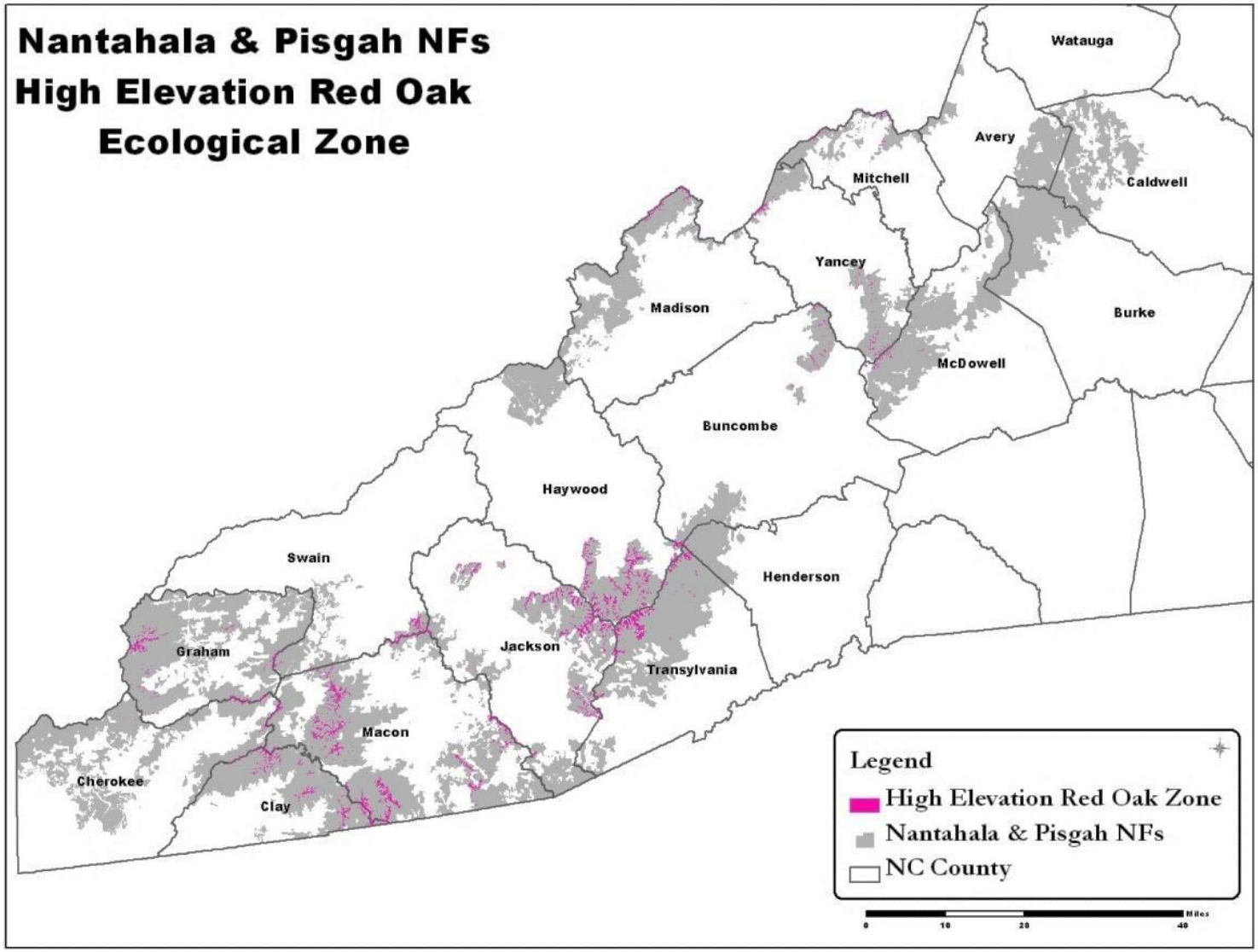
Hunter et al. (1999) suggests that the available acreage of northern hardwood habitat is greater now than in the past, primarily due to expansion of northern hardwoods into areas formerly occupied by spruce-fir forests. This is also true for expansion in high- elevation red oak forest (Schafale 2012). Canopy gaps and openings are typically driven by wind events and ice storms, although hemlock dieback from hemlock woolly adelgid may have recently increased the number of openings. Patch sizes are variable.

Non-native pathogens are a potential problem for several tree species in this ecosystem including hemlock woolly adelgid, balsam woolly adelgid, gypsy moth, and beech scale.

Trends with the 1987 Plan:

The 1987 Plan contains a goal to emphasize management of high value hardwood sawtimber, but with more emphasis on oak species and black cherry than species predominant in the northern hardwood ecozone. About 50% of this high elevation ecozone is currently within designated areas such as wildernesses, wilderness study areas, and special interest areas.

Figure 11. High Elevation Red Oak Ecological Zone.



High Elevation Red Oak

Key Characteristics: Predominantly red oak overstory occurring on high elevation ridges.Wind and ice are typical disturbance events that shape the canopy structure; some occurrences exhibit stunted tree growth from exposure to wind and ice. In the past, American chestnut was predominant and was replaced by red oak. Shrub density is variable with deciduous azaleas, including the endemic pink-shell azalea. Pennsylvania sedge is occasionally abundant.

Composition and Structure:

Red oak is currently part of the co-dominant canopy class in mature stands, sharing the main canopy with white oak and northern hardwood species.

Very little of this ecozone contains canopy heights greater than 100 feet tall, with an average of only 14% greater than 75 feet tall.

The abundance of red oak in the understory provides the potential for this community to maintain itself following disturbances.

Drivers and Stressors:

Due to its presence at higher elevations, this ecozone has structural development driven more by disturbance than the other oak dominated ecozones (Lorimer and White 2003). Most notably wind, snow and ice tend to limit overstory crown height development and create canopy gaps.

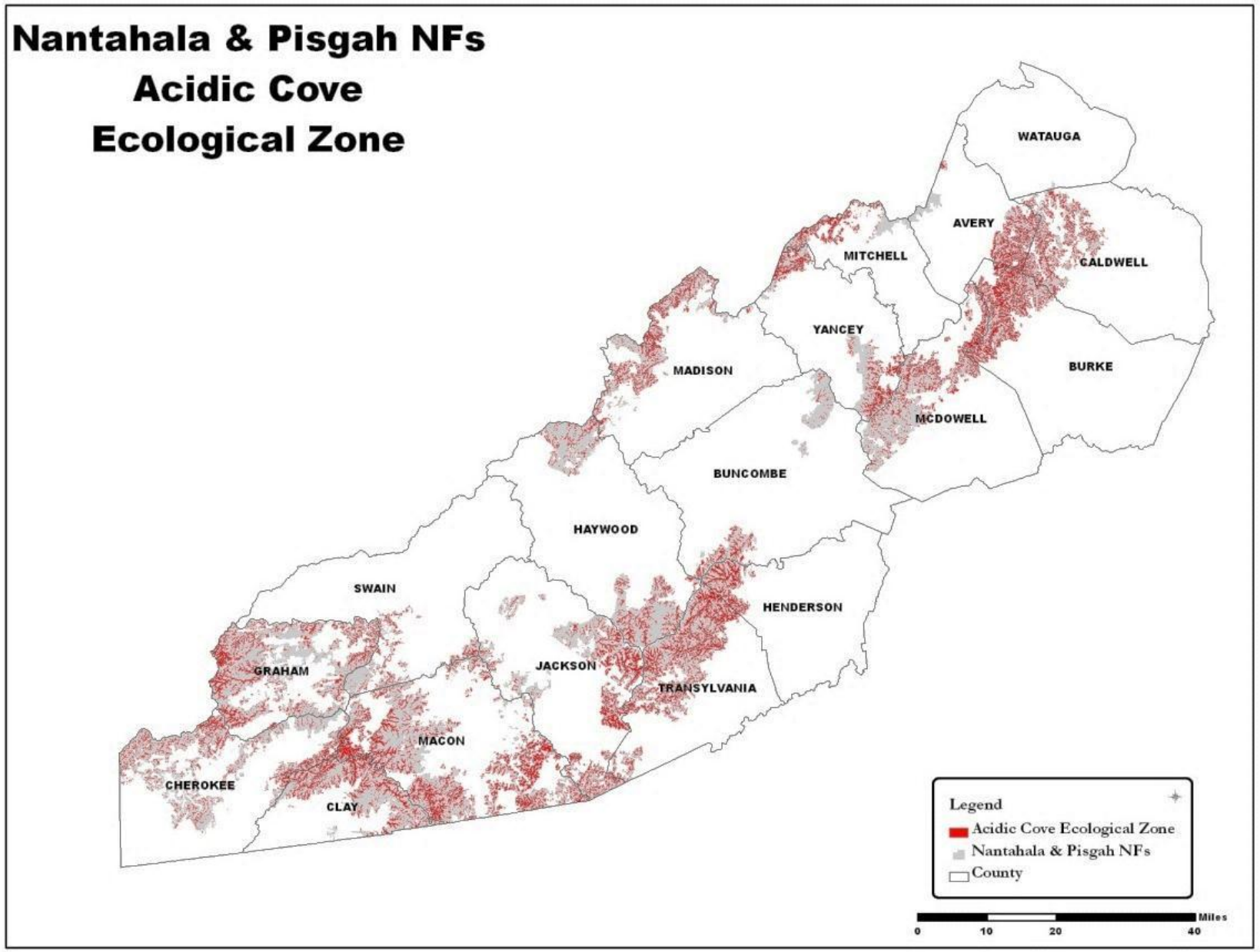
Trends with the 1987 Plan:

The 1987 Plan contains the following goal:

Emphasize high value hardwood sawtimber. Take advantage of the forests' capability to produce large trees of hardwood species valued for beauty and durability of this wood such as Northern red oak and black cherry…

Much of this ecozone is located in management areas that minimize vegetation management, limiting the ability to achieve this goal. In the late 1980s to early 1990s about 3% of the ecozone was young forest, an outcome of timber management activities. However, since then very little management has occurred. A large percentage (57%) of this ecozone is in older age class; less than 5% is greater than 151 years in age.

Figure 12. Acidic Cove Ecological Zone.



Acidic Cove

Key Characteristics: High forest canopy with tulip poplar, hemlock, yellow buckeye, black birch typical in the overstory. Tall rhododendron and dog hobble are common midstory species. Seeps are common as these areas are often associated with springs and streams. Bryophytes are extremely diverse.

Composition and Structure:

The ecozone is the largest ecozone on Nantahala and Pisgah NFs, (~ 23% of the forest). Yellow poplar, black birch, and eastern hemlock, dominate the more protected portion of typic acidic cove forests' overstory (Schafale and Weakley 1990). Red oak and chestnut oak are dominant on steeper north-facing slopes.

Typical structural conditions within the acidic cove ecozone include an open subcanopy with a dense midstory and understory layer of rhododendron. Cove forests have large trees and high basal area; stand age structure is mixed with trees exceeding 300 years. The presence of large diameter snags is also an important feature of the cove forests (Busing 2005). Historical accounts place rhododendron in more localized patches along riparian corridors or present in very low densities with increased fire use by early European settlers (Guyon et al. 2003, Nesbit 1941). Existing high densities and coverage of rhododendron may have occurred after the exploitive logging era, chestnut blight, and the era of fire exclusion which provided the opportunity to expand onto slopes and ridgetops on north facing coves (Van Lear et al. 2002, Rivers et al. 1999). Few herbaceous species are present within this community. Bryophyte diversity, particularly near streams and in steep gorges, is very high. Many rare nonvascular plant species occur within the acidic cove ecological zone. The federally threatened small whorled pogonia also occurs in this ecozone.

High numbers of endemic salamanders are present (Petranka 1998), and population densities of these animals in cove forests make these extremely important habitats. Additionally, cove forests support very high densities of breeding birds, especially mature forest-dependent neotropical migrants (Hinkle et al. 1993).

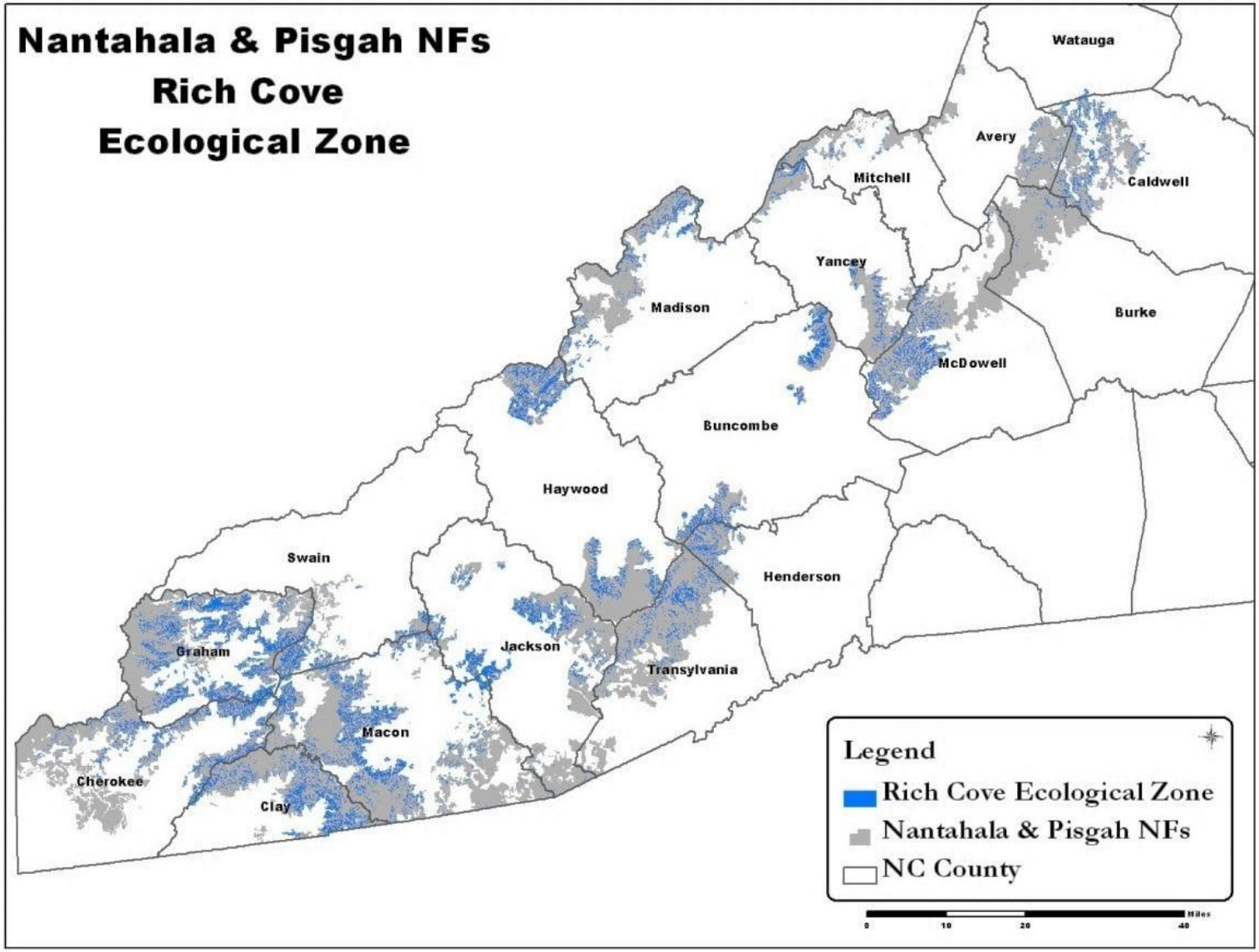
Drivers and Stressors:

Gap-phase dynamics, as well as wind, ice storms and disease allow for natural tree regeneration within this ecozone (Lorimer 1980, Runkle 1982, Busing 2005, Rivers et al. 1999). Patch sizes can vary from single trees to more numerous trees, depending on the level and frequency of disturbance. Large scale disturbance events are uncommon in the sheltered sites with the exception of areas with vegetation management, larger tree gaps may form, considering recent impacts to eastern hemlock (Guyon et al. 2003, VanLear et al. 2002). Historically, this zone was subject to very infrequent fires with surface fires at an average frequency of about 88 years (Landfire 2009, Wade et. al. 2000), yet fire did play a role in composition and structure on certain sites (VanLear et al. 2002, Christensen and Fesenmeyer 2012).

Trends with the 1987 Plan:

With an emphasis on larger landscape burns during the last seven years across the Nantahala and Pisgah NFs has resulted in prescribed burns within the acidic cove ecozone, amounting to 8,622 acres, which is a little more than 3 percent of the ecozone. In general, these areas served as fire breaks for upland burns.

Figure 13. Rich Cove Ecological Zone



Rich Cove

Key Characteristics: High tree diversity in the overstory including tulip poplar, basswood, and sugar maple; silverbell and cucumber tree occurs as a midstory tree species. The shrub layer is sparse shrub layer. Highly diverse herbaceous layer with a high percent herb cover, including American ginseng, black cohosh and bloodroot among many others. Salamander diversity is high due to mesic conditions and high amount of moss-covered down woody debris. Rich coves may be distinguished from acidic cove by the absence of the heath shrub layer (such as rhododendron).

Composition and Structure:

Appalachian cove hardwood forests represent some of the most diverse ecosystems in the world outside of tropical zones (Hunter *et al*. 1999). High vegetative diversity, combined with topographic, microclimatic, and soil characteristics combine to provide an extremely productive habitat for numerous mammals, amphibians, and birds.

In North Carolina this zone is most abundant at mid elevations, from 2,500-4,000 feet; however, it can occur from the lowest elevations within the region to around 4,500 feet (Natureserve 2013, Schafale 2012). The ecozone covers approximately 18% of the Nantahala and Pisgah NFs.

Hardwood tree diversity has the potential to be the highest in this ecozone; however, prior land use history (i.e. agriculture and even-aged timber management) has resulted in many of these areas having low tree diversity, with high abundance of tulip poplar. Compared to acidic cove, there is less of a midstory shrub layer.

The understory development of second growth forests in rich coves is much more robust, heavily diversified with species and containing a correspondingly highly diversified structure. The herbaceous community also adds a high degree of structural diversity to the understory and midstory.

High numbers of endemic salamanders are present (Petranka 1998), and population densities of these animals in cove forests make these extremely important habitats. Additionally, rich cove forests support very high densities of breeding birds, especially mature forest-dependent neotropical migrants (Hinkle et al. 1993).

Drivers and Stressors:

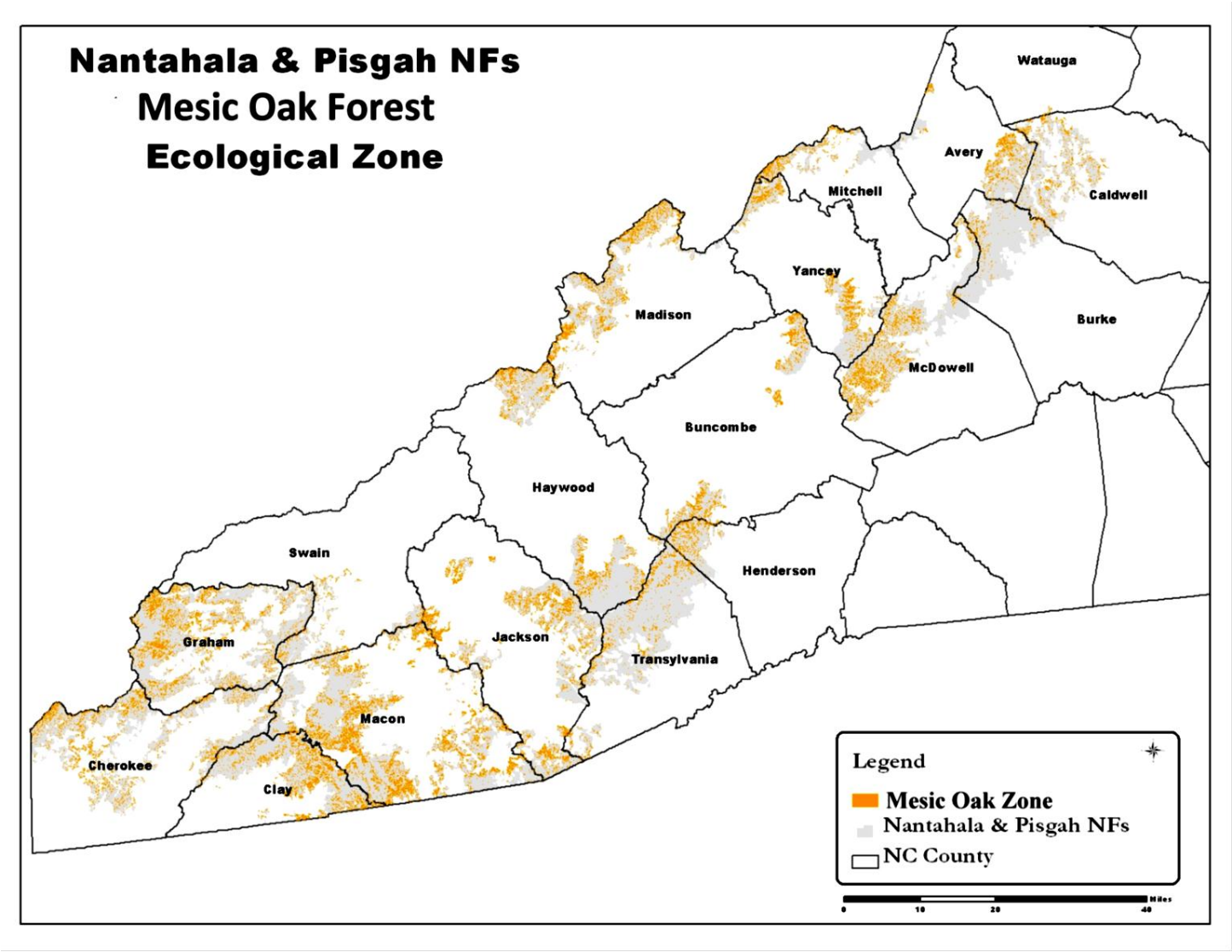
Because these forests occur in cool, moist and sheltered sites, frequent large-scale disturbances are uncommon. Tree fall gaps and wind throw are likely the most common forms of natural disturbance in older cove forests, producing uneven-aged stands that are structurally complex. Fire is not a likely source of disturbance in these forests.

Invasive plant species pose a large threat in this ecozone, particularly when the area is opened up through management or other type of disturbance.

Trends with the 1987 Plan:

In light of the 1987 Plan’s goal to emphasize high-value hardwood sawtimber, this is one of the ecozones where the Forest Service currently performs a lot of timber management.

Figure 14. Mesic Oak Forest Ecological Zone.



Mesic Oak

Key Characteristics: Diversity of oak trees in the canopy including red and white oak with a diversity of hickories; red maple and tulip poplar present where disturbance has occurred. More tolerant red maple occurs in the midstory because fire has been excluded; low shrub density; herbaceous diversity variable but can be high, especially on basic substrates. Dogwood is common in the midstory. Wood thrush and ovenbird are likely to be present among many other bird species. A high amount of hard mast production occurs that benefits wildlife.

Composition and Structure:

This ecozone occurs on somewhat protected to partially sheltered landforms that are convex in shape (Simon 2011). This ecozone covers almost 18% of the two national forests, and is the most common of the oak dominated zones. White oak, red oak, and various hickories are the dominant tree canopy species within this ecozone. Closed late-forest conditions are dominant within this zone. In particular, higher productivity sites have allowed the mesic non-oak species encroachment leading to heavily closed canopy conditions exacerbating a shift away from an oak dominated community (Nowacki and Abrams 2008). Dominant oaks in the overstory are not well represented in the understory, resulting in a dramatic shift in species composition (Muzika et. al. 1999).

Within the oak-dominated ecozones the mesic oak zone has a more open shrub layer, likely a result of intense shade from well-developed overstories and midstories. Herbaceous plants provide the greatest diversity of species within this zone. Species richness varies across the ecozone from 52 to 115 species, with the greatest variation in the herb layer (Ulrey 1999, CVS 2013). Rare plant and animal diversity is very high across the ecozone compared to other zones, with two federally listed species. Given its abundance and even distribution across the two forests, this zone provides the greatest potential for mast production for wildlife species.

Drivers and Stressors:

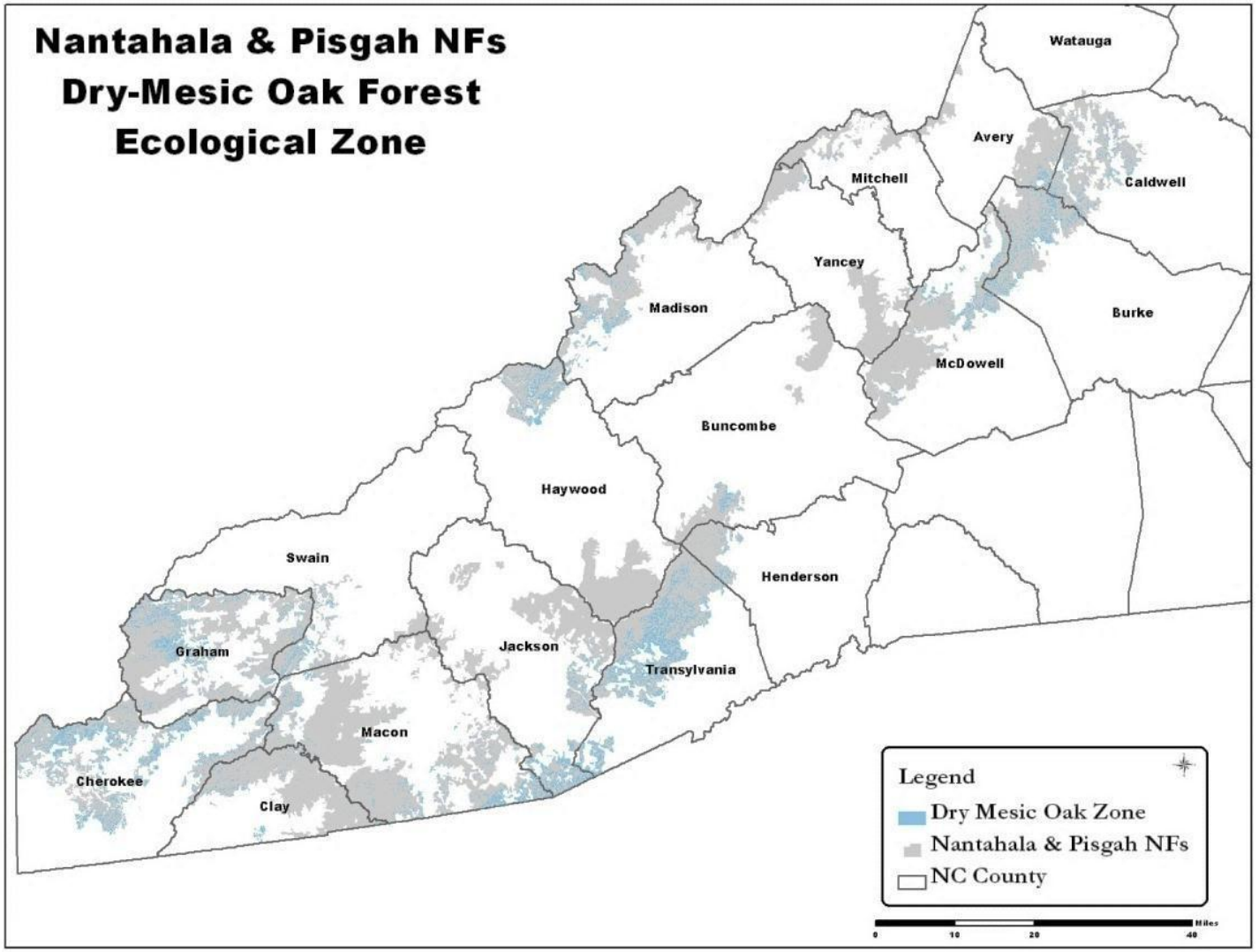
American chestnut occurred throughout this ecozone and its loss has influenced the present dominance of canopy species. Without fire, gap-phase regeneration and forest management are the greatest influences on the canopy. Individual tree mortality creates small gaps while occasional ice storms or extreme wind events and forest management resulting in larger canopy openings. The aging oak forests are also subject to insect and disease complexes such as oak decline and oak wilt. The gypsy moth has not had a substantial impact on stands of this ecozone but may become a large disturbance agent in the future. Current openings across the two forests within this type are low, slightly more than 3% with less than 40% cover and slightly more than 8% between 40-60% canopy cover.

Pre-settlement forests suggest a fire return interval with the predominance of low intensity fires every 25 years, and occasional more intense fires would help to maintain and regenerate the fire tolerant oaks (Landfire 2009).

Trends with the 1987 Plan:

During the last 20 years, slightly more than 1% of this ecozone has been regenerated. Minimal amounts of this ecozone are greater than 150 years in age.

Figure 15. Dry-Mesic Oak Forest Ecological Zone.



Dry-Mesic Oak

Key Characteristics: Chestnut oak, white oak, white pine, and a variety of hickories and other canopy tree species are present. The midstory tends to have huckleberry and other deciduous heaths; white pine and red maple occur in the midstory where fire has been excluded. Herbaceous diversity is variable but tends to be sparse. There is a high amount of hard mast production for wildlife.

Composition and Structure:

This ecozone is dominated by a mix of oaks, red oak, white oak, chestnut oak, southern red oak, various hickories, red maple, black gum, and often white pine (Simon 2011, Landfire 2009). Within older communities, mesic species are advancing into the intermediate and co-dominant canopy positions as well as increasing in abundance in smaller size classes (Nowacki and Abrams 2008). As a result, the understory and midstory are denser in older stands. The shrub layer can be dense, although generally less than four feet in height, often dominated by bear huckleberry or appalachian river cane. Shrub densities, consisting of both deciduous and evergreen species, exceed 50% in 53% of the zone on national forest lands. Herb and fern densities are variable across the ecozone, from a low of 33 species in shrub thickets to greater than 100 species in rich areas (Ulrey 1999, Peet et. al. 2013). Rare plant and animal diversity is low across the ecozone compared to other zones. Mast production for wildlife species is high.

Drivers and Stressors:

American chestnut occurred throughout this ecozone and its loss has influenced the current overstory composition and contributed to the spread of aggressive mesic species such as white pine and red maple (Abrams 2003). In the absence of fire, gap-phase regeneration and forest management are the greatest influences on the canopy. Individual tree mortality creates small gaps while occasional ice storms or extreme wind events and forest management result in larger canopy openings.

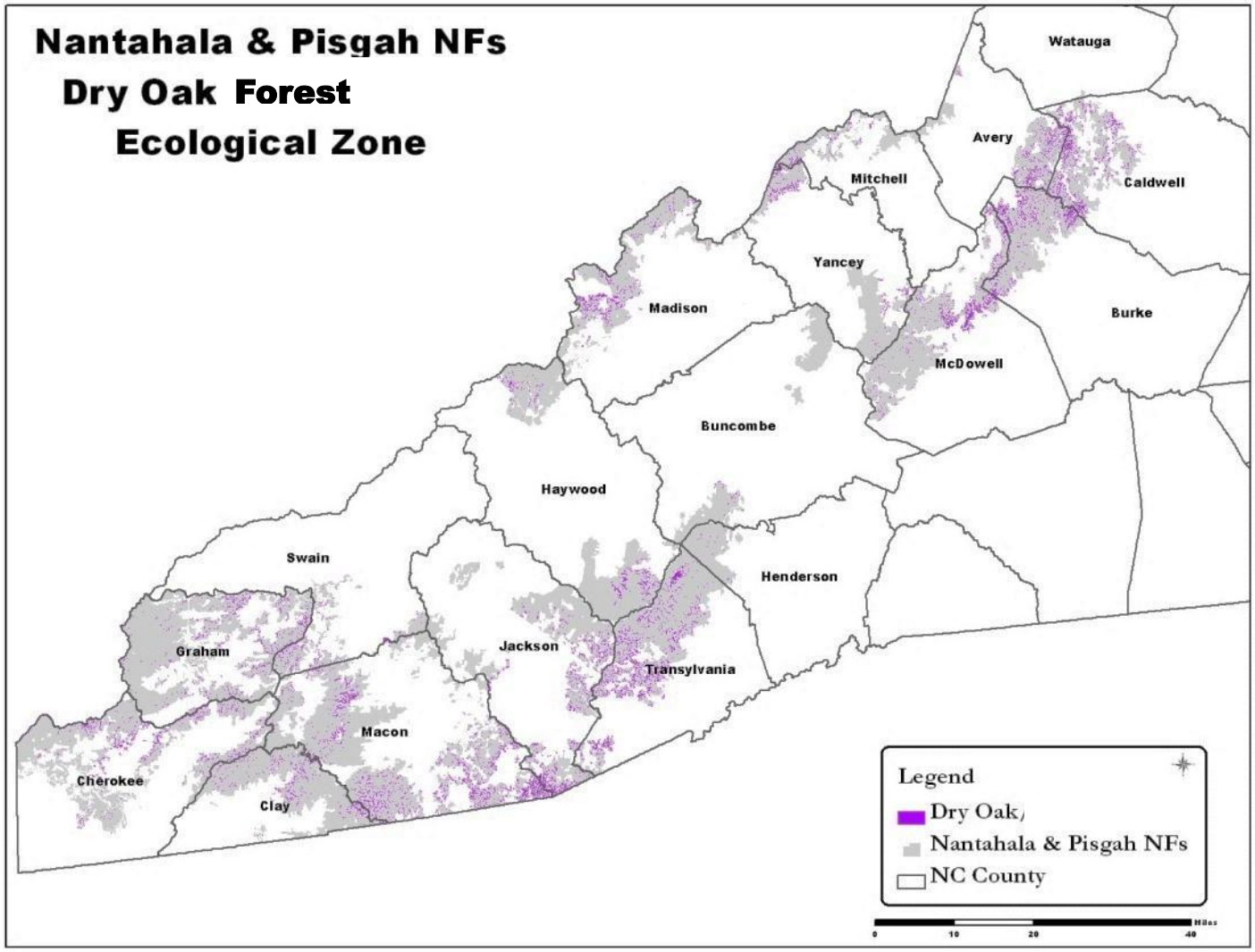
The aging oak forests are also subject to insect and disease complexes such as oak decline and oak wild. The gypsy moth has not had a substantial impact on stands of this ecozone but may become a larger disturbance agent in the future.

Fire suppression during the last 50-70 years has perpetuated the even-aged structure and allowed for the dominance of more mesic midstory and canopy species, in particular white pine across the Blue Ridge Escarpment.

Trends with the 1987 Plan:

Some young forest habitat has been created during the life of the current forest plan, but more during the period between1973 and 1992. The lands within the ecozone were most heavily influenced by the logging and fires from 1913 to 1932 when 41% of the lands were converted to young forest habitat. Very little forest exists that is older than 131 years old, making this proportionally the youngest out of the four oak dominated ecozones.

Figure 16. Dry Oak Forest Ecological Zone.



Dry Oak Ecozone

Key Characteristics: Chestnut oak, scarlet oak, and black oak are predominant overstory species; open canopy structure due to mortality from oak decline, lower site productivity and higher fire frequency. The midstory is typically dense with mountain laurel and lowbush blueberry; low herb density under dense midstory, but higher (grasses, legumes, and asters) where the midstory is sparse. This ecozone generally occurs on rocky south and west-facing aspects with thin soils; snags frequent. American chestnut was a common component prior to the blight.

Composition and Structure:

This ecozone is dominated by chestnut oak, scarlet oak, black oak, white oak, and occasionally white pine (Landfire 2009). This ecozone tends to have high structural diversity due to the potential for high light availability from low overstory densities. On low productivity sites, crown closures between 30-50% have been recorded (Fralish 2004). However, current openings across the two forests within this ecozone are low, slightly more than 4% with less than 40% cover and slightly more than 8% between 40-60% canopy cover. Over 60% of the canopy heights are in the 50-100 foot height class across the two forests. This contrasts with a lower average height, 45 feet, within the xeric oak zone of the central hardwood forest (Fralish 2004). Structural development is dominated by oak species. Mesic hardwoods are less aggressive within this ecozone.

Herb densities are low to moderate across this ecozone, varying from a low of 33 species in dense shrub thickets to 68 in more open areas (Ulrey 1999, Newell and Peet 1995). Rare plant and animal diversity is low across the ecozone compared to other ecozones.

Drivers and Stressors:

American chestnut occurred throughout this ecozone and its loss has influenced the present dominance of canopy species as well as influenced the spread of aggressive mesic species such as white pine and red maple.

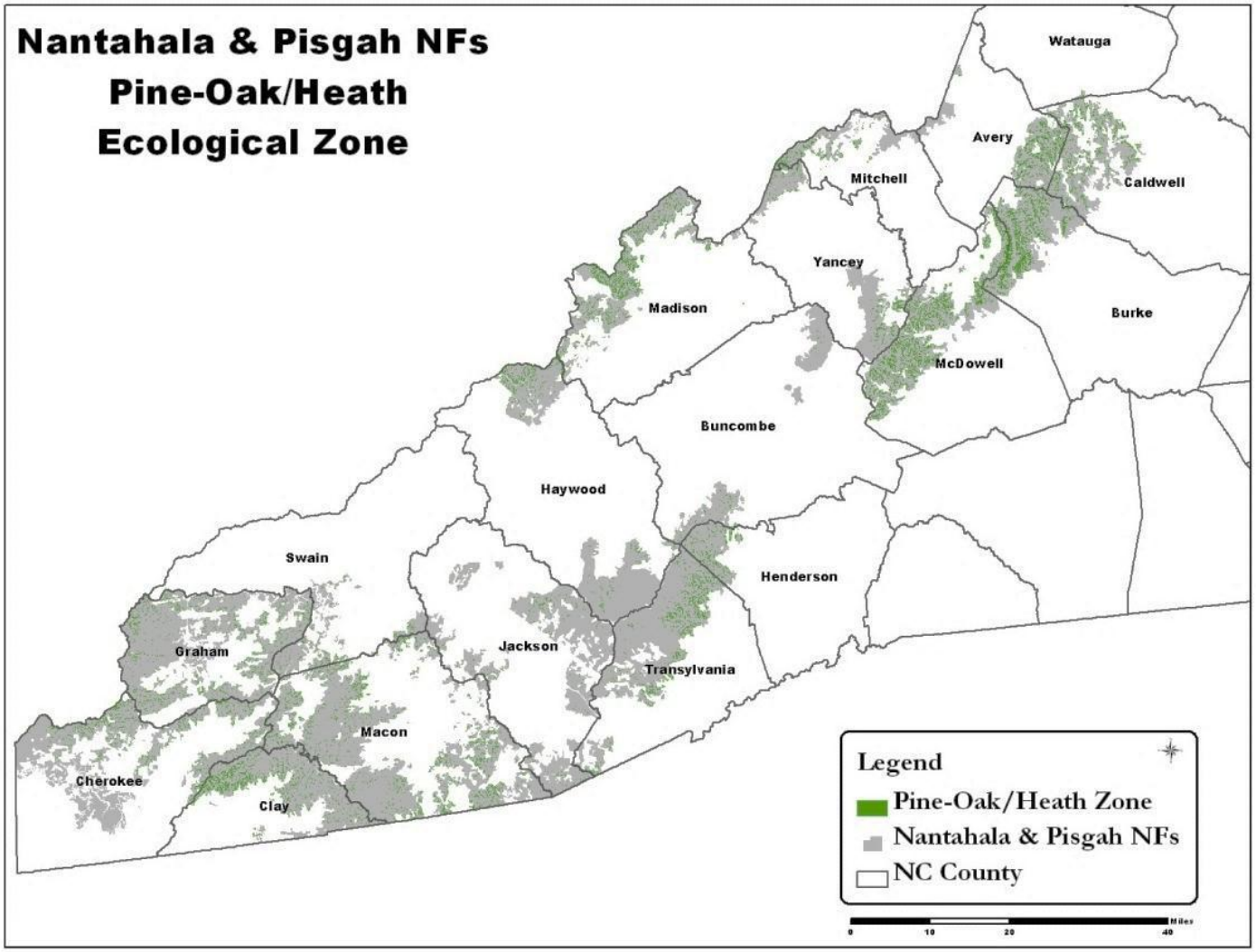
These forests are located on low productivity sites and may have a higher degree of disturbance in comparison to dry-mesic and mesic oak ecozones. Gap-phase regeneration is the greatest influence on the canopy, creating small gaps, while occasional ice storms or extreme wind events result in larger canopy openings. Fire disturbance can have a major influence on species abundance and cover, and structural heterogeneity. Schuler and McClain (2003) found that oak communities had fire frequencies ranging from 7-32 years with greater frequency on drier sites. Estimates from Landfire (2009) suggest surface fire intervals of 10 years. As a result, fire suppression during the last 50-70 years has resulted in changes to this ecozone.

Trends with the 1987 Plan:

The dry oak ecozone shows its most recent period of measurable young forest habitat creation from 1973 to 1992, starting before the current forest plan and extending through the first decade. More recently, there has been little young forest habitat created. For the dry oak ecozone, the exploitive logging era and its related wildfires most influenced young forest development from 1913 to 1932.

Seventy-two percent of this ecozone is in the mature forest phase, with the majority of those acres being in the closed condition. However, only a small percentage (6%) is currently developing old growth characteristics.

Figure 17. Pine-Oak/Heath Ecological Zone.



Pine-Oak/Heath

Key Characteristics: Pitch pine and/or table mountain pine are overstory components, commonly with chestnut oak, black oak and scarlet oak. Midstory and herbaceous layers are similar to the dry oak ecozone. This ecozone occurs on rocky south and west-facing aspects and ridges with thin soils. American chestnut was a common component prior to the blight.

Composition and Structure:

The canopy is composed of pitch pine and/or table mountain pine with chestnut oak, scarlet oak, black gum, and red maple. Sourwood, sassafras, blackjack oak, Virginia pine, and shortleaf pine may be present. The understory is likely to contain abundant mountain laurel, with blueberry or huckleberry. This ecozone occurs on dry, rocky south facing slopes and mid-elevation ridges with thin, acidic soils. More than half of the NFS lands in the pine-oak/heath ecozone were established between 1903 and 1932. The single decade with the most young forest habitat creation was 1913 to 1922.

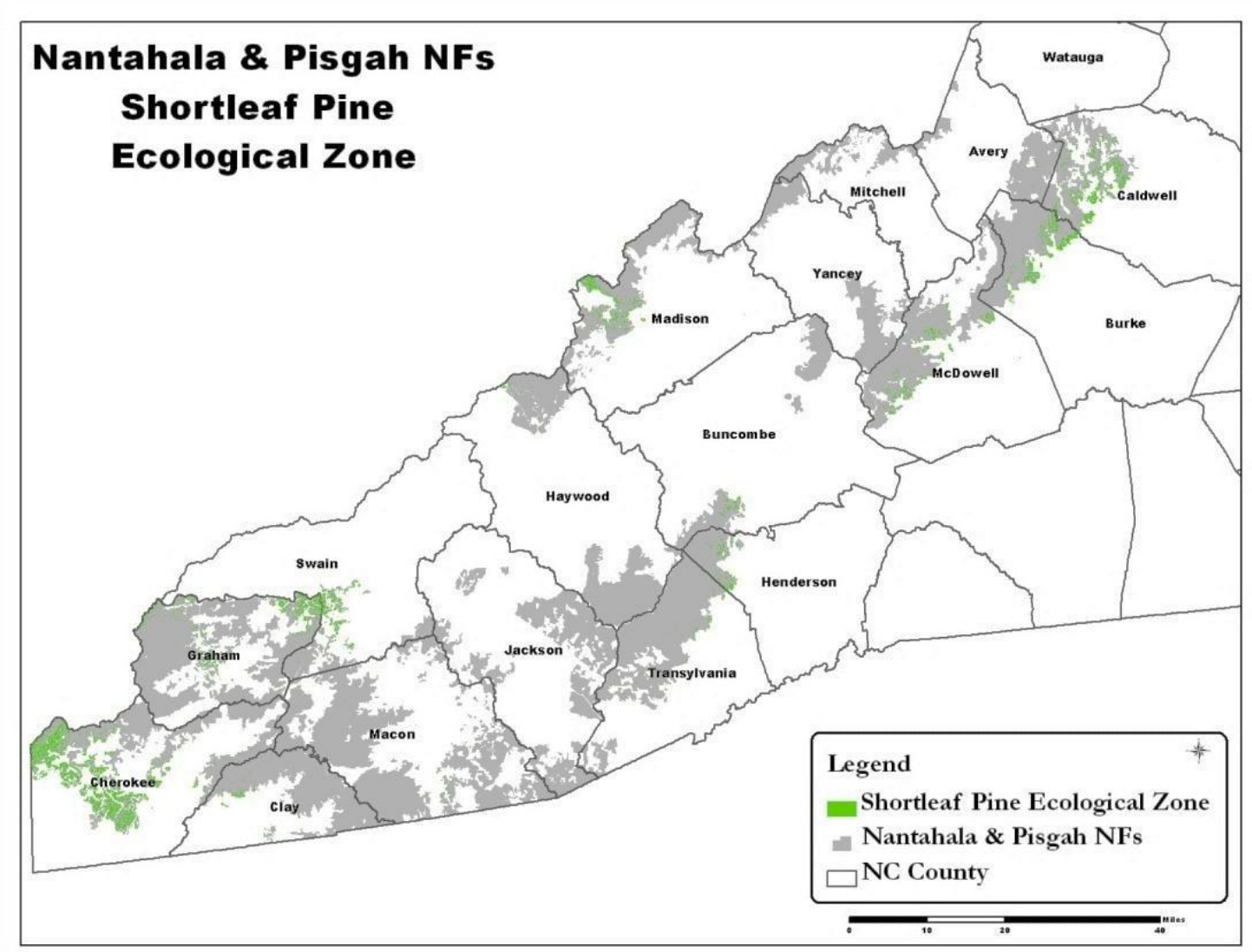
Drivers and Stressors:

In addition to the loss of American chestnut, current stand structure has stemmed from post European land use and fire suppression, allowing oaks to expand their importance and traditionally fire intolerant pines to occupy greater proportions of the overstory community (Waldrop et al 2003). Red maple (& other mesic species) started to invade after disturbances at turn of the 19th century (sanitation logging of American chestnut or intense fire) but before mountain laurel dominated the understory (Brose et al. 2002). Though mesic species are not highly competitive on the driest sites, they are present in the understory and midstory. Mountain laurel became more aggressive on sites after American chestnut lost overstory dominance. Periodic fire through the 1950s continued pine establishment (Brose and Waldrop 2006b), but little pine or hardwood species have been found to be regenerating since then (Waldrop et al. 2000). The dominance of mountain laurel in the understory has prevented all tree regeneration after the 1950s (Vose et al. 1997, Brose et al. 2002, Dumas et al. 2007, Jenkins et al. 2011). Sixty-three percent of the Nantahala and Pisgah NFs acres in the pine-oak/heath ecozone have greater than 50% shrub density. Even in contemporary stands, single occurrence fires will remove high percentages of the laurel understory while multiple burns create more open forest conditions with less cover of shrubs and saplings (Randles et al. 2002, Dumas et al. 2007). Without repeated burning, hardwood and ericaceous sprouts will continue to sprout and dominate the site (Coweeta).

Trends with the 1987 Plan:

Management constraints such as poor access, low commercial value, and elevated scenic values have limited management options in the most recent decade. The 1987 plan does not emphasize management or restoration of this vegetation type, except for a general focus on oak regeneration. Roughly 30% of the pine-oak/heath ecozone is within a management area designated as wilderness, wilderness study area, or special interest area.

Figure 18. Shortleaf Pine Ecological Zone.



Shortleaf Pine

Key Characteristics: Shortleaf pine is dominant in the overstory, or codominant with southern red oak, blackjack oak, and a variety of other hardwoods. Blueberries are common in the shrub layer, along with mountain laurel. The herbaceous layer is sparse in the absence of fire but very diverse where fire has occurred. White pine may be aggressive on some sites.

Composition and Structure:

This ecozone occurs at the far eastern and western portions of the planning area below 2,300 feet elevation. A little more than 4% of the Nantahala and Pisgah NFs are within this ecozone. The forest is dominated by shortleaf pine with lesser amounts of southern red oak, pitch pine, and other hardwood species. Mesic tree species, such as white pine and red maple may dominate in the midstory on sites with no recent fire history. Average canopy heights range between 50-100 feet; over 60% of national forests lands contain this canopy height range.

Many sites, particularly those with no recent fire occurrences, have a dense shrub layer which is typically dominated by ericaceous species such as mountain laurel, low bush blueberry or bear huckleberry. Shrub densities exceeding 50% cover extend across about 45% of the ecozone on national forest lands. Herbaceous diversity can be sparse under the densest shrub layer accounting for sites with 20 vascular plant species (Ulrey 1999). However, a more open fire-maintained habitat can have as many as 70 species, particularly grasses, legumes, and asters. Few rare plants have been documented within the shortleaf pine ecozone in the Nantahala and Pisgah NFs. Two herbs are known to occur, both fire adapted, and flower and fruit under more open conditions.

Historically, sizable areas of southern yellow pine forests in the southern and western portions of the Southern Blue Ridge Ecoregion (SBR), potentially including parts of the Nantahala and Pisgah NFs, supported remnant family groups of red-cockaded woodpecker and small populations of Bachman's sparrow, neither of which presently occur within the physiographic area. The current value of mountain yellow pine habitats for vulnerable birds, other than early successional species, is poorly understood, as few studies have been conducted in these areas.

Drivers and Stressors:

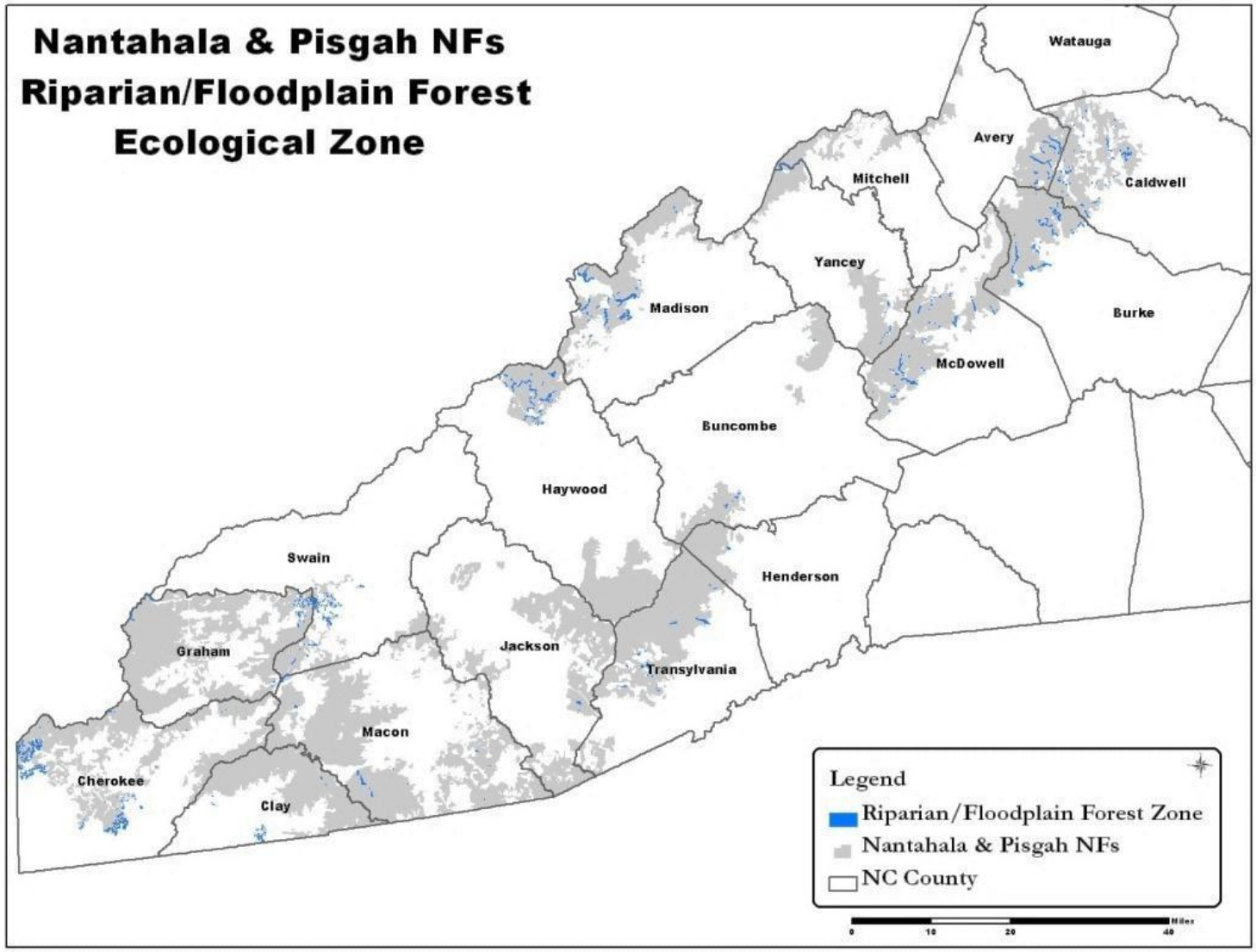
Wind storms, tornadoes, insect infestations, and frequent wildfires are all important natural disturbance events influencing this zone. Fire is considered an important factor in maintaining this habitat with a fire return frequency as low as four years (Landfire 2009). The absence or infrequency of fire can result in more canopy oak dominance, an increase in fire intolerant trees such as red maple or white pine, and an increase in shrub density. Both components of this ecozone are at risk in maintaining their representation due to an increase in mesic hardwood species in the absence of fire (Nowacki and Abrams 2008). About 15% of this zone across the national forests have openings with less than 60% canopy cover. These sites with the absence of fire have resulted in an increase of white pine (Elliott and Vose 2005).

The last southern pine beetle infestation occurred across both forests in the late 1990s. Patch sizes varied dramatically depending on insect outbreaks and if they were followed by fire events, which created larger openings.

Trends with the 1987 Plan:

During the last seven years across the Nantahala and Pisgah NFs, prescribed burns have occurred on 7,329 acres within this ecozone, representing 16.5% of this ecozone.

Figure 19. Floodplain Forest Ecological Zone



Floodplain Forest

Key Characteristics: Proximity to water defines this ecozone and in the case of floodplain forest, the potential for flooding is a key characteristic. Sycamore, silver maple, willow and ash trees are common in the overstory of floodplain forests; riparian forests may have a variety of tree species, including hemlock. Beavers have historically influenced the structure of these forests through dam construction.

Composition and Structure:

This is the least represented ecozone on the Nantahala and Pisgah NFs, representing less than 0.5%. The large floodplain system only occurs at lower elevations along large rivers and can have many fluvial features such as river terraces or islands, point bars, or oxbows (Simon 2011). It is influenced by frequent flooding, typically for a low duration within the small river subtype, with scoured river banks. Two separate plant community associations have been delineated within this zone, primarily differing by size (Natureserve 2103, Schafale 2012).

Canopy composition is varied but often includes sycamore, numerous hardwood species, and occasionally eastern hemlock and white pine. Within both types the shrub layer can be dense, consisting of doghobble and great laurel extending throughout the forest while black alder, yellowwood, Virginia sweetspire, and silky dogwood cover the river banks. Shrub density with greater than 50% cover occurs across 42% of national forest lands. Within more open shrub sites, a rich herb layer, typically with many annuals and biennials, can occur. Vascular plant species counts have varied from 13 to 123 across sites within this ecozone. The low diversity sites were dominated by evergreen shrubs. Few rare species are known to occur within this ecozone, although this is the only ecozone where the federally endangered shrub, Virginia Spiraea, occurs

Drivers and Stressors:

Flooding, beaver activity, and high winds from hurricanes are the three major natural disturbance patterns influencing this ecozone. Openings are generally restricted to single trees or small groups and generally not affected by flooding, more so by beaver activity. Large winds from major hurricanes can result in larger gaps, occurring on a 20-plus year frequency (Batista and Platt 2003). On sites with dead or dying eastern hemlocks, the gaps could be larger. Flooding typically does not affect the overstory, rather opening up those sites with denser shrub layers, depositing sediments and nutrients, and transporting plant propagules.

Fire is a very infrequent disturbance in this ecozone with a fire return frequency of surface fires unknown and speculated from 120-200 years (Landfire 2009). Compared to other ecozones, more numerous invasive non-native plant species have been located within floodplain forests, even within those with fewer disturbances during the last 50 years (CVS 2013).

Trends with the 1987 Plan:

Of the 11 ecozones, the floodplain forest contains the least active management. While prescribed burns are not prescribed for this ecozone, some portions do occur within larger burn units and serve as natural fire breaks for mostly shortleaf pine ecozone targeted burns. During the last seven years across the Nantahala and Pisgah NFs, prescribed burns have occurred on 140 acres within the floodplain forest ecozone, representing 5% of this ecozone.

Aquatic Ecosystems

The southeastern United States supports the highest aquatic species diversity in the entire United States (Burr and Mayden 1992, Taylor et al. 1996, Warren et al. 2000, Williams et al. 1993). Southeastern fish species make up 62% of the United States fauna, and nearly 50% of the North American fish fauna (Burr and Mayden 1992). Molluscan diversity in the region is 'globally unparalleled', with 91% of all United States mussel species found in the southeast (Neves et al. 1997). Crayfish diversity and global importance in the region rivals that of mollusks (Taylor et al. 1996). Crayfish in the southeast comprise 95% of the total species found in all of North America (Butler 2002a).

Unfortunately, patterns of imperilment are similar. Greater than two-thirds of the nation's freshwater mussel and crayfish species are extinct, imperiled, or vulnerable (Williams et al. 1993, Neves et al. 1997, Master et al. 1998). The majority of these at-risk species are native to the southeast. The number of imperiled freshwater fish species in the southeast (84) is greater than any other region in the country and the percentage of imperiled species is second only to the western United States (Minckley and Deacon 1991, Warren and Burr 1994).

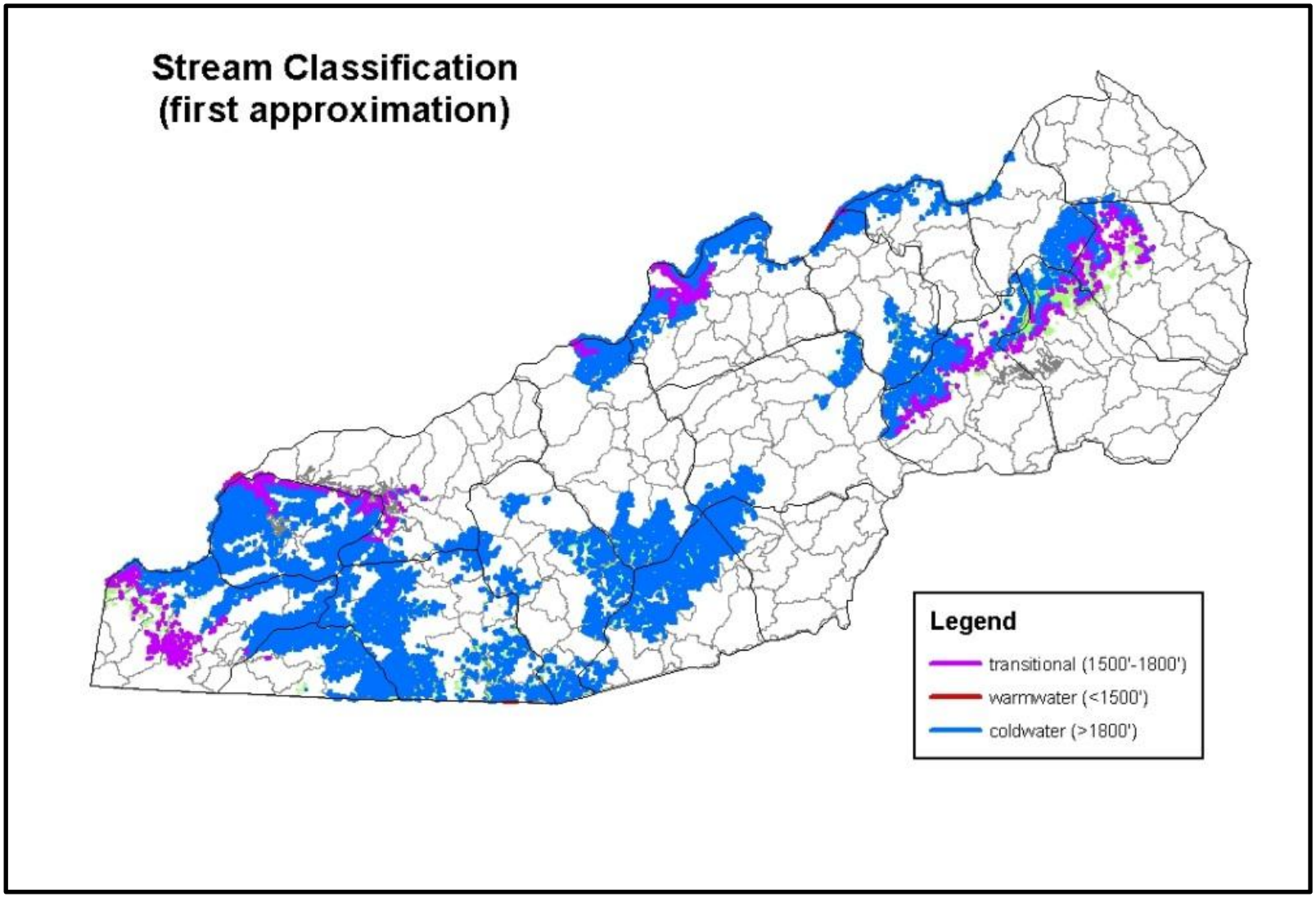
The overall species richness of North Carolina's aquatic fauna is directly related to the geomorphology of the state, which defines the major drainage divisions and the diversity of habitats found within. Seventeen major river basins are identified in North Carolina. Five western basins are part of the Interior Basin and drain to the Mississippi River and the Gulf of Mexico (Hiwassee, Little Tennessee, French Broad, Watauga, and New). Parts of these five river basins are within the Nantahala and Pisgah NFs. Twelve central and eastern basins are part of the Atlantic Slope and flow to the Atlantic Ocean. Of these 12 basins, parts of the Savannah, Broad, Catawba, and Yadkin-Pee Dee basins are within the Nantahala and Pisgah NFs.

The Nantahala and Pisgah NFs, for the most part, support higher elevation coldwater streams, and relatively little cool- and warmwater resources. The majority of Nantahala and Pisgah NFs' aquatic species diversity occurs in the small amount of cool- and warmwater resources.

Key Characteristics – Coldwater Streams: Water temperature does not exceed 18^{o}C for extended periods (elevation above 1,800 feet is a proxy for water temperature); well-defined pool and riffle habitat in stream reaches with higher gradient, and more run habitat in reaches with lower gradient; availability of suitable spawning habitat (i.e. clean, silt-free gravel); presence of brook trout is an indicator of reference conditions.

Key Characteristics – Cool and Warmwater Streams: Elevation below 1,800 feet; high fish and mussel diversity. Cool- and warmwater streams make a small part of the aquatic habitat across Nantahala and Pisgah NFs but contain most of the vertebrate and invertebrate aquatic diversity found on these national forests.

Figure 19. Stream Classification



Drivers and Stressors:

In North Carolina, water quality has improved over the last several decades in many waters that were historically polluted primarily by point-source discharges; however, overall habitat degradation continues to threaten the health of aquatic communities. Increased development and urbanization, poorly managed crop and animal agriculture, and mining impact aquatic systems with point and nonpoint source inputs. Additionally, impoundments on major rivers and tributaries drastically alter the hydrologic regime of many North Carolina waterways and result in habitat fragmentation, blockage of fish migration routes, and physical habitat alterations.

Trends with the 1987 Plan:

Brook trout habitat has expanded during the time since the 1987 Plan went into effect due to watershed restoration activities, including improving stream crossings, removing barriers to fish passage, and closure and restoration of problematic roads and trails.

Best Management Practices are consistently implemented for new projects and monitoring data verifies they are successful in preventing sediment reaching streams (see section on Assessing Air, Soil, and Water). However, many old roads and trails still exist throughout Nantahala and Pisgah NFs that are potential sources of sediment reaching streams, especially where stream crossings occur and where roads or trails are very close to streams. Sediment reaching streams can negatively affect aquatic habitats.

The 1987 Plan contains the following general direction:

Identify where existing road conditions do not meet water quality standards and develop strategies to bring them into compliance, except where physical conditions preclude complete correction and the road cannot be legally closed. Schedule implementation consistent with funding availability.

Ecosystem Health Stressors & Disturbance

Key Questions Addressed in this Section:

- What are the native and nonnative species that threaten ecosystem health?
- What types of disturbance events impact the ecosystems?
- What is the historical role of fire?
- What is the current role of fire?

What are the native and nonnative species that threaten ecosystem health?

Table 10 lists the relevant native and non-native threats to the forest ecosystems in NC. This list includes those threats currently impacting or likely to impact the forest in the foreseeable future. It also includes those threats that could potentially have a large impact on forest ecosystems.

More information about these and other threats can be found at: http://www.fs.fed.us/foresthealth/management/index

Table 10. Nantahala and Pisgah NFs Threats Summary

Threat	Origin	Species Affected	Impact Scale
Annosus Root Rot	Native	White Pine	Localized
Anthracnose	Non-native	F. Dogwood, A. sycamore, B. Walnut	Widespread
Armillaria Root Rot	Native	Many	Scattered
Asian Longhorned Beetle	Non-Native	Maples	Localized
Balsam Woolly Adelgid	Non-Native	Frasier Fir	Widespread
Beech Bark Disease	Non-Native	American Beech	Widespread
Butternut Canker	Non-Native	Butternut	Widespread
Chestnut Blight	Non-Native	A. Chestnut and Scarlet Oak	Widespread
Didymo	Non-Native	Cold Water Organisms	Localized
Elm Spanworm	Native	Ash, Hickory, Walnut, Oak, Others	Scattered
Emerald Ash Borer	Non-Native	Ash Species	Widespread
Forest Tent Caterpillar	Native	Oaks, Maples, Blackgum	Scattered
Gray's Lily Disease	Native ?	Gray's Lily	Scattered
Gypsy Moth	Non-Native	Oaks, Maples, Many Others	Scattered
Hemlock Woolly Adelgid	Non-Native	Eastern and Carolina Hemlocks	Widespread
Laurel Wilt	Non-Native	Laurace Family	Localized
Littleleaf Disease	Native	Shortleaf Pine	Widespread (rare in NC mountains)
Oak Decline	Native	N. Red, Scarlet, Black, White, Chestnut	Scattered
Oak Wilt	Non-Native	Red Oak Group	Localized
Red Oak Borer	Native	Red Oak Group > White Oak Group	Scattered
Sapstreak Disease	Native	Sugar Maple, Tulip poplar	Localized
Sirex Woodwasp	Non-Native	Many NA Pine Species	Scattered
Southern Pine Beetle	Native	Southern Pines	Widespread
Spruce Budworm	Native	Red Spruce, other conifers	Scattered
Sudden Oak Death	Non-Native	Red oak Group, Rhodo, Vaccinium spp	Localized
Thousand Cankers Disease	Non-Native	Black Walnut	Localized
White Nose Syndrome	Non-Native	Five Eastern Bat Species inc. Indiana	Localized
W. Pine Blister Rust	Non-native	E. White Pine	Localized
White-Pine Weevil	Native	E. White Pine	Widespread

Insects and disease: Generally known for disturbances focused on specific species or species groups, insects and disease may affect forests on varying scales and intensity. The degree of the disturbance is generally related to the spatial arrangement of the targeted species on the landscape. Canopy gaps may be created at the individual tree or small group scale (oak decline), or larger sizes and scales (balsam woolly adelgid, chestnut blight, hemlock woolly adelgid, southern pine beetle). Disturbance intensity may be stand replacement (balsam woolly adelgid), mixed (chestnut blight, hemlock woolly adelgid, gypsy moth), or light (oak decline, elm spanworm). Insects and diseases may also affect specific portions of the landscape and associated ecozones. Southern pine beetle is likely to occur in the shortleaf pine oak and pine oak heath ecozones. Hemlock woolly adelgid is likely to affect acidic coves and riparian forests.

Invasive Species: A result of humans interacting with forest ecosystems within a globally connected society, introduced organisms are capable of creating drastic change in the composition and structure of native forest communities. The influence of invasive species is found throughout the 11 ecozones on the Nantahala and Pisgah NFs.

Non-native invasive species have been identified as one of the four critical threats to USFS ecosystems. In 2010, the National Forests in North Carolina completed an environmental assessment for the treatment of non-native invasive plants on the Nantahala and Pisgah NFs.

Table 11. Highest priority nonnative invasive plant species on the Nantahala and Pisgah NFs

Scientific Name	Common Name	Treatment Priority
Celastrus orbiculatus	Oriental bittersweet	High
Paulownia tomentosa	Princess tree	High
Spiraea japonica	Japanese meadowsweet	High
Polygonum cuspidatum	Japanese knotweed	High
Microstegium vimineum	Japanese stiltgrass	Low
Ligustrum sinense/vulgare	Chinese/European privet	High
Miscanthus sinensis	Chinese silver grass	High
Rosa multiflora	Multiflora rose	High
Elaeagnus umbellata	Autumn olive	Medium
Lonicera japonica	Japanese honeysuckle	Medium
Alliaria petiolata	Garlic mustard	Medium
Centaurea stoebe ssp. micranthos	Spotted knapweed	Low
Tussilago farfara	Coltsfoot	Medium
Albizia julbrissin	Silk-tree	Medium
Ailanthus altissima	Tree of heaven	Medium
Pueraria montana var. lobata	Kudzu	Medium
Dioscorea polystachya	Chinese yam	High
Buddleja davidii	Butterfly Bush	Medium
Berberis thunbergii	Japanese Barberry	Medium
Anthriscus sylvestris	Wild Chervil	Medium
Hydrilla verticillata	Hydrilla	Low
Myriophyllum aquaticum	Parrot Feather Milfoil	Low
Ampelopsis brevipedunculata	Amur Peppervine	Medium

A list of the highest priority invasive plant species was developed from both botanical surveys completed during the past 15 years and non-native invasive plant inventories that were conducted in

2002-2003 across selected watersheds (Table 11). Thousands of acres on the Nantahala and Pisgah NFs are known to have some occurrences of these 17 species; however, the exact infested acreage within the Nantahala and Pisgah NFs is unknown and changes annually. Since the 2010 environmental assessment, six additional non-native invasive plants have been identified as threatening portions of the two forest units. Most of the 23 species identified in Table 11 are prevalent across the region and are continuing to spread, actively impacting vegetation composition and structure. Recent inventories have identified specific infestation areas where non-native invasive plants are impacting rare species or rare habitats and prioritized those areas for treatment due to the immediate risk to rare native communities. More discussion of how invasive plants affect the 11 ecozones can be found in the supplemental report titled Ecological Zones on the Nantahala and Pisgah NFs.

What types of disturbance events impact the ecosystems?

Wind Disturbances: Wind disturbances take several forms (microbursts, tornados, & hurricanes) varying in scale and intensity respectively (Lorimer and White 2003). Though not separate in their occurrence (e.g. hurricanes can generate tornadoes and microbursts), microbursts generally affect smaller portions of the landscape than tornadoes and hurricanes. The intensity of disturbance may be similar accounting for scale of disturbance. A forest impacted by downburst may have as many trees blown down or damaged as an area impacted by a hurricane. All three forms of wind disturbance may produce light, moderate, or severe levels of disturbance. The southern Appalachians have been impacted by 14 hurricanes since the late 1870s (Greenberg and Mcnab 1998). Wind disturbances are more likely to occur on slopes and ridge tops within the southern Appalachian landscape (Rankin and Herbert in press, Lorimer and White 2003).

Ice and Snow: Winter related disturbances are a regular occurrence in the Nantahala and Pisgah NFs. Ice build-up during winter storms may cause varying intensities and scales of impact to forests (Rankin and Herbert in press). Light disturbance, including damaged crowns and broken limbs may occur across vast portions of a landscape, or broken and snapped tops and uprooted trees can occur in patches. Though winter storms can affect forests at all elevations, high elevations may receive damage at higher intensities and frequency than lower elevations. Ice storms are less likely to create stand-replacing conditions than other disturbance types (Lorimer and White 2003).

Landslides: Associated with other disturbance events (rain, fire) landslides provide the greatest likelihood of truly early seral conditions (Lorimer 2001) on the Nantahala and Pisgah NFs. Refer to the Geologic Hazards sections for more discussion on landslides.

Flooding: Affecting forests in close proximity to rivers and streams, flooding has the potential to create true early seral conditions when large winds often associated with a rain event disturbs the overstory. Hurricanes are one example (Batista and Platt 2003). Flooding more frequently affects the midstory, particularly those with dense shrub layers. Flood events also result in an influx of sediments, nutrients, and seed propagules, often short-lived species, such as annuals or biennials. Refer to the Geologic Hazards sections for more discussion.

Pollution: Air pollutants, primarily nitrogen and sulfur deposition have contributed to changing conditions on the Nantahala and Pisgah NFs. Though not primarily a stand-replacing disturbance, air pollutants may cause acute damage to forest vegetation. Deposition may more readily effect forest growth through reductions in soil nutrients and mobility of toxic elements such as aluminum. Refer to the Air Resources section for more information.

Table 12. Types of disturbances on the Nantahala and Pisgah NFs

Disturbances	Type		Time		Size & Recurrence			Effect	
	Abiotic	Biotic	Discrete	Chronic	Small Freq (SFD)	Med. Intermittent (MMD)	Large Infreq (LID)	Patches	Diffuse
Invasive/ exotics		X		X	X	X		X	X
Insect outbreaks/ epidemics		X	X	X		X	X	X	X
Herbivory		X		X	X	X			X
Forest Management		X	X		X	X	X	X	X
Fire	X		X		X	X	X	X	X
Winter storms	X		X		X	X	X	X	X
Hurricanes	X		X			X	X	X	X
Air pollution	X			X	X	X	X		X
Tornadoes	X		X		X	X	X	X	
Downbursts	X		X		X			X	
Drought	X			X	X	X	X		X
Floods	X		X		X			X	
Mass Wasting	X		X		X			X	
Landslides	X		X		X			X	
Soil Erosion	X			X	X				X

Fire Suppression: Fire suppression from the early 1900s is contributing to a long-term composition and structural shift in the Nantahala and Pisgah forest communities. Effects are present throughout all community components from the forest floor to the overstory (Nowacki and Abrams 2008; Stanturf et al. 2002; Lafon 2010). These shifts are changing the way the current forest landscape responds to other common disturbances (Stanturf et al. 2002; Arthur et al. 2012) and may result in future forests that do

not resemble current or past forest communities (Nowacki and Abrams 2008; Abrams 2003; Oak 2002; Nesbitt 1941).

Gap Phase (small scale): Commonly cited as the most frequent disturbance type in the Southern Appalachian landscape, gap phase disturbance has the highest importance in sheltered cove forests and stands of later successional and old growth age and character (Rankin and Herbert in press, Busing 2005). The single tree and small tree gaps created range in sizes depending on the event that causes it (wind, ice, disease, senescence, etc.). Research reports gap sizes range from 0.05 to 10 ac (Clebsch and Busing 1989; Greenberg and McNab 1998; McNab et al. 2004, Rankin and Herbert in press) creating a variety of conditions.

Drought: Responsible for seasonal and periodic declines in forest health and mortality, drought also contributes to stress of forest plants exposing them to attack by other pest and disease mechanisms. Many forest decline events may be linked to drought which serves as an inciting factor. Forest plant species react differently to drought, some having more tolerance than others (Klos, Wang, and Bauerle 2010). Where plants grow on the landscape is also important (Clinton and Borings 1993). Western North Carolina receives intermittent periods of drought and high moisture that continue to impact forest health and growth. Two of the longest periods of low precipitation have occurred in the last 30 years according to palmer drought index data (Western North Carolina Vitality Index 2011). Climate change models predict large fluctuations in the wet and dry periods in Western NC and agreement between models are poor making future impacts of drought hard to discern.

What is the Historical Role of Fire?

Fire has played an integral role in determining historic patterns of forest vegetation across the Southern Appalachian Mountain region (Delcourt and Delcourt 1997; Fesenmyer and Christensen 2010). Historically, both before and after European colonization, humans often used fire to manipulate forest structure and composition, (DeVivo 1991; Van Lear and Waldrop 1989; Stewart 2002; Fowler and Konopik 2007). Scientists believe that naturally occurring fire from lightning, in addition to utilitarian, fire use by Native Americans and early European settlers, caused frequent fires across the Southern States for a time spanning more than 10,000 years (Fowler and Konopik 2007). However, throughout the past several hundred years, agriculture, urban growth, and wildland fire suppression have completely altered natural fire cycles, and fire exclusion has created a trend of larger fires with the potential to be more destructive (Duncan and Mitchell 2009). It is believed that the effects of fire suppression have been dramatic in terms of large scale fuel accumulations and changing structure and composition within many forest communities in North Carolina.

Historically, oak forests had the most frequent and intense fires while cove and riparian areas with species such as yellow poplar and hemlock had less frequent and very low intensity fires. In addition, it was normal for fires on the upper drier slopes to be naturally extinguished as they burned into the cool moist habitats in coves and along streams (Aldrich et al. 2009; Runkle 1982). Excluding fire from the landscape over the last 80 years has led to major changes in forest structure, function, and composition, particularly among forest types dominated by yellow pines and oaks (Aldrich et al. 2010, Flatley et al. 2013). For example, the lack of fire has increased the density of fire-sensitive trees and shrubs which have prevented pine and oak regeneration, shaded out grasses and forbs, and reduced the diversity of vegetation across the Southern Appalachians (Harrod et al. 2000; Harrod et al. 1998; Turrill et al. 1995).

Since the1990s, land managers throughout the Appalachians have implemented the use of natural and prescribed fires to reverse the

effects of fire suppression. However, historic fire suppression has resulted in an increase in wildland fuels making wildfires more difficult to control which can be a threat to forest health in that when these forests do eventually burn, they often burn with adverse intensity and/or severity (Reilly et al. 2012; Vose 2000; Vose 2003). As a result, land managers are challenged to answer two, inter-related questions 1) how to effectively reduce hazardous fuels, and 2) how to restore fire-dependent communities, especially pine and/or oak forest, while minimizing undesirable effects (Reilly et al. 2012; Vose 2000; Vose 2003).

Fire Classifications

The 2009 update to the Federal Fire Policy categorizes two kinds of wildland fires, prescribed fire and wildfire. Prescribed fire is fire applied to ecosystems, at specific locations, and under specific weather conditions, to accomplish predetermined management objectives. Fire prescriptions typically control effects on ecosystems by controlling fire intensity, either by choosing the proper environmental conditions – wind, humidity, fuel moisture – or through site preparation. Fire prescriptions also address fire behavior and spread, by moving flames with the wind (heading fire), against the wind (backing fire), or at right angles to the wind (flanking fire). Because wind patterns and fuel conditions are more variable in the mountains compared to other regions of the south, considerable experience and training are required to conduct a successful prescribed fire in the southern Appalachians (Achtemeier 2008).

Wildfires, on the other hand, are unplanned. Although prescribed and wildfires can share many characteristics, wildfires are more likely to burn under severe fuel and weather conditions, creating hot fires that are difficult, and dangerous to control. Because they are more likely to burn hot, wildfires are also more likely to adversely affect southern Appalachian forests, killing desirable trees and consuming the organic portion of the soil.

There are two seasonal peaks in wildland fire occurrences, the primary one in March and a secondary one starting in October. These months correspond with weather and fuel conditions that are conducive to easy fire ignition and spread (dry, low humidity, windy and no canopy cover of leaves). In the southern Appalachians, the peak of the lightning fire season usually occurs in May; before thunderstorms reach their greatest frequency in July and August (Alexander 1935). More than 90 percent of all lighting fires occur from April through August.

Fires can also be classified by intensity and season. Hotter, more intense fires, for example, are more likely to produce early successional habitat than cooler, less intense fires. The effects of fire intensity, however, also depend upon the season. The effects of low-intensity fires during the growing season, however, can be similar, or even more severe, than high-intensity fire during the dormant season, because the stem of most woody plants is severely damaged when the cambium layer reaches 145^{o} F (Wright and Bailey 1982), and this temperature is more easily reached during the heat of the growing season. In addition, growing-season fire typically kills woody species more effectively than dormant-season fires, because most of the carbohydrates in shrubs and trees are located aboveground (Knapp et al. 2009). When these plants are top-killed, the plant contains fewer reserves for re-sprouting (Drewa et al. 2002).

What is the Current Role of Fire?

Wildfire presents a significant and growing threat to people and landscapes throughout the Southern Appalachians and specifically the area in and around the Nantahala and Pisgah National Forests. Each year, an average of 200 unplanned ignitions burn a total of 8,732 acres on these lands. Ninety-five percent of these wildfires

potentially involve the Wildland Urban Interface (WUI). Population growth has recently outpaced other parts of the nation, leading to the development of dense human communities in extensive fire adapted landscapes that require frequent burning for hazardous fuel reduction and ecosystem maintenance.

There are numerous communities at risk within the Pisgah and Nantahala NFs, making fire suppression difficult to implement. In 2001, Congress directed an initial nationwide list of communities-at-risk from wildfires that are in the vicinity of federal lands. In North Carolina, there are over 3,000 communities that were identified.

Prescribed Fire

Prescribed fire is a useful tool for managing our national forest land. Prescribed burning occurs under preplanned conditions, considering social concerns for smoke management, public health and safety, and welfare of property. It is a recommended treatment for a specific area with specific objectives documented in a prescribed fire burn plan. Weather conditions are carefully monitored before and during a burn. Weather is a major factor and has a great influence on whether or not a burn will achieve the desired results.

Prescribed burning in the mountains did not begin until the 1980's but this practice is gaining acceptance for some management objectives. Prescribed fire is primarily used in the Nantahala and Pisgah National Forests for the following reasons:

1) Hazardous Fuel (vegetation) Reduction: Fuels such as logs, branches, slash, grass, leaves brush, and pine needles accumulate and can create a fire hazard. By burning the area under the desirable conditions these fuels are removed, decreasing the amount of fuel that is available to burn during a wildfire. Wildfires that burn into areas where fuels have been reduced by prescribed burning cause less damage and are much easier to control.

2) Site Preparation: Certain trees cannot tolerate shady conditions created by other species. In areas being managed for pines, prescribed fire reduces certain types of vegetation that compete for light, moisture and nutrients. Prescribed fire also reduces the leaf litter on the forest floor which often prevents seed germination for natural reproduction of desirable vegetation.

3) Wildlife Habitat: Prescribed fire promotes new sprouts and herbaceous growth that serves as beneficial food for many animals. New travel routes are opened up through dense vegetation and are created with the use of prescribed fire. Fire effects on wildlife are most closely associated with changes to habitats and microhabitats in the forest, such as changes to the trees, shrubs and leaf litter. Low intensity burns generally do not kill trees. Because the trees are not killed, the general structure of the forest remains unchanged, and microhabitats within the stand are either little affected or recover quickly.

Prescribed fire can play an integral role in maintaining biodiversity and reducing hazardous fuels on the Nantahala and Pisgah NF. Currently, the Nantahala and Pisgah NFs plan for approximately 6,000 acre per year to be treated, costing on an average of $55.00 per acre to implement.

Many variables influence the forest's ability to meet the current prescribed fire goals. Factors that can constitute a barrier to the implementation of prescribed burns are air quality concerns, weather, and lack of resources (USDA Forest Service 2011a). The expanding wildland urban influence also influences burning opportunities. At times, budget constraints limit the availability of personnel and equipment.

At-Risk Species in the Planning Area

Key questions addressed in this Section:

- What are the federally listed animal and plant species?
- What are the animals and plants of conservation concern?

This section identifies species in the plan area that are federally listed threatened and endangered species, proposed for federal listing and candidate species relevant to the plan area and planning process. A preliminary list of potential species of conservation concern (SCC) will be shared and described in the near future, but is not included now since it is still under development. The list of potential SCC will continue be refined during the assessment process. A final identification of SCC will be made during the plan development phase.

What are the federally-listed animal species?

Federally-Listed Animal Species

Ten federally-endangered (E) or threatened (T) wildlife species are known to occur on or immediately adjacent to the Nantahala and Pisgah NFs. These include four small mammals, two terrestrial invertebrates, three freshwater mussels, and one fish (Table 14). Two endangered species which historically occurred on or adjacent to the national forests are considered extirpated from North Carolina and are no longer tracked by the North Carolina Natural Heritage Program.

Currently, the United States Fish and Wildlife Service (USFWS) is addressing petitions to federally list two aquatic species known to occur on or immediately adjacent to the Forest: eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), a large aquatic salamander, and sicklefin redhorse (*Moxostoma species 2*), a fish, and four small mammals (northern long-eared bat (*Myotis septentrionalis*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), and tri-colored bat (*Perimyotis subflavus*). It is possible that actions to list these species could take place within the life of this forest plan. These species are potential SCC.

The 1987 Plan contains the following direction:
Emphasize recovery and conservation of threatened, endangered, and sensitive species….Threatened and endangered plant and animal species are protected, managed or recovered consistent with the Endangered Species Act; and sensitive species are conserved….Develop conservation strategies for sensitive species. Follow recovery objectives for T&E species.

One of the current challenges in recovering these species is that many of the impacts that affect populations may not occur on Nantahala and/or Pisgah NF land, such as white nose syndrome in bats that hibernate in caves. None of those cave hibernacula occur on Nantahala and/or Pisgah NF but summer foraging and breeding habitat do occur.

Table 13. Federally-listed wildlife species known to occur or historically occurring on or immediately adjacent to the Nantahala and Pisgah NFs.

Common Name	Scientific Name	Federal Status
Small Mammals		
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	Endangered
gray myotis	*Myotis grisescens*	Endangered
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Terrestrial Invertebrates		
spruce-fir moss spider	*Microhexura montivaga*	Endangered
noonday globe	*Patera clarki Nantahala*	Threatened
Freshwater Mussels		
Appalachian elktoe	*Alasmidonta raveneliana*	Endangered
little-wing pearlymussel	*Pegius fabula*	Endangered
Cumberland bean	*Villosa trabilis*	Endangered
	Fish	
spotfin chub	*Erimonax monachus*	Threatened
Species Considered Extirpated From North Carolina		
American burying beetle	*Nicrophorous americanus*	Endangered
eastern cougar	*Puma concolor cougar*	Endangered

What are the federally-listed plant species?

Federally-Listed Plant Species

Discussions with the Asheville field office of the U.S. Fish and Wildlife Service resulted in an updated list of 11 threatened and endangered plant species to consider in the revised forest plan (see the table that follows). Of these, eight have known populations on the Nantahala and/or Pisgah NF and three others, while not known to occur, have suitable habitat on the national forests.

Table 14. Federally listed plant species across the Nantahala and Pisgah NFs.

Scientific Name	Common Name	Federal Status	Status	Natural Communities, Habitat
Geum radiatum	Cliff Avens	E	Occurs	High Elevation Rocky Summit
Gymnoderma lineare	Rock Gnome Lichen	E	Occurs	High Elevation Rocky Summit, moist rock outcrop in or adjacent to streams, High Elevation Granitic Dome
Houstonia montana	Mountain Bluet	E	Occurs	Grassy Bald, High Elevation Rocky Summit
Sagittaria fasciculata	Bunched Arrowhead	E	May Occur	Southern Appalachian Bog, stream or ditch adjacent to drained bog, Swamp Forest-Bog Complex
Sarracenia jonesii	Mountain Sweet Pitcher Plant	E	May Occur	Southern Appalachian Bog
Helonias bullata	Swamp Pink	T	Occurs	Southern Appalachian Bog, Swamp Forest-Bog Complex
Hudsonia montana	Mountain Golden-heather	T	Occurs	High Elevation Rocky Summit, Pine-Oak/Heath Forest
Isotria medeoloides	Small Whorled Pogonia	T	May Occur	Moist forests often with White Pine
Liatris helleri	Heller's Blazing Star	T	Occurs	High Elevation Rocky Summit, Montane Acidic Cliff
Solidago spithamaea	Blue Ridge Goldenrod	T	Occurs	High Elevation Rocky Summit
Spiraea virginiana	Virginia Spiraea	T	Occurs	Riverside scour zone

SPECIES OF CONSERVATION CONCERN

A species of conservation concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area. Species of

Conservation Concern (SCC) MUST include the following:

1. Species with global ranks G/T1-2
2. Species petitioned for federal listing with positive 90-day findings, and
3. Species federally delisted within last 5 years and delisted species with monitoring requirements

In addition, SCC MAY include the following:

4. Species with global status G/T3 *or* state status S1-2,
5. Species listed as threatened or endangered by the NC Wildlife Resources Commission (WRC)
6. Species listed as high priority for concern by USFWS, NCWRC, or Eastern Band of the Cherokee Indians (EBCI)
7. Species where data shows local conservation concern (range, declining trends, low numbers)

Aquatic and Terrestrial Species

A group of aquatic and wildlife professionals was consulted and it was decided that species listed as threatened or endangered by the state of North Carolina (NC) or the Eastern Band of Cherokee Indians (EBCI) or identified as high priority for concern (e.g. Federal Species of Concern (FSC), etc.) by the U.S. Fish and Wildlife Service (USFWS), NC, or EBCI, should be included on the list of potential SCC.

Plant Species

Plant species that MUST be included on the list of SCC, were derived from three separate data sources, 1) The GIS Biotics database maintained by the Natural Heritage Program, 2) Natureserve Explorer online database, and 3) the 2012 Natural Heritage Program List of Rare plan species. To derive the potential list for all these plant groups, a group of species experts were consulted for vascular plants, mosses, liverworts, and lichens

**The potential list of species of conservation concern is still under development and will be posted online when it is available for public input.

Air, Soil, Water, and Geologic Resources

Key questions addressed in this Section:

Air Resources

- What is the airshed where air pollution emissions could impact the National Forests?
- What are the known sensitive air quality areas, such as Class I areas, non-attainment areas, and air quality maintenance areas?
- What is the trend in air pollution emissions?
- Have any federal or state agency air quality implementation plans been developed that include the Forests? Are Forest Service emission estimates included in the appropriate plans?
- What is the trend in fine particulates, ground-level ozone, and acidic deposition within or near the Forests?
- Is recent sulfur deposition exceeding the critical loads to protect aquatic ecosystems, and are recent ozone exposures exceeding the critical levels to protect sensitive vegetation?

Soil, Water, and Geologic Resources

- What is the condition of the watersheds across Nantahala and Pisgah NFs?
- What watersheds provide drinking water to communities and what is their overall health?
- Is the soil and water on the Nantahala and Pisgah NFs of sufficient quality to sustain a healthy ecosystem and what are the trends?
- What geology and soil resources occur across Nantahala and Pisgah NFs?
- How have roads impacted stream channels and what are the general trends?
- What is the status of ground water resources and what are the potential demands on its use?
- What soils are sensitive to erosion and where do they occur on the landscape? How has management impacted these soils?
- What geologic hazards exist for the Nantahala and Pisgah NFs [i.e. landslides, acid-producing (sulphidic) rocks, etc.]?

Air Resources

What is the airshed where air pollution emissions could impact the National Forests?

- An airshed has been defined by the USDA Forest Service as "a geographic area that, because of topography, meteorology, and/or climate is frequently affected by the same air mass."
- A broad airshed impacts Pisgah and Nantahala NFs. For example, water that evaporates off of the Gulf of Mexico can travel across Alabama and Georgia as clouds, pick up sulfur and nitrogen, and then release these pollutants as acid deposition through rain or snow over the Pisgah and Nantahala NFs.
- Potential sources of air pollution within 124-186 miles of the Forests are evaluated if they may cause adverse effects to the three Class I areas within the Forests.

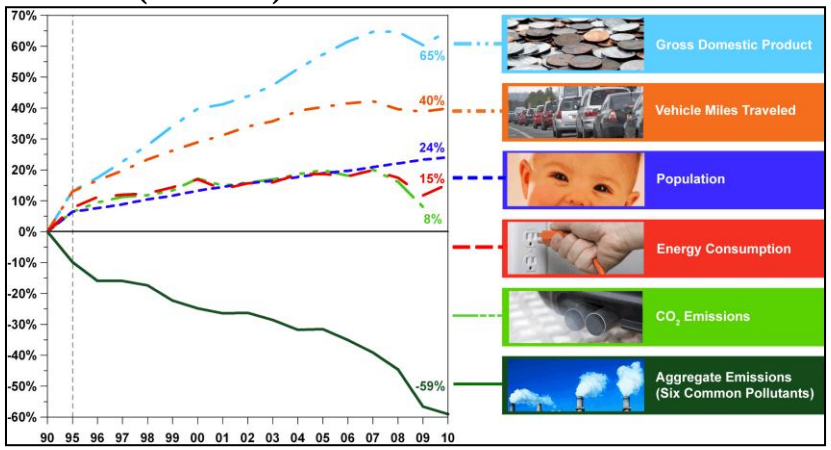
What are the known sensitive air quality areas, such as Class I areas, non-attainment areas, and air quality maintenance areas?

- The 1977 Clean Air Act amendments established a program to prevent significant deterioration of air quality by creating three different designations for sensitive air quality areas.
- Class I areas are wildernesses greater than 5,000 acres that were established before 1977. A Class I designation gives these areas special protection from existing air pollution. Pisgah National Forest contains two Class I areas: Linville Gorge Wilderness and Shining Rock Wilderness. Nantahala National Forest contains one Class I area: Joyce Kilmer-Slickrock Wilderness.
- Non-attainment areas and air quality maintenance areas are determined by considering the National Ambient Air Quality Standards (NAAQS). If the NAAQS are exceeded for one or more pollutant in an area, that area is designated as a non-attainment area. No non-attainment or air quality maintenance areas exist within the Pisgah or Nantahala NFs.
- Air quality near the Nantahala and Pisgah NFs is currently meeting the NAAQS for ozone and fine particulates. This means that current sources of pollution are not causing air quality to exceed the thresholds to protect human health and welfare. However, occasionally emissions from prescribed fires have released fine particulate matter resulting in emissions that exceeded daily thresholds for fine particulate matter.

What is the trend in air pollution emissions?

- Air pollutants come from sources as diverse as power plants, animal feedlots, unpaved roads, vehicles, and more.
- Sulfur dioxides, particulate matter, nitrogen oxides, and ammonia are among the most common and harmful types of air pollution.
- These pollutants can cause harmful changes to ecosystems, including changes to soil and water chemistry from acidic deposition, damage to sensitive vegetation due to chronic and acute ozone exposures, and increased visibility impairment in scenic areas.
- Data from the National Emissions Inventory (NEI) shows that concentrations of sulfur dioxides, particulate matter, and nitrogen oxides decreased between 2002-2008. It is anticipated that emissions of these pollutants will continue to decline.
- National trends in air quality are shown in Figure 20. Pollutant emissions have declined even while other factors such as vehicle miles traveled, population, and energy consumption have risen.

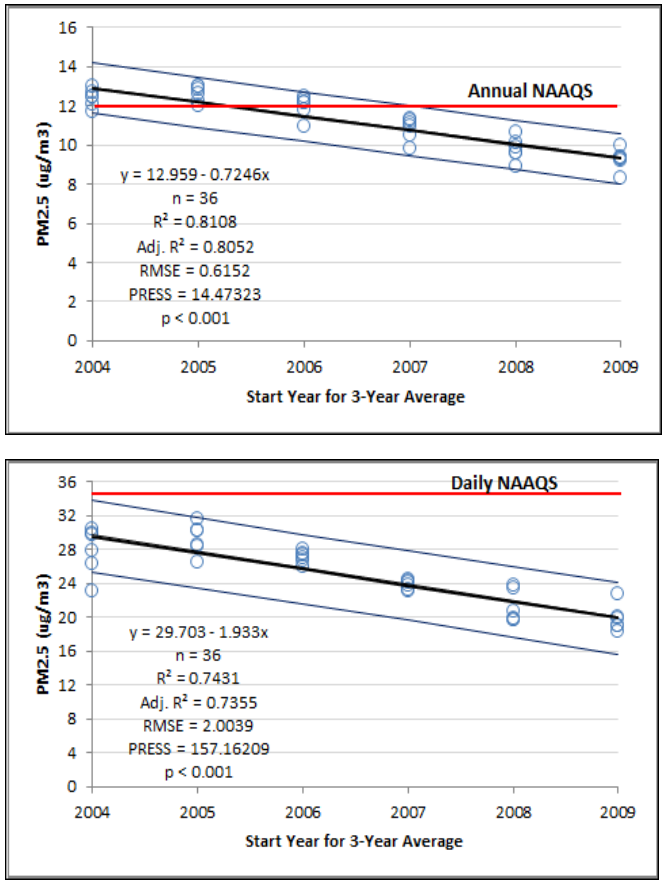
Figure 20. Comparison of Growth Measures and Emissions, 1990-2010 (EPA 2012).



Have any federal or state agency air quality implementation plans been developed that include the Forests? Are Forest Service emission estimates included in the appropriate plans?

- The USDA Forest Service is cooperating with the North Carolina Division of Air Quality, the Tennessee Division of Air Pollution Control, and other air regulatory agencies to identify air pollution emission reduction strategies to achieve natural background visibility at the three federally mandated Class I areas.
- The Regional Haze Plan establishes baseline (2000-2004) visibility conditions and a goal for significant improvement in visibility by 2064.
- Because of emissions reductions, average visibility from 2006-2010 improved over the baseline average.
- Emissions of air pollutants from Forest Service prescribed fires have been included in regional air quality modeling studies. The 2018 estimates of prescribed fires (41,801 acres) exceeds current estimates of the number of acres being treated (10,300 acres in 2012). Utilizing the 2018 estimates, the North Carolina Division of Air Quality concluded that agriculture burning, prescribed wildland fires, and wildfires are "a relatively minor contributor to visibility impairment at the Class I areas in North Carolina" (NCDAQ 2007).

Figure 21. Downward trends apparent for fine particulates.



What is the trend in fine particulates, ground-level ozone, and acidic deposition within or near the Forests?

The NAAQS for fine particulate matter ($PM_{2.5}$) are measured on a daily and annual basis. The annual NAAQS is 12 ug/m^3. This standard was designed to prevent harmful levels of chronic $PM_{2.5}$. The daily NAAQS is 35 ug/m^3. The daily NAAQS is designed so concentrations of $PM_{2.5}$ will sometimes rise above the annual average, but they will not rise to a level that could create acute health effects.

- Figure 21 shows that, as for other pollutants, $PM_{2.5}$ concentrations have decreased. In these figures the open circles (blue) are the results at each of the six ambient monitoring sites. The black line shows the downward trend in PM2.5, while the blue lines are the 95 percent confidence intervals for the trend estimate. The red line shows the current National Ambient Air Quality Standard (NAAQS) for the annual (12 ug/m3) and daily (35 ug/m3) NAAQS.
- The ozone NAAQS is calculated by determining the fourth-highest, eight-hour daily average ozone concentration for each year and then averaging three consecutive years. The NAAQS is exceeded if the three-year average is 0.075 parts per million (ppm) or greater.
- As shown in Figure 22, ozone concentrations are decreasing.
- Data from the National Atmospheric Deposition Program (NADP) was combined with precipitation and other data to spatially estimate forest-wide average annual sulfate and total nitrogen deposition. As shown in Figure 23, and similarly to other pollutants described above, wet sulfate deposition has significantly decreased over time.

Figure 22. Maximum daily 8-hour average for ozone.
The open circles (blue) are the results at each of the ambient monitoring sites. The black line shows the downward trend in ozone, while the green lines are the 95 percent confidence intervals for the trend estimate. The red line shows the current National Ambient Air Quality Standard (NAAQS) for ozone of 0.075 parts per million (ppm).

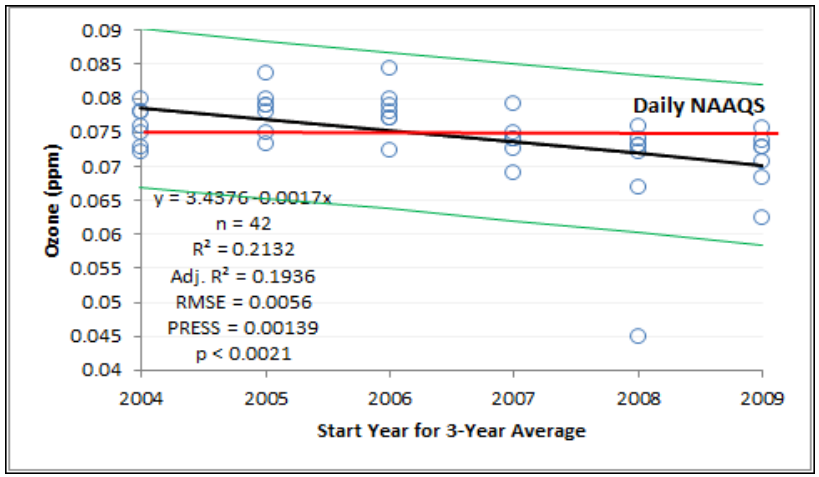
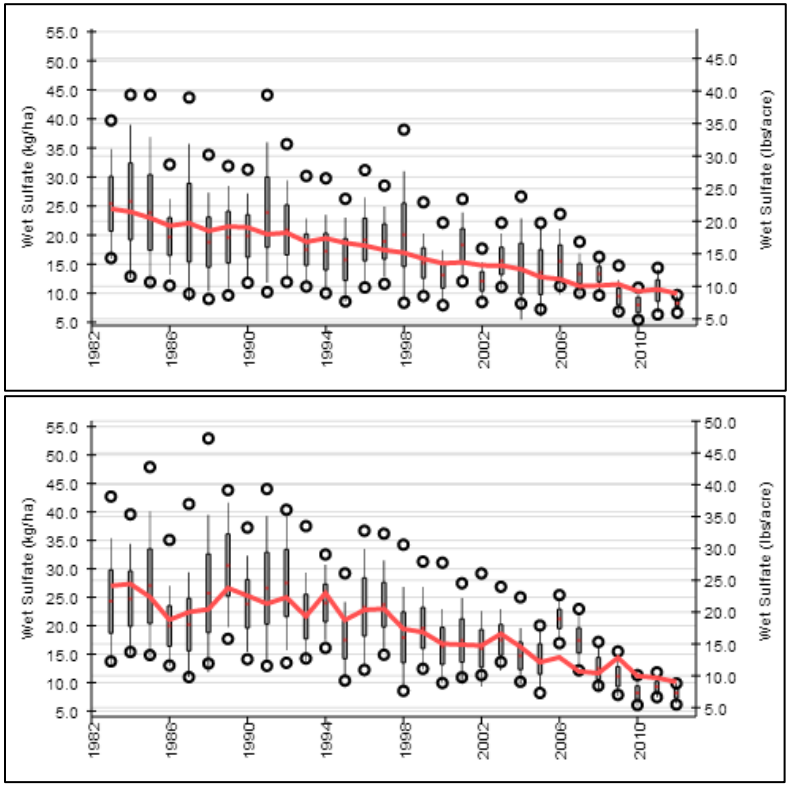


Figure 23. Trends in the average annual wet sulfate deposition within the Nantahala (top) and Pisgah (bottom) National Forests proclamation boundary. The red line is the predicted trend in wet sulfate deposition, while the boxplots and open circles show the distribution in the data (Grimm and Lynch 2004).



Is recent sulfur deposition exceeding critical loads to protect aquatic ecosystems, and are recent ozone exposures exceeding the critical levels to protect sensitive vegetation?

- Acidic deposition accelerates the loss of base cations from the soils and increasing soil H^+ ions. Soil acidification from sulfates can be highly persistent, and its effects result in nutrient imbalances that impair plant growth as well as an overall loss of aquatic biodiversity in sensitive watersheds.
- Critical loads for sulfur deposition are being exceeded.
- The 2009-2011 mean annual total sulfur deposition is about 5 kilograms per hectare (kg/ha). If future total sulfur deposition remained at 5 kg/ha then most of the suitable and unsuitable areas for timber harvesting may contain streams that will be able to attain or maintain an acid neutralizing capacity (ANC) of 30 mico-equivalents per liter (µeq/L).
- Establishing a desired threshold of ANC of 50 µeq/L for streams would provide suitable stream chemistry for all trout and numerous other aquatic organisms. Continuing the 2009-2011 mean annual total sulfur deposition may result in 26,000 acres of lands classified as suitable for timber harvest having a low or very low strength of evidence for the streams to maintain or attain an ANC of 50 µeq/L. In the non-wilderness unsuitable lands, about 99,000 acres have a low or very low strength of evidence that an ANC of 50 µeq/L or greater can be maintained or attained in the future.
- In some unsuitable areas, reduction in total sulfur deposition will be enough to alleviate soil base cation depletion. However, there are also places where current and historical deposition is high enough that simply reducing total sulfur deposition will not be sufficient to allow ecosystem recovery. In some sensitive watersheds, the harvesting of timber has been identified as having a greater impact to soil base cation supplies than if future sulfur deposition decreased by an

additional 78%, compared to 2002 estimates. Additional harvesting is likely to accelerate the loss of base cation from the soil by the removal of the wood from the site. The negative impacts of historical sulfur deposition and timber harvesting can be restored or mitigated by applying lime to the soils to replace lost base cations.

- Current ozone exposures are below the critical levels for tulip poplar, and ozone is probably causing minimal impacts to ozone sensitive species within the Forests and the Class I areas.

Soil, Water, and Geologic Resources

What is the condition of the watersheds across Nantahala and Pisgah NFs?

Watershed Condition Framework

In 2010, 6th-level watersheds (typically, 10,000 to 40,000 acres) were used to define areas of restoration across the Forest using the national Watershed Condition Framework (WCF) (USDA Forest Service 2010a). An underlying assumption was that funds would be made available for watershed restoration, for example for management activities that would improve a Class 2 watershed to a Class 1 watershed. Watershed condition was assigned following a rapid assessment of existing data, knowledge of the land, and professional judgment. The three watershed condition classes are directly related to the degree or level of watershed functionality or integrity: Class 1 - Functioning Properly, Class 2 - Functioning at Risk, and Class 3 - Impaired Function (USDA Forest Service 2010a). Based on this rapid assessment, most watersheds that contain Nantahala and Pisgah NF land received a Class 2 rating, with a minority receiving Class 1. One watershed was ranked Class 3 - the Reed Creek-Chattooga River watershed shared by the Nantahala NF, Chattahoochee NF, and Sumter NF. It was evaluated by the Sumter NF as impaired.

The following are general observations regarding watershed conditions:

- Trends are likely improving in most watersheds, but the risk is high that a catalyst of change, such as a large storm event, could result in impaired conditions.
- Attributes found to have the greatest adverse impact on watershed condition ranking in the WCF are associated with water quality problems, the lack of large woody debris, absence of brook trout, roads and trails not maintained to standard, soil contamination, and fire condition class.
  - Water quality problems including acidification, consumption advisory (due to historic mercury levels), proximity of old mines, and knowledge of impaired conditions.
  - Lack of large wood in streams was a factor rated as impaired on all watersheds.
  - The absence of brook trout from areas of their historic range and assumed reductions in populations resulted in all watersheds being assessed as impaired for this specific attribute. (This is only one element of the overall watershed rating.)
  - Open Road Density ratings assessed road and trail miles per square mile area. Sixty-eight percent of all watersheds have open road and trail densities above 2.4 miles per square mile, the threshold established by the assessment team as an indicator of impairment.
  - The Road Maintenance attribute is related to the percentage of drainage features that are maintained in accordance with best management practices (BMPs). None of the drainage features are cleaned regularly, which

means they are not maintained to the standards set by North Carolina BMPs or to the 1987 Plan.
  - Proximity to Water measured road and trail segments located within 300 feet of a mapped stream channel. Seventy-seven percent of the watersheds have greater than 25% of the road and trail system in the stream buffer and resulted in an Impaired Function ranking. This relatively high amount is attributed to system roads that were constructed decades ago, often on old railroad grades used for the transport of timber.
  - Extensive areas of soil contamination are present because of atmospheric deposition; sulfur and/or nitrogen deposition is above terrestrial critical load in watersheds across the Forests. Almost 93 percent of the WCF watersheds ranked "Soil Contamination" as Impaired Function due to atmospheric deposition.

Threats to Watershed Health

- The loss of the eastern hemlock from the Southern Appalachians as a result of hemlock woolly adelgid is likely to have a notable impact on water yield, large woody debris, stream shading, and riparian composition.
- Shifts in rainfall patterns would lead to periods of flooding and drought that can significantly impact water resources.
- On landscapes susceptible to mass soil movement saturated soils can give way and move under the force of gravity downslope in the form of landslides and debris avalanches (read more in the Geology Section).
- Where stream channels remain connected to their adjacent floodplains, flood flows are not expected to be a threat to watershed health.
- Roads and trails not maintained to standard have the potential to contribute sediment to streams, especially at stream crossings.

What watersheds provide drinking water to communities and what is their overall health?

Table 16 displays where Pisgah or Nantahala NF is a source of drinking water to a community.

- The health of surface water sources is good from these largely protected watersheds.
- State assessments indicate "good" water quality where assessments were completed in the North Fork Mills River and Mackeys Creek.
- The quality or sustainability of ground water sources is not monitored by the Forest Service, thus little is known.

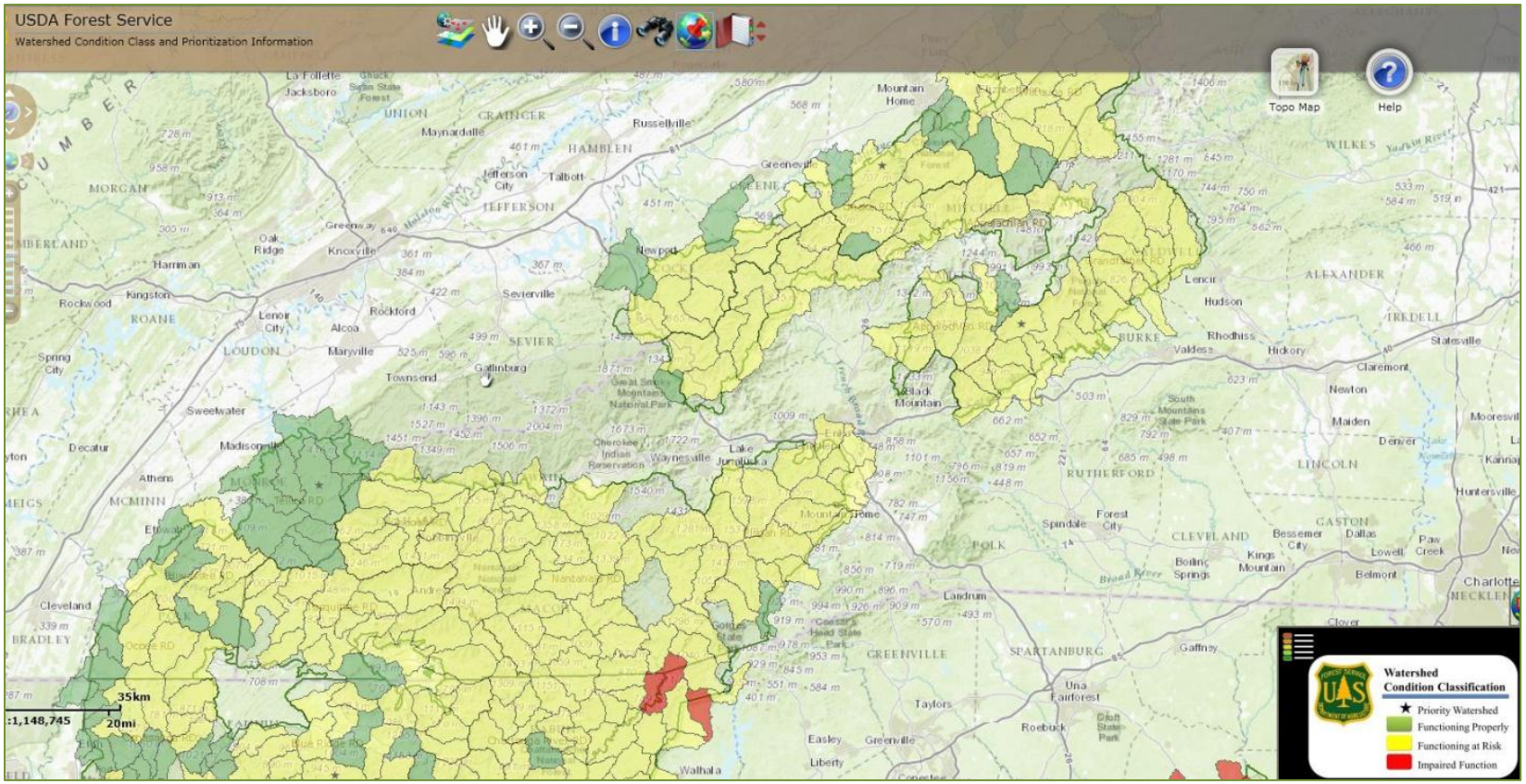


Figure 24. Photo capture of the WCF analysis output for the Pisgah and Nantahala NFs and surrounding forests (http://apps.fs.usda.gov/WCFmapviewer)

Table 15. Water quality status of drinking water provided to communities by the Nantahala or Pisgah NF

Community	Specific Use	County	Stream Name	State Stream Water Quality Assessment Status*
Town of Weaverville	Reservoir	Buncombe	Ox Creek	None Available
Town of Robbinsville	Reservoir	Graham	Long Creek	None Available
City of Hot Springs	Reservoir	Madison	Cascade Branch	None Available
Town of Old Fort	Reservoir	McDowell	Jarrett Creek	No Assessment Available
Town of Marion	Reservoir	McDowell	Mackeys Creek	Good
City of Hendersonville	Reservoir	Henderson	N. Fork Mills R. Bradley Creek	Good None Available
City of Brevard	Water Intake/Leaf Screen	Transylvania	Catheys Creek	None Available
Town of Highlands	Spring	Macon		Unknown
Carolina Water Service Inc.	Well/ Pipeline	Yancey		Unknown
Marble Community Water System	Wells (4)	Cherokee		Unknown
Town of Santeetlah	Wells (5)	Graham		Unknown

* Source: (EPA 2013)

Is the soil and water on the Nantahala and Pisgah National Forests of sufficient quality to sustain a healthy ecosystem and what are the trends?

Soil & Water Quality and Past Practices

- Some of the largest impacts to the soil stability are likely to have occurred during the early 1900s due to the extensive harvest of timber and the transportation network needed to remove timber for processing.
- As regrowth of the forest occurred and tracts of land were consolidated under federal ownership, land management practices improved and soils began to recover.
- The operation of coal burning energy plants to the west brought a more silent threat to soil quality as prevailing winds delivered elevated levels of sulfur and nitrogen that fell as acid rain on the naturally acidic soils.
- What this means to soil productivity is difficult to determine since reference soil nutrient conditions do not exist. Plant growth does not seem to show notable degradation of soil productivity.

Forest Management Impacts on Soil Quality

- Extensive logging in the early 1900s, resulted in an extensive network of skid and haul roads on the landscape. Overtime many of these roads were abandoned; some were closed while others left to stabilize on their own. The stabilization of these "old woods" roads has been an ongoing effort of the Forest Service since the land was acquired to reduce erosion and improve soil productivity.
- Areas of soil compaction, such as on these old woods roads, continue to improve as compaction is reduced by natural processes thus slowly improving soil productivity.

- The soil resource is potentially affected by commercial timber sale activities, and system and temporary road development.
- The Forest Service is directed by national policy to: Design and implement management practices to maintain or improve the long-term inherent productive capacity of the soil resource.
- Effects to the soils from projects are considered not significant when 85 percent of the activity area is unaffected and retains its potential long-term soil productivity.
- Monitoring determined that the Forests have met the soil quality performance standard in 94% of the post-harvest units surveyed between 2009 and 2012, and with follow up rehabilitation the Forests are 100% in compliance.
- The Forests are successfully designing and implementing the extraction of timber to minimize soil disturbance, specifically minimizing excavated skid roads and the size of log landings.

Timber Harvest Water Yield & Sediment

- In recently harvested areas in the planning area, there exists an elevated risk to stream channels from flooding since the removal of trees reduces water loss from the soil.
- Existing forest plan standards have done well to mitigate potential adverse effects of short-term increases in peakflow.
- Where stream channels are present within a harvest unit, streams are buffered from potential adverse effects from increases in streamflow.
- Between 2009 and 2013, Forestry Best Management Practices (BMPs) were monitored to determine whether or not BMPs were implemented and effective at controlling sediment and other pollutants during timber sale and road reconstruction and maintenance activities.
- From the information collected and analyzed over the last five years, it is evident that the Nantahala and Pisgah NFs are implementing BMPs during timber sales that are effective in protecting streams and water quality.
- There has been a dramatic improvement in BMP implementation and effectiveness and a decrease in sediment delivery to streams since the last decade of BMP monitoring. It is expected that this improving trend will continue with the design of new and more effective practices.

Prescribed & Wildfire

Fire and Soil Erosion

- When mineral soil is exposed by fire the potential for soil erosion is increased, however this is not typically the case.
- The Burned Area Emergency Response assessment of the Stoney Fork Wildfire of 2010 identified very little disturbance to the forest duff layer due to the low residence time of the fire in one area.
- Burns with previous soil disturbance may be more at risk than soils that have only been burned.
- Fireline construction and reconstruction using heavy equipment exposes a relatively wide area of mineral soil by removing vegetation and the organic layer. Fireline constructed by dozer greatly increases the risk of erosion and sedimentation because of the displacement of the organic soil layers and exposure of bare mineral soil. Dozerlines that cross streams have the greatest potential to become a source of sediment.

Fire and Nutrients

- Fire can alter the nutrient cycle and have both short- and long-term effects. Nutrient availability of forest soils is often limited and relies on the internal cycling of nutrients to sustain plant growth (Knoepp et al. 2004).

- Prescribed burns that have low residence time on the forest floor conserve more of the humus or duff layer and associated nutrients, benefiting the site by a slight, transitory release of plant essential nutrients.
- Forest managers recognize the importance of this pool of nutrients when burning, and design prescriptions that minimize consumption of site nutrients and maintain long-term site productivity.

Watershed Improvements

- Over the past planning period, thousands of acres of watershed improvements have been accomplished on the Forests. These projects stabilized soil erosion and reduced sources of human-caused sediment in numerous watersheds.
- It is likely that many tons of soil were stabilized that would have otherwise been eroded away and entered the stream network, where it would have adversely affected water quality and aquatic habitat.
- The annual watershed improvement program (totaling from 200 to 500 acres per year of improvements) has taken great strides to improve water quality on NFS lands and cumulatively downstream.
- The Forests have designed and implemented numerous stream rehabilitation projects using natural channel design techniques.
- Over the past planning period, the Forest Service has done well to meet the existing standard to "Use habitat restoration, improvement, and reintroduction to re-establish or expand native species populations and diversity." (USDA Forest Service 1994, p. III-24)

Riparian Areas

- Since implementation of the 1987 Plan, riparian and adjacent areas of influence (streamside zones) are in the Riparian Management Area (MA-18) where activities are to benefit the form and function of the riparian area.
- Over the years, monitoring has evaluated the implementation and effectiveness of forestry practices to meet the 1987 Plan standards to enhance riparian values, e.g., preventing sediment and maintaining stream temperatures.
- Comparing the 1992-2000 and 2009-2013 monitoring data seems to reveal an improving trend in the implementation and effectiveness of BMPs; a testimony to improved pre-harvest planning and administration of contracts during logging operations.
- Trends in riparian area diversity are improving where a diversity of tree and understory species exists. However, in areas where vegetation composition is predominantly hemlock with an understory of rhododendron, trends in riparian habitat diversity are likely to decline.
- Trends in large woody debris in stream channels are improving where a diversity of tree and understory species exists in the streamside area. However, in areas where vegetation composition is predominantly hemlock with an understory of rhododendron, trends in large woody debris are likely to have a short-term improvement, followed by a long-term decline.

What geology and soil resources occur across Nantahala and Pisgah NFs?

- Soils within the Forests can be grouped by landscape position.
- The soils vary widely in productivity, behavior, and response to management. While natural fertility and mineralogy are influenced by the type of materials from which the soils developed, site quality for the growth of native tree species

often is more closely related to landscape position and elevation than to parent material.
- Above 4,800 feet, productivity is limited by the short growing season and severe climate.
- Hydric soils (a wetland primary indicator) occur across the landscape in areas along stream channels, on floodplains, and in isolated springs and seeps, and occupy 594 acres in the planning area. There are an additional 74,205 acres of partially hydric soils.
- There are 3,498 acres of prime farmland soils in the planning area.

How have roads impacted stream channels and what are the general trends?

- Roads generally pose the greatest risk to streams, both stream channels and water quality. Roads can affect stream channels by intercepting, concentrating, and diverting flows from natural flow paths.
- The Forest Service and local groups, such as the French Broad River Keepers, keep a close watch on road conditions and are efficient at identifying issues. Following high rainfall events, district personnel often review the open road system and other areas of concern.
- Solving issues of erosion and sedimentation can, at times, be slow however due to declining personnel and budgets.
- There exist 134 miles of road and 105 miles of trail on soils having a "severe" erosion hazard from unsurfaced roads and trails.
- These road and trail segments are expected to require more frequent maintenance and implementation of erosion control measures than other segments.
- Monitoring of road BMPs, conducted at the time of the Forestry BMP monitoring, found that Roads BMPs were properly implemented and effective at controlling sedimentation at 93.1% and 94.7% of the sites surveyed, respectively.
- Sediment delivery to streams was primarily due to legacy system roads located along a stream channel, within the Management Area 18 (Streamside Management Zone).
- Road Stream Crossings were also monitored during Forestry BMP monitoring. In the planning area there are approximately 2,178 locations where roads cross streams.
- These monitoring results are a small sampling of the total, but are assumed to give a good indication of current conditions and effectiveness at protecting water quality across the area.
- Implementation and effectiveness rates were 88.5% and 89.5%, respectively. Sediment from the road crossings was controlled at 93% of the sites. The remaining 7% of the crossings had some level of sediment entering the stream channel, but only one crossing was found to be a major concern, needing immediate attention.
- Much of the road network is a remnant of decades ago and often not designed to current standards.
- Trends in water quality relative to the current road network overall are expected to decline as a result of an aging road infrastructure and shrinking budgets. Should predictions of increased storm runoff associated with climate change come to fruition risk of road erosion would likely increase.

What is the status of ground water resources and what are the potential demands on its use?

- Ground water resources are largely intact on Nantahala and Pisgah NFs.
- Ground water extraction from wells and springs occurs in 77 locations; supplying water to individual homes, small businesses and communities.
- Information on the quality and quantity of ground water at these locations is not available, but activities that pose a risk to

ground water, such as landfills, mining, oil and gas extraction and associated hydraulic fracturing, are not occurring in the planning area, therefore, water quality is assumed to be good.
- Demands on ground water are likely to increase as a result of increasing populations in both rural areas and cities.
- With this increasing use looming on the horizon, special attention will need to be given to ground water and ecosystems dependent on ground water.

Ground Water Dependent Ecosystems

- These areas contain ecological resources that potentially are highly susceptible to permanent or long-term environmental damage from contaminated or depleted ground water.
- Particular threats in the planning area include facility and road development, contamination from roads, clearing of vegetation, and over- extraction of ground water by permitted users.

What soils are sensitive to erosion and where do they occur on the landscape? How has management impacted these soils?

- A review of the soil data and interpretations from the NRCS Web Soil Survey Site shows that a majority of the planning area has soils sensitive to erosion should the surface organic layer be removed.
- A "very severe" hazard exists for 36% of the area that is found in management areas suitable for timber production. However, this risk is mitigated by taking extra precautions that reduce the exposure of bare soil.
- Monitoring indicates very little long-term soil disturbance from activities other than roads and trails over the past planning period.
- Soil quality monitoring also shows that the high hazard ratings within these management areas have been mitigated through proper application of effective BMPs.
- Roads and trails have been found to be the greatest concern on these erosion sensitive soils since they often cut into the slope, exposing soil to weathering, and interrupt flow of both surface and groundwater.
- With the growing inability to reconstruct and maintain the existing road and trail network the hazard of erosion is likely to increase.
- Properly design and constructed roads and trails often mitigate the hazard of erosion in these and other areas by effectively draining roads and trails using frequent rolling-dips and ditch relief culverts, and the application of gravel surfacing.

What geologic hazards exist for the Nantahala and Pisgah NFs [i.e. landslides, acid-producing (sulphidic) rocks, etc.]?

In September 2004, Hurricanes Frances and Ivan triggered landslides that caused 5 deaths, destroyed at least 27 homes, and disrupted transportation corridors throughout western North Carolina. In response, the North Carolina General Assembly passed the Hurricane Recovery Act of 2005, authorizing the North Carolina Geological Survey (NCGS) to prepare county-scale landslide hazard maps for 19 mountain counties (Wooten et al. 2008a). Geologic hazards also are part of the Western North Carolina Vitality Index developed by the Mountain Resources Commission in partnership with the Blue Ridge National Heritage Area and the USDA Forest Service. The Vitality Index was developed to allow planners and decision makers the information necessary to inspire quality discussion and craft informed decisions on issues affecting western North Carolina's abundant natural resources and its potential for sustainable growth (North Carolina Mountain Resources Commission, 2012 a, b, c). The 18 counties

where the Nantahala and Pisgah NFs are located are part of the 27 counties covered by the Western North Carolina Vitality Index. The Index draws on information from various State agencies including the North Carolina Department of Environment and Natural Resources, North Carolina Geological Survey, and Land Quality Section.

Geologic hazards are geologic processes or conditions (naturally occurring or altered by humans) that are a potential danger to public health and safety, infrastructure, and resources. Geologic hazards on the Nantahala and Pisgah NFs include landslides, floods, acid-producing rocks, waterfall hazards, ultramafic rocks with asbestos minerals, and abandoned mines. Like fire hazards, some geologic hazards on the National Forests affect public safety and infrastructure on the Forests and off the Forest in adjacent communities (Collins 2005; Collins 2008; Gori and Burton 1996; Wieczorek and Morgan 2008; Wooten 2008).The increase in population and infrastructure next to the National Forests increases the risks to public safety from geologic hazards associated with the Forests and adjacent private land.

In response to the 20 fatalities in the June 11, 2010 flash flood at the Albert Pike Recreation Area on the Ouachita National Forest in Arkansas, the Forest Service Washington and Region 8 (in Atlanta) offices are taking actions to review hazards and risks to public safety at developed recreation sites. Also, the Forest Service is instructed to identify existing and potential geologic hazards, land base limitations, and affected management activities in all land management plans. (FSM 2880.3)

Geologic hazards may affect or be affected by Forest management activities. It is important to distinguish between *hazard* and *risk*. A hazard is a potential source of harm to people or damage to infrastructure and resources. Risk is the likelihood or probability that a person will be harmed (or property and resource will be damaged).

For example, an active rockfall area below a cliff in a part of the forest never visited is a geologic hazard but it is not a risk to public safety. Risk to public safety arises only when people are exposed to the hazard. A new hiking trail that traverses across the active rockfall zone would create a risk to public safety. The level of risk would depend on how many people used the trail. For one hiker, the risk of rockfall injury may be low; but if there are many hikers using the trail, the risk that some hiker will suffer a rockfall injury may be substantial. A new campground built at the base of the active rockfall zone would create another type of risk to public safety. Campers who spend one of more night(s) and day(s) in the campground have a much longer exposure to the rockfall hazard than the hiker passing through the rockfall zone.

Landslides

The primary geologic hazard affecting the Nantahala and Pisgah NFs is the hazard from various types of landslides, including those related to road slope failures. The landslides triggered by Hurricane Frances and Ivan in September 2004 became a keystone event for the State of North Carolina and for the Nantahala and Pisgah NFs. Wooten et al. (2008a) noted:

In September 2004, intense rainfall from the remnants of Hurricanes Frances (September 7–8) and Ivan (September 16–17) triggered at least 155 slope movements (Fig. 1) that caused 5 deaths, destroyed at least 27 homes, and disrupted transportation corridors throughout western North Carolina (Wooten et al. 2005, 2007). In response to the destruction from these storms, the North Carolina General Assembly passed the Hurricane Recovery Act of 2005, authorizing the North Carolina Geological Survey (NCGS) to prepare county-scale slope movement hazard maps for 19 mountain counties. Macon County was selected as the pilot study

area, as it was the location of the fatal Peeks Creek debris flow (Latham et al. 2005, 2006), as well as 32 other debris flows triggered by Hurricanes Frances and Ivan. The resulting Macon County slope movement hazard maps (Wooten et al. 2006) are provided in a GIS format to local government agencies to help protect public safety and guide informed decisions on land use.

The intense rains triggered hundreds of landslides on the Nantahala and Pisgah NFs and other lands in the 18-county area. In Macon County the Peeks Creek landslide (debris flow) resulted in five fatalities, seriously injured two people, and destroyed 16 homes. The landslide began near the top of Fishhawk Mountain, swept down steep slopes and across the National Forest and then onto private land with homes in the Peeks Creek valley. The Peeks Creek landslide traveled a destructive path of two miles from the landslide source area at elevation 4,400 feet to the Peeks Creek junction with the Cullasaja River at elevation 2,200 feet.

Geologists classify the type of landslide that resulted in fatalities in Peeks Creek as a "debris flow"; the U.S. Geological Survey has published fact sheets on debris flow hazards in the Blue Ridge and the Appalachian Mountains of the Eastern United States (Gori and Burton, 1996; Wieczorek and Morgan, 2008). A debris flow typically originates on a mountainside as a debris slide (a slab of soil, colluvium, weathered bedrock, trees and other vegetation), and as it slides down slope it liquefies into a debris flow. Depending on the geologic setting, some debris flow can travel hundreds or thousands of feet down slope. As the debris slide moves downslope it can gouge into the mountainside, scrape off more soil, colluvium, etc., and snowball into a much larger landslide mass or "debris flow." As the debris flow sweeps downslope, if it runs into creek drainage, the debris flow then flushes down the creek drainage. In the drainage, more water is added to the debris flow; and the debris flow can scrape up the stream bed load, stream banks, and riparian trees, and increase the snowball effect into an even more destructive debris flow.

The U. S. Forest Service Coweeta Hydrologic Laboratory and Bent Creek Experimental Forest are engaged in cooperative research with North Carolina Geologic Survey on landslide hazards on and related to, Forest lands. This research and mapping has provided new information on landslide hazards in the region that was not available when the 1987 Forest Plan was prepared. Landslide hazard maps are available in a GIS format for Macon, Watauga, Buncombe, and Henderson counties (Wooten et al. 2006, 2008, 2009, and 2011). These maps show where debris flows have occurred, where debris flows may start on the Nantahala and Pisgah NFs; and where debris flows may travel downslope onto private land.

Accurate mapping of existing and past landslide events is an important step in identifying areas of potential landslide hazards and evaluating the results of landslide susceptibility modeling.

The hundreds of landslides on Nantahala and Pisgah NFs damage roads, trails, and infrastructure across the Forests, impacted streams and riparian areas, and required millions of dollars for storm recovery. The landslides included natural landslides as well as land management-related landslides, such as failure of road fill slopes and road cut slopes.

Each landslide is placed in one of three categories: 1) natural landslide on unmodified slopes, or a natural landslide that happens to intersect and damage a road, 2) landslide originating as a road fill slope failure, 3) landslide originating as a road cut slope failure.

The assessment of 105 landslides (slope failures) of the hundreds of landslides on the Nantahala and Pisgah NFs from Hurricanes Frances and Ivan indicates that:

- 22% of the landslides (23 of 105 landslides) are natural landslides;
- 7% of the landslides (7 of 105 landslides) are cut slope failures;
- 71% of the landslides (75 of 105 landslides) are fill slope failures.

The dominant and most widespread type of landslides in this assessment of 105 landslides is the failure of road fill slopes, accounting for more than two-thirds of all landslides.

A similar relationship is indicated by five of the largest, catastrophic and well-known landslides from September 2004.

- Peeks Creek, a natural landslide (Nantahala RD)
- Blue Ridge Parkway MP 348 road fill slope failure (Bear Drive Branch, Grandfather RD)
- Blue Ridge Parkway MP 349 road fill slope failure (Licklog Branch, Grandfather RD)
- Blue Ridge Parkway MP 322 road fill slope failure (Grandfather RD)
- Whitewater Falls road waste fill slope failure (Nantahala RD)

For these five major landslides from September 2004, 20% are natural landslide, and 80% are road-related fill slope failures.

Road cut slope failures versus road fill slope failures

Hurricanes Frances and Ivan put road cut slopes and fill slopes to a slope stability test along hundreds of miles of roads on the

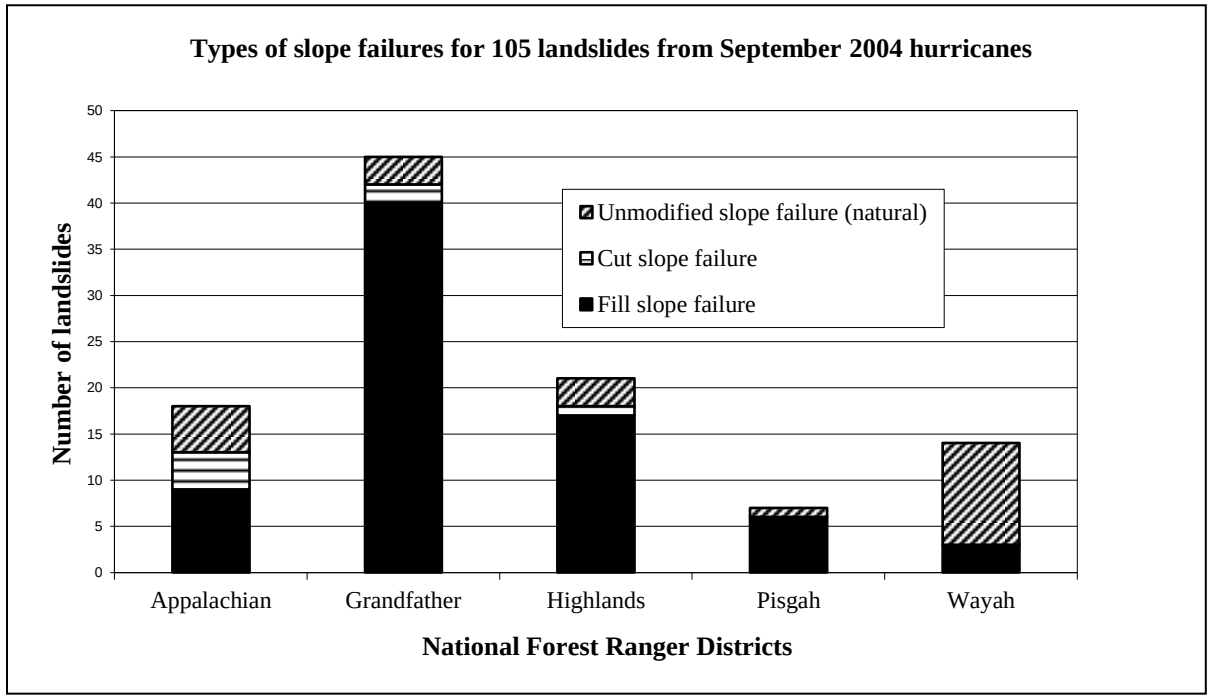


Figure 25. Natural landslides and land management-related landslides for 105 landslides of the hundreds of landslides on the Nantahala and Pisgah NFs from Hurricanes Frances and Ivan, September 2004

Nantahala and Pisgah NFs. Fill slope failures were the most common type of landslide on single lane FS roads. Cut slope failures were much less frequent than fill slope failures. This difference in slope stability behavior suggests that, generally, cut

slopes are more stable than fill slopes, and fill slopes are more vulnerable to failure that cut slopes. The watershed impacts of cut slope failures and fill slope failures are compared as follows:
Cut slope failure:

- Most of slide mass stays on road; small portion of slide mass reaches may reach creeks via road drainage ditches.
- Slide mass on road is accessible, and can be hauled to suitable disposal area.
- Slide mass usually contains more rock, less fines (potential fine sediment) than fill slope failure.
- Roadbed acts as a bench to stop further downslope movement of the landslide, thus limiting the downhill extent of landslide damage.
- Roadbed acts as a bench to prevent development of highly destructive debris flows.

Fill slope failure:

- Slide mass slips or flows downhill, often directly into a creek, drainage bottom, or riparian area.
- Most or all of slide mass is downslope from road and is not be retrievable.
- Slide mass usually contains more fines (potential fine sediment) than cut slope failure.
- Road fill failure can slip far downhill, thus increasing the downhill area affected by the landslide.
- Road fill failure can bulldoze or gouge the mountainside, snowball into a much larger landslide, and transform into a highly destructive debris flow that can travel hundreds or thousands of feet downslope and downstream.

This finding has implications for watershed impacts as well as for design of road damage repairs.

Most common geologic cause of major debris flows and other large landslides from September 2004 hurricanes

Slope Steepness

A critical factor in causing landslides is the steepness of the slope or mountainside. For natural landslides, such as the debris slide/debris flow on Peeks Creek, the slope steepness is a critical factor not only in a triggering landslide but also in the landslide's velocity, power, destructiveness, and length of downslope area affected. Peeks Creek landslides started high on the mountain and traveled over two miles downhill in its destructive path.

What determines the steepness (slope gradient or angle) of a mountainside? In many areas where landslides occurred in the September 2004 hurricanes on the Nantahala and Pisgah NFs, the steepness (slope gradient or angle) of the mountainside was determined by the geologic structure: dip slope. In geology, a "dip" is the angle of a bedrock layer or plane to a horizontal plane. A "dip slope" is the slope of a land surface that is determined by and conforms approximately with the dip of the underlying bedrock layer or plane, such as a bedding plane or bedrock joint.

The September 2004 landslides often occurred where steep planar surfaces in bedrock created steep dip slopes, consisting of bedrock overlain by a colluvial soil. The steep bedrock planes (at angles

above 25 degrees) are at or near the angle of repose for the colluvial soils.

Slip Surface: Character and Extent

In addition to the steepness of dip slope contributing to slope failures, the smoothness of the bedrock surface comprising the dip slope affects the ease with which the overlying colluvium layer (or road fill slope) can detach and produce a slope failures. The horizontal and vertical extent of the dip slope, especially of the smooth bedrock surface, influences the length and width of the debris slide initiating the debris flow.

Tree Roots

Tree roots can affect the slope stability of shallow colluvial soils on steep slope. However, the effectiveness of trees roots depends on the bedrock structures underlying the colluvial mantle.

When a bedrock plane is parallel to the ground surface (forming a dip slope), it is difficult for tree roots to penetrate into the bedrock. For example, if 1'-3' thick layer of soil overlie a bedrock plane, the tree roots grow downward into the soil but cannot penetrate easily into a bedrock plane that has few fractures. As a result, the potential for tree roots to anchor the colluvial mantle is severely limited by the bedrock structure. Because of the lack of tree root penetration into bedrock, the colluvial mantle is more susceptible to slope failure on a dip slope.

In contrast, when bedrock planes are perpendicular to the ground surface (forming an antidip slope), then many bedrock planes are available for tree roots to penetrate into the bedrock. As a result, the potential for tree roots to anchor the colluvial mantle is enhanced by the bedrock structure. When tree root penetrate into bedrock, the colluvial mantle is anchored and is more resistant to slope failure.

Subsurface Water Flow and Hydrostatic Pressure

For rainfall-induced landslides, intense rains induce subsurface flows into the shallow colluvium layer bounded by the underlying bedrock dip slope can lead to hydrostatic pressure and stresses that exceed the strength of the colluvium and results in a debris flow. A multi-year field research project to investigate and quantify the role of rainfall-induced subsurface water flow in infiltration of debris flows is being conducted through collaboration by the N. C. Geological Survey, U.S. Geological Survey, the Colorado School of Mines, NASA, University of Oklahoma - School of Meteorology, and U.S. Forest Service Research. The project, funded by NASA, is titled "*Advancing Multi-scale Landslide Hazard Prediction by Integrating High Resolution Remote Sensing Data and Subsurface In-situ Monitoring."* The sampling, testing, and monitoring sites will include sites on NFS lands in Macon County.

Critical role of road maintenance in avoiding or minimizing debris flows resulting from road fill failures

One contributor to failure of road fill slopes is lack of road maintenance, for example, plugged culverts that allow storm water to flow down road and spill over into road fill slopes; or broken or worn out culvert that allow storm flows to saturate road fill slopes.

The Forest has 1,613 miles of open road, and many miles of system roads temporarily closed to public use. The road system is aging, and it is challenge to fund the annual and periodic maintenance of the extensive roads system. Reduced budgets lead to reduced, deferred, or lack of road maintenance. It is important to recognize that one consequence of not funding road maintenance is the potential increase in failures of road fill slopes.

A review of major debris flows resulting from fill slope failures in the U.S. and overseas, and including lessons learned from the

September 2004 hurricane debris flows affecting the Nantahala and Pisgah NFs identified a variety of procedures for early detection, warning, and loss prevention (Collins 2008). Two of the procedures involve prioritized maintenance and prioritized repair based on engineering geologic detection of early warning signs of unstable road fill slope. In times of limited budgets for road maintenance, these procedures provide a means to prioritize funding to minimize the hazard of road fill slope failures resulting in debris flows.

Landslide activity in 2013

Landslides occurred on the Nantahala and Pisgah NFs in 2013. The Forest Service is assessing damage from storms in January and July 2013. A July 3, 2013 debris flow began on the Nantahala National Forest in the headwaters of a tributary to the East Fork of Dicks Creek in Jackson County. The debris flow swept off the NFS land onto private lands downslope. The debris flow resulted in property damage to private land and a NCDOT road below. At least two debris dams made up mainly of large woody debris remained in the creek on private land, and are a concern for future damage.

In July 2013 the National Park Service closed a 20-mile section of the Blue Ridge Parkway due to an incipient landslide or road fill failure just north of Tanbark Tunnel. The Blue Ridge Parkway (BRP) closure extends from Milepost 375, a few miles north of the Asheville, to Milepost 355 at N.C. 128/Mount Mitchell State Park. In 2004, three BRP road fill failures initiated debris flows the swept thousands of feet down slopes on the Grandfather Ranger District. The flows damaged Forest Service facilities and endangered public safety. The July 2013 BRP incipient road fill failure and the 2013 above-normal rainfall prompted a rapid assessment of landslide hazards and risks to public safety on the Pisgah NF (Collins 2013).

Circa March 2013 a massive rockfall occurred at Bridal Veil Falls along U.S. 64 highway nears Highlands, NC. For further information see Highlands Newspaper Internet Directory, 2013: http://www.highlandsinfo.com/WeatherArchives.htm. This is the second massive rockfall at Bridal Veil Falls since 2003. See the Waterfalls Hazards section for more information on massive rockfalls at Bridal Veil Falls.

Acid-producing rocks (sulphidic rocks)

Where is acid producing rock (sulfidic rock) a concern and what steps are taken to mitigate its potential effects to water quality?

- The soil and highly weathered rock derived from the rock is generally not a hazard because the iron sulfide minerals like pyrite and pyrrhotite have long been leached out through the natural weathering process.
- In fresh rock, however, the degree of potential acid runoff depends on the concentrations of sulfide minerals present, and the amount of surface area exposed in the excavated area and used in embankments or stockpiled in waste areas.
- Guidelines for handling acid producing material were developed by the N.C. Division of Water Quality and the North Carolina Geological Survey (NCDWQ 2007).

Other geologic hazards on the Forest

More information on landslides and acid-producing rocks as well as on other geologic hazards that affect and/or are affected by forest management are in supplemental report on geologic hazards including floods, waterfall hazards, ultramafic rock with asbestos minerals, and radon. Abandoned mines are discussed in Energy and Minerals section of Assessment.

Carbon Stocks

Key questions addressed in this Section:

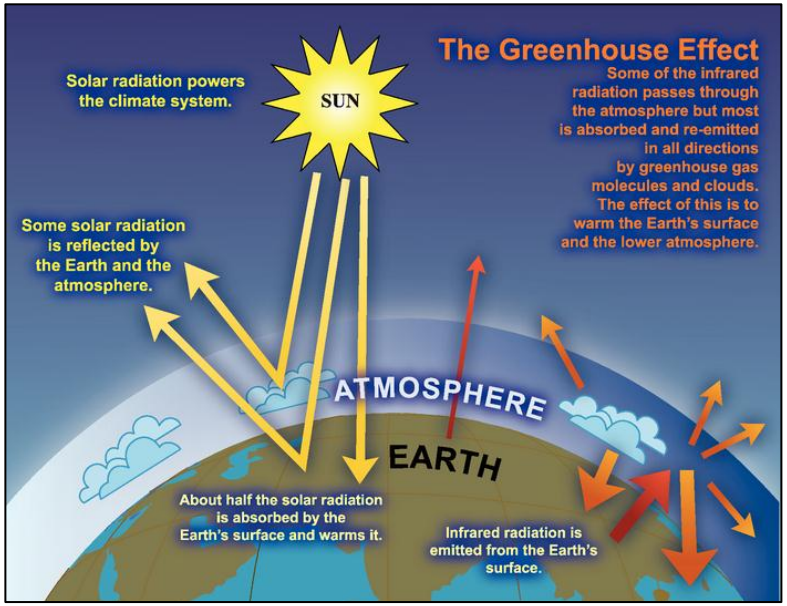
- What is the relationship between carbon sequestration and storage and climate change?
- What activities and processes may increase or decrease carbon stored by forests?
- What are the current carbon stocks of the Nantahala and Pisgah NFs?
- What effects do tree harvest and prescribed burning on the Nantahala and Pisgah NFs have on carbon stocks?
- What are the carbon stock trends over time for the Nantahala and Pisgah NFs?

What is the relationship between carbon sequestration and storage and climate change?

The Forest Service, in its Strategic Framework for Responding to Climate Change, has reported that "climate change is one of the greatest challenges to sustainable management of forests and grasslands and to human well-being that we have ever faced, because rates of change will likely exceed many ecosystems' capabilities to naturally adapt (USDA Forest Service 2008).

Excess greenhouse gases (GHGs) in the atmosphere are a measureable and significant contributor to a changing climate. Their concentrations have steadily increased over the past century (IPCC 2007). Carbon in the atmosphere (carbon dioxide or CO_2) has the largest effect of GHGs on the climate. Growth rates of atmospheric CO_2 are relatively high, with 2010 experiencing one of the largest annual growth rates of the past decade (Global Carbon Project 2011). CO_2 concentration in late 2011 was at 391 parts per million, a level that is higher than at any point during the past 800,000 years (Global Carbon Project 2011; Figure 26). For further information see the Climate Primer: http://www.fs.fed.us/ccrc/climate-basics/climate-primer.shtml.

Figure 26. A simplified model of the greenhouse effect. Source: IPCC 2007a Ch.1.



Human activities have led directly to increases in GHG concentrations and therefore an enhanced greenhouse effect. Predicted GHG emission scenarios, based on different assumptions about population growth, energy use, etc., are used by climate scientists to predict future trends of GHG atmospheric

concentrations that are the climate-driving forces used for climate change projections. (Daniels et al. 2012)

Carbon sequestration is the process by which atmospheric CO_2 is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils. Forests help to mitigate the climate effects of increasing atmospheric CO_2 concentrations by removing carbon from the atmosphere through the process of vegetative growth and storing carbon as biomass. Worldwide, forests offset up to 60% of global CO_2 emissions from fossil fuel combustion (Pan et al. 2011). However, loss of forest land cover is responsible for about 20% of global human-caused carbon emissions (IPCC 2007). In the U.S., forests and carbon stored in wood products are a net carbon sink and offset about 13% of total U.S GHG emissions (EPA 2012). Forest management activities will play a critical role in ensuring that forests remain a net carbon sink."

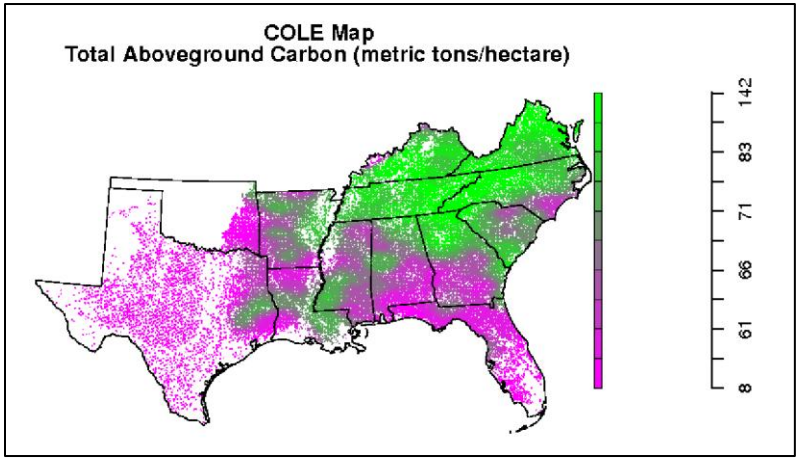


Figure 27. Forest carbon distribution in the Southeastern US (Carbon On-Line Estimator, Van Deusen and Heath 2013)

What activities and processes may increase or decrease carbon stored by forests?

The Intergovernmental Panel on Climate Change (IPCC) defines mitigation as an intervention to reduce the emissions or enhance the storage of greenhouse gases (IPCC 2007a, IPCC 2007b).

Forests and other ecosystems as carbon sinks provide for mitigation by their very existence as they absorb CO_2, removing it from the atmosphere. Forest management activities will play a critical role in ensuring that forests remain net carbon sinks (USDA Forest Service 2010c).

The Nation's forests and grasslands provide clean water, scenic beauty, biodiversity, outdoor recreation, natural resource-based jobs, forest products, renewable energy and carbon sequestration. Sustainable forestry practices can increase the ability of forests to sequester atmospheric carbon and help to mitigate the effects of changing climate while enhancing other beneficial services. For further information see the following link: http://www.fs.fed.us/ecosystemservices/carbon.shtml. Effective climate change mitigation requires balancing carbon sequestration with other beneficial services (USDA Forest Service 2008a).

Mitigation is predicated on adaptation: the long-term capacity of ecosystems to capture and store carbon depends in large part on their ability to adapt to a rapidly changing climate. Adaptation and mitigation strategies must complement each other. Carbon accrues in trees, soil, and wood products and the use of wood-based substitutes for fossil fuel-based products decreases the amount of greenhouse gas emissions. However, slow growth and the loss of vegetation to storms, insects, disease, and wildfire results in reduced or direct loss of carbon to the atmosphere. Forest management is important for protecting, maintaining, and improving the amount of carbon stored in forests (USDA Forest Service 2008a).

"Harvested biomass converted into solid wood products, biofuels, or other fossil fuel substitutes may add to the stocks of sequestered carbon which help to mitigate climate change" (USDA Forest Service 2008a, p. 10).

"Most opportunities for increased sequestration of greenhouse gases on forests and grasslands are on private lands" (USDA Forest Service 2008a, p. 10).

"Management practices, such as thinning, revegetation and prescribed fire, designed to maintain or restore forests may, at least over the short- or mid-term, reduce total carbon stocks. However, not taking action to improve ecological health will likely result in substantially lower carbon stocks and substantially increased carbon emissions in the future as the result of forest decline, severe wildfire, and losses from storms, insects, and disease" (USDA Forest Service 2008a, p. 10).USDA Forest Service 2008a)

The Forest Service was established to help stem the Nation's dramatic forest losses in the 19th century. Within a single generation, net forest loss almost entirely ceased. America's forests have stabilized at about 750 million acres, one-third of the Nation's land area. A century of forest conservation and restoration has turned America's forests from a net carbon source into a net carbon sink (USDA Forest Service 2010c) America's forests, including the carbon stored in wood products and landfills, offset about 12% to 16% of the carbon dioxide that Americans emitted (EPA 2012).

Forest regrowth in the United States and the attendant high rates of carbon sequestration, however, have limits, linked as they are to recovery from past deforestation and logging practices. Greenhouse gas accumulations in the atmosphere will have uncertain effects on carbon sequestration. On the one hand, increasing carbon dioxide might accelerate forest growth and carbon uptake; on the other, climate change will exacerbate drought, wildfire, insects, disease, and other disturbances. (USDA Forest Service 2010c)

The National Roadmap for Responding to Climate Change states, "Managing America's forests and grasslands to adapt to changing climates will help ensure that they continue to produce the benefits that Americans need, while helping to mitigate the effects of a changing climate and to compensate for fossil fuel emissions through carbon storage in healthy forests" (USDA Forest Service 2010c, p. 2)

What are the current carbon stocks of the Nantahala and Pisgah NFs?

Existing carbon stocks and changes over time are estimated using Forest Inventory and Analysis (FIA) data, which provides estimates for five pools of carbon within the forest ecosystem. The 2011 estimates for the Nantahala and Pisgah NFs total 72.0 teragrams (Tg or million metric tonnes) +/- 5.0 Tg of carbon. This represents about 0.16% of the total of approximately 45,278 Tg of carbon in forests of the coterminous United States (EPA 2012). The average density of forest carbon is about 68.9 metric tonnes per acre (Mt/ac).

Table 16. 2011 Nantahala and Pisgah NFs Carbon Stocks (Metric tonnes or Mt)

Total Carbon	By Carbon Pool				
	Above Ground Live Carbon	Below Ground Live Carbon	Dead Wood Carbon	Litter Carbon	Soil Carbon
72,010,405	35,637,818	6,904,064	4,778,916	3,496,699	21,192,908

Table 17. Metric Tonnes of 2011 Carbon Stocks by Forest Type and Dominant Tree Size Class

Forest type field call	Total	Large diameter(sfwd 9 to 19.9;hdwd 11 to 19.9 inches)	Medium diameter(sfwd 5 to 8.9;hdwd 5 to 10.9 inches)	Small diameter(0.1 to 4.9 inches)
Total	72,010,405	55,866,699	14,919,782	1,223,924
Eastern white pine	1,153,498	768,998	384,500	-
Eastern white pine / eastern hemlock	544,009	544,009	-	-
Red spruce / balsam fir	685,075	685,075	-	-
Table Mountain pine	128,233	128,233	-	-
Eastern white pine / northern red oak / white ash	752,972	752,972	-	-
Shortleaf pine / oak	439,480	439,480	-	-
Virginia pine / southern red oak	326,774	99,732	227,042	-
Other pine / hardwood	2,966,790	1,458,405	1,508,385	-
Post oak / blackjack oak	312,667	312,667	-	-
Chestnut oak	12,507,572	10,742,086	1,398,159	367,327
White oak / red oak / hickory	8,906,424	6,362,810	2,352,346	191,268
Northern red oak	3,488,013	2,473,643	517,926	496,445
Yellow-poplar / white oak / northern red oak	13,889,880	12,749,678	1,140,202	-
Scarlet oak	1,795,803	679,210	1,116,593	-
Yellow-poplar	5,044,214	4,401,474	642,740	-
Chestnut oak / black oak / scarlet oak	3,231,630	2,635,043	596,587	-
Cherry / white ash / yellow-poplar	427,689	-	427,689	-
Red maple / oak	101,336	-	101,336	-
Mixed upland hardwoods	7,302,535	5,258,311	2,044,224	-
Sugar maple / beech / yellow birch	5,310,633	3,157,876	2,152,757	-
Black cherry	168,884	-	-	168,884
Hard maple / basswood	2,526,295	2,216,998	309,298	-

What effects do tree harvest and prescribed burning on the Nantahala and Pisgah NFs have on carbon stocks?

Trees harvested from the Nantahala and Pisgah NFs are converted to a variety of primary wood products. Sawtimber may be converted partially into lumber that remains in structures for many years. Bark, chips and sawdust may be used for other products or uses, such as paper or to generate electricity, which given off as emissions over different periods. Landfilled residues and waste are often sequestered for extended periods of time. Forest Service Research has developed methods to estimate the uses of harvested wood and the rates at which the carbon in various products are sequestered or emitted to the atmosphere.(Smith, et al 2006).

Annual harvests from the Nantahala and Pisgah NFs average 65,940 ccf (USDA Forest Service 2014). On average 0.06% of the standing total stocks of carbon are harvested each year. Of this annual harvest it is estimated that more than 30% will remain in a sequestered state (wood products in use or in landfills) after 50 years (See table 19).

Table 18. Nantahala and Pisgah NFs Fate of Carbon from Annual Average Forest Harvests

Year After Harvest	Total C in Allowable Sales Quantities (metric tons)	C Remaining in Primary Wood Products (metric tons)	Wood Product C Accumulating in Landfills (metric tons)	Total Carbon Emissions (metric tons)	Emitted with Energy Use (metric tons)	Emitted without Energy Use (metric tons)
0	44,489					
10		13,640	5,543	25,306	15,520	9,786
20		9,463	7,040	27,986	16,414	11,572
30		7,607	7,576	29,306	16,722	12,584
40		6,365	7,900	30,223	16,875	13,348
50		5,460	8,141	30,887	16,936	13,952

Table 20 displays the total GHG emissions from Nantahala and Pisgah NFs as a total of all US emissions. The Nantahala and Pisgah NFs have a relatively small prescribed burning program, with an average of 8,116 acres burned annually. Emissions from these activities represent a small fraction of the total carbon stocks of the forest as well as the carbon estimates in available fuels.

Annual prescribed burning emits carbon at the rate of only about 0.4% of the carbon in down wood and litter, but only 0.05% of the total standing carbon stocks. Prescribed burning generates GHG emissions other than carbon as methane and nitrogen oxides. Estimates of these emissions and comparisons of their effects as CO_2 Equivalents are presented in Table 21.

Table 19. Total GHG Emissions 2009 (includes land use change)

	Million Mt CO2e	% of US Total
United States	5,209.70	100.00%
Region 8 State Totals	2003.1	38.45%
North Carolina	123.9	2.38%
Nantahala-Pisgah NF	1.32	0.03%

Table 20. Nantahala and Pisgah NFs Emissions from Annual Average Prescribed Burning

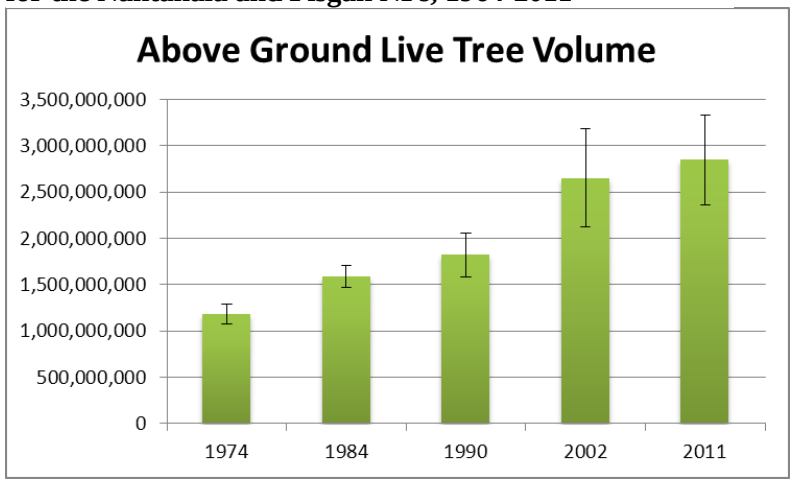
GHG GAS	EMISSION FACTOR (lb/metric ton)	EMISSION FACTOR (lbs/U.S. ton)	FUEL CONSUMPTION (tons/acre)*	ACRES BLACKENED (acres)**	TOTAL EMISSIONS (lbs)	TOTAL EMISSIONS (metric tons)	CO2 Equiv. (metric tons)
CARBON DIOXIDE - CO2	3,457.00	3,137.00	3.00	8,116.00	76,379,676.00	34,645.82	34,645.82
METHANE -CH4	11.90	10.80	3.00	8,116.00	262,958.40	119.28	2,504.84
NITROGEN DIOXIDE -N2O	0.46	0.42	3.00	8,116.00	10,226.16	4.64	1,437.96

What are the carbon stock trends over time for the Nantahala and Pisgah NFs?

Forest carbon stocks fluctuate over time as the forest grows and goes through varying levels of impact from disturbance. When the Nantahala and Pisgah NFs were established, the land had been heavily cut over. Some of the land had been rained and cultivated for agriculture. Reforestation, fire protection, and limited harvests provided for regrowth of the forest and large accumulations of carbon stocks. Forest Inventory and Analysis (FIA) inventories reflect the impacts from the original condition of these forests and the continued growth and recovery that continues today.

Based on trends in tree volume estimates from FIA, the Nantahala and Pisgah NFs have been a steady carbon sink for a number of decades. The most recent inventories indicate that the Nantahala and Pisgah NFs is a carbon sink, with most recent 9-year accumulations at the rate of about 7.3%. Although this increase is well within the sampling error for the inventory, the trends reflect that a continued increase over time without interruption. These estimates include the growth, mortality, and harvests. Even considering the current harvest and burning levels the forest maintains large carbon stocks that continue to grow, although the growth rates may be slowing and close to reaching their upper limits.

Figure 28. Total above ground live tree volume estimates for the Nantahala and Pisgah NFs, 1964-2011



Social, Cultural, and Economic Conditions

Key questions addressed in this Section:

- What are the demographics of the 18-county area? How do they differ from the state and nation as a whole?
- What are the important cultural traditions in western North Carolina?
- What specific forest-related resources, uses, and opportunities are required or demanded for completion of cultural traditions?
- What unique cultural traditions occur in the Nantahala and Pisgah NFs?
- What are the important sectors of the economy?
- What are the direct and indirect economic contributions from Forest Service expenditures and impacts of the plan unit?
- What have payments to counties been over time and how are they calculated?

What are the Demographics of the 18-county area? How do they differ from the state and the nation as a whole?

The median age of residents in most counties is five to ten years older than the nation as a whole. Exceptions are Jackson and Watauga counties, home to major state universities where students make up an important part of the demographic. Several statistics for Jackson and Watauga counties are exceptions to the demographic trends for this reason.

Western North Carolina is much less diverse racially than either the state or nation as a whole, with 90% of the population identifying as "white alone" and 4% identifying as African American alone. Burke County has the highest percentage of African Americans and Asians. Jackson and Swain counties, which are in close proximity to the Qualla Boundary, have the highest percentages of American Indians. The total Hispanic/Latino population in the 18-county area is approximately 5%, with the highest percentage in Henderson County.

Buncombe and Henderson counties have significantly higher population densities than the other 16 counties and the state as a whole. Per capita income in all the assessment counties is lower than the state as a whole and significantly lower than the nation as a whole.

Educational attainment is generally lower in the 18-county area than the nation as a whole, with the exceptions of Buncombe, Henderson, Transylvania and Watauga counties.

One unique characteristic of the Plan area is that in most counties the percentage of second home ownership is significantly higher than the state or country as a whole. Nationwide the percentage of second home ownership is 5.1%; however, 14 of the 18 counties in the Plan area have higher percentages of second home ownership, with the highest being Avery County at 42.7%.

What are the important cultural traditions in North Carolina?

Western North Carolina is known as the Mountain Region of North Carolina, as it includes the Appalachian Mountains, with the Great Smoky and Blue Ridge mountain ranges. The Nantahala and Pisgah NFs are located within this area along with the Great Smoky Mountains National Park and the Eastern Band of Cherokee Indians land (the Cherokee Qualla Boundary). The Blue Ridge Parkway passes through the Nantahala and Pisgah NFs. The mountains, valleys, rivers, waterfalls, small towns, and associated culture are such that the area is Congressionally designated as the Blue Ridge National Heritage Area.

The study area for the Nantahala and Pisgah National Forest Plan Revision includes 18 counties. These are configured into Councils of Government named after notable geography: High County, Western Piedmont, Isothermal, Land of Sky, and Southwestern. The relationship between the geographic area and its resources and the people who live and visit is very important. As a point of demonstration, each county in western North Carolina has a County Heritage Plan, which emphasizes the natural and the cultural attributes of the area and the links between them.

Western North Carolina contains few major urban centers; it is nestled in the Southern Appalachian Mountains with Atlanta, GA; Greenville, SC; Charlotte, NC; Chattanooga and Knoxville, TN as the closest large urban areas. The 18-county area containing the Nantahala and Pisgah NFs includes the urban population centers Asheville, Boone, Hendersonville, Waynesville, and Black Mountain. The area is connected to other regions by two interstate highways; I-40, running from Tennessee southeast toward the Piedmont, and I-26, running north/south through the most populated counties in the region. Largely a rural area, most of the region is connected by State highways and roads.

Western North Carolina has several colleges and universities, most notably Appalachian State University in Watauga County, the University of North Carolina at Asheville, Warren Wilson College, and Montreat College in Buncombe County, Western Carolina University in Jackson County, Mars Hill College in Madison County, and Brevard College in Transylvania County. The area is home to many third- and fourth-generation residents, many of Scots-Irish decent. The region has received many retirees and second-home owners over the years, both groups citing the natural beauty and cultural opportunities of the area as major reasons for their move. The Cherokee Qualla Boundary is also located in western North Carolina, just south of Great Smoky Mountains National Park. The main section of the Qualla Boundary lies in eastern Swain County and northern Jackson County, but there are many smaller noncontiguous sections to the southwest in Cherokee and Graham Counties.

Social, cultural, and economic factors in western North Carolina have changed dramatically since the 1960s. The larger metropolitan areas have grown faster and have been better able to withstand economic downturns than the more rural counties. Arts, entertainment, and recreation represent a significant growth sector in the region, with Buncombe, Watauga, Henderson, and Jackson counties being the major centers for these activities. In addition, the region is recognized for its wilderness and roadless areas which are resources limited in both the Southern Appalachians and the Eastern United States.

Steady population increases since the 1960s have resulted in a change in the values and lifestyles from previous generations, especially regarding the use and preservation of natural resources. Long-time residents depended on natural resources to make a living and to provide a setting for traditional events and activities and generally favor use and conservation of natural resources. New residents, often relocating from large cities outside the region, are

more inclined to see natural resources set aside and preserved for the ecological and aesthetic services they provide. This dichotomy of views continues to challenge the region to plan for and achieve sustainable outcomes.

What unique cultural traditions occur in the Nantahala and Pisgah NFs?

The USDA Forest Service's 2011 *Western North Carolina Report Card on Forest Sustainability* (p. 13) lists "cultural/spiritual values" as an indicator of socioeconomic benefits. A rating of "improving" was assigned to this indicator as "the contribution of arts and craft to the regional economy is significant and is considered an industry with a demonstrated competitive advantage relative to the rest of the State and the Nation. With over 100 spiritual retreats, the region continues to offer the opportunity to experience the mysteries of the natural world."

In addition to inspiration, the national forests provide some of the materials used in important arts and crafts well known to the area. It is this relationship between the mountains and the communities, including their arts, crafts, music, and lifestyles, which grows the strong sense of place present in western North Carolina.

Cultural Heritage

The rich cultural mosaic of the Blue Ridge mountains and foothills of North Carolina has its origins in three separate continents—North America, Europe, and Africa. There are three major strands of this rich tapestry of cultural heritage including Cherokee Heritage, Scots-Irish Heritage, and African Heritage. The cultural traditions of the Eastern Band of Cherokee Indians, Scots-Irish, and Africans have blended into a culture unique to the Southern Appalachian Mountains. The mountains themselves have helped to protect and nurture this cultural mosaic by providing a degree of relative isolation from the rest of the state and nation.

Native Cherokee Heritage

The town of Cherokee, NC, located within the Qualla Boundary in the far western part of the state, is the cultural center of the Eastern Band of Cherokee Indians. Approximately 8,000 of the 13,000 enrolled members of the Tribe live within the Qualla Boundary. Commonly referred to as the Cherokee Indian Reservation, the Qualla Boundary is technically not a reservation because individual tribal members only hold title to about 80% of the land; however, because the land is held in a federal trust, it can only be sold to other tribal members. Other Cherokee lands in North Carolina include the 2,255-acre parcel in Graham County, home to the Snowbird community, and 5,320 acres scattered throughout Cherokee County, near the old Cherokee communities of Marble, Grape Creek, and Hanging Dog.

Balancing the modern world with ancient traditions, the Cherokee welcome millions of visitors each year while overseeing the mountain landscape that is their ancestral home. They educate their youth to participate fully in the global economy while passing on the Cherokee language and culture. Cherokee, NC is not only a part of Cherokee history; it is also a part of Appalachian history and is one of the most historic places in North Carolina and the Blue Ridge Mountains. Cherokee, NC is also home to many traditional artisans working to preserve Cherokee crafts that have been passed down for generations. Traditional Cherokee crafts such as basket weaving are a special skill that is celebrated in order to preserve important parts of Cherokee culture. For a more extensive review of the Eastern Band of Cherokee Indian history and influences see the section *Areas of Tribal Importance*.

Scots-Irish Heritage

The relocation of lowland Scots to Northern Ireland in the early 17th Century created a cultural group today referred to as "Scots-Irish." Over the course of the century, many Scots-Irish immigrated to the New World. Other Scottish and Irish families came as well, including many of the Highland Scots who were defeated at the Battle of Culloden in 1746. Famine in Ireland also played a major role in Irish immigration to America during the mid-19th Century.

Scots-Irish settlers brought with them the agricultural, music, craft, and storytelling traditions of their homeland. Living in small, relatively isolated communities, Scot-Irish settlers sustained their cultural ties through the preservation of these traditions and had a profound influence on shaping the distinctive agricultural, music, storytelling, and crafts of the Southern Appalachians.

African Heritage

Most of the earliest settlers of African descent came to western North Carolina as slaves; working on small farms in the fertile mountain valleys where they introduced melons, okra, groundnuts (peanuts), millet, yams, and dozens of medicinal plants to the area. After Emancipation, many former slaves purchased or were given land to farm and developed African-American communities apart from white settlers. African Americans managed to preserve many of their folkways and cultural traditions and a number of these traditions—notably food and music—have become an integral part of greater Appalachian culture. For example, the five-string banjo which is the backbone of old-time and bluegrass music was derived from instruments brought to America by enslaved West Africans.

Religion

The settlement and continued development of western North Carolina, as was much of the Southern United States, was greatly influenced by several religious denominations. As a result, church attendance in the area tends to be higher than the national average and many spiritual retreats and church related social gatherings take place on the Nantahala and Pisgah NFs. In addition, several of the popular summer camps in the area are associated with religious denominations.

Music Heritage

A fertile meeting ground for European and African music traditions, the North Carolina mountains and foothills still ring with the sounds of the fiddle, banjo, string bands, and cloggers, which can be heard everywhere from front porches to festival stages and town squares. Traditional mountain music includes lively strains of old-time, bluegrass, ballad singing, blues, and sacred music. These evolved from traditions brought over from Europe and Africa, and some represent a powerful blend of musical elements from the two continents.

Appalachian mountain music includes many instruments, styles and sounds, but bluegrass music is often honored and celebrated as a piece of Appalachian history in almost every part of this East coast mountain range. Bluegrass music has over the years become a style that has been influenced by people and cultures from around the world. Old Time music traditionally includes the Appalachian fiddle and banjo. It can also include a full string band playing alongside the fiddle and banjo. Old Time music was played during community celebrations and events in the early days of settlement in the western North Carolina mountains and is rooted in the music of the Anglo-Irish fiddle, as well as the rhythms of shuffle bowing and the banjo, both of which come from African-American history. In addition, Old Time music has been

influenced over the years by ragtime, blues, jazz, gospel and country music.

Appalachian Crafts Heritage

The North Carolina mountains and foothills have become the geographic center of handmade crafts in the United States. The region fostered the country's traditional craft movement (1800s to early 1900s) as well as the contemporary craft movement (1940s). The Craft Revival began, with a focus on preserving the traditional arts and crafts which were beginning to be less valued than industrialized products. As a result, a multi-million dollar handicrafts industry developed. The Southern Highland Craft Guild formed and currently has about 900 members and two locations along the Blue Ridge Parkway. In addition, in 1946 the Qualla Arts & Crafts Mutual, Incorporated, the nation's oldest and foremost Native American cooperative, was founded to preserve and promote Cherokee crafts to help strengthen tribal values and provide livelihoods while offering unique beauty to the world.

Today, over 4,000 craftspeople live and work in western North Carolina, where the traditional and contemporary crafts flourish side by side, and create a craft economy of more than $206 million in the region. Visitors from all over the world come to the North Carolina mountains and foothills in search of fine Appalachian crafts. Here visitors can meet mountain artists in their studios, participate in hands-on demonstrations, and sample a great variety of crafts at festivals, galleries, and museums. Many visitors also come to the region's venerable craft schools, such as the Folk Art Center in Asheville, the John C. Campbell Folk School in Brasstown, or the Mountain Heritage Center in Cullowhee, to learn a new craft or improve their current skills.

Tradition of gathering forest products

Please note that permits are required for collection of most gathered forest products and that collecting of some species such as ginseng is limited.

Gathering and trading of plants, lichens, and fungi from forests in the United States has been important for generations. Native Americans had well-established trade routes throughout the land for thousands of years. As other groups came to North America, trade in these products expanded to Asia and Europe. Internationally, these forest botanical products are referred to as non-wood or non-timber forest products (NTFP). The U.S. Department of Agriculture, Forest Service refers to these products as special forest products (SFP). Below are a few of the major SFP collected in the Nantahala and Pisgah NFs (USDA Forest Service 2010).

Plants for Healing – The Cherokee have a long tradition of using plants for healing and preventive medicine. Wild herbs and other plants were gathered carefully, with the harvester taking only the fourth plant and leaving behind a gift of gratitude, such as a small bead. Plants used by Cherokee healers include blackberry, black gum, hummingbird blossoms, cattail, greenbrier, mint, mullein, sumac, wild ginger, wild rose, yarrow, and yellow dock.

Eatables – Ramps, also known as wild onions or wild leeks, are native to the eastern North American mountains. As one of the first plants to emerge in the spring, ramps were traditionally consumed as the season's first "greens." They were considered a tonic because they provided necessary vitamins and minerals following long winter months without any fresh vegetables. Throughout the mountains of the eastern United States, including many Western North Carolina counties, annual spring ramps festivals are held and most ramps consumed at these festivals are gathered from the local forests. In addition, these festivals have become major tourist attractions and are actively promoted by the communities in which they are held.

Medicinals – Ginseng is the most valuable medicinal collected in these forests. It has a rich history of being collected, cultivated, and traded for centuries. The fleshy tuber-like root of the plant is used

to make medicine and herbal remedies, and is highly prized in Asian markets.

Black cohosh and bloodroot are two others that are often sought for primarily commercial value. Collection of medicinals requires a minimum $20 permit and there is a per-pound charge.

Florals – Galax is an evergreen ground cover harvested for use in the floral industry as the leathery, shiny green leaves are long-lasting in arrangements. The plant's durable, shiny green leaves turn red in the fall and are popular background foliage in floral arrangements. People living in the mountains of North Carolina and other rural Appalachian locations have harvested galax to supplement their incomes since before the 20th Century. Ferns are also sought to some extent. Log moss was collected in large quantities in the past, but collection is now prohibited due to documented declines in prevalence from over collection.

Crafting Materials – Mountain laurel and rhododendron are also sought for crafting, as their often twisty limbs and trunk may be formed into a variety of product, and seed heads are useful for ornaments. River cane and white oak are often used for baskets and vines of all kinds such as grape and the non-native invasives Oriental bittersweet and Japanese honeysuckle are used for craft products.

What are the important sectors of the economy?

There were approximately 466,514 full- and part-time jobs and $16.8 billion (2012$) in labor income in the economy of the eighteen-county area. The Government sector is the largest area employer with approximately 68,217 jobs (approximately 14.6 percent of the total employment) and approximately $3.4 billion in labor income (approximately 31 percent of total labor income). The top five industrial sectors in the area in terms of employment are: 1) Government, 2) Health Care & Social Assistance, 3) Retail Trade, 4) Manufacturing and 5) Accommodation & Food Service. The top five industrial sectors in terms of labor income are: 1) Government, 2) Health Care & Social Assistance, 3) Manufacturing, 4) Retail Trade, and 5) Construction. There are higher paying jobs in the manufacturing sector relative to other industrial sectors.

What are the direct and indirect economic contributions from Forest Service expenditures and impacts of the plan unit?

There are approximately 1,890 full- and part-time jobs and $63.5 million in labor income attributable to annual Nantahala and Pisgah NF activities. This is 0.41 percent of the employment and 0.38 percent of the labor income of the analysis area economy. The products, uses and services of the two forests have their largest effect in three sectors: the Accommodation & Food Service sector with approximately 575 (30.4%) of the 1,890 jobs and $10 million (15.7%) of the $63.5 million of the labor income; and, the Government sector with approximately 244 (12.9 %) of the 1,890 jobs and $20.6 million (32.4%) of the $63.5 million of the labor income; and the Retail sector with approximately 301 (15.9%) of the 1,890 jobs and $7.2 million (11.3%) of the $63.5 million of the labor income.

What have payments to counties been over time and how are they calculated?

The largest Forest Service contribution in terms of both employment (1,086 part and full-time jobs) and labor income ($26.4 million/year) is recreational visitation. Forest Service expenditures (both labor and non-labor) account for 371 (19.6 %) of the estimated 1,890 full- and part-time jobs. The next largest contribution comes from wildlife related recreation, which accounts for an estimated 11.9% (225 jobs) of the total employment contribution and nearly 9.1% of the $63.5 million in

labor income. The timber program contributes 152 part- and full-time jobs and 6.9 million per year. Payments to states from Secure Rural School Act, received by the counties account for another 56 jobs and $2.3 million in labor income.

Money spent by tourists is a type of export that brings outside dollars to the area and therefore is usually the type of recreation accounted for in economic impact or contribution analysis. Money spent by locals, however, includes a mix of outside and "inside" dollars. Since locals receive a portion of their income from outside sources - like Social Security - that portion of their spending drives economic activity. But locals also spend money earned at jobs located within the area. When this money is spent on recreational activities within the local area, rather than spent for recreation or other purposes outside of the local area, the money stays in the local economy for longer, thereby producing a larger multiplier effect. Recreation spending by local residents is associated with another 526 jobs and $13.6million in labor income each year. Wildlife related recreation by local people including hunting, fishing, and wildlife watching contributes another 116 jobs and 3.2 million in labor income each year. See the table that follows for amounts. For a description of how payments are calculated see separate document ***Economic Assessment***.

Table 21. Payments made to Counties from 2003 through 2011

County	2003	2004	2005	2006	2007	2008*	2009	2010	2011
Avery	62,716	63,776	62,132	63,050	62,790	128,853	131,460	122,564	123,154
Buncombe	67,850	68,869	71,612	72,646	72,315	120,705	117,971	116,522	117,193
Burke	100,151	101,790	105,112	106,656	106,222	199,201	200,790	194,959	195,943
Caldwell	143,705	103,146	105,906	107,457	107,021	198,790	204,013	204,568	205,548
Cherokee	200,261	203,760	209,365	212,380	211,538	464,830	456,166	400,045	404,682
Clay	141,456	143,875	147,972	150,106	149,512	302,522	303,672	259,609	261,682
Graham	243,720	247,803	254,541	258,214	257,189	527,086	503,299	441,172	450,346
Haywood	230,373	234,811	240,664	244,240	237,390	414,491	412,576	392,729	397,209
Henderson	358,745	36,487	37,462	38,011	377,856	61,770	61,547	60,575	60,923
Jackson	167,189	169,947	174,946	177,493	176,856	335,622	323,221	294,015	298,525
McDowell	139,768	145,921	153,827	156,086	155,421	339,525	332,952	305,175	308,913
Macon	324,441	330,090	339,027	343,951	342,578	627,324	614,148	562,606	569,578
Madison	116,536	118,470	121,673	123,450	122,957	251,300	248,158	215,779	218,126
Mitchell	39,208	39,886	40,942	41,539	41,360	89,685	89,932	85,275	85,659
Swain	343,320	351,702	359,496	365,473	363,679	603,376	612,246	618,654	623,404
Transylvania	181,961	185,080	190,022	192,805	192,020	335,966	324,308	300,412	305,013
Watauga	13,189	13,053	13,375	13,600	13,673	21,818	22,613	23,079	23,260
Yancey	79,038	80,327	82,471	83,680	83,341	192,466	188,157	169,386	171,400
TOTAL WNC	2,953,627	2,640,797	2,710,545	2,750,837	3,073,718	5,215,330	5,147,229	4,767,124	4,820,558

*The law regarding payments to counties changed in 2008, resulting in higher payments from 2008 through 2011

Benefits People Obtain from the NFS Plan Area

Key questions addressed in this Section:

- What are the key benefits (ecosystem services) provided by the plan area that may be influenced by the land management plan?
- What are the conditions and trends of these benefits?
- What is the ability of the plan area to provide these in the future?
- What is the related direction in the 1987 Plan?

What are the key benefits (ecosystem services) provided by the plan area that may be influenced by the land management plan?

As defined by the U.S. Forest Service, benefits people obtain from ecosystems include:

- Provision services, such as clean air and fresh water, energy, food, fuel, forage, wood products or fiber, and minerals
- Regulating services, such as long term storage of carbon; climate regulation; water filtration, purification, and storage; soil stabilization; flood and drought control; and disease regulation
- Supporting services, such as pollination, seed dispersal, soil formation, and nutrient cycling
- Cultural services, such as educational, aesthetic, spiritual, and cultural heritage values, recreational experiences, and tourism opportunities.

To assist the U.S. Forest Service in defining the "key" benefits, opinions were solicited from over 400 individuals who attended one or more of six public meetings. By far, the most frequent responses related to cultural services. In addition, 119 responses were from a survey submitted as part of the planning record. One opinion expressed more frequently in this survey was the thought of how important the national forests are to people as a place to go to relieve the stress of everyday life, thus contributing to the health and well-being of society. The top responses for cultural services and the top responses that fit in the other three categories as a whole are listed in the table below.

Table 22. Key words from meeting participants regarding benefits of Nantahala and Pisgah NFs.

Key Cultural Services	Key Provisioning, Regulating, and Supporting Services
Recreation	Health and well-being
Hunting	Timber
Fishing	Clean Water
Hiking	Habitat
Tourism	Clean Air
Camping	Economy
Access	Diversity (biological)
Economy	Nature/Natural Resources
Jobs	Food
Family	Wildlife

In order to ensure a broader perspective is considered beyond the local communities, results of two nationwide surveys were considered in determining the list of key benefits (USFS 2012; Weigel 2011). While most top benefits recognized nationally were also among the top benefits recognized locally, *viewing nature* was one benefit identified near the top of one national survey that did not appear as a frequent answer in the local meetings, although a

number of related words appeared that could be interpreted at least in part as *viewing nature*. These words include *scenery, scenic, quality of life*, and *beautiful experience*. To recognize this grouping of benefits and to ensure a broader perspective is addressed, the list of key benefits will include *viewing nature*.

Many of the key benefits may be interrelated, for example: recreation-hiking-camping, and; clean air-clean water-health. While such groupings are subjective, they may facilitate discussion of condition, trends, and future availability.

Key Benefit Groupings:

- Recreation-hiking-camping-viewing nature-access: Addressed in the separate document ***Assessing Recreation Settings, Opportunities and Access, and Scenic Character***
- Clean air-clean water-health: Addressed in two separate documents: ***Assessing Soil and Water Resource,*** and ***Air Assessment***
- Wildlife-habitat-diversity-nature-natural resources: Addressed in *Introduction, Assessing Terrestrial Ecosystems, Aquatic Ecosystems, and Watershed, and Assessing Multiple Uses*
- Hunting-fishing-family-food-access: addressed in section *Assessing Multiple Uses, the Transportation System,* and the separate document ***Assessing Recreation Settings, Opportunities and Access, and Scenic Character***
- Economy-tourism-jobs: Addressed in the separate document - ***Economic Assessment***
- Economy-timber-jobs: Addressed in the separate document - ***Economic Assessment***

What are the conditions and trends of these benefits?

Recreation-hiking-camping-viewing nature-access: Nantahala and Pisgah NFs are among the most heavily visited national forests for most typical national forest recreation opportunities with the exception of winter sports. Activities that rely on infrastructure or facilities such as roads, trails, or developed sites are increasingly challenged by fewer funds for maintenance. The trend is to close lesser used developments and focus maintenance on the highly used facilities.

Clean air-clean water-health: Monitoring indicates management activities on the Nantahala and Pisgah NFs consistently meet clean air and clean water requirements. Some historical water quality issues remain difficult to resolve.

Wildlife-habitat-biological diversity-nature-natural resources: The dynamic nature of biological diversity is apparent across the landscape as some species thrive and others decline. With current management direction and resources young forest habitat has declined while mature and old forest habitat has increased. Non-native invasives species and insects and diseases impact portions of the landscape to a greater extent than management's ability to respond, thus changing the species composition of some areas, however most of the forests retain their expected composition and successional processes.

Hunting-fishing-family-food-access: Many game species are associated with young forests or a matrix of open grassy and herbaceous areas, young forests and older forests. The amount of young forest has declined to 0.75%, providing very little of this habitat. Also, motorized access to some areas of the forest has declined due to road closures in response to lower funds for maintenance. This impacts access for hunting, fishing, and gathering.

Economy-tourism-jobs: please see separate document - ***Economic Assessment***

Economy-timber-jobs: Please see separate document - ***Economic Assessment***

What is the ability of the plan area to provide these in the future?

Recreation-hiking-camping-viewing nature-access: These benefits will continue to be provided, with challenges. Fewer well-maintained facilities on NFS lands are anticipated in the future, while use is expected to continue to grow.

Clean air-clean water-health: The ability of the national forests to provide benefits to public health is expected to continue. Clean air and clean water are not expected to be limiting factors in the plan area.

Wildlife-habitat-diversity-nature-natural resources: These benefits will continue to be available, with challenges. It will be a challenge to increase wildlife habitat diversity through management activities such as timber sales, since funds for such actions continue to decline.

Hunting-fishing-family-food-access: These benefits will continue to be available, with challenges. The capacity to provide habitat for game species is a limiting factor. Motorized access may decline somewhat as a result of limited road maintenance dollars.

Economy-tourism-jobs: These benefits will continue to be provided. The scenic backdrop provided by the presence of the national forests will continue to draw tourists, though no additional tourist-related developments are likely to occur on the national forests in the near future and site closures or shortening of seasons are likely due to limited funds.

Economy-timber-jobs: These benefits will continue to be provided at a low level. Funding to prepare and administer timber sales is expected to be a limiting factor.

What is the related direction in the 1987 Plan?

The Forest Goals identified in Chapter III (pg. III-1) of Amendment 5 embody conceptually the general vision for how the Pisgah and Nantahala NFs' management is intended to provide benefits.

Objectives in Amendment 5 are listed in Table E-1. Annual Average Outputs and Activities (pg. E-3). Objectives are listed for the following:

- *Recreation Developed Use – 1,227,000 recreation visitor days per year*
- *Recreation Dispersed Use – 3,219,000 recreation visitor days per year*
- *Trail Construction and Reconstruction – 24 miles per year*
- *Wilderness Existing and Recommended – 81,780 acres*
- *Wildlife and Fish Habitat Improvement – 2,180 acres per year*
- *Timber Allowable Sale Quantity – 6.6 million cubic feet per year*
- *Timber Reforestation – 3,300 acres per year*
- *Timber Stand Improvement – 1,504 acres per year*
- *Water Meeting Water Quality Goals – 3,297,000 acre-feet per year*
- *Mineral Leases and Permits – 277 per year*
- *Human Resource Programs – 748 enrollees per year*
- *Protection Fire Management Effectiveness Index – $1,006 per thousand acres*

- *Protection Fuel Breaks and Fuel Treatment – 933 (acres per year?)*
- *Land Purchase and Acquisition- 800 acres per year*
- *Land Exchange – 400 acres per year*
- *Property Boundary Line Location – 107 miles per year*
- *Soil and Water Resource Improvement – 39 acres per year*
- *Local Road Construction/Reconstruction – 41 miles per year*
- *Arterial and Collector Construction/Reconstruction – 0 miles per year*

The ability to implement the objectives in the 1987 Plan is directly tied to staffing levels and funding levels.

Multiple Uses

Key questions addressed in this Section:

- What plants and animals are identified by the Tribal governments as being important for traditional uses? What trends are apparent with the current plan in place?
- What grazing activity occurs in the plan area? What trends are apparent with the current plan in place?
- What is the status of timber harvest on Nantahala and Pisgah National Forests and across the 18-county area? What trends are apparent with the current plan in place?
- What are the conditions and trends related to water use and enjoyment of the plan area?
- What fish, wildlife, and plant species are commonly enjoyed and used by the public for hunting, fishing, trapping, gathering, observing, or sustenance? What trends are apparent with the current plan in place?
- What kinds and amounts of permitted Special Uses exist across the Nantahala and Pisgah NFs? Are any trends apparent?

Multiple-use management contributes a range of benefits and services which can include tangible and intangible benefits. The multiple-use mandate under the Multiple-use Sustained-Yield Act of 1960 and the National Forest Management Act of 1976 is not exclusive to a single resource or use, and the sustained-yield principle applies to all multiple-use purposes for which the national forests are administered.

What plants and animals are identified by the Tribal governments as being important for traditional uses? What trends are apparent with the current plan in place?

Traditionally, tribal members collect edible herbs and mushrooms, medicinal parts of herbs, shrubs and trees, and river cane and young white and red oak for making crafts. Crawfish and redhorse are used for food along with game animals. Red cedar trees and large red or white oak trees are of particular cultural appreciation, however a variety of animal habitats is also seen as important, including both young and old forest and diverse rich coves.

Herbicide use in areas where food plants or fish are collected, or near sacred waters and waterfalls, is generally not acceptable to tribal members, though it may be acceptable for controlling non-native-invasive species and other specific uses depending on location and timing.

Management actions that would promote the collected plants would be favored. These actions could include prescribed burning and other vegetation management actions designed to promote specific species. In addition, management that promotes diversity of bird species and promotes a prey base of small mammals for raptors would also be desirable. Creation of diverse wildlife habitats through various vegetation management actions would be appropriate.

Cherokee Traditionally Harvested Plants

Edible Plants	**Harvest Times**
Green-headed coneflower (*Rudbeckia laciniata*)	Early Spring/ Early Summer
Branch Lettuce (*Micranthes micranthidifolia*)	Early Spring
Crow's foot, Toothwort (*Cardamine diphylla*)	Early Spring
Ramps (*Allium tricoccum*)	Early Spring

Edible Plants	**Harvest Times**
Solomon's seal (*Polygonatum biflorum*)	Spring
Wild Lovage (*Ligusticum canadense*)	Spring
Bean salad (*Prosartes lanuginosum*)	Spring
Bear Grass, Spiderwort (*Tradescantia virginiana*)	Spring

Mushrooms	
Wishee (*Grifola frondosa*, *Polyporus umbellatus*)	Fall
Milkies *(Lactarius corrugis* and *L. volemus*) Summer/Fall	Late
Morels (*Morchella ssp*)	Spring
Oyster (*Pleurotus ostreatus*)	Fall
Slicks, Honey Mushroom (*Armillaria mella*)	Fall
Lion's mane (*Hericium erinaceum*)	Fall

Medicinal Herbs	
Arrowhead (*Sagittaria latifolia*)	Spring Summer
Black Cohosh (*Actaea racemosa*)	Spring-Fall
Bethroot (*Trillium erectum*)	Spring
Bowman's root, Ipecac (*Gillenia stipulata*)	Summer, Fall
Blood root (*Sanguinaria canadensis*)	Spring-Fall
Blue Cohosh (*Caulophyllum thalictroides*)	Spring-Fall
Butterfly Weed (*Asclepias tuberosa*)	Summer, Fall
Colic root (*Aletris farinosa*)	Spring
Elderberry (*Sambucus canadensis*)	Summer
Filmy Angelica (*Angelica triquinata*)	Summer

Wild Ginger (*Asarum canadense*)	Spring-Fall
Medicinal Herbs	**Harvest Times**
Hepatica, liverwort (*Anemone americana*)	Spring-Fall
Hydrangea (*Hydrangea arborescens*)	Summer
Indian Tobacco (*Lobelia inflata*)	Summer, Fall
Wild Indigo (*Baptisia tinctoria*)	Summer
Jack-in-the-pulpit (*Arisaema triphyllum*)	Spring-Fall
Jewelweed (*Impatiens capensis, I. pallida*)	Spring-Fall
Joe-pye-weed (*Eutrochium purpureum*)	Summer, Fall
Licorice Goldenrod (*Solidago odora*)	Summer, Fall
Mayapple (*Podophyllum peltatum*)	Spring-Fall
New Jersey Tea (*Ceanothus americanus*)	Summer, Fall
Passion Flower, Maypop (*Passiflora incarnata*)	Summer, Fall
Sarsaparilla (*Aralia nudicaulis*)	Summer, Fall
Slippery Elm (*Ulmus rubra*)	Spring-Fall
Spikenard (*Aralia racemosa*)	Summer, Fall
Squaw vine (*Mitchella repens*)	Spring-Fall
Stone Root (*Collinsonia tuberosa*)	Summer, Fall
Witch Hazel (*Hamamelis virginiana*)	Spring-Fall
Medicinal Herbs	**Harvest Times**
Wild Yam (*Dioscorea villosa*)	Spring-Fall
Yellowroot (*Xanthoriza simplicissima*)	Spring-Fall
Crafts	
River Cane (*Arundinaria gigantea*)	All season
White Oak (*Quercus alba*)	All season

The 1987 Plan does not provide direction for managing plants traditionally harvest by tribal members. General direction to conserve riparian areas and promote diversity would provide appropriate habitats, but there are no objectives for maintenance, restoration, or enhancement of these plants.

What grazing activity occurs in the plan area? What trends are apparent with the current plan in place?

Grazing in the traditional sense as seen on western national forests does not occur in either Nantahala or Pisgah NFs. Grazing is used as a tool for maintaining Southern Appalachian balds, such as those associated with Roan Mountain. No animal unit month targets or objectives are associated with the1987 Plan.

What is the status of timber harvest on Nantahala and Pisgah National Forests and across the 18-county area? What trends are apparent with the current plan in place?

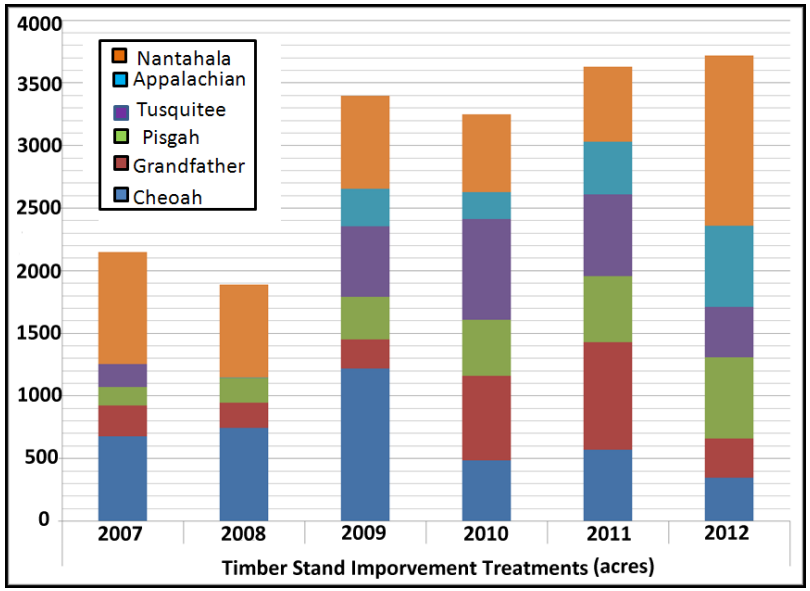
In addition to supplying wood products to local communities, timber harvests create age and structural diversity, create temporary early successional habitat (young forest), salvage value otherwise lost through damage or competition, may be used to create permanent openings, and may enhance scenery by opening vistas.

Regeneration treatments, such as regeneration harvests or some prescribed burning, improve conditions for natural regeneration of forest species and may enhance the species diversity within local areas.

Figure 29. Oak Regeneration

Forest vegetation treatments in timber stands improve the species composition and enhance tree growth in forest ecosystems.

Figure 30. Timber Stand Improvement Treatments Acres by District



The Knutson-Vandenberg Act of 1930 provides the authority for collection of funds from timber sale receipts to protect and improve the future productivity of renewable resources of forest

lands on the timber sale areas. The KV Act was further amended in 2005 to include restoration, habitat, soil and water, and recreation improvements.

The Forest Service's National Forests in North Carolina have used this opportunity to complete restoration, habitat and improvement work on sale areas:

- Monitoring of Forest Conditions: Inventory for silvicultural prescription development and checking of regeneration areas for desired species stocking and diversity.
- Non-native Invasive Species treatments: Biological and chemical control of invasive plants and insects on National Forest lands.
- Site Preparation for Natural Regeneration: The use of chemical, mechanical, and prescribed fire to reduce competition and increase resources available for newly developing natural regeneration.

Figure 31. Prescribed burning used for site preparation.

- Site Preparation for Artificial Regeneration: The use of chemical, mechanical, and prescribed fire to reduce competition and increase resources available for newly developing planted seedlings. See Figure 31.
- Tree Planting: To increase the species diversity, hard mast production or restore lands with key biological components
- Stand Improvement: Activities used following successful regeneration of a forest stand to increase its health, growth, value, and diversity.
- Understory Vegetation Management: Activities completed in the understories of mature forests to enhance understory condition (reintroduction of fire, habitat enhancement).
- Wildlife Habitat Improvement and Creation: Activities to enhance the condition of existing wildlife habitat or create new habitat conditions within timber sale areas (seeding, burning, edge treatments, etc.).

Whereas the total timber harvest volume from all lands in the 18-county area is 67 million cubic feet per year, the amount of timber sold from Nantahala and Pisgah NFs averages 2.1 million cubic feet per year (10-year average). This indicates these national forests provide approximately 3.1% of the timber coming from the plan area. With Nantahala and Pisgah NF lands making up 27% of all forest land in the 18-counties, these national forests are providing a disproportionately small percentage of wood products. However, this small percentage is valued by area mill owners for containing a larger percentage of high quality large diameter hardwood sawlogs (Remington, personal communication 2013). This niche market is possible since national forest management allows for longer timber rotations than is generally possible for other timber land owners. Table 24 displays the average harvest amount from counties in the planning area, while Figure 32

displays the actual volume offered for sale from Nantahala and Pisgah NFs for the last 21 years.

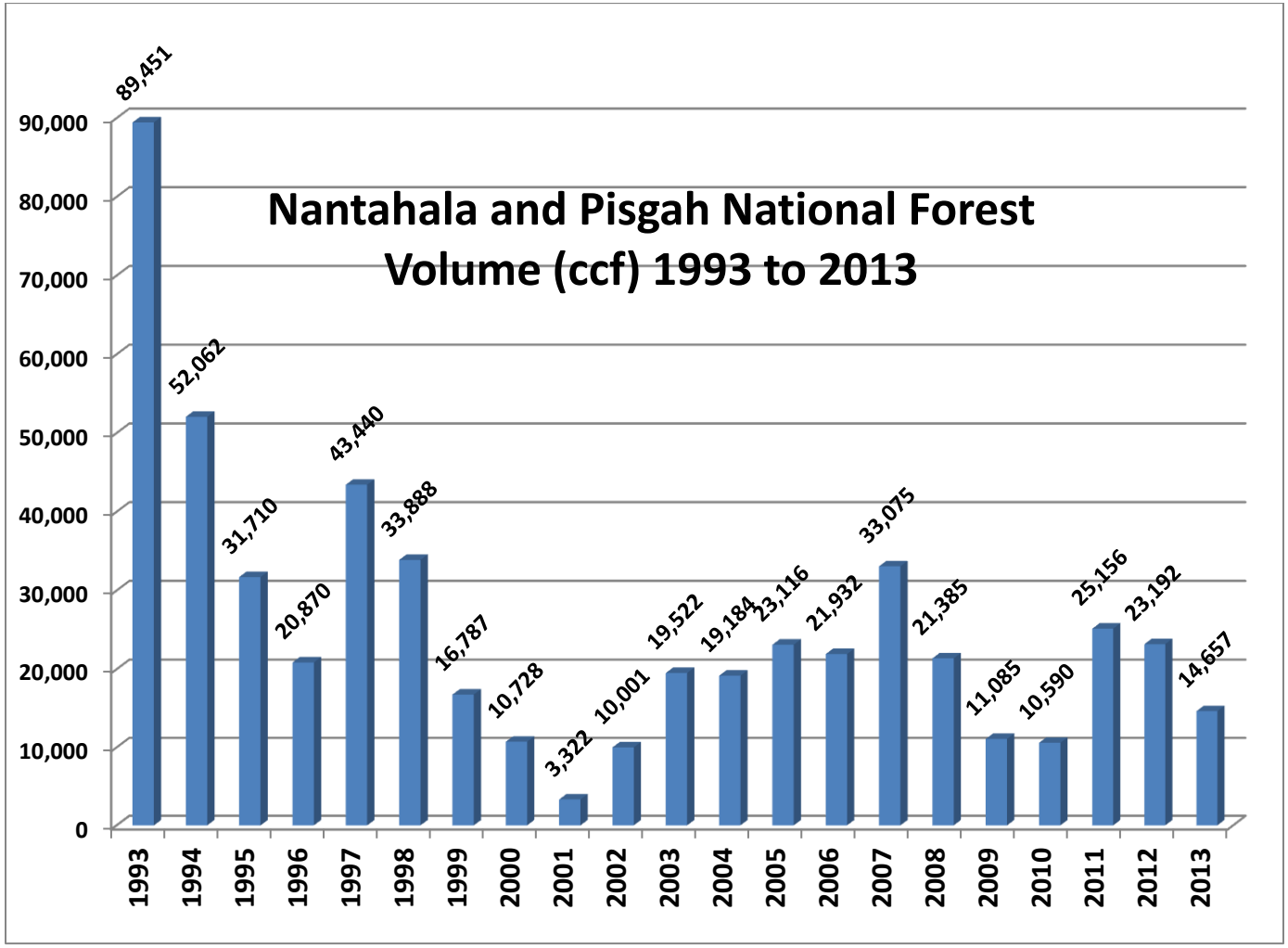
Table 23. Average annual harvest removals of live trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, from ALL LANDS in the 18-county area of western North Carolina (EVALIDator Version 1.5.1.04, April 2013)

County	Cubic Feet	County	Cubic Feet
Cherokee	1,975,843	Avery	2,732,557
Clay	237,727	Buncombe	4,298,249
Graham	8,870,581	Burke	4,354,848
Haywood	3,901,125	Caldwell	7,663,602
Jackson	4,660,335	Henderson	58,223
Macon	143,995	McDowell	15,773,027
Swain	698,433	Madison	388,100
		Mitchell	802,655
		Transylvania	1,534,780
		Watauga	7,353,625
		Yancey	1,550,500
Total	20,488,039		46,510,166
TOTAL for 18 Counties 66,998,205 Cubic Feet (67 million cubic feet)			

The trend of timber sales for Nantahala and Pisgah NFs depends on internal Forest Service funds and workforce capacity to prepare sales and the associated environmental analysis, and may be influenced by events such as litigation, finding new species, and changing policies. Beginning with the 1994 Amendment the Allowable Sale Quantity, or maximum sustainable volume available from the Nantahala and Pisgah NFs suitable timberlands in any 10-year period was established as 66 million cubic feet. For the last ten years the total offered was 20.3 million cubic feet. So while the current plan allows for a greater volume of timber production, funds, staffing, and other factors play a significant influence. Some factors affecting the fluctuations in timber sales over the past 20 years include:

- Policy shift away from clearcutting as a regeneration method.
- United States Court of Appeals, Eleventh Circuit – Sierra Club v. Martin decision (1997), which resulted in extensive analysis of Management Indicator Species population trends
- Discovery of the endangered Indiana bat on the Nantahala NF in 2000
- Court decision in mid-2000's which resulted in new analysis protocols for sensitive species determinations
- Downward trends in timber program budget and workforce.

Figure 32. Timber volume offered for sale 1993-2013



*To convert thousand cubic feet to million cubic feet multiply by 100.

Figure 34 displays the acres of harvest and regeneration by regeneration method and by district. Figure 33 displays the value of the timber harvested each year.

Figure 33 Commercial Harvest Values – Timber Sold from NFS Lands

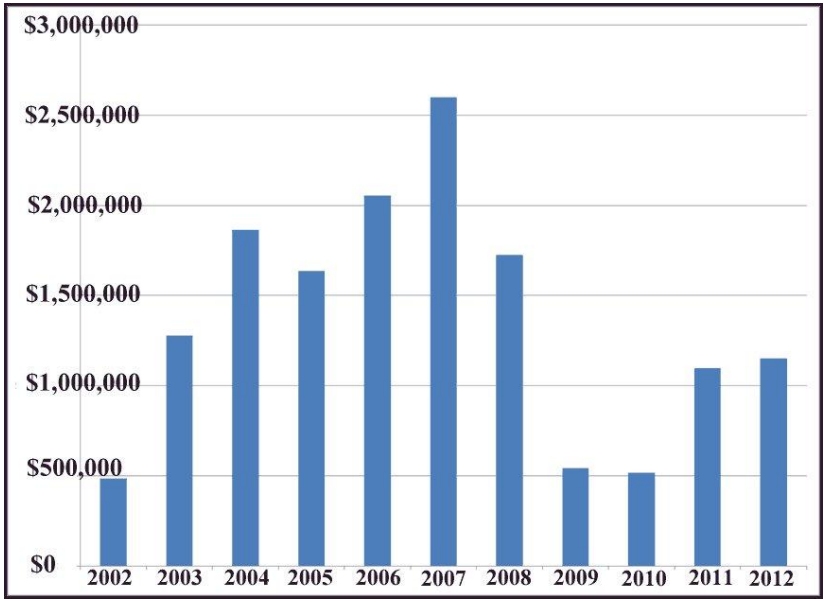
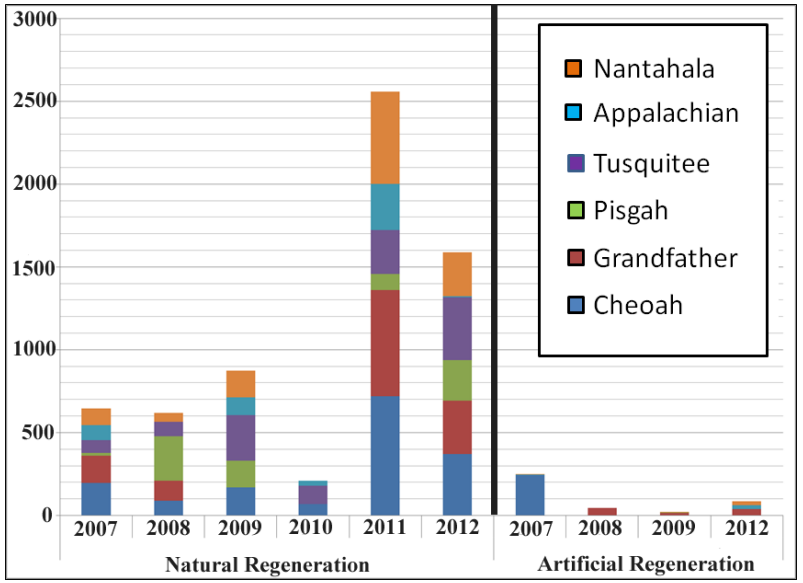


Figure 34. Commercial Harvest Acres – Timber Sold from NFS Lands.



Most regeneration on Nantahala and Pisgah NFs occurs naturally with planting needed only for specific tree species.

What are the conditions and trends related to water use and enjoyment of the plan area?

The condition of key watersheds, water resources and water within the plan area is covered in the chapter titled *Assessing Air, Soil and Water Resources*.

The condition and trends related to water recreation is covered in the chapter titled *Assessing Recreation Settings, Opportunities and Access (including Infrastructure) and Scenic Character.*

What fish, wildlife, and plant species are commonly enjoyed and used by the public for hunting, fishing, trapping, gathering, observing, or sustenance? What trends are apparent with the current plan in place?

Outside of developed recreation areas, fishing and hunting are permitted throughout the national forests in North Carolina. Many game animals thrive in the national forests. According to the North Carolina Wildlife Resources Commission, any lands open to the public for hunting are called "game lands." While the Forest Service manages the habitat and protects water quality in the national forests, the North Carolina Wildlife Resources Commission regulates fishing. Anglers should have a fishing license and hunters must have the proper licenses or permits needed to hunt. For information on licenses refer to the Wildlife Resources Commission at www.ncwildlife.org.

In addition to big game species including black bear, deer, and wild turkey, many people hunt small game species in North Carolina such as rabbits and squirrels as well as quail, grouse, and pheasants. Each year approximately 150,000 sportsmen and women take more than 1.0 million trips afield in pursuit of resident small game species. According to a survey of hunters during a recent hunting season, it was estimated that hunters harvested approximately 8,750 grouse, 230,000 quail, 382,500 rabbits, and 482,000 squirrels in North Carolina (NCWRC 2013).

North Carolina has many opportunities for the 1.2 million anglers who fish in the state. Inland fishing consists of both game (see list of inland game fish below) and non-game fish. Any fish not classified as a game fish is considered a nongame fish when found in inland fishing waters and includes shellfish and crustaceans. Additionally, the harvest of several game fish species is regulated by length limits. Further information on specific regulations can be found at www.ncwildlife.org.

The following are designated as inland game fish and are found in western North Carolina:

- Black bass (largemouth and smallmouth)
- Crappie (white and black)
- Sunfish
    - Bluegill
    - Redbreast sunfish
    - Redear sunfish
    - Pumpkinseed
    - Rock bass
- Mountain trout (including brook, brown and rainbow trout)
- Walleye
- Sauger
- Pickerel, chain
- Muskellunge
- Yellow perch

There are no closed seasons on inland game fish in WNC with the following exceptions:

1. In Hatchery-Supported Trout Waters, where the season for all fishes is closed and fishing is prohibited from approximately

March 1–April 5. This closed season for fishing does not apply to power supply lakes or municipal water supply lakes.

2. In undesignated waters where it is unlawful to possess trout caught during the closed season (approximately March 1– April 5).
3. Fishing is prohibited from Feb. 15 – April 15 in the Linville River from the mouth, as marked at Lake James, upstream to the N.C. 126 Bridge

Table 25. Hunting and Fishing Licenses by County for Western North Carolina in 2011-2012.

County	Hunting	Inland Fishing	Hunting & Fishing
Avery	49	679	854
Buncombe	424	9633	3991
Burke	286	4832	2756
Caldwell	334	4768	2868
Cherokee	127	1752	1451
Clay	69	597	561
Graham	46	657	820
Haywood	214	3672	2256
Henderson	222	3722	2111
Jackson	106	2047	1409
Macon	123	1739	1408
Madison	89	1071	1282
McDowell	227	2565	1857
Mitchell	96	862	832
Swain	48	1076	731
Transylvania	120	1301	1195
Watauga	218	1584	1138
Yancey	94	859	1185
Totals	**2892**	**43,416**	**28,705**

According to Cordell and Betz (2008), many types of hunting and fishing are down in participation numbers for people in the United States ages 16 years and older, but bird and other wildlife viewing, study, and photography are up. For example, between 1996 and 2006 there was a drop of 5.2 million anglers and of 1.5 million hunters. However, during this same period, the number of people who watch or photograph wildlife increased by 8.2 million, showing a net gain in participants in wildlife-associated recreation of 1.5 million.

Hunting and fishing continue to be important outdoor recreation activities in western North Carolina. Since 2006-07 North Carolina saw a decrease in hunting and fishing participants through 2009-10, with a slight upward trend since then (see Table 27). The harvest data by county for 2011-2012 is displayed in Table 28.

Table 26. North Carolina Hunting License Sales from 2006 through 2012 (NCWRC 2013)

Fiscal Year	Total Licenses Sold
2006-07	270,091
2007-08	261,973
2008-09	257,708
2009-10	252,365
2010-11	253,712
2011-12	254,536

Table 27. Big Game Harvest in Western North Carolina Counties 2011-12

County	Bear	Deer	Turkey
Avery	5	56	26
Buncombe	7	81	24
Burke	27	135	58
Caldwell	12	56	34
Cherokee	75	87	70
Clay	16	33	17
Graham	112	46	59
Haywood	31	28	21
Henderson	1	43	14
Jackson	28	48	49
Macon	55	143	65
Madison	29	84	29
McDowell	66	70	53
Mitchell	8	31	15
Swain	35	48	23
Transylvania	26	83	34
Watauga	0	8	6
Yancey	30	40	17
Totals	**563**	**1,120**	**614**

Trapping

North Carolina offers a wide variety of trapping opportunities. Regulated trapping is an integral component of wildlife conservation programs, as it controls abundant wildlife, removes nuisance animals, aids in restoring native species, and protects habitat, property and threatened and endangered species. Trapping on game lands is managed by the North Carolina Wildlife Resources Commission. Additional information on trapping season dates, regulations, best management practices, furbearer management, and furbearer species can be located on the NC WRC website at www.ncwildlife.org.

2012-13 Trapping Seasons

- November 1 – February 28: West of Hertford, Bertie, Martin, Pitt, Green, Lenoir, Duplin, Pender and New Hanover counties
- **Statewide for beaver only: November 1 – March 31: NOTE:** Landowners whose property is or has been damaged or destroyed by beaver may take beaver on their property anytime by any lawful method without obtaining a permit from the Wildlife Resources Commission. The landowner may obtain assistance from other persons in taking the depredating beaver by giving those persons permission to take beaver on the landowner's property.
- Fox: There are numerous session laws that have been approved by the NCGA relating to foxes. As of 2012, there were 22 fox trapping seasons in 38 counties. Due to the complexity of trapping foxes, a separate document was created. To find out if you can trap foxes in your county, please download the Fox Harvest Season Dates from the NC WRC website at www.ncwildlife.org.

NOTE: In addition to the regular trapping seasons listed above, coyotes may be taken in counties, areas, and times where fox-trapping is allowed by statute.

Gathering

Gathering occurs for both commercial and non-commercial personal use reasons. The three categories of gathered materials are: edibles, medicinals, florals, horticulturals, and crafting materials. As a group, these are referred to as "non-timber forest products."

Edibles – Berries, mushrooms, and ramps are the most commonly collected edibles. Ramps, a wild onion, are collected in the spring in large quantities as a part of a long-standing tradition in these mountains. Indeed, many small communities hold ramp dinners and ramp festivals, often as fund-raising events for local volunteer fire departments or other service organizations. Free collection of ramps is allowed up to five pounds per person. Due to heavy demand for ramps, this species is monitored as a management indicator species.
Other types of collection require a permit. Individuals may collect other edibles such as berries and mushrooms for personal consumption without a permit.

Medicinals – Ginseng is the most valuable medicinal collected in these forests. Black cohosh and bloodroot are two others that are often sought for primarily commercial value. Collection of medicinals requires a minimum $20 permit and there is a per-pound charge.

Florals - Galax is by far the herb most sought after for sale to florists. The plant's leathery, shiny green leaves are long-lasting in floral arrangements. Ferns are also sought to some extent. Log moss was collected in large quantities in the past but its collection is now prohibited due to documented declines from over collection.

Horticulturals - Mountain laurel, rhododendron, Fraser fir seedlings and cones, tree saplings and other types of cones are typical horticultural products collected from the national forests.

Crafting Materials – Mountain laurel and rhododendron are also sought for crafting, as their often twisty limbs and trunk may be formed into a variety of product, and seed heads are useful for ornaments. Vines of all kinds such as grape and the non-native invasives Oriental bittersweet and Japanese honeysuckle are used for craft products.

Firewood and Locust posts – While considered "timber products," firewood is collected throughout the forest. The amount of firewood collected in 2012 was 2,346 ccf (hundred cubic feet).

Locust trees cut for posts are an item used widely by private landowners for fence posts due to their decay-resistant wood. Locust trees are considered biologically an early successional species that proliferates in old fields and forest edges. The locust post volume harvested in 2012 was 3,268 ccf.

Current Plan Language – Gathering Forest Products

Vegetation Management: Utilize all forest products form timber sale areas to the extent practicable. (1987 plan amendment 5 pg. III-33)

Gathering Forest Products: Require a permit for collection of Forest products for commercial or personal use including moss, plants, shrubs, trees, firewood and other wood products consistent with the Management Area direction and National Forest policy. Allow recreational gathering of fruits, nuts, ramps, cones, and berries consistent with Management Area direction and National Forest policy.
(1987 plan amendment 5 pg. III-39)

Additional direction for specific management areas on pages III-95, III-108, III-125, III-130, III-133, III-142, III-146, and III-175. For some management areas permitted collection is restricted.

Trends with the Current Plan in Place – Gathering Forest Products

Each non-timber forest product is considered individually to assess if there is a need for limiting collection permits. Because the entire plant is harvested in the case of ginseng and log moss, recovery time is very slow and impacts from over-collection have been

documented. Log moss collection is now prohibited and ginseng collection is limited. If other plants are threatened with over-collection, the current plan would not prevent limitations from being imposed, without impacting the collection of other non-timber products.

Observing

While the entirety of the national forests and all they contain is valued for "observing" there are nonetheless certain biological features that are of particular draw. These include birds, fall colors, spring wildflowers, and potentially elk.

The list of birds known from Nantahala and Pisgah NFs contains 131 species (USDA Forest Service 2013b; USGS 2012a).

Popular birding routes are:

- Appalachian District – Max Patch and Yellow Mountain Gap
- Pisgah District – North Mills River, Pink Beds, and Davidson River
- Nantahala District – Ranger Falls, Padgett Poplar Tree and Whiteside Mountain
- Cheoah District – Stecoah Gap, Cherohala Skyway, Joyce Kilmer Memorial Forest Service
- Tusquitee District – Fires Creek

The fall color season associated with these diverse hardwood forests is a major tourism driver. Excellent places to view these colors are:

High Elevation -

- Cherohala Skyway in Graham County
- Wayah Bald and Wine Spring Creek area in Macon County
- Big Butt trail in the Mount Mitchell area of Yancey County
- Roan Mountain in Mitchell County

Mid-elevation

- Chunky Gal Mountains from Standing Indian to Shooting Creek along US 64 in Macon and Clay Counties
- along NC 28 and 143 within Graham County from Fontana Village to Stecoah Gap, within the Moses Creek drainage along Forest Service Road 4651 in the Roy Taylor forest in Jackson County
- along US 19E in the Poplar area of Yancey County from the Cane River to Spivey Gap
- along Curtis Creek road (FSR 482) and US 70 in McDowell County, and the Harper Creek area in Avery County

Low Elevation –

- Joe Brown Highway in Cherokee County;
- US 64 in eastern Clay County;
- US 441 in southern Macon County;
- NC 28 in Swain County near Fontana Lake;
- US 25-70 in the Hot Springs area; and
- along NC 181 and the other forest roads in the Steeles Creek area in Burke and Caldwell Counties. For further information see http://www.fs.usda.gov/detail/nfsnc/home/?cid=stelprdb5326570.

Spring wildflowers may be seen virtually anywhere within the Nantahala and Pisgah NFs. Trails that stand out include:

- Whitewater Falls to the Corbin Creek Bridge – Nantahala Ranger District
- Rufus Moran Trail - Nantahala Ranger District

- Appletree Trail - Nantahala Ranger District
- Wasilik Poplar Trail - Nantahala Ranger District
- Joyce Kilmer Memorial Forest – Cheoah Ranger District
- Paint Fork Road / Jack Branch Trail / River Ridge Loop Trail – Appalachian Ranger District
- Moore Cove Falls Trail – Pisgah Ranger District
- Flat Laurel Creek Trail – Pisgah Ranger District

For further information see http://www.fs.fed.us/wildflowers.

What kinds and amounts of permitted Special Uses exist across the Nantahala and Pisgah NFs? Are any trends apparent?

The goals of the special use program are to provide and sustain benefits to the American people; to meet energy resource needs; sustain and enhance recreation opportunities; and improve the quality and availability of outdoor recreation experiences.

A special-use authorization is a legal document such as a permit, term permit, lease, or easement, which allows occupancy, use, rights, or privileges of NFS land. The authorization is granted for a specific use of the land for a specific period of time.

Authorizations for use of NFS land include activities such as outfitting and guiding, recreation, telecommunication, research, photography and video productions, and granting road and utility rights-of-ways.

The greatest number of special use authorizations issued on the Nantahala and Pisgah NFs are for road easements and for outfitting and guiding activities. Outfitting and guiding activities include hiking, biking, rock climbing, rafting, horseback riding, and fishing, to name a few.

Outfitting and guiding conducted on NFS lands have become one of the primary means for the recreating public to experience the outdoors. The trend has remained constant for outfitting and guiding proposals with hiking, biking, and backpacking being the most common.

From 2011 to 2012, the Nantahala and Pisgah NFs had a 44% increase in proposals for recreation event permits. Though most proposals received continue to be for mountain bike activities, the new trend is ultra-endurance mountain biking events as individuals continue to look for new ways to challenge themselves.

Table 28. Pisgah NF Special Use Permits for 2012

Type of Use	# of Permits	Acres Permitted	Service Use Days*
Recreation Events	23		
Outfitting and Guiding	144		93,771
Concession Campground	2		
Other Recreational Uses	12		
Non-Commercial Group Use	20		
Communication Uses	13		
Utilities (power, phone, fiber)	30	669.64	
NCDOT Easements	64	922.59	
Forest Road Easements	9	35.80	
Private Road Easements	83	74.19	
Other Land Uses	160		


Water Storage

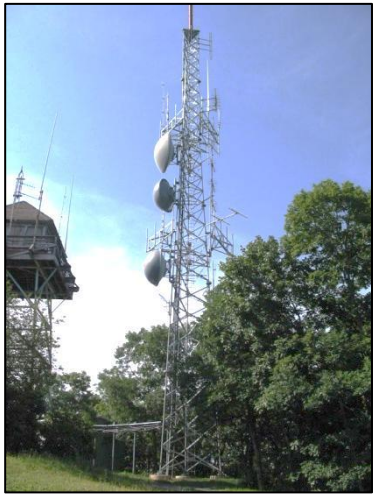

Marina

Table 29. Nantahala NF Special Use Permits for 2012

Type of Use	# of Permits	Acres Permitted	Service Use Days*
Recreation Events	15		
Outfitting and Guiding	71		179,124
Concession Campground	2		
Marina	5		
Other Recreational Uses	18		
Non-Commercial Group Use	8		
Communication Uses	28		
Utilities (power, phone, fiber)	26	929.22	
NCDOT Easements	136	1121.48	
Forest Road Easements	7	18.61	
Private Road Easements	170	164.64	
Other Land Uses	145		

Many of the outfitting and guiding permits are issued for activities on the two forests and/or across district boundaries. The number of service use days for outfitting and guiding is reported by activity rather than by forest therefore, the total number of service use days could span across multiple districts and/or the two forests.

Communications towers and river rafting guided trips are two types of special uses on the national forests.



Current Plan Language – Special Uses

Respond to special use requests according to the following priorities:

- *Those relating to public safety, health and welfare, e.g., highways, powerlines, and public service improvements.*
- *Those contributing to the general public benefit associated with National Forest resources; and*
- *Those that benefit only private users, e.g. road permits, rights-of-way for powerlines, telephones, waterlines, etc.*

Approve no special uses that can reasonably be met on private land unless they are clearly in the public interest.

Issue no new special use permits for domestic agricultural, or fish production water uses (III-44).

Additional direction on pages III-44, III-95, III-109, III-125, III-130, III-134, III-138, III-143, III-146, III-162, III-171, and III-175.

Trends with the Current Plan in Place

The trend for increasing recreation events will likely continue. Road easement and outfitter guide permit requests will likely remain the most numerous special uses.

Recreation Settings, Opportunities and Access (including infrastructure), and Scenic Character

Key questions addressed in this Section:

- How many people visit the national forests and what activity preferences?
- What is the Availability of Recreation Opportunities on Other Lands within in the Broader Landscape?
- What are the recreation settings and opportunities?
- How is scenery managed on the Nantahala and Pisgah NFs?
- What is the outlook for sustainable recreation?

How many people visit the national forests and what activity preferences?

Many types of recreation and tourism are dependent on the presence of natural amenities such as beaches, lakes, forests, and mountainous terrain (English, Marcouiller, and Cordell 2000). National forests managed by the United States Forest Service (Forest Service) are poplar tourism and outdoor recreation locations. In addition, outdoor recreation contributes to social and economic sustainability and provides opportunities to connect people with nature. The focus of the Forest Plan (the Plan) assessment for recreation is to identify and evaluate information about recreation settings; use; trends and sustainability of recreation opportunities in the plan area; recreational preferences of the public; recreational access; and scenic character. Western NC is a place of natural beauty and the region includes several popular recreation areas including the Blue Ridge Parkway; the Great Smoky Mountains National Park; and the Nantahala and Pisgah NFs, two of the most visited national forests in the United States (USDA Forest Service 2011). Visitors to the Nantahala and Pisgah NFs enjoy a wide variety of outdoor recreational activities such as birding, boating, camping, canoeing, fishing, hiking, horseback riding, hunting, mountain biking, and picnicking. There are numerous hiking trails, including a 200 mile section of the Appalachian Trail; top-ranked mountain biking trails; rivers such the Nantahala, French Broad, Cheoah, and Chattooga, with world-class whitewater rafting, kayaking, and canoeing.

Table 30. Top Five Most Visited National Forests in the National Forest System

National Forest Name	Total Estimated Visits	State
White River NF	12,286,922	CO
Uinta-Wasatch-Cache NF	7,628,757	UT
National Forests in North Carolina	**7,510,712**	**NC**
Lake Tahoe Basin Management Unit	5,786,395	CA
Arapaho-Roosevelt NF	5,413,906	CO

Source: USDA Forest Service 2008 National Visitor Use Monitoring Survey.

What is the Availability of Recreation Opportunities on Other Lands within in the Broader Landscape?

The 18-county area touched by the Nantahala and Pisgah NFs in NC offers recreational opportunities that draw tourists and residents alike to national parks, state forests, state parks, as well as county and city parks. The Nantahala and Pisgah NFs share boundaries and opportunities for outdoor recreation with two sister national forests in Georgia (Chattahoochee NF) and Tennessee (Cherokee NF). In addition, other recreational opportunities nearby include Jefferson National Forest and Mount Rogers National Recreation Area in southwest Virginia; Great Smoky Mountains National Park; Blue Ridge Parkway; and state parks.

North Carolina's current Outdoor Recreation Plan (NC SCORP 2008) estimates there are 2,726,624 outdoor recreation acres across the state. Of these, 2,154,637 are in federal ownership and include areas such as:

- Ten areas under jurisdiction of the National Park Service, including Great Smoky Mountains National Park, the Blue Ridge Parkway, and the Carl Sandburg Home
- 416,000 acres of national wildlife reserves under jurisdiction of the United States Fish and Wildlife Service
- Cherokee Indian lands in western NC, totaling nearly 56,000 acres
- Several reservoirs and military installations under jurisdiction of the Department of Defense
- 484,368 acres in state ownership, including 197,347 acres of land and water in the NC State Parks system, organized into 34 park units that are staffed and open to the public

Large lakes that provide water-based recreation opportunities within the 18-county area as well as in the Nantahala and Pisgah NFs are managed by Tennessee Valley Authority (TVA), Brookfield (formerly Alcoa, Inc.), and Duke Energy. The lakes and rivers in western NC attract people to pursue a variety of recreational activities including fishing, canoeing, kayaking, and motorized boating.

Major providers of outdoor recreation on other lands within the broader landscape include federal, state, and local agencies and partners and include the following:

National Park Service (NPS 2013; NPS 2014):

The Blue Ridge Parkway (BRP) was constructed as a scenic driving experience connecting two national parks, Great Smoky Mountains (TN and NC) and Shenandoah in Virginia. The BRP is a linear national park unit of 469 miles and is comprised of 81,785 acres, with another 2,776 acres of scenic easements and receives nearly 14.5 million visits annually (NPS 2013, p. 184).

The Great Smoky Mountains National Park (GSMNP), which is approximately 704,000 acres, has become the most visited of all national parks in the U.S. Within a day's drive of over half of the population of the U.S., the park provides for public benefit and enjoyment by over nine million visitors each year (NPS 2014). GSMNP is known for the diversity of its plant and animal resources, the beauty of its ancient mountains, the quality of its remnants of American early settlement culture, and the wilderness within its boundaries. The park also maintains over 800 miles of trails including a section of the Appalachian Trail with elevations ranging from 800 feet to 6,642 feet at Clingman's Dome.

The Appalachian National Scenic Trail (AT) is a 2,180-mile long-distance hiking trail between Maine and Georgia through the wild, scenic, wooded, pastoral, and culturally significant lands of the Appalachian Mountains. For further information see http://www.nps.gov/appa/parkmgmt/upload/CompPlan_web.pdf .

State of North Carolina (NC SCORP 2008):

- ***North Carolina Division of Parks and Recreation*** http://www.ncparks.gov/Visit/main.php.
  - *State Parks:* There are seven parks within or near the 18-county area including Grandfather Mountain, Mount Mitchell, Chimney Rock, Gorges, Lake James, Elk Knob, and Stone Mountain. These parks provide opportunities for boating, camping, hiking, picnicking, as well as scenic overlooks and visitors centers.
  - *State Trails:* Two of the four state trails are in the 18-county area and include the French Broad River Trail and Mountains-to-the-Sea Trail. The French Broad Paddle Trail is a recreational water craft trail from the headwaters of the French Broad River in Rosman, NC and winds 117 miles to the state line where it connects the Tennessee French Broad River Blueway. There are campsites approximately every 8-10 miles on the banks of the river along the trail. The Mountains-to-Sea Trail (MST), upon completion will link Clingman's Dome along the western edge of the state in the Great Smoky Mountains National Park to Jockey's Ridge State Park on the outer banks – a distance of over 900 miles.
  - *State Rivers*: There are four state rivers, two of which fall within the 18-county area. Horsepasture River (Transylvania County) and Linville River (Avery County).
  - In addition, there are four state recreation areas, seven state lakes, and 20 state natural areas outside the 18-county area.

For more information on state recreation areas see the "Directory of State Parks and Recreation Areas" located at http://www.ncparks.gov/Visit/rules/docs/rules_subchapter_12a.pdf.

- ***North Carolina Forest Service*** http://www.ncforestservice.gov: (NC SCORP 2008)
  - *State Forests:* There are two state forests that are managed as working forests to demonstrate and research sustainable forest management, promote public education, provide recreational opportunities, and conserve natural resources. DuPont State Forest (10,400 acres) is located in the southern mountains of Transylvania and Henderson Counties.
  - *Educational Forests:* There are six educational state forests, with two with in the 18-county area. Holmes is in Henderson County and Tuttle is in Caldwell County. These education forests feature self-guided trails that include exhibits, tree identification signs, a forest education center, a talking tree trail, a picnic facilities. Rangers are also available to conduct classes for school and youth groups.

- ***County and Municipal Resources*** (NC SCORP 2008):

There are 75 county governments which have official outdoor park and recreation programs. In the 18-county area, federal and state lands are most abundant in Swain County (245,152 acres) with four others containing over 100,000 acres. The counties with the most acres of county park lands are Buncombe (1,911 acres); Burke (834 acres); and Henderson (516); and counties with less than 30 acres of county park lands include Clay (22 acres); Graham (5 acres); Madison (26 acres); and Yancey (17 acres). In general, counties provide outdoor recreational areas that are not large enough to be managed feasibly at the state or federal level. Counties can provide resource-based areas including beaches, swimming sites, boat access sites, picnic areas, scenic areas, and some campgrounds. In addition, some facilities provided by county programs can include playgrounds, sports fields, and tennis courts.

One hundred and forty-six municipalities have recreational programs and facilities. These programs and facilities vary greatly, mainly depending on the population of the municipality. As a result of population densities and lack of open-space, most outdoor recreational facilities include playgrounds, swimming pools, ball fields, tennis courts, and picnic areas.

Nantahala and Pisgah National Forests Visitation

The National Visitor Use Monitoring Survey (NVUM) is a Forest Service program which provides science-based estimates of the volume and characteristics of recreation visitation to the National Forest System, as well as the benefits recreation brings to the American public (USDA Forest Service 2010b). Information about the quantity and quality of recreation visits is a requirement for national forest plans (Executive Order 12862 – Setting Customer Service Standards) and the NVUM data is useful for forest planning and decision making. The NVUM is completed on a 5-year cycle with the latest completed survey (round two) for the Nantahala and Pisgah NFs being conducted during FY2008 (October 1, 2007 through September 30, 2008) with updates made in 2010. During round two of the NVUM, annual visitation to the Nantahala and Pisgah NFs were estimated to be 4.6 million (compared to 173.5 million for the entire National Forest System) with 153,000 estimated visits to designated wilderness areas (compared to 6.7 million nationally). In addition, the Nantahala and Pisgah NFs are viewed via scenic byways such as the Blue Ridge Parkway. Detailed information and results of the NVUM can be found at the following link: http://www.fs.fed.us/recreation/programs/nvum.

Table 31. Activity Participation in the Nantahala and Pisgah NFs by Percentage

Activity	Percent Participation	Percent Main Activity	Average Hours Doing Main Activity
Hiking/Walking	60.4	38.5	2.4
Viewing Natural Features	55.0	15.0	4.0
Relaxing	37.9	4.0	10.8
Driving for Pleasure	32.0	6.9	2.2
Viewing Wildlife	30.9	0.9	2.9
Nature Center	11.2	0.8	1.8
Bicycling	10.1	8.6	2.0
Picnicking	10.0	1.6	1.6
Fishing	8.4	5.8	3.7
Nature Study	7.0	0.5	2.4
Other Non-motorized	5.9	3.0	2.6
Historic Sites	4.8	0.5	1.7
Gathering Forest Products	3.7	0.0	0.0
Some Other Activity	3.6	3.5	4.1
Developed Camping	3.2	1.2	25.0
Non-motorized Water	2.8	2.1	3.8
Hunting	2.5	2.5	6.8
Motorized Trail Activity	2.3	0.1	3.0
Backpacking	2.2	1.1	28.8
OHV Use	2.1	2.0	3.6
Primitive Camping	1.1	0.5	62.5
Horseback Riding	1.0	1.1	4.0
Resort Use	0.4	0.0	56.7
Motorized Boating	0.3	0.0	3.8
Other Motorized	0.2	0.1	1.8

Results of the 2008 NVUM for the Nantahala and Pisgah NFs showed over 71% of visitors interviewed cited recreation was the purpose of their visit and the forests serve a mostly local client base. Nearly 47% of the recreational visitors were from within 25 miles of the forest and 14% living between 25 and 50 miles away; however, nearly 20% of visitors traveled more than 200 to visit the Nantahala and Pisgah NFs. In addition, most visits to the two forests were day visits with the average visit lasting less than 10 hours and over half of the visits lasting less than four hours. Nearly 38% of the visitors were female; 98.7% of visitors were White; American Indian/Alaska Natives (2.3%) were the most common racial/ethnic group; visitors were evenly distributed across age groups with ages 16-19 and 70 or older somewhat lower than other groups. Visitors to the Nantahala and Pisgah NFs participated in a variety of recreation activities and used a variety of facilities and special designated areas.

Customer Satisfaction Rating for the Nantahala and Pisgah NFs

Customer satisfaction results showed that almost 83 percent of the people who visited the Nantahala and Pisgah NFs were very satisfied with the overall quality of their recreation experience and less than one percent expressed any level of dissatisfaction. There were a few areas that the public felt managers need to focus on, including General Forest Areas (restroom cleanliness, availability of recreation information, and road conditions) and Wilderness (restroom cleanliness and availability recreation information).

Recent Outdoor Recreation Changes and Trends

For the United States population during FY2010 – 2011, participation in walking for pleasure and family gatherings outdoor were the most popular activities and participation rates for these activities have changed very little in recent years. Participation in swimming, diving, and related activities and in sightseeing were both over 60%, while viewing or photographing birds was over 40%; making these the three activities which have grown the fastest from 2005 – 2009 to 2010 – 2011. Other activities with increasing participation rates include viewing or photographing other wildlife besides birds, boating, fishing, and snow/ice activities. Participation rates for four recreation activities decreased between the time spans, and include picnicking, bicycling, developed camping, and primitive camping.

Table 32. Percent of United States residents of age 16 or older participating in selected outdoor recreation activities

Activity	Percent Participating	
	2005-09	2010-11
Walking for pleasure	85	84.7
Family gatherings outdoors	74	74.4
Swimming, diving, etc.	61.3	66.1
Sightseeing	52.7	60.8
Viewing/photographing other wildlife	50.2	54.1
Picnicking	51.7	47.5
Viewing/photographing wild birds	35.7	41.4
Boating	35.5	38.2
Bicycling	37.5	35.6
Fishing	34.2	35
Snow/ice activities	24.9	26.6
Developed camping	23.8	21.7
Primitive camping	14.5	12.4

Recreation Preferences and Demand

Documenting the outdoor recreation activities preferences and activity participation rates are an important step in the assessment

phase of the Forest Plan. These preferences could contribute to the overall plan by providing information that can be used to identify the need for change and to develop components including desired conditions, objectives, standards, and guidelines.

General Outdoor Recreation Participation

According to Cordell, et al., (2008) between 2003 and 2007 there was an overall increase of participation in outdoor recreation activities in the United States and some activities such as hiking, visiting nature centers and viewing/photographing scenery comprised nearly 75 percent of the "forest-based activity days that occurred on public lands" (p. 3).

Changing U.S. Population Demographics

The changes in the United States Census data from 2000 to 2010 show African American and Hispanic/Latino ethnic populations increasing in number (U.S. Census 2012). In addition, the Pew Research Center recently reported that Asian Americans are the highest-educated, fastest-growing immigrant race group in the country (Taylor et al. 2012). Population demographic changes in the 18-county area of western NC somewhat follow these overall trends. Specifically, the changes in North Carolina population demographics from the 2000 census to the 2010 census show White and African American population percentages are decreasing, while Hispanic/Latino and Asian populations are increasing.

Visitation Patterns in Southeastern National Forests

One study conducted on a southeastern national forest which examined outdoor recreation preferences of four race/ethnic groups (African Americans, Asians, Hispanic/Latinos, and Whites) showed the preference for frequency of visits to public lands, duration of stay while visiting, and people with whom they would recreate were similar across all age groups, genders, and race/ethnic groups (Parker and Green 2013). Specifically, the majority of visitors came with family or friends. Furthermore, the top two outdoor recreation activities participated in most often are similar among participants and included hiking/walking and family time. In addition, picnicking and relaxing were also popular activities for all groups. Ethnic and minority groups also noted the need for more guided tours, hikes, and information on the history of the national forest as well as promotions, programs, and activities such as festivals, concerts, outdoor movies, and fireworks.

The source for the following National, Regional, and NC recreation activity participation information is from the 2000 – 2007 National Survey on Recreation and the Environment (NSRE) which is a general population household telephone survey of Americans age 16 and older (USDA Forest Service 2002).

Recreation Preferences and Demands for North Carolina

In 2007, the Forest Service prepared an analysis of responses to the NSRE for residents from North Carolina. The NSRE has yielded just fewer than 3,000 total surveys for North Carolina during this period. The following information is an excerpt from the Forest Service report "National Survey of Recreation and the Environment: North Carolina and the North Carolina Market Area".

Table 33. Percent of NC residents of age 16 or older participating in selected outdoor recreation activities

Activity	%	Activity	%	Activity	%	Activity	%
Walk for pleasure	82.0	Swimming in lakes, streams, etc.	39.7	Drive off-road (any type)	20.7	Big game hunting	7.2
Family gathering	74.6	View/photograph birds	34.0	Developed camping	20.5	Canoeing	6.7
Driving for pleasure	58.2	Bicycling	31.0	Visit archeological sites	18.0	Small Game hunting	6.4
View/photo natural scenery	57.0	Boating (any type)	31.0	Mountain biking	15.7	Waterskiing	6.3
Visit nature centers, etc.	52.9	Freshwater fishing	30.9	Primitive camping	14.6	Mountain climbing	5.3
Sightseeing	52.9	Visit a primitive area	29.8	Coldwater fishing	11.5	Caving	4.2
Picnicking	50.0	Day hiking	29.7	Hunting (any type)	9.9	Kayaking	3.1
Visit a beach	44.2	View/photograph fish	26.5	Rafting	9.3	Orienteering	3.0
Visit historic sites	43.1	Gather mushrooms, berries, etc.	26.3	Backpacking	8.4	Rowing	2.5
View/photo other wildlife	43.0	Visit other waterside (not a beach)	24.4	Horseback riding (any type)	7.8	Rock climbing	2.3
View/photo wildflowers, trees	41.0	Motorboating	22.5	Horseback riding on trails	7.3	Migratory bird hunting	1.7

Recreation Preferences and Demands for the Southern Region and United States

Participation in most outdoor recreation activities has been growing steadily over the past few years. Of forest-based recreation activities, viewing and photographing fish, wildlife, birds, wildflowers, and native trees are among the fastest growing in the South. To Southerners outdoor recreation is an important part of their lifestyles. However, due to climate and type of forest setting, the abundance of forests in the South, in comparison with other less forested regions of the country, does not result in higher per capita forest recreation participation (USDA Forest Service 2002; Arndt et al. 2002). Regional data covers 13 southern states including Alabama, Georgia, Arkansas, Kentucky, Florida, Louisiana, Mississippi, North Carolina, South Carolina, Virginia, Tennessee, Texas and Oklahoma.

Table 34. Percentages of the population participating in outdoor recreational activities in the South and United States in 2001

Activity	Percentages		Activity	Percentages	
	South	US		South	US
Walk for pleasure	83.1	84.9	Visit a waterside besides the beach	27.1	27.1
Family gathering	71.9	73.9	Motorboating	24.9	24.0
Visit nature centers	53.7	59.3	View or photograph fish	21.4	21.7
Sightseeing	53.0	54.0	Developed camping	20.7	26.8
Driving for pleasure	52.8	53.7	Visit prehistoric sites	19.5	21.3
Picnicking	49.7	57.3	Drive off-road	17.8	17.0
View/photograph natural scenery	46.6	55.1	Mountain biking	16.2	23.4
Visit historic sites	43.8	47.7	Primitive camping	13.0	16.2
Swimming in lakes, streams, etc.	42.4	44.4	Hunting	12.8	10.5
View/photograph wildlife	36.8	41.1	Horseback riding (any type)	10.6	10.0
View/photograph flowers, etc.	36.7	41.2	Coldwater fishing	10.4	14.4
Visit the beach	36.5	40.0	Rafting	9.2	10.0
Bicycling	35.0	41.6	Horseback riding on trails	8.9	8.1
Gather mushrooms, berries, etc.	31.2	28.0	Backpacking	8.6	12.2
Visit a wilderness	31.1	35.5	Canoeing	7.5	10.2
Warmwater fishing	28.5	20.2	Migratory bird hunting	2.7	2.2
View or photograph birds	27.5	30.1	Kayaking	1.8	3.5
Day hiking	27.4	36.5			

What are the recreation settings and opportunities?

Characteristics of recreation visits such as types of sites, length of stay, and activities help managers understand visitors' preferences, patterns, and use. Research has shown that visitors' preference for an experience partly determine their setting preferences (Andereck and Knopf 2007). For example, some wilderness visitors backpack in remote areas because they seek solitude and the associated benefits. Solitude is a frequently cited motive for visiting parks, forests, and wilderness areas. People form bonds with specific places and sites and as a consequence, recreationists may feel a sense of ownership for favorite places and may want a say in how these places are managed. Recreation management frameworks, such as the Forest Service's Recreation Opportunity Spectrum (ROS), suggest that a diverse set of recreation opportunities, including diverse recreation settings, are necessary to meet the needs and desires of a diverse population of recreationists (Graefe et al. 2009).

Recreation Opportunity Spectrum Ranges

Settings, activities and facilities are the three components of recreation supply, 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. The key to providing most experience opportunities is the setting and how it is managed. The Recreation Opportunity Spectrum (ROS) offers a framework for understanding these relationships and interactions (USDA Forest Service 1982, 1986, and 1990). The Spectrum has been divided into major classes for Forest Service use:

1. **Primitive** (P) is the most remote, undeveloped recreation setting, generally located three miles or greater from any open road and 5,000 acres or larger in size. In these two national forests, Primitive ROS class is limited to Congressionally designated Wildernesses even though they may not meet the requirements for size and distance from roads. Motorized vehicles are not allowed and facilities and evidence of management are minimal. Visitor group size is often limited to create a sense of isolation and solitude.
2. **Semi-Primitive Non-Motorized** (SPNM) 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. Motorized vehicles are not allowed; and facilities are generally rustic; and management emphasis is for site protection. These settings accommodate dispersed, non-motorized recreation such as hiking, biking, hunting, and horseback riding. Some evidence of users may occur but interaction is generally low.
3. **Remote Roaded Natural** (RN2) is a sub classification of Roaded Natural and accounts for areas 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. Facilities are generally rustic, using native materials with design refinements, and providing some comfort for the user as well as site protection. Evidence of users may be prevalent but interaction is generally low.
4. **Roaded Natural** (RN1) is a sub-classification of Roaded Natural. Settings 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. Facilities are generally rustic, using native materials with design refinements, and providing some comfort for the user as well as site protection. RN1 also accounts for undeveloped, but highly roaded, settings popular for dispersed recreation activities such as hunting, fishing, camping, and horseback riding. Evidence of users is prevalent and interaction is moderate.

5. **Rural** (R) settings represent the most developed recreation sites and modified natural settings on the forest including the developed facilities at the Cradle of Forestry and highly developed campgrounds/recreation complexes like Davidson River and Lake Powhatan. Facilities are designed primarily for user comfort and convenience. Evidence of users is readily evident, and interaction is moderate to high.

Recreation Opportunity Spectrum Acreages and Distribution

ROS maps for the 1985 Forest Plan have not been located. GIS-based that includes ROS classifications were likely developed by planned Management Area (MA) allocations for Nantahala and Pisgah NFs sometime after the 1995 revision. Without original hand-drawn or GIS-based maps, this GIS coverage is the best available information, recognizing that errors occur with the transfer of line-drawn maps to the GIS database. Analysis of acreages in each ROS classification, and the percentages displayed in the following table are based on current acreage instead of 1995 acreage.

Table 35. Spatial Distribution of ROS Classifications on the Nantahala and Pisgah NFs

Spatial Distribution of ROS Classifications (Planned Settings) by District							
District	Primitive	Semi-Primitive Non-Motorized	Remote Roaded Natural (RN2)	Roaded Natural (RN1)	Rural	Mixed ROS	Unclassified
Tusquitee (NNF)	3.9%	9.5%	59.2%	23.1%	0.3%	0.8%	3.2%
Cheoah (NNF)	10.2%	14.7%	63.2%	9.1%		1.6%	1.3%
Nantahala (NNF)	3.5%	10.3%	66.2%	12.2%	0.01%	3.8%	4.0%
Pisgah (PNF)	15.5%	6.2%	61.4%	4.7%	0.2%	8.2%	3.9%
Grandfather (PNF)	6.1%	25.3%	55.4%	7.2%	>0.01%	0.04%	5.9%
Appalachian (PNF)		17.4%	59.1%	9.6%		12.4%	1.6%

Note: Unclassified acres range from new acquisitions since the 1995 Amendment to information missing in the GIS database.

Available Recreation Opportunities

A wide range of developed and dispersed recreation opportunities are offered in the Nantahala and Pisgah NFs. More than 280 developed sites in in these two forests serve as destinations or hubs from which to access forest lands. Types of sites and distribution across districts are shown in the following table.

Table 36. Nantahala and Pisgah NFs: Developed Recreation Sites by Type and District

	Nantahala Forest			Pisgah Forest			
Site Type	**Cheoah District**	**Tusquitee District**	**Nantahala District**	**Appalachian District**	**Grandfather District**	**Pisgah District**	**Totals**
Boating Site	8	4	5	2	0	0	**19**
Campground	4	2***	3	3	3*	4	**19**
Roadside/Hunt Camp	5	1	1	0	1	7	**15**
Group Camp	1	0	2	2******	1**	3	**9**
Horse Camp	0	1	2	1	0	2	**6**
Cabin/Lookout/Lodge	3	0	1	0	0	0	**4**
Fishing Site	1	1	0	2	1	0	**5**
Information Site	0	0	1	0	0	3	**4**
Interpretive Site	0	0	2	0	0	0	**2**
Observation Site	2	0	9	1	2	1	**15**
Picnic Site	2*****	3	8****	6	3	9	**31**
Swim Site	1	1	1	0	0	2	**5**
Target Range	1	1	2	0	0	0	**4**
Non-motorized Trail head	13	7	20	23	20	59	**142**
OHV Trail head	0	0	1	0	1	0	**2**
Visitor Center	0	0	0	0	1	1	**2**

Notes: *Boone Fork CG not currently open; **Boone Fork Group Camp not currently open; ***Two loops of Hanging Dog Campground not currently open; ****Arrowwood Glade Picnic Area not currently open; *****Not including picnic sites along Cherohala Skyway; ******Silvermine Group Camp currently closed due to flash flood damage during summer 2013

To help define the recreation opportunities for the Nantahala and Pisgah NFs, outdoor activities are classified into broad categories. These include sightseeing/driving for pleasure/nature study; water-based recreation; trails; camping; and dispersed recreation.

- ***Sightseeing/Driving for Pleasure/Nature Study***
  - Three scenic byways are open year round to accommodate driving for pleasure. Two of these are nationally-designated: Cherohala National Scenic Byway and a 17-mile portion of Forest Heritage National Scenic Byway. The remainder of Forest Heritage Scenic Byway and Mountain Waters Scenic Byway were designated as National Forest Scenic Byways.
  - Fourteen observation sites, including Looking Glass Falls, Wiseman's View, Brown Mountain, Patton's Run, Dry Falls, Wayah Bald, and Roan Mountain. Some of these offer interpretation about the site; some, like Cherohala National Scenic Byway corridor, include multiple developed overlooks; and some provide facilities for picnicking or for short hikes.
  - Developed picnicking options range from a few tables to accommodations for group gathering. Currently, 31 picnic areas provide capacity to accommodate more than 3,700 people.
  - The mountains of western NC offer unique habitats for plants and animals and offer popular locales for viewing birds and other wildlife, nature study and wildcrafting (i.e., collecting plant materials in their natural habitat for food, medicine, and crafts). In its statewide program, NC features a Mountain region Birding Trail in "site groups" which include Nantahala and Pisgah NFs locations. See www.ncbirdingtrail.org for further information. In addition, four NC wildlife viewing areas are currently listed for Nantahala and Pisgah NFs and more information can be found at www.wildlifeviewingareas.com.

- ***Water-based Recreation***

Water-based Recreation in the Nantahala and Pisgah NFs can be broadly categorized into four sub-categories:

  - *Whitewater paddling*
    Forest Service facilities are located on the Cheoah, French Broad, Nantahala, and Nolichucky rivers, with trailhead access to the Upper Chattooga. Free-flowing rivers that offer outfitter-guide services in the Nantahala and Pisgah NFs are the French Broad and Nolichucky. No guide services are currently available on the NC section of Chattooga and the floatable season (December 1 – April 30) is restricted to flows above 350 cubic feet per second. See the following web link for further information: http://www.americanwhitewater.org. The Nantahala River routinely draws a varied audience due to frequent water releases, Class II and III rapids along the eight-mile section between the Duke Energy power plant and Wesser, NC. Also, there are sixteen commercial outfitters available to the public. Outfitter-guides operate on Cheoah River and provide limited transportation services on the high-challenge portion of the Nantahala during some scheduled releases.

  - *River and creek-oriented recreation*
    Dispersed fishing, wading, tubing, and other activities as well as a few facilities characterize a large percentage of these forests' river and creek-oriented recreation. Developed facilities for activities including picnicking, camping, and fishing are offered at some locations.

  - *Wild and Scenic Rivers*
    There are three designated Wild and Scenic Rivers within the boundaries of Nantahala and Pisgah NFs.

    Wilson Creek Wild and Scenic River is a total of 23 miles in length. With nine miles on the Pisgah NF, the river offers

fantastic vistas, ridges more than 4000 feet high, and whitewater rapids and trails that travel to spectacular waterfalls. In addition, Wilson Creek offers developed recreation facilities and access (restrooms and constructed stairs) and is popular for wading, fishing, and other low-water activities. Parking is limited along narrow State Route 1328.

Horsepasture Wild and Scenic River on the Nantahala NF is the shortest of the three with a total length of four miles. One and three quarters of a mile travel through the forest. It is an exceptional example of an escarpment river with five major waterfalls within two miles – Drift Falls, Second Falls (or Turtleback Falls for its turtle shell like rock formation), Rainbow Falls, Stairstep Falls, and Windy Falls with numerous cascades, rapids, boulders, and rock outcroppings. Access is available via Rainbow Falls trail out of Gorges State Park.

Chattooga Wild and Scenic River originates in the mountains of western NC and runs a total of 59 miles from NC into Georgia and South Carolina, with 9.8 miles on the Nantahala NF including a section running through the Ellicott Rock Wilderness. The Chattooga is used by paddlers during high water flows. Limited trailhead access is available on the Nantahala NF's segment of the Chattooga River but includes the Chattooga River trail and off State Route 1100/Bull Pen Road.

- *Waterfalls*

More than 44 named waterfalls attract visitors to admire their beauty and power as well as providing the opportunity to wade or swim in cold pools. Many of the waterfalls listed below are adjacent to system trails. Some such as Bridal Veil Falls can be viewed from state highways and others like Dry, Looking Glass, and Whitewater Falls offer wide hardened trails, handrails, uniform stairs, and resting benches. Sliding Rock, in the Pisgah NF, is an unusual developed recreation "swimming" site, complete with lifeguards and restrooms during the summer season. See the following table for a list of waterfalls on the Nantahala and Pisgah NFs.

Table 37. Waterfalls on the Nantahala and Pisgah NFs by Ranger District

Nantahala National Forest	District	Pisgah National Forest	District
Big Snowbird Creek (Big Falls, Middle, Upper)	Cheoah	Elk River (aka Big)	Appalachian
Sassafras	Cheoah	Roaring Falls	Appalachian
Slickrock Creek (aka Lower Falls)	Cheoah	Douglas	Appalachian
Wildcat	Cheoah	Walker	Appalachian
Big Laurel	Nantahala	Catawba	Grandfather
Bridal Veil	Nantahala	Harper Creek	Grandfather
Cullasaja	Nantahala	Huntfish	Grandfather
Dry	Nantahala	Steele Creek	Grandfather
Glen	Nantahala	Upper Creek	Grandfather
Mooney	Nantahala	Toms Creek	Grandfather
Paradise (aka Wolf Creek)	Nantahala	Courthouse	Pisgah
Quarry (aka Upper Cullasaja)	Nantahala	Daniel Ridge	Pisgah
Ranger (Skitty Creek)	Nantahala	Graveyard Fields	Pisgah
Rufus Morgan	Nantahala	Looking Glass	Pisgah
Silver Run	Nantahala	Moore Cove	Pisgah
Wesser Falls (Nantahala River)	Nantahala	Rainbow	Pisgah
Whitewater	Nantahala	Skinny Dip	Pisgah
Beech Creek	Tusquitee	Slickrock Creek	Pisgah
Leatherwood	Tusquitee	Sliding Rock	Pisgah
North Shoal Creek	Tusquitee	Stairway	Pisgah
		Turtleback	Pisgah

- *Motorized and non-motorized recreation on large lakes*
  Large lakes adjacent to National Forest Lands on the Nantahala NF include Chatuge, Hiwassee, Fontana, and Santeetlah. The lakes themselves are owned and managed by the Tennessee Valley Authority (TVA) or corporations such as Brookfield (formerly Alcoa) and Duke Power. Forest Service facilities include boat launches (some operated in cooperation with the North Carolina Wildlife Resources Commission (NCWRC); swimming beaches; picnic areas; fishing piers; and campgrounds.

- *Recreation (generally non-motorized) on small mountain lakes*
  The small mountain lakes, Balsam, Cherokee, Cliffside, and Appalachia on the Nantahala NF and Powhatan on the Pisgah NF, provide intimate, and generally non-motorized water-based recreation experiences. As with the large lakes, Forest Service facilities include swimming beaches; picnic areas;

fishing piers; and campgrounds. Balsam Lake Lodge provides direct access to Balsam Lake. Group picnicking in covered pavilions is available at both Cherokee and Cliffside Lakes.

- ***Trails, Trailheads, and Shelters***

More than 140 developed trailheads provide access to Off Highway Vehicle (OHV) Trail Complexes; bike and equestrian trail complexes; hiking trail complexes; and a number of backcountry areas and Wildernesses.

- *Motorized Trail Complexes*

Two OHV complexes, Brown Mountain in the Pisgah NF and Wayehutta in the Nantahala NF, provide motorized trail access. Both accommodate wheeled vehicles less than 50" wide. In addition, two trails in the Brown Mountain complex accommodate full-sized vehicles. A segment of motorized trail on the Pisgah Ranger District, Ivestor Gap Trail, is open to street-legal vehicles on a seasonal basis for access to berry picking areas.

- *Non-Motorized Trail Complexes*

For many visitors exploring a trail is the best way to enjoy the Nantahala and Pisgah NFs. National Forest System trails allow people to experience the forests beyond picnic areas, campgrounds, and forest highways. More than 1,560 miles of trails for hiking, mountain biking, and pack and saddle provide access into these two national forests. From 2011 through 2013 the Forest Service coordinated an assessment of non-motorized trail condition, use, and user preferences through a series of collaborative meetings with trail volunteers and user groups. The resulting document, *Nantahala and Pisgah National Forest Trail Strategy, 2013,* is available for download from the following website: http://www.fs.usda.gov/detail/nfsnc/home/?cid=STELPRDB5341557 (USDA Forest Service 2013a).

Table 38. Motorized mileage for the Nantahala and Pisgah NFs

Motorized Trail Miles by Use-Type	
Brown Mountain	**Mileage**
Trail Bike	6.0
Trail Bike, ATV	20.1
Trail Bike, ATV, 4WD	6.1
Sub Total	**32.2**
Wayehutta	**Mileage**
Trail Bike, ATV/UTV	22.7
Ivestor Gap	**Mileage**
Highway Legal Vehicles	2.3
Grand Total	**57.20**

Table 39. Non-motorized mileage by Ranger District by use type for the Nantahala and Pisgah NFs

Non-Motorized Trail Miles by Use-Type					
Use Type	**Total Mileage**	**Hike Only**	**Horse/Hike**	**Bike/Hike**	**Horse/Bike/Hike**
Nantahala National Forest	**649**	**504**	**72**	**21**	**52**
Cheoah RD	252	198	15	0	39
Nantahala RD	276	223	39	1	13
Tusquitee RD	121	83	18	20	0
Pisgah National Forest	**911**	**609**	**50**	**157**	**95**
Appalachian RD	264	203	39	15	7
Grandfather RD	267	206	3	43	15
Pisgah RD	380	200	8	99	73
Total	**1560**	**1113**	**122**	**178**	**147**

- *Trailheads*

A broad spectrum of trailhead facilities abounds in both the Nantahala and Pisgah NFs. These trailheads, and associated trails and roads, provide hike, bike, horse, and motorized access to areas in both national forests. Some trailheads are highly developed with paved parking and picnic and restroom facilities, while the least developed include undefined parking and little else. Most developed trailheads are identified on Nantahala and Pisgah NFs trail maps.

- *Trail shelters*

Twenty-two shelters offer trail-side overnight accommodations along the Appalachian National Scenic Trail and other trails. These shelters are typical primitive three-sided structures, though some are more complex. Many have nearby pit or moldering toilets.

- *Camping*

Nantahala and Pisgah NFs offer a variety of different camping options, from large developed campgrounds with showers and electrical hook-ups to rustic roadside and backcountry hunt camps including but not limited to:

- 19 developed family-type campgrounds
- Six horse camps
- Nine group camps
- One 16-person lodge (Balsam Lake)
- One rustic cabin (Swan Cabin)
- Two “camping cabins” in Cheoah Point Campground
- Five large concession-operated campgrounds, four group camps, and several associated small campgrounds
- More than 100 individual dispersed sites are identified in 15 roadside/hunt camp areas. These sites are often developed in areas of concentrated use and along popular water corridors.

To limit impacts, dispersed camping is only allowed at designated sites in many areas of the forest including:

- Pisgah NF: (1) throughout the Pisgah Ranger District; (2) in corridors along Neals Creek, South Toe River, Big Ivy Road, Cold Springs Creek, and River Road/French Broad River in

the Appalachian Ranger District; and (3) along the Curtis Creek corridor in the Grandfather Ranger District.
- Nantahala NF: In the corridors in the Cheoah, Santeetlah, and Tellico rivers in both the Cheoah and Tusquitee Ranger District.

Areas closed for an dispersed camping include Bent Creek Experimental Forest; the Cradle of Forestry's developed areas; Wilson Creek corridor; land around Balsam Lake; the Coweeta Experimental Forest; U.S. 64 Cullasaja Gorge corridor; the Fontana Lake Finger Lake area; the 1,000 foot corridor along the Nantahala River between Silvermine Creek and Junaluska Road, including any islands; within the boundaries of developed day-use sites and campgrounds; in many wildlife openings; and areas with no-camping signs.

Camping in developed or dispersed areas is limited to 14 days within a 30 day time period. A camper who wishes to relocate after the 14 day limit is required to move more than 10 miles from the previously occupied camping site.

- ***Dispersed Recreation***
  - *Wilderness and Wilderness Study Areas*

Congressionally designated Wildernesses and Wilderness Study Areas are discussed in the chapter titled *Assessing Designated Areas* within this document and in the *Assessing Recreation Settings, Opportunities and Access, and Scenic Character* supplemental report.

  - *Managed Backcountry*

Additional semi-primitive backcountry opportunities are available in the approximately 119,000 acres of the Nantahala and Pisgah NFs (Management Area 5). In these areas, the "emphasis is on providing large blocks of backcountry where there is little evidence of other humans or human activities other than recreation use".

  - *Rock Climbing*

Rock climbing, ice climbing, rappelling, and mountaineering are technical and unique ways to experience national forests. The rugged but accessible terrain makes climbing in the Nantahala and Pisgah NFs appealing and climbing in a forested, yet remote environment are characteristics of climbing in the area unique. Climbing in the Nantahala and Pisgah NFs provides a wide range of options, levels of commitment, and rock types. Seasonal restrictions may vary from site to site.

  - *Recreational Rockhounding and Mineral Collection*

Western NC is a destination for many amateur rockhounds and mineral collecting organizations. Rockhounding is primarily done as a dispersed recreation activity at old commercial mines and mineralized outcrops on the national forest. Some of the common minerals collected include: kyanite, feldspar, mica, corundum, and quartz. More information regarding the current rockhounding guidelines on the Nantahala and Pisgah NF is posted on the forest's website at: http://www.fs.usda.gov/detail/nfsnc/recreation/?cid=stelprdb5420144.

Connecting People with Nature

In addition to providing a venue for various forest-based recreation activities, the Nantahala and Pisgah NFs also provide many other opportunities to connect people with nature such as conservation education and interpretive and outreach programs. Just a few of these opportunities include:

- *Conservation Education*
  - The Cradle of Forestry in America is a historic site within the Pisgah NF which was site aside to commemorate the

beginning of forest conservation in the United States. The Cradle of Forestry tells the story of the first forestry school and the beginnings of scientific forestry in America. Once home to the Biltmore Forest School, the site includes a visitor center; amphitheater; and a collection of historic and reconstructed buildings, objects, and site furnishings.

- Small seasonally operated visitor centers are located at Linville Gorge, with exhibits and sales materials based on wilderness education, and Roan Mountain, with exhibits about rare species, cultural history, rhododendrons, high elevation mountain balds and other site-specific subjects.
- A few self-guided interpretive trails and interpretive signs provide educational messages. For example, the Bob Padgett Popular and the Wasilik Popular are among the oldest living Tulip Popular trees in the state, and can be accessed by short trails and a short hiking loop through Joyce Kilmer Memorial Forest offers glimpses to an old growth cove forest ecosystem.
- Unique heritage interpretation opportunities are provided at locations such as Civilian Conservation Corps (CCC) sites including Massey Branch and Curtis Creek: and Wilson Lick, a former ranger station; Wayah Bald fire tower; and a Cherokee Indian history at Tsali Trailhead just to name a few.

o *Interpretive and Outreach Programs*

Each year Rangers from the six districts on the Nantahala and Pisgah NFs conduct interpretive programs and provided outreach to visitors and local communities. Some of these programs include:

- Smokey Bear
- Woodsy Owl
- Youth fishing days
- Leave No Trace and Seasonal Wilderness Ranger Programs
- Conservation Field Day
- Career Day
- Alternative spring breaks

In addition, campground programming is provided by the Cradle of Forestry in America Interpretive Association. Programs provide information on subjects including bears, local birds, plants, etc.

How is scenery managed on the Nantahala and Pisgah NFs?

On National Forest System lands, the Visual Management System (VMS) provides an overall framework for the orderly inventory, analysis and management of scenery (USDA Forest Service 1974, 1995, and 2008b). The entire forest is rated into areas that are "seen" or "seldom seen". The distances between the viewer and the seen area ("Distance Zones") and the viewer's interest in scenery ("Sensitivity Levels") are also considered. Potential scenery impacts are analyzed from viewpoints including:

- Use areas such as campgrounds, picnic areas, observation areas, trail heads, visitors centers, etc.
- Water bodies
- Open FS system roads, State Roads, and U.S. Highways
- FS system trails and other public trails
- Gated FS system roads and trails

In the inventory phase of the VMS, landscape Character Types were identified and classified into Variety Classes. Character Types are land areas having common distinguishing visual characteristics of landform, rock formations, water forms, and vegetative patterns, and are used as a frame of reference in classifying scenic quality based on physical features of the landscape. The second tier of classification is Variety Class, which subdivides the landscape into areas of scenic importance. This is based on the premise that landscapes with more variety or diversity

have a greater potential for high scenic value, although all landscapes have some scenic value.

There are three **Variety Classes** identified in the Visual Management System (VMS):

- **Variety Class A** – Distinctive: Areas of unusual or outstanding scenic value, not common in the landscape character type.
- **Variety Class B** – Common: Areas where combinations of form, line, color, and texture are repeated throughout the character type, not unusual from standpoint of scenic value.
- **Variety Class C** – Minimal: Areas of little change in form, line, color, or texture, and contain no characteristics of Classes A or B.

In the initial scenery inventory created for the current LMP all landscapes within the Character Type were determined to have some degree of variety and scenic value, therefore no lands were classified as Varity Class C. Variety Class A landscapes were ultimately identified as special interest areas to be managed for their respective unique characteristics. All remaining lands were classified as Variety Class B – Common.

After determination of Variety Class, two other considerations affecting management of scenery were considered as directed in the VMS: Sensitivity Level and Distance Zone. Sensitivity Level is a measure of viewer concern for scenic quality and Distance Zone is the distance from viewer to landscape or feature being viewed. Both of these elements were identified in the initial scenery inventory for the current LMP, though this was a generalized or broad-scale inventory for land management planning purposes (a more detailed assessment of these elements is typically conducted for project-level scenery analysis).

Sensitivity Levels are a measure of people's concern for scenic quality on National Forest Lands. Three levels are used:

- **Level 1 – Highest Sensitivity:** Seen areas from primary travel routes, use areas, and water bodies where at least ¼ of users have a MAJOR concern for scenic quality. These include primary recreation areas, resorts, botanical areas, historic sites, primary areas for fishing, swimming, and other water activities, and highly sensitive communities. Level 1 also includes secondary travel routes, use areas, and water bodies where at least ¾ of visitors have a major concern for scenic quality. Examples of this Level include views from the Blue Ridge Parkway, the AT, scenic byways, and interstate highways.
- **Level 2 – Average Sensitivity:** Seen areas from primary travel routes, use areas, and water bodies where less than ¼ of users have a major concern for scenic quality OR secondary travel routes, use areas, and water bodies where at least ¼, but not more than ¾, of users have a major concern for scenic quality.
- **Level 3 – Lowest Sensitivity:** Seen areas from secondary travel routes, use areas, and water bodies where less than ¼ of visitors have a major concern for scenic quality. These include recreation sites like occasionally used, unimproved hunter camps, secondary roads or use areas with only occasional use, and National Forest Lands seldom seen from any travel route, use area or water body.

Analyzed viewpoints can be on Forest Service or non-Forest Service lands. Viewpoints can include views from private businesses open to the public, such as restaurants, observation areas, and from public or private roads in residential areas.

Distance Zones define how far the viewer is from the area viewed and are determined on a site specific basis considering landforms, vegetative screening, and the degree of detail perceived in landscape elements. In the Visual Management System, these are defined as:

- **Foreground**: Area from viewer up to ½ mile away
- **Middleground**: Area from foreground to 3 to 5 miles away
- **Background**: Area from middleground to the horizon

Visual Quality Objectives (VQO) are determined by the combination of Variety Class (A, B, and C); Sensitivity Levels (1, 2, or 3); and Distance Zones (Foreground, Middleground, or Background). These objectives, management goals, are defined as:

- **Preservation (P):** Only ecological changes are allowed. This VQO must be achieved immediately after completion of activity. This applies to areas such as designated Wilderness.
- **Retention (R):** Management activities which are not visually evident to the average viewer. This VQO must be met within one growing season.
- **Partial Retention (PR):** Management activities can be evident but remain visually subordinate to the characteristic landscape. This VQO must be met within two growing seasons.
- **Modification (M):** Management activities may visually dominate the original characteristic landscape, but vegetation and landform alteration must appear as natural occurrences. Roads, structures, etc. must remain visually subordinate. This VQO must be met within three growing seasons.
- **Maximum Modification (MM):** Management activities may visually dominate the characteristic landscape; however when viewed as background the visual characteristics must be of natural occurrences.

Per direction in the Nantahala and Pisgah National Forests Land Management Plan, Amendment 5, scenery resources are managed to meet VQOs assigned to each Management Area (MA). In some MAs, a range of VQOs have been assigned. See the following table for VQOs by acres.

Table 40. Visual Quality Objectives by Management Area (MA)

Assigned VQOs Incorporated into	Acres	% of
Preservation	68,010	6.8%
Retention		15.8%
Retention or Partial Retention		31.8%
Retention, Partial Retention, or Modification	9,570	1.0%
Retention or Modification	3,880	0.4%
Retention, Partial Retention, Modification, or	1,260	0.1%
Partial Retention or Modification		15.9%
Modification (Partial Retention where seen		27.0%
No VQO Assigned	12,250	1.2%

Below are descriptions of the Management Emphasis for Management Areas in the above table. Management area acreages are approximate as of 1994 (USDA Forest Service 1995b).

MA 1B - Timber production, motorized access, grouse & deer habitat, 38,498 ac. available
MA 2A - Scenery, timber production, motorized access, grouse & squirrel habitat, 40,642 ac. available
MA 2C - Scenery, motorized access, old forest wildlife habitat, 37,680 ac. available
MA 3B - Timber production, limited motorized access, wild turkey & deer habitat, 232,873 ac. available
MA 4A - Scenery, limited motorized access, old forest wildlife habitat, limited timber production, 55,604 ac. available
MA 4C - Scenery, non-motorized access, old forest wildlife habitat, 179,992 ac. available

MA 4D - Old forest wildlife habitat, non-motorized access, vegetation management for ESH, 160,080 ac. available
MA 5 - Backcountry recreation, non-motorized access, bear habitat, 119,685 ac. available
MA 6 - Wilderness Study Areas, recreation/solitude, non-motorized access, 8,419 ac. available
MA 7 - Designated Wilderness, recreation/solitude, non-motorized access, 66,550 ac. available
MA 14 - Appalachian Trail Corridor (foreground), recreation, motorized access at trail intersections, vegetation management for wildlife or trail benefit, 12,450 ac. Available

What Are the Identified Distinctive Landscapes and How Are They Managed?

The current LMP identifies distinctive (Variety Class A) landscapes as "Special Interest Areas" and allocates them to MA 13. This management area combines areas of geological, botanical, and zoological interest; as well as those with unique scenic attributes. MA 13 includes five administratively designated Scenic Areas:

- Looking Glass Rock
- Glen Falls
- John Rock
- Whitewater Falls
- Craggy Mountain

These scenic areas are managed to protect and emphasize their special characteristics, and all proposed management activities must meet Retention VQO. The areas are not managed for timber production, but activities such as wildlife improvements, prescribed fire, trail construction, and road construction are allowed if they enhance the area's unique qualities, foster public enjoyment of the area, and are compatible with other management objectives.

What is the outlook for sustainable recreation?

Sustainable Recreation has been defined as the set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations. As described in previous sections, recreation opportunities on National Forests provide many economic benefits to local communities and a variety of social benefits to the public. The Forest Service strives to manage these opportunities in a manner that protects the ecological sustainability of the area. The socio-economic benefits derived from recreation are largely dependent on sustaining the infrastructure and services that support those recreational activities. However, there are several indicators that the NFs are not trending towards a sustainable recreation program. Some of these indicators include:

- Declining budgets will erode the agency's ability to maintain developed facilities. Less than half of the existing developed site infrastructure is currently predicted to be sustainable over the long-term.
- There is a substantial backlog of trail maintenance needs, as well as public demand for more trails. As budgets decline, the agency is increasingly challenged to provide the staffing needed to work with partners and volunteers to properly plan and maintain the trail system, even with non-appropriated funding sources.
- Trails not maintained to standard, proliferation of non-system trails, and unmanaged streamside camping may create environmental and cultural resource damage.
- There is increased crowding and user conflicts in many locations. Favorite locations and trails are exceeding their capacity at times, and conflicts can increase as visitation increases.
- Road access may decline as road maintenance funds decrease. This could affect various recreation uses.

Renewable and Nonrenewable Energy and Mineral Resources

Key questions addressed in this Section:

- What are the current types, extent, and general location of energy and mineral activities and energy facilities on the Nantahala and Pisgah NFs?
- What is the potential for energy and mineral activity on the Nantahala and Pisgah NFs?
- What portion of the Nantahala and Pisgah NFs subsurface is not federally owned, and where are the locations?
- Are there any abandoned mines or mining related hazards in need of reclamation or restoration?
- What are the current policies for rock hounding and gold panning on the forests?

What are the current type, extent, and general location of energy and mineral activity and energy facilities on the Nantahala and Pisgah NFs?

ENERGY AND MINERAL SUPPLY

Federal leasable minerals
A Bureau of Land Management (BLM) hardrock mineral lease (NC-ES 13667) for olivine is in effect in the Buck Creek area of Clay County on the Tusquitee Ranger District in the Nantahala NF. The 158 acre BLM lease for olivine is in effect but mining operations under the lease are not active.

Federal mineral materials
A Forest Service (FS) mineral materials contract for crushed stone and riprap is in effect in the Massey Branch quarry near Robbinsville area of Graham County on the Cheoah Ranger District, Nantahala NF. Contract operations occur within 34.4 acres of the Massey Branch quarry, where mining operations have occurred for many years under a series of five-year mineral material contracts. The most recent five-year contract was issued in May 2012 and will expire May 31, 2017. This five year contract is for 1,250,000 tons, mined at a rate of 250,000 tons per year. Actual production for 2010-2012 is:

Year	Production (short tons)
2010	9,623
2011	9,248
2012	9,975

The Johns Knob quarry on the Cheoah Ranger District was a key source of mineral materials to build the Cherohala Skyway in Graham County. In 2013 the Ranger District received a request to use the quarry for a landslide repair on the Skyway.

Other quarries that have been active in the past include: 1) O.J. Wilson quarry (2 acres), a dimension stone quarry near Unicoi in Yancey County on the Appalachian Ranger District, Pisgah NF, 2) A. Taylor quarry (3 acres), a dimension stone quarry near Linville in Avery County on the Grandfather Ranger District, Pisgah NF.

The Nantahala and Pisgah NFs use mineral materials (crushed rock aggregate, rip rap, landscaping rock, etc.) for 1) FS administrative uses such maintaining roads and developing recreation sites, trailheads, and other facilities, 2) FS contracts, such for timber sales, flood or landslide repairs, where mineral materials are needed for the project. The vast majority of mineral materials used

by the FS are purchased from private rock quarries located on private land off the Forest.

The Cotton Patch area located on the Appalachian Ranger District of the Pisgah NF is under a special use authorization issued to the NC Department of Transportation for a waste area due to recurring slide activity on Interstate 40. The stockpile contains approximately 100 cubic yards of material that could eventually be crushed for future use.

In fiscal year 2012, the Tusquitee and Nantahala ranger districts each issued two mineral material permits for landscaping rock to the general public.

Privately-owned minerals (non-federal subsurface; non-federal minerals; reserved and outstanding rights; split estate)
Hewitt Quarry, a mineral reservation located within the Nantahala National Forest in Swain County, occupies approximately 25 acres of the 300 acre private mineral estate. The quarry contains limestone or low grade marble.

Energy and Mineral Demand

Twenty-first Century Demand

The 1987 Forest Plan was developed more than a quarter of a century ago. Since then U.S. demand for minerals has grown to include not only traditional demands for minerals but also new and emerging demands for minerals essential for high technology, computers, Internet, fiber optics, cell phones, GPS, national defense, strategic and critical minerals, nanotechnology, renewable energy (wind, solar, biomass), clean car technology, greenhouse gas reduction and carbon capture infrastructure, and other climate change mitigation and adaptation infrastructures.

Fossil Fuel Consumption

The Nantahala and Pisgah NFs use energy and non-energy mineral resources for a wide range of resource programs. The overwhelming majority of the tools, equipment and energy used to manage the Forest and sustain ecosystems are made of minerals, not wood. Minerals are used in three forms, 1) the hardware made from minerals: tools, equipment, computers, GPS, cell phones, vehicles, culverts, bridges, water wells, fire trucks, aircraft, electrical grid, and other infrastructure, 2) highly processed mineral supplies needed to fuel, power, operate and maintain the hardware or to conduct operations (applying fertilizer, herbicides, fire retardant, etc.): gasoline, diesel, oil, chemicals, batteries, etc. 3) minerals used as construction materials or in a relatively raw form: aggregate, rip-rap, concrete, landscaping rock, building stone, etc.

Forest Fleet

In fiscal year 2012, the Nantahala and Pisgah NFs consumed a total of 100,228 gallons of fossil fuels (gasoline and diesel), and travelled 1,981,419 miles.

The FS also consumed fossil fuel through such activities as, 1) contractors performing road grading, road resurfacing, cutting up and hauling fallen trees that block roads and bridges, etc., 2) volunteers travelling back and forth to the Forest, 3) helicopters and fixed wing aircraft used in fire management, insects and disease surveillance, and monitoring, and flood and wind storm damage assessments, 4) airplane, bus and vehicle transportation of fire fighters from across the U.S. to fight forest fires on the forests.

Forest Recreation

The Forest provides and promotes public recreation requiring substantial travel that consumes fossil fuels (gasoline, diesel, oil).

The number of Nantahala and Pisgah NFs visitors and distances travelled in FY2008 are reported in the Forest's Visitor Use Report as part of National Visitor Use Monitoring (USDA Forest Service 2010). MVUM report data was used to estimate total round-trip miles travelled by Forest visitors. The draft estimate indicates that visitors travelled about 500 million miles in order to recreate on the Nantahala and Pisgah NFs in FY2008. Assuming 20 miles per gallon, recreation users of the Forest consumed on the order of 25 million gallons of gasoline/diesel in FY2008. This estimate includes only round trip mileage from the visitors' home to the Forest, and does not include any additional miles the visitor may have travelled on the Forest as part of the visit.

Forest Timber Harvest

For FY 2010-2012, the Nantahala and Pisgah NFs used an estimated 120,647 gallons per year for fossil fuel consumption for timber harvest.

Mineral materials consumption

The Forest uses mineral materials (crushed rock aggregate, rip rap, landscaping rock, etc.) to construct and maintain the roads, develop recreation sites, trailheads, and other facilities. The largest use of mineral materials is road aggregate on the Forest's approximately 1,613 miles of open roads. Every year the Forest resurfaces a few roads with several thousand tons of aggregate. For fiscal year 2010 to 2012, the Forest's average annual aggregate use was 4,000 tons per year. However, there is a backlog of roads in need of resurfacing, so the 4,000 tons per year is substantially less than the annual surface rock replacement needed to maintain 1,613 miles of open road.

Table 41. Tons of aggregate used by Ranger District for FY 2010-2012

	FY10	FY11	FY12
Appalachian	None Reported	130	None Reported
Cheoah	None Reported	601	None Reported
Grandfather	None Reported	640	300
Pisgah	390	555	427
Tusquitee	94	1,082	None Reported
Nantahala	33	6,253	1,350
Total	**517**	**9261**	**2077**

In addition to regular maintenance, minerals materials in large quantities are needed to repair roads and stream crossings damaged or destroyed by storm events, floods, road slopes failures, etc. These episodic emergencies can increase the need for mineral materials far beyond the annual use for routine maintenance and surface rock replacement. The Forest Service uses rocks pits on the Forest to supply some mineral materials, however, the vast majority of mineral materials used by the Forest Service are purchased from quarries on private land off the Forest.

What is the potential for energy and mineral activity on the Nantahala and Pisgah NFs?

FEDERAL LEASABLE MINERALS

Solid Minerals Other Than Coal and Oil Shale

Mineral resources on the Nantahala and Pisgah NFs include more than 40 metallic and non-metallic minerals.

Table 42. Mineral resources on the Nantahala and Pisgah National Forests based on Mineral Resources Data System (MRDS) of the U.S. Geological Survey (2013a)

Arsenic	Gold	Nickel	Silver
Asbestos	Graphite	Niobium	Stone, Dimension
Barium-Barite	Iron	Olivine	Sulfur
Beryllium	Kaolin	Palladium	Talc-Soapstone
Chromium	Kyanite	Platinum	Tantalum
Cobalt	Lead	Pyrite	Thorium
Copper	Magnesite	Quartz	Tin
Corundum	Manganese	Rare Earth Elements	Titanium, Metal
Feldspar	Marble	Rhodium	Vermiculite
Fluorine-Fluorite	Mica	Silica	Zinc
Garnet	Molybdenum		Zirconium

The North Carolina Geological Survey (NCGS) recognizes the mineral resource potential of the Nantahala and Pisgah NFs and notes (Reid 2013):

> *"Large portions of the Nantahala and Pisgah National Forests are underlain by a Precambrian rift basin (Coleman and Cahan, 2012). Western North Carolina has been the focus of extensive mineral exploration since the early exploration and development of the State. Ore deposit models, summarized in Cox and Singer (1992), suggest the potential for further mineral discoveries including volcanogenic massive sulfides, and precious metal vein systems."*
>
> *"Diverse other mineral commodities in the two national forests include: monazite (source of rare earth elements – see Mertie, 1975) and important industrial minerals 'alaskite' (quartz, mica, and feldspar), olivine, gold, diamonds, industrial garnet, building- and dimension stones (river rock and flat mylonitized stone), marble, talc, and gemstones…"*

North Carolina and the U.S. have an emerging need for a variety of mineral resources to build and operate the infrastructures for National defense and renewable energy (wind, solar, biomass), clean car technology, greenhouse gas reduction and carbon capture infrastructure, high tech computer and Internet infrastructure, and other climate change mitigation and adaptation infrastructures.

Oil and Gas

During the oil crisis of the early 1980s, large areas of Nantahala and Pisgah NFs were leased for federal oil and gas. When oil prices dropped, interest waned because of the exploration costs and unfavorable risk/reward in an unproven province for oil and gas exploration and development.

In 1992, the U.S. Geological Survey conducted a study of the bedrock geology and mineral resources of the Knoxville 1°x2° Quadrangle, Tennessee, North Carolina, and South Carolina, an area that includes most of the Forest (Robinson et al. 1992). In regard to oil and gas potential, the study found that the northwestern portion of the Knoxville quadrangle is a high-risk frontier area for natural gas exploration.

In 2008 the Bureau of Land Management issued a report "North Carolina - Reasonable Foreseeable Development Scenario for Fluid Minerals" that assessed oil and gas occurrence potential and oil and gas development activity potential for federal lands in North Carolina, including the Forest. The BLM report concluded: "No oil and gas wells are forecast to be drilled in North Carolina in the next ten years…There are no estimates of the surface disturbances associated with the development of oil and gas on

federal minerals within the State of North Carolina because no new wells are predicted to occur over the next ten years."

In 2013, the State of North Carolina was in the process of assessing oil and gas potential in western North Carolina based on more recent developments in oil and gas technology as well as geological evaluations.

Coal

A 1992 US Geological Survey study of the bedrock geology and mineral resources of the Knoxville 1°x2° Quadrangle, Tennessee, North Carolina, and South Carolina, an area that includes most of the Forest (Robinson et al. 1992), concluded that rocks in the Knoxville quadrangle contain no coal.

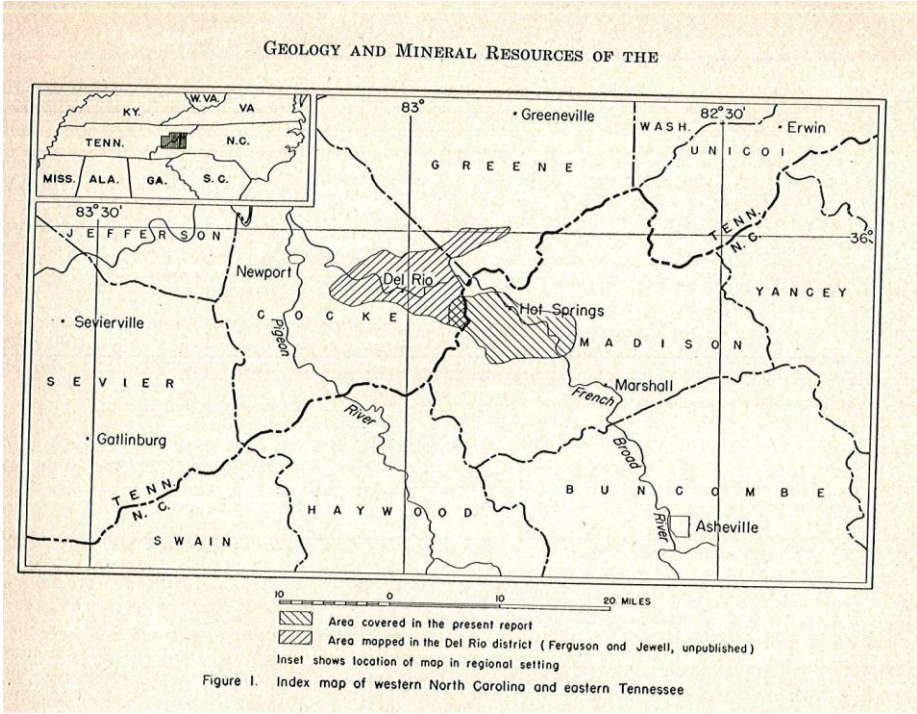
Geothermal

The North Carolina Geological Survey conducting a study of the geology and mineral resources of the Hot Springs window, Madison County (Oriel, 1950). The study area, depicted in Figure 35, includes parts of the Pisgah NF. The reports states:
"The hot springs constitute the most valuable mineral resource in the area covered by the present report. Since their discovery, the springs have attracted visitors from many states and have been an important source of revenue for the town and county."

The US Geological Survey conducted a study of the major warm springs in the Appalachians extending from western Georgia to eastern New York (Hobba et al. 1979).

Based on these studies by the NCGS and USGS, the portion of the Pisgah NF in the vicinity of Hot Springs has potential for geothermal resources, including Enhanced Geothermal Systems (EGS) as defined by the U.S. Department of Energy.

Figure 35. Map of Hot Springs window area studied by Oriel, 1950



Federal Mineral Materials

The Forest has a high potential for the occurrence of mineral materials (aggregate, rip rap, building stone, landscaping rock, etc.) that can be used to meet the Forest's needs as well as local or regional needs for mineral materials. The potential for development of mineral materials will be based on Forest Plan direction.

Renewable Energy

Renewable energy includes wind, hydropower, solar, biomass, and geothermal energy. Currently, hydropower is the only renewable energy source being utilized in any measurable amount on the Nantahala and Pisgah NFs. The Nantahala NF has four hydroelectric dams in operation and the Pisgah NF has none.

The Nantahala Project, Duke Energy Carolinas, LLC is located in western North Carolina on the Nantahala River and on two tributaries, Dicks Creek and White Oak Creek. The headwaters of the Nantahala River are south of the project in the Nantahala Mountains, with elevations exceeding 5,000 feet above mean sea level. Approximately eight miles downstream of the project, the Nantahala River flows into the Tennessee Valley Authority's Fontana Lake on the Little Tennessee River, a tributary of the Tennessee River. This project occupies 41 acres of the Nantahala NF and generates an average of 215,159 megawatt hours (MWh) of energy annually.

The Queens Creek Hydroelectric Project, Duke Energy Carolinas, LLC is located on Queens Creek, 1.5 miles upstream of its confluence with the Nantahala River, near the town of Topton, Macon County, NC. The project does not occupy any federally-owned lands. The Queens Creek Project generates an average of 5,000 MWh of energy annually.

The East Fork Project, Duke Energy Carolinas, LLC is located on the East Fork of the Tuckasegee River in western North Carolina and lies within the Tuckasegee River watershed, which is a subbasin of the Little Tennessee River. The Tuckasegee River flows through the cities of Cullowhee, Sylva, and Bryson City before it joins the Little Tennessee River almost 50 miles from its headwaters. The project reservoirs are surrounded by steep, forested slopes ranging in elevation from 2,250 to 3,800 feet mean sea level. The East Fork Project consists of three hydroelectric developments which are Tennessee Creek, Bear Creek, and Cedar Cliff. The East Fork Project generates an average of 94,710 MWh of energy annually.

The Tapoco Project, Alcoa Power Generating, Inc. is located on the Little Tennessee and Cheoah Rivers in Graham and Swain Counties in North Carolina and Blount and Monroe counties in Tennessee. The project includes four developments: Santeetlah, Cheoah, Calderwood, and Chilhowee. The Tapoco Project historically has generated about 1,445,582 MWh of electricity annually.

The Energy Policy Act of 2005 recognizes the Forest Service's role in meeting the renewable energy goals of the United States. Consistent with Agency policies and procedures, the use and occupancy of NFS lands for alternative energy production, such as wind energy development, are appropriate and will help meet the energy needs of the United States.

A 2005 report by the National Renewable Energy Laboratory, identifies and evaluates the potential for solar and wind energy resource development on NFS lands. This report identifies approximately 35,000 acres of NFS lands in North Carolina that are in a wind class suitable for utility-scale wind turbine development; however, some of that potential area occurs on the Croatan NF on the coast of North Carolina.

The greatest potential for wind energy generation exists along some of the highest ridges in western NC. No special use permits for wind energy have been proposed or are being considered at this time.

Woody biomass includes trees, woody plants, including limbs, tops, leaves, and needles that are a by-product of forest

management. Woody biomass can be utilized to produce energy both on a residential scale (firewood) and on a commercial scale.

The primary obstacle to the utilization of woody biomass in western NC is the lack of biomass purchasing plants in the 18-county area of western NC. Therefore, the Nantahala and Pisgah NFs are currently not selling any woody biomass from the forest, with the exception of that which is sold in the form of firewood permits.

What portion of the subsurface of the Nantahala and Pisgah NFs is not under federal ownership, and where is that located?

Most of the minerals underlying the federals lands that make up the Nantahala and Pisgah NFs are federally owned. However, some tracts acquired by the USDA Forest Service either had the mineral rights reserved (reserved rights) or already had the mineral rights severed (outstanding rights). The land status in which owner of the mineral rights on a tract is different than the surface owner of the tract is referred to by various names: split estate; private subsurface ownership; reserved or outstanding mineral rights (ROR); nonfederal mineral ownership; nonfederal minerals rights; private mineral rights.

GIS data for the Nantahala and Pisgah NFs lists 205 tracts with ROR mineral rights in which there is less than 100% federal mineral ownership. In the GIS attribute table for the 205 ROR tracts, the recorded acres (deed acres) total is 125,714 acres, while the GIS calculated acres is 102,523 acres. One explanation for the difference is that the ROR applies only to part of some tracts. In addition, North Carolina has a law providing for extinguishment of ancient mineral rights: N.C. Ancient Minerals Act (N.C. Gen. Stat. § 1- 42.1 through § 1- 42.9).

These two factors may result in a much larger reduction in actual acres subject to ROR.

Are there any abandoned mines or mining related hazards in need of reclamation or restoration?

Recent Abandoned Mine Lands (AML) closures to abate mine hazards for public safety have been accomplished at Ray Mine on the Appalachian District, Pisgah NF. More closures are planned. The Tusquitee Ranger District has identified several mine shafts and is considering shaft closure in the Buck Creek area of Clay County on the in the Nantahala NF.

The MRDS of the U.S. Geological Survey can be used to develop an AML inventory. MRDS is a database of mineral site records including present and past mines, prospects, and occurrences along with related geologic, commodity, and deposit information. The MRDS has about 200 records for Nantahala and Pisgah NFs, but only some of these records would lead to an AML site needing a safety closure.

What are the current policies for rockhounding and gold panning on the forests?

The Forest Service's current policy on the public website can be accessed at the following location: http://www.fs.usda.gov/detail/nfsnc/recreation/?cid=stelprdb5420144.

- Rockhounding and gold panning may take place on most national forest lands – provided only small quantities of material are removed for personal, non-commercial purposes.
- Recreational rockhounding and gold panning are not allowed in Congressionally-designated wilderness areas or in the corridors of designated wild and scenic rivers.

- Recreational rockhounding and gold panning are not allowed in forest areas where mineral rights are owned by a private party, or in an area that is under mineral lease to a private party.
- Permits are required for removal of mineral materials for scientific and research purposes.
- Commercial removal of minerals requires a prospecting permit from the Bureau of Land Management.
- Materials must be removed using small hand tools without mechanical means or motorized equipment. Removing mineral materials with a pick, shovel, sluice box or similar large tools can cause significant impacts to resources is considered mechanical so therefore not allowed.
- Suction dredges are not allowed by forest closure order.
- Gold pans may be used for gold panning in the beds of streams, but the banks of streams cannot be disturbed by digging or removing materials.
- Any disturbance to or removal of historical or archaeological artifacts is prohibited by federal law.

The Transportation System

Key questions addressed in this Section:

- What is the history of the Nantahala and Pisgah NF road system? How much road construction and decommissioning has taken place recently?
- What does the U.S. Forest Service call a road?
- What is the current condition of the transportation system on the Nantahala and Pisgah NFs and how is it managed?
- What informs decisions regarding whether roads are open, closed, or seasonally open?
- What are anticipated funding levels for maintenance and development of the road system? What opportunities are available to accomplish transportation maintenance and development?
- To what degree does the current transportation system meet the direction in the current plan?

What is the history of the Nantahala and Pisgah NF road system? How much road construction and decommissioning has taken place recently?

The establishment of the Forest road network began with the purchase of the first tract of land for each national forest. Many of the initial tracts already had roads, trails and railroad grades (both existing and abandoned) running across the acreage. However many other purchased tracts did not have existing access of any type. The initial Forest road network was carved out of the existing roads and railroad grades on the acquired tracts. The easiest way to add roads to the system was to utilize existing routes and convert abandoned railroad grades which had gradual grades, reasonable horizontal curvature, and stable subgrade. At the same time funding was secured to build additional roads and road segments to access specific areas within many of these tracts. Many planned roads were constructed in the 1930's during the heyday of the Civilian Conservation Corps. Roads were built to access newly developed campgrounds, picnic areas, scenic sites and to support harvesting timber. Even at this time a number of roads and road segments were gated and closed seasonally or all the time.

By the mid 1940's both Forests had detailed transportation development plans in place. New road construction as well as existing road management was governed by these documents. Rigorous transportation planning and analysis has informed all additions to the permanent road system since this time.

The Forest road system has grown from 732 miles in 1945 to 2,245 miles in 2013. Over 90% of the roads constructed since 1945 are closed to vehicular access. These are minimal standard roads designed for intermittent use. Newly constructed roads are well located on stable soils. Many are out-sloped, have frequent drainage dips, spot surface stabilization, vegetated cut and fill slopes and stabilized fords at live stream crossings. Many roads are vegetated upon completion of activities in the area. As a result, these roads require very little, if any maintenance between use cycles. While these roads are closed to motorized vehicular traffic they provide excellent non-motorized public access. At the same time they provide critical administrative access for forest management, wildfire as well as search and rescue.
New system road construction is relatively rare. Approximately 12.5 miles of system roads were constructed from 2001 through 2011, while 20.7 miles of road were decommissioned in that time period. Currently, needed access may be provided by a temporary

road used for the duration of the management activity, then closed out and revegetated; not carried over for future motorized access.

Based on our forest infrastructure database and management system there is a significant backlog of deferred maintenance needs. Further analysis of the data reveals that aggregate surface replacement and culvert replacement are the two items driving the costs.

What does the U.S. Forest Service call a road?

In the Forest Service Manual a road is defined as a motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified or temporary.

- Classified Roads are roads wholly or partially within or adjacent to National Forest System (NFS) lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, NFS roads and other roads authorized by the Forest Service.
- Unclassified Roads are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.
- Temporary Roads are authorized by contract, permit, lease, or other written authorization not intended to be a part of the forest transportation system and not necessary for long-term resource management.

Within the category of classified roads the Forest Service has developed and implemented a system which classifies each road based on its intended purpose and access management objective. Each road is assigned a Road Management Objective which defines design, operation and maintenance criteria. Road Management Objective Classes are defined in the following table:

Table 43. Road Management Objectives Summary

Road Management Objectives Summary

RMO Class	Description	Design Criteria						Maintenance Direction	Management Direction	Access Management	Wildlife Objective	Timber Objective	Recreation Objective
		Sufacing	Lanes	Normal Drainage	Maint Level	Speed	ADT						
D-0	Road in Storage	Dirt, Native	1	Outslope Dips	1	0	0	Pull culverts at live stream crossings. Use dips in lieu of culverts for cross drainage. Outslope road. Provide no maintenance except to prevent unacceptable environmental damage. Allow woody vegetation to grow on road prism.	Roadway put to bed for future use. Compatible with Management Areas 3B, 4A, 4D, 5, 6, 10. By exception compatible with Areas 4C.	Physically close. Eliminate and prohibit all motorized access.	None	Future access for timber harvesting.	None
D-1	Linear Wildlife Opening	Dirt, Seeded	1	Outslope Dips	2	0	<1	Maintain as Linear Wildlife Opening. Mow roadbed annually. Brush shoulders once every 3 years. Maintain turnarounds suitable for fire equipment at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs.	Scarify, seed, and fertilize roadbed. Provide access for future timber operations and for fire protection. Compatible with Management Areas 3B, 4A, 4C, 4D, 14 15 and 17. By exception compatible with Area 5.	Closed with a gate or other structure. Allow occasional access for mowing operations and administrative use and fire protection.	Create and maintain as wildlife habitat.	Future access for timber harvesting.	Discourage non-motorized use but do not prohibit.
D-5	Linear Wildlife Opening (hiking only)	Dirt, Seeded	1	Outslope Dips	2	0	<1	Maintain as Linear Wildlife Opening. Mow roadbed annually. Brush shoulders once every 3 years. Maintain turnarounds suitable for fire equipment at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs.	Scarify, seed, and fertilize roadbed. Provide access for future timber operations and for fire protection. Compatible with Management Areas 3B, 4A, 4C, 4D, 14 15 and 17. By exception compatible with Area 5.	Closed with a gate or other structure. Allow occasional access for mowing operations and administrative use and fire protection.	Create and maintain as wildlife habitat.	Future access for timber harvesting.	Prohibit bikes and horse traffic.
D-2	Open 4-wheel driveway	Dirt, Rutted	1	Outslope Dips	2	0-5	1-5	Maintain drainage and silt traps to minimize environmental damage. Maintain road prism only to the extent to provide passage for high clearance vehicles. Brush once every 3 years. Install and maintain route markers, warning, regulatory, and quide signs.	Use to provide a 4-WD experience. Compatible with Management Areas 1B, 2A, 2C. By exception compatible with Areas 3B and 4A.	Leave open for high clearance vehicles	Encourage use for hunting and/or fishing.	No commercial timber harvest.	Encourage 4 WD vehicle use.
D-3	Restricted Low Standard Timber Haul Road	Spot gravel	1	Outslope Dips Silt Traps	1	0-5	1-5	Blade every two years. Mow cut and fill slopes once every 3 years. Maintain drainage. Maintain turnarounds suitable for fire equipment at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs.	Use as 2-WD access for timber harvesting and fire protection. Compatible with Management Areas 3B, 4A, 4D, 11,14,15, and 17. By exception compatible with Areas 1B, 13.	Closed with a gate or other structure. Restricted most of the year. Access can be allowed seasonally for hunting and other public/administrative activities and fire protection..	Access route for wildlife habitat management.	Provide and maintain as access route for timber harvesting and treatments. Entry once each decade.	Encourage non-motorized use such as hiking, biking, and horseback riding.
D-4	Restricted High Clearance Vehicle Road	Dirt, Rutted	1	Outslope Dips	2	0-5	1-5	Maintain drainage and silt traps to minimize environmental damage. Brush once every 3 years.	Use only for high clearance vehicle access for limited, administrative use and/or rescue operations. By exception compatible with most management areas except 7.	Closed with a gate.	Access route for wildlife habitat management.	No commercial timber harvest.	Accept non-motorized use such as hiking, biking, and horseback riding, but do not encourage.
C-1	Seasonal Low Speed single-lane gravel road	Light Gravel 2"	1 w/ turnouts	Culverts Ditches	3	15-25	3-5	Blade once a year. Brush once every 3 years. Maintain shoulders and drainage. Maintain drainage. Maintain turnarounds suitable for fire equipment at the end of dead-end roads. Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees.	Use as 2-WD access for administrative, timber harvesting and fire protection. Compatible with Management Areas 1B, 4A. By exception compatible with Areas 3B.	Gated but seasonally open. Available for administrative duties and fire protection.	Seasonally open for hunting. Access route for wildlife habitat management.	Provide and maintain as access route for timber harvesting and treatments. Entry once each decade.	Accept non-motorized use such as hiking, biking, and horseback riding, but do not encourage.

C-2	Restricted Low Speed single-lane gravel road	Mod Gravel 4"	1 w/ turnouts	Outslope Dips Silt Traps	3	20-30	5-10	Blade every two years. Brush once every 3 years. Maintain shoulders and drainage. Maintain turnarounds at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter.	Use as 2-WD access for timber harvesting and fire protection. Compatible with Management Areas 13, 15, and 17. By exception compatible with Areas 2A, 2C, and 4C.	Closed with a gate. Restricted most of the year. Access allowed for administrative activities and fire protection.	None	Provide and maintain as access route for timber harvesting and treatments. Entry twice each decade.	Encourage non-motorized use such as hiking, biking, and horseback riding.
C-3	Low Speed single-lane gravel road	Mod Gravel 4"	1 w/ turnouts	Culverts Ditches	3	30-45	5-15	Blade twice a year. Brush once every 2 years. Maintain shoulders and drainage. Maintain drainage. Maintain turnarounds suitable for fire equipment at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter.	Use as 2-WD access for timber harvesting and fire protection. Compatible with Management Areas 1B, 2A, 2C, and 9. By exception compatible with Areas 14.	Open to all traffic.	None	Provide and maintain as access route for timber harvesting and treatments. Entry twice each decade.	Encourage motorized use.
B-1	Open Moderate Speed single-lane gravel road	Gravel 6"	1.5	Culverts Ditches	4	20-40	25-100	Blade three times a year. Brush to maintain site distance (minimum once every two years). Maintain shoulders and drainage. Maintain drainage. Maintain turnarounds suitable for fire equipment at the end of dead-end roads.Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter.	Provide safe travelway for passenger cars and trucks. Moderate use (25-100 ADT). Design speed between 20-40 mph. Single lane with intervisible turnouts and widespots for passing. Compatible with Management Areas 2A, 2C, 9. By exception compatible with Areas 14.	Open to all traffic.	None	Provide and maintain as year round access for timber harvesting and treatments.	Provide for moderate degree of user comfort and convenience.
B-2	Open High Speed double-lane gravel road	Gravel 8"	2	Culverts Ditches	5	30-50	100-250	Blade four times a year. Brush to maintain site distance (minimum once every two years). Maintain shoulders and drainage. Maintain drainage. Maintain turnarounds suitable for fire equipment at the end of dead-end roads. Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter.	Provide safe travelway for passenger cars and trucks.. High use (100-250 ADT). Design speed between 30-50 mph. Double lane. Compatible with Management Areas 2A, 2C. By exception compatible with Areas 14.	Open to all traffic.	None	Provide and maintain as year round access for timber harvesting and treatments.	Provide for high degree of user comfort and convenience.
A-1	Restricted Developed Site Access Road	Paved	1 or 2	Culverts Ditches	5	20-30	25-75	Maintain paved surface. Maintain shoulders and drainage. Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter. Renew centerlines, edge stripes, and other pavement and curb markings.	Provide access to developed recreation and administrative sites. Compatible with Management Areas 9, 11, 12 and 16.	Open to all traffic. Gate used to close road when site is closed.	None	None	Provide for high degree of user comfort and convenience.
A-2	Open High Speed double-lane paved road	Paved	2	Culverts Ditches	5	50+	>250	Maintain paved surface. Maintain shoulders and drainage. Install and maintain route markers, warning, regulatory, and quide signs. Remove hazard trees and clean up litter. Renew centerlines, edge stripes, and other pavement and curb markings.	Provide safe travelway for all vehicles. Very High use (250+ ADT). Design speed between 30-50 mph. Double lane. Compatible with management areas 2A and 2C.	Open to all traffic.	None	Provide and maintain as access route for timber harvesting and treatments.	Provide for high degree of user comfort and convenience.

What is the current condition of the transportation system on the Nantahala and Pisgah National Forests and how is it managed?

The Nantahala and Pisgah NFs road system is managed using a Road Maintenance Management System. The Road Maintenance Management System provides a process to effectively and efficiently manage their road maintenance programs. This management includes setting priorities, planning, budgeting, scheduling, performing, monitoring, and evaluating maintenance of Forest roads.

Informing this Road Maintenance Management System are the Road Maintenance Levels that are assigned to each road. Maintenance levels are consistent with the RMOs and maintenance criteria. The factors considered in the selection of Road Maintenance Level are resource program needs, investment protection requirements, service life and operational status, user safety, composition and amount of traffic, surface type, speed, user comfort and convenience, functional classification, and traffic service level.

Maintenance Levels are as follows:

1. Intermittent service roads that are closed to vehicular traffic. Basic custodial maintenance is performed to prevent resource damage and to protect the investment.
2. Open for use by high-clearance vehicles.
3. Open for use by a prudent driver in a passenger car. Typically these roads are low speed single lane with turnouts and spot surfacing.
4. Open roads that provide a moderate degree of user comfort and convenience at moderate speeds. Most of these roads are double lane and aggregate surfaced.
5. Open roads that provide a high degree of comfort and convenience. Normally double lane and paved.

Approximately 2,246 miles of roads provide access to Nantahala and Pisgah NFs. Of these, 752 are open for public motor vehicles part or all year, including roads open seasonally for hunting. The remaining 1,494 miles are not open to public motor vehicles, but are available for non-motorized access to the forest (walking, etc.) and are available for purposes such as forest management and fire control (Maintenance Levels 1 or 2).

Table 44. Miles of Road per District

	Miles of Road					
District	**ML-5**	**ML-4**	**ML-3**	**ML-2**	**ML-1**	**Total**
Appalachian	2	18	76	143	62	301
Cheoah	5	24	58	202	70	359
Grandfather	7	30	80	139	44	300
Nantahala	82	42	113	307	210	754
Pisgah	18	28	81	84	71	282
Toecane	2	11	24	50	18	105
Tusquitee	6	35	97	98	64	300
Totals	**120**	**177**	**505**	**973**	**521**	**2296**

The Forest Service uses a database known as INFRA as an integrated data management tool to manage and report accurate information and associated financial data on the inventory of infrastructure including roads, bridges and many other aspects of land management.

Also informing the Road Maintenance Management System are condition surveys that are performed to determine existing road conditions. Maintenance prescriptions are then developed to address deficiencies identified in the surveys. These prescriptions are prioritized and then these maintenance prescriptions are combined to develop the annual Forest Road Maintenance Plan.

The plan is further modified to meet any limitations due to the availability of funding for maintenance activities.

To meet available funding resources these plans may be altered by deferring maintenance, implementing closures, restricting traffic, and reducing the frequency of maintenance operations. Some roads may be allowed to disinvest to allow uncompensated deterioration of assets gradually.

What informs decisions regarding whether roads are open, closed, or seasonally open?

Every segment of Forest Service System Road is designated with a Road Maintenance Objectives that dictates each road's status (open/closed). In order to implement any action that would change the road system operation, the proposed change must first be approved in a formal decision. Transportation analysis is the process that informs these decisions.

The objective of transportation analysis is to identify facilities needed to efficiently achieve Forest land and resource management direction while minimizing costs and environmental impacts. A number of resources are available to aid in the planning of the transportation system.

The Roads Analysis Process conducted in 2003 analyzed open (Maintenance Levels 3, 4 and 5) roads. It identified problem areas, opportunities to improve the road system, the ability of the road system to accommodate present and future traffic volumes, and the values and risks of the open road system.

What are anticipated funding levels for maintenance and development of the road system? What opportunities are available to accomplish transportation maintenance and development?

As noted in the 2003 RAP, "A continuous decrease in the amount of funds available for reconstruction of the collector and arterial roads, the backbone of the Forest Service system, has occurred as purchaser credit has decreased. The result is a continuous and significant increase in deferred maintenance backlog."

Maintenance of the road system is an annual line item in the Forest Service's budgets. Traditionally, maintenance of the road system is accomplished using project monies or receipts from the sale of Forest Service Timber. Some programs that provide auxiliary funding and are coordinated through the Region include Forest Highways, Public Lands Highways, Federal Aid Routes, and Emergency Relief-Federally Owned.

Maintenance Sharing is an option for sharing financial responsibility for maintaining Forest roads with cooperators, local governments or users.

Where applicable, Cooperative Agreements may alleviate some of the costs for the management of Forest Service roads. Cooperative Agreements are used to define the responsibilities of a cooperator or commercial hauler on a Forest Service road.

Current trends in funding and in the cost of maintenance indicate that transportation budgets will continue to be insufficient to meet road maintenance and repair needs on the Forests. In order to provide a safe road system that minimizes environmental impacts, new sources of funding must be identified or maintenance required must be diminished either by reducing mileage or reducing maintenance levels.

To what degree does the current transportation system meet the direction in the current plan?

The 1987 Plan provides guidance for what types of roads are acceptable in the various management areas as well as road densities.

The Forest Plan provides direction on the following:

- Proportion of arterial, collector and local roads
- Density of roads
- Road closures and road use restrictions
- Management of access
- Development of schedules for transportation schedules
- Management of OHV use
- Resolution of resource management issues

The Plan also provides design and maintenance guidelines. The following table displays requirements set forth in the plan to guide road management in the various areas.

Table 45. Management Area Direction – 1987 Plan

MA	Most Applicable RMOs	By exception RMOs	Restrictions on Collector, and TSL C roads *(all Arterial roads are open)*	Restrictions on TSL D roads	Recreation use.	Resource Emphasis	Open Road Density
1B	D2, C1, C3	D3, D4	Open, except for seasonal closures. Maintain at level 3 or greater. Sign all routes.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Motorized Recreation Use including passenger cars and four-wheel-drive ways.	High yield Timber	2.00 miles / sq mile
2A	D2, C3, B1, B2, A2	D4, C2	Open, except for seasonal closures. Maintain at level 3 or greater. Sign all routes.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Motorized Recreation Use including passenger cars and four-wheel-drive ways.	Motorized Recreation Use and Timber	2.00 miles / sq mile
2C	D2, C3, B1, B2, A2	D4, C2	Open, except for seasonal closures. Maintain at level 3 or greater. Sign all routes.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Motorized Recreation Use including passenger cars and four-wheel-drive ways.	Motorized Recreation Use. Not suitable for Timber.	2.00 miles / sq mile
3B	D0, D1	D2, D4, C1	Seed closed roads to provide linear wildlife strips.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Provide access for timber. Provide for wildlife habitat.	Timber, Linear wildlife openings	0.50 miles / sq mile
4A	D0, D1, D3, C1	D2, D4	Closed. Maintain at level 3 or greater. Sign all routes.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Emphasize non-motorized use. Provide limited access for motorized vehicles.	Non-motorized Recreation Use and wildlife	0.25 miles / sq mile
4C	D1	D0, D4, C2	Closed. Maintain at level 3 or greater. Sign all routes.	Close to Public Use except designated ORV routes. Maintain at level 2 or greater. Sign all routes.	Provide limited access for motorized vehicles.	Non-motorized Recreation Use and wildlife. Not suitable for Timber.	0.25 miles / sq mile
4D	D0, D1, D3,	C1, D4	Closed. Maintain at level 3 or greater. Sign all routes.	Close to Public. Maintain at level 2 or greater.	Emphasize non-motorized use.	High quality wildlife habitat.	0.00 miles / sq mile
5	D0	D1, D4	Closed. Maintain at level 1.	Closed. Maintain at level 1.	Emphasize semi-primitive non-motorized use.	Emphasize semi-primitive non-motorized use.	0.00 miles / sq mile
6	D0	D4	No roads	No roads	Wilderness Study Area	Manage as Wilderness until congress designates.	0.00 miles / sq mile
7	No roads	No roads	No roads	No roads	Wilderness	Protect Wilderness	0.00 miles / sq mile
8	ALL		As determined by research objectives.	As determined by research objectives.	Trails and Dispersed Rec.	Meet Research Objectives	As determined by research objectives.

Management Area Direction – 1987 Plan

9	C3,B1,A1	D4	Open, except for seasonal closures. Maintain at level 3 or greater. Sign all routes.	No roads	Allow no ORV use within area	Manage to achieve a natural setting on Roan Mountain.	
10	D0	D4	No roads	No roads	Allow no ORV use within area	Research in RNAs	0.00 miles / sq mile
11	D3, A1	D4	Open, except for seasonal closures. Maintain at level 3 or greater.	No roads	Allow no ORV use within area	Cradle of Forestry	
12	A1	D4	Open, except for seasonal closures. Maintain at level 4 or greater. Sign all routes.	No roads	Design all roads for all-weather use and high traffic volume.	Developed Recreation	
13	C2	D3, D4	Restricted use. Maintain at level 3 or greater. Sign all routes.	Closed. Maintain at level 1.	Emphasize non-motorized use. Provide limited access for motorized vehicles. Allow no ORV use within area	Access to unique areas.	
14	D1, D3	D4, C3, B1, B2	Closed except where crossing trail. Maintain at level 3 or greater. Sign all routes.	Closed. Maintain at level 1.	Emphasize non-motorized use.	Appalachian Trail	Minimize roads within 1/2 mile of trail.
15	D1, D3, C2	D4	Closed. Maintain at level 3 or greater. Sign all routes.	Closed. Maintain at level 1.	Semi-primitive, non-motorized use.	Manage Wild and Scenic Rivers	
16	A1	D4	Open. Maintain at level 4 or greater.	No roads	Allow no ORV use within area	Provide Access to Administrative Sites	
17	D1, D3, C2	D4	Provide limited seasonal access	Provide limited seasonal access	Emphasize non-motorized	Maintain or Improve Mountain Balds	
18	ALL	D4	Manage roads according to adjacent Management Area	Manage roads according to adjacent Management Area	Emphasize non-motorized	Enhance Riparian Values	

The following table was prepared with the 2003 RAP to illustrate the compliance with the road density requirements of Management Areas 1-7.

Table 46. Open Road Density by Management Area

Management Area ⟶ **(desired road miles per sq. mile)**	**MA1** **(2)**	**MA2** **(2)**	**MA3** **(0.5)**	**MA4** **(0.25)**	**MA5,6,7** **(0)**
% of acres at or below the desired open road density	79%	60%	49%	23%	41%
% of acres one density category higher than desired	21%	40%	30%	34%	53%
% of acres greater than one density categories higher than desired	n.a	n.a.	21%	43%	6%

The design requirements of the 1987 Plan are met with new road construction, however, legacy roads often exist outside these allowances and as a result are challenging to maintain. The 1987 Plan also states that roads must be maintained "to accommodate the intended use and to protect resources." Meeting this requirement is problematic with the current roads budget. This issue is further compounded by the road maintenance that has been deferred in the past.

Areas of Tribal Importance

Key questions addressed in this Section:

- What Indian Tribes are associated with the plan area?
- Are there existing tribal rights, including those involving hunting, fishing, gathering, and protecting cultural and spiritual sites?
- What areas of known tribal importance, including Traditional Cultural Places (TCPs), Sacred Sites or Sacred Places, are in the plan area or affected by management of the plan area? How are these areas currently managed; what are the existing standards and guidelines?
- What resources are traditionally and culturally important to the Tribes?
- What project activities are of concern to Tribes in areas of Tribal importance?
- For areas culturally sensitive to an Indian Tribe or Tribes, how is confidentiality protected as required by 36 CFR 219.1(e)?
- What Agreements or Memoranda of Understanding setting forth processes for consultation and project review exist for the plan area?

What Indian Tribes are associated with the plan area?

American Indian Tribes associated with the plan area include federally recognized Indian tribes with historic ties and interests in the management of the Nantahala and Pisgah NFs, as well as those with knowledge concerning cultural resources. These Tribes are consulted and often partners in the cultural resource program. These include the Eastern Band of Cherokee Indians (Cherokee, NC), their Qualla Boundary adjacent to the Nantahala NF, along with interspersed Tribal land parcels surrounded by NF system lands. There are more than 20 miles of EBCI and Forest Service shared property lines. The EBCI has more than 56,000 acres of land in six counties (Clay, Cherokee, Graham, Haywood, Jackson, and Swain) of the 18 in the planning area. The Cherokee Nation (Talequah, OK) and the United Keetoowah Band of Cherokee (Talequah, OK) are the two other Federally recognized sovereign Cherokee tribes involved. Prior to European and American settlement, the lands presently included in the Nantahala and Pisgah NFs were part of the Cherokee Territory and homelands. Over time, these lands were ceded to the United States of America under several land cession treaties. The Catawba Indian Nation (Rock Hill, SC) has ties to the lands comprising the Grandfather Ranger District. The Muscogee Creek Nation (Okmulgee, OK) and Kialegee Town Creek (Wetumka, OK) have interests in the present Nantahala NF. The Shawnee Tribe (Miami, OK) has expressed interest in management of the Pisgah and Nantahala NFs as well.

Are there existing tribal rights, including those involving hunting, fishing, gathering, and protecting cultural and spiritual sites?

There are no existing applicable American Indian Treaty rights in the Plan area. Tribal rights based upon federal laws and regulations do exist pertaining to the above activities and areas.

What areas of known tribal importance, including Traditional Cultural Places (TCPs), Sacred Sites or Sacred Places, are in the plan area or affected by management of the plan area? How are these areas currently managed, what are the existing standards and guidelines?

Table 49 includes the 1987 Forest Plan, Cultural Resources Management Forest-wide Direction and the current existing standards and guidelines.

To date more than 75 locations of TCPs, SSs, and areas with historic ties to the EBCI and other Cherokee Tribes have been identified. At least 15 of these are located on the Pisgah NF while the remaining are located on the Nantahala NF. These areas range in size/acreage from individual locations of a couple of acres to areas encompassing several thousands of acres. Presently they are defined within existing management areas as well as crossing management areas. They are managed as special areas, requiring close, formal consultation with Tribes concerning proposed activities and some require preservation and total avoidance from activities.

Sacred Sites and Places (SSs): Executive Order (EO) 13007 defines a "sacred site" as". . . 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 has informed the agency of the existence of such a site." Sacred Places may include any specific location on NFS lands, whether site, feature, or landscape, that is identified by an Indian tribe, or the religious societies, groups, clans, or practitioners of an Indian tribe, as having historically important spiritual and cultural significance to that entity, greater than the surrounding area itself. Sacred places may include but are not limited to geological features; bodies of water; burial places; traditional cultural places; biological communities; stone and earth structures; and cultural landscapes uniquely connecting historically important cultural sites; or features in any manner meaningful to the identifying tribe (USDA Forest Service 2012). Identified SSs are currently managed to preserve and protect their significant characteristics. Numbers, kinds, and locations of SSs are kept confidential to protect them.

Sacred sites are designated by an Indian Tribe or Indian individual determined to be an appropriate authoritative representative of an Indian religion. The FS does not make this determination or have to approve this determination. Many miles of historic routes used and related to the Cherokee Tribes are documented to have crossed the Forests (Marshall 2011; EBCI 2013). The condition of portions have been documented but not yet evaluated for significance. Important archeological sites and Cherokee historic sites have been tied to these routes. Some of these sites may be on NF lands.

What resources are traditionally and culturally important to the Tribes?

The South Atlantic Landscape Conservation Cooperative (SALCC/NPS) (2013) recently completed their Engaging the Cultural Resource Community Session. Its Mission: Create a shared blueprint for landscape conservation actions that sustain natural and cultural resources (Cakir, personal communication 2013). Meeting with the Catawba, it was shared that "today, the river remains central to Catawba life, but is also a source of deep concern as development, agriculture, and timber practices have impaired the quality of the water with too many nutrients, little dissolved oxygen, coliform, sedimentation, and mercury". For further information see the following website: http://www.catawbariverkeeper.org/News/waterqualityfacts.

Important Cultural Landscapes were [identified]: [These included] Rural Farms, Rice Fields, Battlefields, Longleaf Pine. Natural

Resources for living cultures [included]: Clean Water, Longleaf, Sweetgrass, Clay, Shellfish and Huntable Species. These traditional and culturally important resources mirror those of the Cherokee, with differences in particular species. River cane and white oak are two of the many species important to the Cherokee and tribal members are also interested in areas that contain clay. The *Multiple Uses* section of this document contains a current list of edible, medicinal and craft species used by the Cherokee. Landscapes, topographic, and geological features, including waterfalls and mountain peaks, are often areas associated with Tribal history, traditions, and cultural connections.

What project activities are of concern to Tribes in areas of Tribal importance?

All activities that have potential to affect Tribal traditional and special areas, species and activities are of concern. Timber harvest, road construction or reconstruction, and increased access have the potential to adversely impact these areas. Harvest may be beneficial in some areas, especially when it promotes traditional species or reduces invasive species. Similarly, prescribed burning can be beneficial. Herbicide use is most often a concern and considered negative. Activities and use that decrease solitude often cause conflicts with traditional practices in areas. All activities that have the potential to adversely impact archeological sites are of concern.

How is confidentiality of culturally sensitive information to an Indian Tribe or Tribes as required by 36 CFR 219.1(e) protected?

Culturally sensitive information is not released to the public nor made available throughout the agency. Locational information is not put in public files. Data bases have restricted access to protect this data.

What Agreements or Memoranda of Understanding setting forth processes for consultation and project review exist for the plan area?

The Forest Service's NFsNC is a party to and signatory of the currently expired R8 MOU with the EBCI for Tribal Consultation and Government-to-Government relations. The Programmatic Agreement Between Tribes, the ACHP, the NC SHPO and the NFsNC for Section 106 Compliance (2009) sets forth the process for project reviews.

There is also an MOU among the USDOD, USDOI, USDA, USDOE, and the ACHP regarding interagency coordination and collaboration for the protection on Indian Scared Sites (USDA Forest Service 2012a).

Cultural and Historic Resources and Uses

Key questions addressed in this Section:

- What is the cultural and historic context for the plan area?
- How is the significance of a cultural resource determined?
- What types and how many cultural and historic resources are present in the plan area?
- What trends affect the condition of or the demand for cultural and historic resources or cultural uses?
- What is the condition of all known cultural and historic resources, including historic properties in the plan area identified as eligible or listed in the National Register of Historic Places and designated traditional cultural properties?
- How many Archeological Resources Protection Act (ARPA) violations have there been in the plan area? What is done to stop these impacts?

What is the cultural and historic context for the plan area?

Our history and the land's history are resources that must be understood and taken into account in order to make decisions that prove beneficial for the present and the future. Based upon current data in the National Resources Manager (NRM) database [the NRM includes: *Forest Service ACtivity Tracking System (FACTS)*, *Infrastructure (Infra)*, *Natural Resource Information System (NRIS)*, and *Timber Information Manager (TIM)*] the Nantahala and Pisgah NFs currently have 3,615 recorded cultural resources, prehistoric and historic archeological sites, historic structures, cemeteries, and other traditional cultural properties. These cultural resources were located during inventories of 85,628.18 acres and averaged one site recorded in every 23.7 acres surveyed.

Federally recognized Indian tribes with historic ties and interests in the management of the Nantahala and Pisgah NFs, as well as with knowledge concerning cultural resources, are consulted and often partners in the cultural resource program. These include the Eastern Band of Cherokee Indians (EBCI; Cherokee, NC), located in the Qualla Boundary adjacent to the Nantahala NF, along with interspersed Tribal land parcels adjacent to and in some cases surrounded by NF system lands. There are more than 20 miles of EBCI and Forest Service shared property lines. The EBCI has more than 56,000 acres of land in six counties (Clay, Cherokee, Graham, Haywood, Jackson, and Swain) of the 18 counties in the planning area.

The Cherokee Nation (Talequah, OK) and the United Keetoowah Band of Cherokee (Talequah, OK) are the two other federally recognized sovereign Cherokee tribes involved. Prior to European and American settlement, the lands presently included in the Nantahala and Pisgah NFs were part of the Cherokee Territory and homelands. Over time, these lands were ceded to the United States of America under several land cession treaties. The Catawba Indian Nation (Rock Hill, SC) has ties to the lands comprising the Grandfather Ranger District. The Muscogee Creek Nation (Okmulgee, OK) and Kialegee Town Creek (Wetumka, OK) have interests in the present Nantahala NF. The Shawnee Tribe (Miami, OK) has expressed interest in management of the Nantahala and Pisgah NFs as well.

This assessment attempts to summarize all available information concerning cultural resources on the Nantahala and Pisgah NFs. This data comes from inventory and survey reports; site forms; the computerized infrastructure site database (USDA Forest Service 2013); Geographic Information System (GIS) data layers; annual

site monitoring reports; site excavations and evaluations; cultural resource responses to wildfires and other emergency incidents; as well as existing summaries; and other professional publications.

How is the significance of a cultural resource determined?

All cultural resources are important. Site locations alone help understand and predict human land uses over time. However, given their current conditions and similarities, not all cultural resources are managed as significant, or as eligible for listing in the Heritage Resources Management Programs (HRMP). The NRHP was enacted as part of the National Historic Preservation Act of 1966 (NHPA). Four criteria are used to determine eligibility to the NRHP: a) properties that are associated with events that have made a significant contribution to the broad patterns of our history; or b) properties that are associated with the lives of persons significant in our past; or c) properties that embody the distinctive characteristics of a type, period, or method of construction; or that represent the work of a master; or that possess high artistic values; or that represent a significant and distinguishable entity whose components may lack individual distinction; or d) properties that have yielded, or may be likely to yield, information important in prehistory or history. For further information see http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15.pdf.

The determination of a site's significance is made in consultation with the President's Advisory Council on Historic Preservation (ACHP), the NC State Historic Preservation Officer (SHPO) and Federally Recognized Tribes. The Nantahala and Pisgah NFs have in place a Memorandum of Agreement with the ACHP, NC SHPO, and Tribes which guides and streamlines the process for site eligibility determinations as well as other cultural resource management requirements. Historic contexts, similar to culture histories, are written to develop research questions or characteristics with which to evaluate a cultural resource's significance or eligibility to the NRHP.

What types and how many cultural and historic resources are present in the plan area?

Table 47. Sites, Acres Inventoried, and Site Density of Cultural Resources on the Nantahala and Pisgah NFs

Ranger District	Recorded Sites	Inventoried Acres	Site Density
Cheoah	410	13674.38	1 site / 33.4 acres
Nantahala	691	15056.54	1 site / 21.8 acres
Tusquitee	458	15832.89	1 site / 34.6 acres
Nantahala NF Totals:	***1559***	***44563.81***	***1 site / 28.6 acres***
Appalachian	552	13255.5	1 site / 27.7 acres
Grandfather	740	15621.61	1 site / 21.1 acres
Pisgah	764	12187.26	1 site / 16.0 acres
Pisgah NF Totals:	***2056***	***41064.37***	***1 site / 20.0 acres***
Nantahala and Pisgah NFs Totals:	**3615**	**85628.18**	**1 site / 23.7 acres**

The 1987 land management plan was written prior to the implementation of the Forest Service's National Heritage Strategy for the management of cultural resources. The three principal goals of the strategy are to protect significant cultural resources, to share their values with the American people, and to contribute relevant information and perspectives to natural resource management. The strategy gives specific direction for forest land management planning including the development of goals and objectives, standards and guidelines, management area direction, land suitability in light of cultural resources, and cultural resource monitoring requirements.

Forest Service National Heritage Program standards instituted in 2011 assign annual targets and direct Forests to develop holistic cultural resources management programs which include cultural/historic overviews, surveys of areas expected to contain significant resources, nomination of significant sites to the National Register of Historic Places (NRHP) and NRHP evaluation of previously located sites, site monitoring, stewardship activities inclusive of protection and preservation of Priority Heritage Assets, volunteer and scientific research opportunities and public interpretation. These activities are meant to be in addition to project analysis and compliance work required by Section 106 of the 1966 National Historic Preservation Act (NHPA) and the 1969 National Environmental Policy Act (NEPA).

Priority Heritage Assets (PHAs) are those heritage assets or cultural resources of distinct public value that are or should be actively maintained and meet one or more of the following criteria:

1) The significance and management priority of the property is recognized through an official designation; e.g. listing on the National Register of Historic Places, State Register, etc.
2) The significance and management priority of the property is recognized through prior investment in preservation, interpretation, and use.
3) The significance and management priority of the property is recognized in an agency-approved management plan.
4) The property exhibits critical deferred maintenance needs, and those needs have been documented. Critical deferred maintenance is defined as a potential health or safety risk, or imminent threat of loss of significant resource values.

The following table shows the PHAs by Forest and Ranger District and the associated deferred maintenance costs. Twenty-one (21) PHAs currently exist on the Nantahala NF with a backlog of maintenance needs that totals $142,650. Similarly, on the Pisgah NF there are currently 31 PHAs with a backlog of $266,600 in maintenance needs.

Table 48. Priority Heritage Assets (PHAs) and Deferred Maintenance Costs

Forest and Ranger District	Number of PHAs	Deferred Maintenance Costs ($)
Nantahala NF		
Cheoah	5	57,000
Nantahala	7	42,750
Tusquitee	9	42,900
Total – Nantahala NF	*21*	*142,650*
Pisgah NF		
Appalachian	11	95,700
Grandfather	8	61,000
Pisgah	12	109,900
Total – Pisgah NF	*31*	*266,600*
Grand Total	***52***	***409,250***

The unique and diverse environments of the southeastern United States and the Southern Appalachian Nantahala and Pisgah NFs affected human behavior and have been influenced by humans for more than 10,000 years. Some current archeological research has proposed pushing back the time of humans in the area to 20,000 years ago. Archeological sites contain invaluable information and they are a record of human use as well as environmental data including vegetation, animal species, and climate.

Cultural resources include the artifacts, archeological sites, and built environments created by past inhabitants, our ancestors, and those areas used or affected by them with their ways of life. In order to effectively identify, consider, and manage the multitude of these resources including traditions, folkways and beliefs, Traditional Cultural Properties (TCPs), and American Indian

Sacred Sites (SS); the Forest Service has developed Heritage Resources Management Programs (HRMP). The HRMP on the National Forests in North Carolina (NFsNC) which includes the Nantahala and Pisgah NFs strives to provide the link between past and present cultures; to expand knowledge and understanding of the past; to share the cultural and archeological resources with the public; to actively care for the resources; to participate in ecosystem management; and to support on-the-ground project management activities.

The Heritage Program and Tribal Relations Programs are currently directed and guided by the existing Nantahala and Pisgah NFs Forest Plan. Following are the current Forest-wide General Direction and Standards.

Table 49. Cultural Resources Management Forest-wide Direction – 1987 Nantahala and Pisgah NFs LRMP

General Direction	Standards
1. Protect cultural resources by: - Completing cultural resource inventories prior to ground disturbing or land transfer projects; - Avoiding disturbance of known cultural resources until evaluated and declared not significant; - Prescribing and implementing necessary mitigation measures if site disturbance is necessary; - Issuing antiquities permits to qualified academic institutions, other organizations, or individuals for the study and research of sites; - Protecting appropriate cultural resource properties for ceremonial and religious purposes by Native Americans; and - Maintaining appropriate confidentiality of sites.	a. Consult with Native Americans as appropriate to identify and determine the significance of sites. Contact the tribal councils of the Cherokee Nation, members of the Native American traditional community, and other interested and knowledgeable parties. b. Consult with appropriate parties (above) to agree upon measures needed to mitigate potential adverse effects prior to conducting or permitting testing or excavation at identified sites. c. Allow no activities that would be damaging to identified Native American Religious sites. d. Maintain confidentiality of cultural resources, including Native American Religious sites, as exempted from the Freedom of Information Act. Do not show locations in public documents unless agreed upon by all parties.
2. Manage to eliminate conflicts between Native American traditional and religious ceremonies and other Forest uses.	a. Allow access by Native Americans to sites to conduct or practice traditional and religious ceremonies, fasting, sweat lodge ceremonies, and other appropriate activities. b. Permit Forest use on a case-by-case basis for Native American traditional and religious activity in areas that would otherwise be closed to public access.
3. Foster public use and enjoyment of cultural resources through interpretation or development of suitable sites.	
4. Nominate significant cultural resources to the National Register of Historic Places.	
5. Protect all cultural resources which are listed on or eligible for the National Register of Historic Places or the National Register of Historic Landmarks.	
6. Ensure that all land use permits, contracts, and other Forest use authorizations contain adequate stipulations and clauses for protection of significant cultural resources.	a. Restrict minerals activity at Native American Religious Sites. Allow no surface occupancy. Require mitigation of significant archeological sites prior to any impact.
7. Consult with other Federal agencies, State Historic Preservation Officer, and Native Americans for survey, evaluation, and protection needs.	

Currently, cultural resources and tribal areas are imbedded in other existing Management Areas, yet, existing Forest-wide standards and guidelines provide for their protection and preservation. The exception is the Cradle of Forestry, current Management Area 11. Other federal laws and regulations prompt compatible and coordinated management of cultural resources located on NFS lands that may qualify for special designation. Current

designations that affect sites and areas on the Nantahala and Pisgah NFs include the following:

Congressionally designated National Heritage Areas (NHAs): NHAs are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. The Blue Ridge National Heritage Area is made up of the 25 western counties of North Carolina, including the 18 that contain the Nantahala and Pisgah NFs.

Congressionally designated National Historic Sites (NHSs): The Cradle of Forestry on the Pisgah NF in Transylvania County was designated in 1964 and is also known as the birthplace of American Forestry. The 6,500 acres were set aside by Congress to commemorate the beginning of forestry conservation in the United States and to promote public education and interpretation as well as for its historic preservation.

Congressionally designated National Historic Trails (NHTs): NHTs are administered by the National Park Service (NPS) in conjunction with various partners including other NPS sites, the Forest Service, state parks, non-profits, and private landowners. The 330 mile long American Revolution Overmountain Victory Trail (OMVT) crosses 7.64 miles (in 4 sections) of the Appalachian and Grandfather Ranger Districts on the Pisgah NF. The OMVT travels through four states, Virginia, Tennessee, North Carolina, and South Carolina.

Originally established in 1987 and later extended by Congress in 2008 to include portions in North Carolina, the Trail of Tears (ToT) is 5,045 miles long. The Trail of Tears National Historic Trail commemorates the removal of the Cherokee and the paths that 17 Cherokee detachments followed westward in 1838-1839. Seventeen individual sections of the ToT, totaling 24.09 miles, are located on the Nantahala, Cheoah, and Tusquitee Ranger Districts of the Nantahala NF.

Many miles of historic routes used and related to the Cherokee Tribes are documented to have crossed the Forests (EBCI 2013). The condition of portions have been documented but not yet evaluated for significance. Important archeological sites and Cherokee historic sites have been tied to these routes. Some of these sites may be on Forest Service lands.

National Register of Historic Places (NRHP) Properties and Districts: Prehistoric and historic archeological sites, and structures and objects, may be determined eligible for the NRHP. Of the currently recorded 3,615 cultural resources located on the Nantahala and Pisgah NFs, 238 have been determined eligible and are managed to preserve and protect their significant characteristics. Another 1,242 are unevaluated and also managed for preservation.

Traditional Cultural Properties (TCPs): "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. A traditional cultural property can be defined generally as one 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 (Parker and King 1998). TCPs may include locations, areas and properties, or sites as described above that have particular significance or importance to American Indian tribes. These may include gathering areas as well as cemeteries. TCPs are

administratively designated through formal Tribal and Forest Service consultation. Some may also be eligible to the NRHP. In addition to gathering areas and recorded cemeteries more than 10 locations are presently considered TCPs on the Pisgah NF while an additional 10 plus are located on the Nantahala NF. TCPs vary greatly in size, but are managed for protection and preservation of their significant characteristics.

Historic American Landscapes (HALs) are special places. The Historic American Landscapes Survey (HALS) mission is to record historic landscapes in the United States. The National Park Service oversees the daily operation of HALS and formulates policies, sets standards, and drafts procedural guidelines in consultation with the American Society of Landscape Architects (ASLA). They are important touchstones of national, regional, and local identity and they foster a sense of community and place. Historic landscapes are also fragile places which are affected by the forces of nature, commercial and residential development, and vandalism and neglect. They undergo changes that are often unpredictable and irreversible. For these reasons and for the benefit of future generations, it is important to document these places. Historic landscapes vary in size from small gardens to several thousand-acre national parks. In character they range from designed to vernacular, rural to urban, and agricultural to industrial spaces. Vegetable patches, estate gardens, cemeteries, farms, quarries, nuclear test sites, suburbs, and abandoned settlements all may be considered historic landscapes. For further information see http://www.nps.gov/history/hdp/hals/index.htm.

NFsNC program priorities have been to inventory and evaluate sites, as well as consider project effects on them in proposed project areas, to address site vandalism and looting incidents, to salvage sites impacted by flooding or erosion, to manage Traditional Cultural Properties and Sacred Sites, to maintain deteriorating structures, and to interpret sites for the public. These priorities enable the Nantahala and Pisgah NFs to inventory, evaluate, preserve, and enhance cultural resources. Inventory is the locating of cultural resources and evaluation is assessing site significance for eligibility to the National Register of Historic Places. Enhancement includes interpretation for the public, scientific research, and preservation for the future.

Table 50. Watersheds and Current Number of Cultural Resources on NFs

Watershed	Catawba	Watauga	French Broad	Chattooga	Little Tennessee	Hiawassee
*No. of Sites**	675	68	1363	32	1041	373

*Watersheds not identified for all sites in database at this time.

Table 51. Counties and Current Number of Cultural Resources

County	***Number of Sites***
Avery	68
Buncombe	130
Burke	253
Caldwell	287
Cherokee	267
Clay	106
Graham	398
Haywood	206
Henderson	47
Jackson	159
Macon	405
Madison	192
McDowell	135
Mitchell	65
Swain	79
Transylvania	631
Yancey	92

Pisgah National Forest

The Pisgah NF was the first National Forest in the eastern United States. The first tract of land purchased under the Weeks Act of 1911, the Curtis Creek Tract, is located on the Grandfather Ranger District near Old Fort, NC. The eastern portion of the Pisgah NF was originally established in 1920 as the Boone NF.

The Grandfather Ranger District, located at the western edge of the piedmont hills and within the Appalachian Summit, makes for rich and diverse eco-zones; used extensively and intensively during both prehistoric and historic times. Cultural resources on the ranger district include examples of all time periods. In addition, sites related to the Cherokee and Catawba Tribes have been documented here. Archeological investigations in proximity have evidence that some of the earliest Spanish contacts with tribes in the southeast occurred here. The National Historic Over Mountain Victory Trail, a revolutionary war trail, crosses the Grandfather Ranger District. Another historic route, Rutherford's Trace, also crossing the district, is being proposed as a NHT. NC's most western known goldmine is also on the Forest. The NRHP eligible and Civilian Conservation Corps (CCC) constructed Mortimer Work Center is on this ranger district. The Curtis Creek CCC Camp and the related Curtis Creek and Newberry Roads are NRHP eligible cultural resources on the district. Other minerals like soapstone and mica, used prehistorically and historically are found in the area. Illegal site looting and vandalism and unauthorized off highway vehicle (OHV) and motorcycle use are activities most adversely affecting significant cultural resources on the district.

Table 52. Cultural Resources on the Grandfather Ranger District

NRHP Eligibility	*Eligible*	*Not Eligible*	*Unevaluated*
Prehistoric Sites	18	457	172
Historic Sites	3	27	9
Multi-component Sites	6	25	24

The Pisgah Ranger District includes the Cradle of Forestry, the birthplace of American Forestry. It is a National Register of Historic Places listed site. In addition to many prehistoric sites, the Pisgah Ranger District includes early historic settlement sites. The District is crossed by the Gloucester Gap Road, an NRHP eligible transportation route. Early Federal conservation efforts by the Forest Service and CCC are evident throughout the Nantahala and Pisgah NFs. The first of 24 CCC Camps, Camp John Rock, is on the Pisgah Ranger District. The NRHP eligible Frying Pan fire lookout tower is on this district. The Appalachian Forest Experimental Station (Bent Creek Experimental Station) is another Pisgah Ranger District NRHP listed historic property. Several American Indian Traditional Cultural Properties and Sacred Sites are documented on the District.

Table 53. Cultural Resources on the Pisgah Ranger District

NRHP Eligibility	*Eligible*	*Not Eligible*	*Unevaluated*
Prehistoric Sites	45	446	142
Historic Sites	6	30	26
Multi-component Sites	16	39	54

The Appalachian Ranger District includes some of the rarest pictographs (prehistoric paintings) and highest elevation sites in western NC. Sources for material to make stone tools are unusually diverse in the area, including quartz and quartzite, as well as less available chalcedony, jasper and chert, which can be found nearby. The NRHP eligible Appalachian Trail crosses the Appalachian Ranger District and the Over Mountain Victory Trail also crosses

the district. Two NRHP eligible fire lookout towers, Green Knob and Rich Mountain, are also on the Appalachian Ranger District. The Cloudland Hotel, on Roan Mountain, was the first Victorian era resort in the region. Another NRHP eligible cultural resources is the CCC constructed French Broad Work center.

Table 54. Cultural Resources on the Appalachian Ranger District

NRHP Eligibility	*Eligible*	*Not Eligible*	*Unevaluated*
Prehistoric Sites	4	278	83
Historic Sites	6	47	17
Multi-component Sites	0	44	32

Nantahala National Forest

The Nantahala NF, established in 1920, is the western-most of the Nantahala and Pisgah NFs; however, its proximity to more and relatively larger rivers and valleys than found on the Pisgah NF made it a prehistoric and historic crossroad. The Eastern Band of Cherokee Indians Qualla Boundary is adjacent to the Nantahala NF and some present day Indian lands are within the forest. Many of the best known Indian "Mound Villages" are in close proximity to the Nantahala NF. These were visited and described by early explorers, including Spaniards and William Bartram. The Forest also contains more petroglyphs (rock carvings) than other areas of NC. The National Historic Trail of Tears (1838 Cherokee Removal) is located on the Cheoah, Nantahala, and Tusquitee Ranger Districts. The Forest also contains remnants of past logging camps and communities. Many significant cultural resources are located in proximity to the rivers on the Nantahala NF; however, many of these are now flooded by manmade lakes and reservoirs. Lowering lake levels erode sites and make them susceptible to adverse impacts from dispersed recreation use.

The Cheoah Ranger District is relatively steep when compared to the rest of the Nantahala NF. Valley bottoms are not as wide and drainages are often narrow and restricted. This topography lends itself to erosion; therefore some cultural resources have been buried and preserved by the moving soils. Other areas, less accessible to logging and other development, contain preserved sites as well. The Cherokee Indian Snowbird Community is within the district. The NRHP eligible Joanna Bald and Wachecha Bald fire lookout towers are also on the Cheoah Ranger District and the Appalachian Trail with several associated historic trail shelters crosses the district.

Figure 36. Appalachian Trail Shelter, before and after roof replacement, Cheoah RD

Table 55. Cultural Resources on the Cheoah Ranger District

NRHP Eligibility	Eligible	Not Eligible	Unevaluated
Prehistoric Sites	6	224	65
Historic Sites	7	38	24
Multi-component Sites	2	17	27

The Nantahala Ranger District includes the NRHP eligible 1916 Wilson Lick Ranger Station. In addition, the district has the Wayah Bald, Cowee Bald, and Albert Mountain fire lookouts. The Appalachian Trail with several associated historic trail shelters crosses the Nantahala Ranger District. The proposed National Historic Trail Rutherford's Trace, crosses the Nantahala Ranger

District. Nikwasi, an Indian mound and village, is located in Franklin. Recent development projects have required extensive archeological excavations in Macon County, documenting a very long prehistoric and historic Indian occupation. There are several American Indian Traditional Cultural Properties and Sacred Sites on the Nantahala Ranger District. A 13 year long Passport In Time (PIT) public archeology project at the Appletree Site documented human use of the area as early as the paleoindian period continuing through to present campers.

Table 56. Cultural Resources on the Nantahala Ranger District

NRHP Eligibility	**Eligible**	**Not Eligible**	**Unevaluated**
Prehistoric Sites	25	392	161
Historic Sites	5	35	34
Multi-component Sites	5	12	22

The Tusquitee Ranger District is in proximity to more documented Indian mounds and villages than any other ranger district in the Nantahala and Pisgah NFs. The district also has a higher density of prehistoric and historic sites in proximity to rivers, all very susceptible to adverse impacts from recreation uses and fluctuating water levels. In addition, the Trail of Tears crosses the Tusquitee Ranger District and the historic Unicoi Turnpike also crosses the district. Having relatively easy access, the Tusquitee which had been extensively logged and cut-over before being acquired by the Forest Service and many areas were badly eroded. The NRHP eligible Panther Top fire lookout is on the district and the NRHP eligible Perry Gap Road, also constructed by the CCC is here.

Table 57. Cultural Resources on the Tusquitee Ranger District

NRHP Eligibility:	**Eligible**	**Not Eligible**	**Unevaluated**
Prehistoric Sites	12	224	144
Historic Sites	4	37	15
Multi-component Sites	7	12	16

Contexts

Historic contexts, similar to culture histories, are written to develop research questions or characteristics with which to evaluate a cultural resource's significance or eligibility to the NRHP. Cultural resources are both prehistoric (before AD 1500) and historic (after the advent of written records and European contact). Many more prehistoric and historic artifacts and archeological sites, cultural resources, than presently recorded are likely located on the Nantahala and Pisgah NFs.

The cultural resources of the Forests include a diverse and unusually rich range of prehistoric and historic artifacts and sites. These include: 1) prehistoric campsites, villages, graves, stone quarries and workshops, trails, pictographs (painted) and petroglyphs (incised), and rock shelters; 2) American Indian sacred and traditional sites; 3) historic cabins, trails, mines, logging camps, railroad grades, farms and homesteads, mills, original highway grades, and cemeteries; 4) historic Forest Service structures, including guard stations, lookout towers, camps, administrative centers, and Civilian Conservation Corps-era campgrounds, roads, and buildings; and 5) historic landscapes. Many of these properties and areas are unique and provide the only and/or best preserved record of their former inhabitants and makers, ways of life, human behavior, adaptation and change in western NC.

Prehistoric inhabitants and occupations

The Nantahala and Pisgah NFs Plan Revision area and the Appalachian Mountain region, has been witness to a rich and diverse history of human occupation. Settlement pattern, resource utilization and land use has at times differed significantly from one group of occupants to the next. As for those prehistoric periods and phases which apply to the general project area, detailed

information regarding those peoples and cultures best associated with them is understandably of less volume than that which can be gathered for their historic descendants or replacements. Cultural resources documented on the Nantahala and Pisgah NFs and surrounding areas have provided evidence for each one of these periods and their related cultures, from the Paleoindian (ça. 12,000(+) to 8000 B.C.); the Archaic (ça. 8000 to 1000 B.C.); the Woodland (ça. 1000 B.C. to A.D. 1000); the Mississippian period (ça. A.D. 1000 to 1500); to the Protohistoric-Contact period (ça. A.D. 1500 to 1700). Table 59 summaries these major cultural/chronological periods. Although the exact separation of one cultural period or sub-phase from another is at times difficult to discern and to define, these cultural shifts have traditionally been measured by evidence of changes in lithic tool and ceramic vessel technologies. However, in more recent times, as questions of past lifeways and patterns in human behavior have become the stuff of modern research design, these cultural and temporal shifts have been measured by and analyzed with regard to changes in settlement and subsistence patterns, social and political organizations, environmental adaptations, and even mortuary practices. Thus, archeological research has progressed from its beginning stages where its emphasis was upon cultural chronology, intra and inter-site comparisons, to include more recently a focus upon much broader questions of past human experience.

Table 58.The Cultural Historical Sequence of the Appalachian Summit Region (after Shumate 2005, Purrington 1983, Ward & Davis 1999)

Modern Era	1900 AD - present
Post-Bellum Historic	1865 – 1900 AD
Euro/Anglo/African-American Antebellum Historic	1785 – 1865 AD
Colonial Historic	1492 -1785 AD
Late Mississippian	1700 – 1839 AD
Middle Mississippian	1500 – 1700 AD
Early Mississippian	1000 – 1500 AD
Late Woodland	600 – 1000 AD
Middle Woodland	200 BC – 600 AD
Early Woodland	1,000 - 200 BC
Late Archaic	3,000 – 1,000 BC
Middle Archaic	6,000 - 3,000 BC
Early Archaic	7,500-6,000 BC
Transitional Paleoindian	8,500 – 7,500 BC
Late Paleoindian	10,000 – 8,500 BC
Early Paleoindian	12,000 (+) – 10,000 BC

The earliest of these culture periods, the Paleoindian period, is known in this area of western NC from scattered surface finds of the distinctive fluted spear point associated with this archeological period. Small nomadic groups of people hunted large game during this time, moving from place to place in search of food. This period lasted from around 12,000 BC, or perhaps even earlier, until around 8000 BC.

Figure 37. Fluted spear point from Grandfather Ranger District

During the succeeding Archaic period, there is evidence of changing subsistence practices and settlement patterns. The Archaic period began during the warming related to the retreat of the glaciers, which had previously extended southward into what is now the eastern United States. It was at this time that weather conditions similar to those of modern times were established. The big game animals that the Paleoindians had hunted for food became extinct, and it was necessary for the prehistoric occupants of the area to exploit new sources of food. The Archaic period lasted for about 7,000 years. During that time, deer and small mammals became more important as food, and there was increasing emphasis on harvesting plant foods, such as nuts, berries, and seeds. The chronological and cultural complex known as the Archaic is by far the longest of those applied to the prehistoric period in the southeastern United States. In fact, given the developmental and environmental changes and the regional differences occurring during this 7,000 year period, most authorities accept the division of this larger time frame into three subunits commonly referred to as the Early, Middle, and Late Archaic. The Archaic period on the whole may be characterized as a time of gradual, and yet over time, dramatic change in the natural environment, which colored the response or affected the particular adaptations of the Native American population's then living within the Archaic of the Southeast. The Early Archaic period (ça. 8000-6000 B.C.) witnessed a shift from the former boreal forest environment to one of northern hardwoods, fostered primarily by a change from the former cold weather climate to one characterized as cool and moist. During the Hypsithermal of the Middle Archaic (ça. 6000-3000 B.C), the regional climate warmed again to drier conditions that prompted a vegetation shift to Chestnut Oak Forest of the central and Southern Appalachians (Delcourt and Delcourt 1985). By the Late Archaic period (ça. 3000-1000 B.C.), the drier conditions of the previous sub-period had given way to a climate that may be considered essentially modern, whose vegetational communities more or less mirrored those present at the time of European contact (Steponaitis 1986, p. 370).

Figure 38. Archaic projectile points from the Pisgah NF

Whatever the exact nature of the interrelationship between climate/environment, natural resources, and human occupation in the Southeast, conditions during the Archaic period apparently favored the increase of the latter. This population boom can be measured in the relative increase in the number of Archaic period sites identified in the region (Cable 1980; Ward 1983). Indeed, by the terminal Archaic, aboriginal populations may have achieved a maximum population density within the Southeast (Caldwell 1958). Increasing population was also likely correlated with a shift in settlement patterning within the region. Both variables would have dramatically influenced the archaeological record of Archaic period sites and/or events in time. Population density, settlement pattern, and the archaeological evidence of each variable is ultimately a matter of resource availability and the strategy or strategies used to obtain those resources.

The archaeological record suggests a trend towards increasing sedentism during the terminal Archaic, at which time residence patterns became at least semi-permanent (Brown and Price 1985). This change in settlement patterning is inferred from a number of other significant changes recognizable in the archaeological record of the Late Archaic. For example, the first cultivated plants are associated with this particular cultural and temporal complex. In addition, the first use of stone and ceramic containers can be tied to the Late Archaic. Dwellings with associated storage pits and dense middens can be recognized in the archaeological record of this period, and finally, evidence from the latter source suggests an intensification of long-range exchange networks at this time (Steponaitis 1986, p. 373).

Figure 39. Archaic fire hearths on the Nantahala NF

Around 1000 BC, there is archeological evidence for the development of a relatively settled existence throughout much of the eastern woodlands. This period, known as the Woodland, lasted until around AD 800 in some areas and later in others. It was during this time that crops were intentionally planted, ceramic containers were manufactured, and settled village life became common. It was within the small gardens and field plots sown during the Woodland period that the rudiments of agriculture had its beginning in the Southeast. Recent evidence collected from a largely Middle Woodland site (31MD60) in Madison County, NC reveals that corn was consumed by the residents of this site as early as A.D. 465 (AMS calibrated date, Shumate and Kimball 1998).

Evidence for Woodland period occupation in the NC mountains has been documented in the form of any number of lithic and/or ceramic scatters indicative of small scale camp sites. In addition, investigations in this area have also included evidence of larger, more permanent settlements with hearths, storage pits, living floors, rock clusters, aggregated burials, and/or extensive middens suggestive of small farmsteads and larger villages or communities. The material culture associated with the Woodland period as manifest in the Southern Appalachians is perhaps best described in terms of those diagnostic lithic arrow points and clay ceramic vessels (pottery) that can be identified as associated with Early, Middle, and Late Woodland contexts. In addition to these diagnostic items of material culture, a Southern Appalachian Woodland assemblage might also include ground stone celts, stone hoe blades, drills, gravers, end scrapers, bar gorgets, tubular pipes, boatstones, as well as numerous tools of bone and antler.

By the Middle Woodland period extensive trade networks linking the Hopewell cultures of the Midwest with indigenous cultures of the Southeast brought a variety of new trade goods into the region. Earspools, breastplates, panpipes, platform pipes, celts of copper, containers and beads of marine shell are but a few examples of the

finished products that reached the Southeast at this time. The Garden Creek Mounds and Biltmore Mound are both Woodland period sites adjacent to the Pisgah NF.

Figure 40. Excavation of a Woodland and Mississippian Site on the Pisgah NF

Figure 41. Woodland and Mississippian Pottery Shards from the Pisgah and Nantahala NFs

The **Mississippian** period, which succeeded the Woodland in most parts of the Southeast, was characterized by an increased reliance on domesticated plants for food; by extensive trade, by the construction of larger villages than before; and by the building of large earthen mounds that served as substructures for the houses in which the leaders conducted ceremonial and political meetings.

Until AD 1000, corn agriculture was not something Southeastern people engaged in much, but about that time it became a major player in local lifeways. The increased productivity of corn agriculture could support larger, denser populations. It also provided greater opportunities for accumulating wealth that could be used for political purposes: encouraging alliances, building loyalties, and inflicting social debts. Whatever the reasons, within a few generations of when corn agriculture intensified, social ranking and political centralization increased. These changes coincided with the emergence of the Mississippian cultural tradition, not only in the mountains of NC, but also across much of the Southeast (Learn NC 2013).

Pisgah and Qualla are the names archeologists give Mississippian cultures that were Cherokee ancestors. A stratified site called Warren Wilson, located on the grounds of Warren Wilson College near Swannanoa, NC, is adjacent to the Pisgah NF. This Pisgah village was located on the Swannanoa River, and its spot on the north bank had been used before by both Archaic and Woodland groups. After AD 1000, the fertile bottomland was hosting a sizable Pisgah village. It was the Pisgah people who constructed the largest mound at Garden Creek (the former Woodland site), building a village around it that spread over 5 acres (Learn NC 2013).

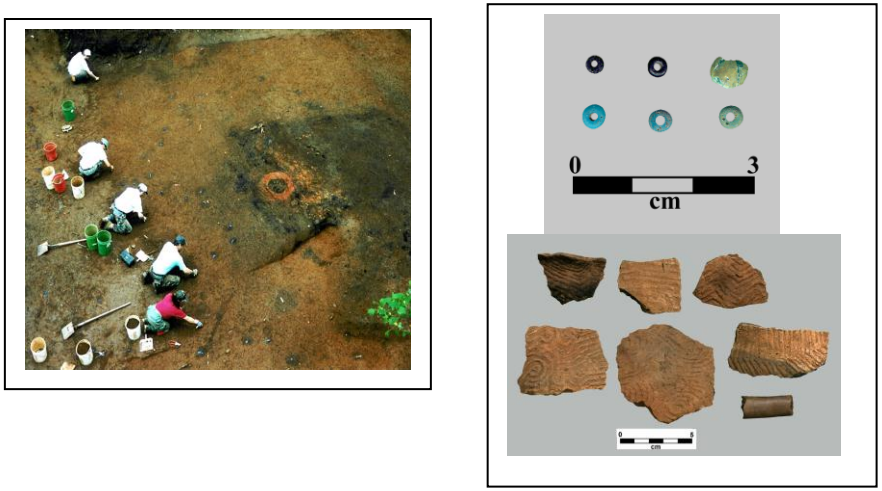
Around AD 1400, people in NC's Southern Appalachians (and most of the western third of the state) started making different

kinds of pottery. Pots lost the distinctive Pisgah look. In the way of archeologically defined cultures, the Qualla culture "emerged" when the new designs became common. The Qualla people also had their own versions of public architecture, in that they stopped using platform mounds for chiefly houses. Rather, they placed townhouses on mound summits. Large and rotunda-like, the townhouses could host several hundred people. The townhouse was the focal point of the community, and it was in this building that community decisions were made. The Qualla lifeway endured into the time of European contact. The Coweeta Creek site in Macon County, NC, is a Qualla townhouse mound site and village (Learn NC 2013) and is located adjacent to the Nantahala NF.

Historic inhabitants and occupations

In the early 16th century, Spaniards came seeking gold in the Great Smokies. By the mid-1600s, the influence of European contact had begun in the area as explorers and traders moved into the mountains. Settlers arrived in the area in the late 1700s.

Figure 42. Excavation of a circa 1650 AD Cherokee Site and Artifacts Including European Trade Beads, Nantahala NF



When the first Europeans came, the western part of NC was a part of the Cherokee Indian Territory. Incentives for historic settlement included the Land Grants given to Revolutionary War Veterans. British, Anglo-American, and African-American settlement of the NC interior began soon after 1670 when the Spanish gave up their claim over the region. By 1740, Pennsylvania Germans, Virginians and North Carolinians of native born and English descent, and the Scotch-Irish in considerable numbers, traveled south along the "Great Wagon Road" west of the Blue Ridge and began to establish a number of settlements and individual farmsteads in the Catawba and Yadkin River Valleys to the east while others traveled from Charleston and Savannah and pushed inwards to the west and northwest (Powell 1989, p. 108).

Although early histories of Euro-American and Native American interaction in the western mountains of NC began as tales of trade and mutual cooperation, by the mid-18th Century they had increasingly developed into accounts of open hostility and calculated warfare. By the beginning of the American Revolution, the Cherokee loss of territory was sufficiently large, and the threat of colonial expansion so constant, that many in the Cherokee Nation sided with the British. Following a series of Indian raids on frontier settlements, General Griffith Rutherford led an expeditionary force from Old Fort in 1776, through the areas of present-day Buncombe, Haywood, and Jackson Counties without incident, to the Cherokee settlements in the area of modern-day Macon County (Shumate and Kimball 2002).

Following the defeat of the Cherokees and their British allies in 1776 and 1781, respectively, the new State of NC successfully arranged, through treaty with the Cherokee, the transfer of thousands of acres located within these mountain areas, thus effectively opening the region to settlement by non-Indian groups of immigrants. By 1783, the NC General Assembly had approved new Land Act legislation that opened for sale vast tracts of these western

lands and established new land offices in order to better facilitate the sale and settlement of the region. Though a few free African-American settlers ventured into the area at this time, it was the English, Welsh, German, French, and the Scotch-Irish who chose to settle within the mountains of western NC (Shumate and Kimball 2002).

By the middle 1800s, millions of acres of land in the southern state were extensively cleared for farms and plantations. As the better lowlands were occupied and used for cotton and tobacco production, many new settlers moved to the often inaccessible mountain areas where farms were often scratched out from the forests. Small-scale timber harvesting was widespread across the South, but the trees and lumber were generally used near the site. There were some larger scale operations which were often located near rivers where the logs could be transported easily to mills. After the Civil War, due to outside investors buying huge parcels of timber land combined with new railroads, extensive and intensive timber harvesting became common. Areas that were once inaccessible, such as steep mountainous terrain, began to be harvested for timber. Logging camps, with squalid conditions, appeared in these areas for a few years then disappeared quickly (Williams 2003).

Forced resettlement of the Cherokee, the "Trail of Tears", took place in 1838. A significant portion, 24.09 miles, and some of the best preserved locations of the Congressionally designated National Historic Trail of Tears and associated sites are located on the Nantahala, Cheoah, and Tusquitee Ranger Districts. During the Removal Period, a number of Cherokee were able to hide in the mountains and eventually obtained the lands comprising the present Cherokee Qualla Boundary in western NC. The 56,000 plus acre Qualla Boundary is located in the western counties of NC. The larger part of the boundary is contiguous; however, numerous outlying land parcels are adjacent to and intermingled with NF lands (Shumate and Kimball 2002).

Figure 43. Two sections of the Trail of Tears crossing the Nantahala NF

The events of the Civil War had little direct impact on western NC counties. Although NC was on the whole sympathetic to the Confederate cause, the mountain region was much less interested in becoming involved in a conflict that was viewed as being between the plantation owners in eastern NC and anti-slavery sentiment from the north. No major battles of the war occurred in these mountain counties and those campaigns that did affect the area were limited to small raids occurring at the very end of the conflict (Boland 1979, p. 14-16).

For early settlers, farming became the main lifestyle and livestock were grazed on cleared land. Increased demand for lumber and other wood products boosted logging and the coming of the railroad to western NC in the 1890s marked the beginning of a new era. After 1890, increasingly large-scale timber operations became commonplace in the southern Appalachian Pisgah and Nantahala NFs.

In 1890, George Vanderbilt acquired a considerable portion of formerly forested acres cut over by the Scottish Brothers Lumber Company and others. Like others, Vanderbilt came to the area on a temporary retreat, but his decision to make the Asheville area his home (or at least one of his homes) would ultimately have a profound and lasting effect on the city and region. The land purchase by Vanderbilt included land in Buncombe, Henderson, Haywood, and Transylvania counties (Snedeker and Noel 1997, p. 1). Within those acres, logging continued, but the management of these operations was placed under the careful supervision of Gifford Pinchot and Dr. Carl Schenck. In 1897, Dr. Schenck founded the Biltmore Forestry School, the first of its kind in America. The federal government acquired this area in a series of transactions dating from 1916 to 1921 in which Edith Vanderbilt, widow of George W. Vanderbilt, sold off approximately 87,000 acres of the Biltmore Estate.

Gifford Pinchot moved on to become the first director of the newly formed U.S. Department of Forestry and Schenck later replaced Pinchot as the second director of this department. Today, the site of Carl Schenck's forestry school is considered the birthplace of American forestry and is included within a larger 6000-acre basin known as the Cradle of Forestry which is designated as a National Historic Site.

As the forest reserves in the western United States grew in leaps and bounds, there was no federal protection for timber areas in the East. In addition, the timber covered mountains in the Northeast and South were quickly being converted to stumps. There were huge problems with land erosion and timber companies leaving the now cut-over land behind; taxes were often not paid and the lands became the property of the counties and states. In 1911, an act was passed that was intended to resolve at least part of the situation. Called the Weeks Act, it allowed the federal government to purchase lands that once had trees/forests. Within a few years, many acres of land were purchased from willing owners and willing counties and states. These lands, after many purchases of often very small pieces of land, were converted to national forests by Congress. The first was the Pisgah NF in 1916 in the state of NC (Williams 2003) and the Nantahala NF was established in 1920.

The national forests were established to protect lands on the headwaters of navigable streams from deforestation, fire, and erosion, so that streamflow could be protected. Forest Service management has produced a relatively stable physical environment in the present Pisgah and Nantahala NFs. In the past, terrain was substantially damaged by a combination of natural and cultural factors. This damage was especially intensive during the late 19th and early 20th centuries. Prior to reforestation massive erosion of the uplands occurred resulting in creeks and rivers flooding and scouring the soil.

Floods, fires, and Forest Service foresters all contributed to the passage of the Weeks Act of 1911, which marked the shift from public land disposal to expansion of the public land base by purchase. It was the origin of the eastern and most southern national forests. The role played by floods, wildfires, and foresters goes back to the beginnings of the conservation movement and professional forestry in the United States. Gifford Pinchot, in his autobiography Breaking New Ground, gives credit to the idea of forest reserves in the Appalachians to Joseph A. Holmes, state

geologist of North Carolina. Pinchot described the eventful beginnings:

> *He [Holmes] and I were holding a session on things in general and Forestry in particular around the fire at the Brick House one night in the winter of '92 or '93, I'm not sure which. In the course of it he suggested that the Federal Government ought to buy a big tract of timberland in the Southern Appalachians and practice Forestry on it. It was a great plan, and neither he nor I ever let it drop. Nearly twenty years later the Weeks law was passed, Holmes's dream came true... (Pinchot 1947, p. 56 in Williams 2003).*

Figure 44. The Restored Cantrell Creek Forest Lodge and 1882 Hiram King House (Schenck housing) at the Cradle of Forestry

Figure 45. 1916 Wilson Lick Ranger Station Nantahala RD. Shakes cover the Original 1913 log structure.

The conditions meeting the Forest Service required restoration of the lands and watersheds and protection of the timber resources. Many acres of cutover land needed to be replanted, erosion control was necessary to preserve soil productivity, and fires were suppressed to help these efforts and to protect the public. Access roads had to be constructed into some areas. The logging railroads had been abandoned. Their remnants are found throughout the Pisgah and Nantahala NFs. The Civilian Conservation Corps (CCC) was used to help complete these efforts, while training and employing its enrollees. The Civilian Conservation Corps was a combined effort of many government units to provide work for unemployed males during the Great Depression. It was devised to cope with national conservation needs as well as unemployment, a collective response to the worsening economic conditions of 1933. One of the first areas of focus for CCC activity was in the national forests, where the CCC remained for its 9-year existence until increased demand for employees in an improved economy and the war effort brought about its end. Today, many of the remaining physical features the CCC built have been placed on the National Register of Historic Places. Activities of the CCC were not limited to construction; contributions such as fighting forest fires and reducing pests and disease were also extremely important to national forest enhancement.

In 1933, there were 14 CCC camps on the National Forests in NC. One of these camps, F-11, was actually in Tellico Plains, Tennessee, but administered by the National Forests in NC. Of the 13 camps in North Carolina, nine were on the Pisgah National Forest and four were on the Nantahala NF.

Table 59. Civilian Conservation Corps Camps on the Pisgah and Nantahala NFs in 1933

Camp No.	Company No.	Camp Name	Location (Post Office)	Date Occupied
Pisgah National Forest				
NC F-1	402	John Rock	Pisgah Forest, Transylvania County	May 19, 1933
NC F-2	404	Mills River/Yellow Gap	Hendersonville, Henderson County	May 19, 1933
NC F-3	406	Jim Staton	Old Fort, McDowell County	May 25, 1933
NC F-4	401	McCloskey	Marion, McDowell County	May 20, 1933
NC F-5	403 JW*	Mortimer	Mortimer, Caldwell County	May 20, 1933
NC F-6	412	Globe	Lenoir, Caldwell County	May 30, 1933
NC F-7	407 JW*	Alex Jones	Hot Springs, Madison County	May 27, 1933
NC F-8	409	Big Ivy	Barnardsville, Buncombe County	May 30, 1933
NC F-14	428	Gloucester/Balsam Grove	Balsam Grove, Transylvania County	June 22, 1933
Nantahala National Forest				
NC F-9	405	Nawokada	Franklin, Macon County	June 7, 1933
NC F-10	408 JW*	Winnfield Scott	Aquone, Macon County	May 28, 1933
NC F-12	425 C*	Nathaniel Greene	Rainbow Springs, Clay County	June 28, 1933
NC F-13	435	Bob Reynolds	Topton, Cherokee County	June 27, 1933

* JW denotes "Junior White" camp, C denotes "Colored" camp

As work progressed and successes mounted, new CCC camps were established, and camps were often reoccupied to complete new projects. Side-camps were often established closer to project locations than the base camps. Some camps, moveable buildings and tent camps as well as permanent camps were utilized, and companies were often relocated to different locations throughout the state as well as the region, and even administered by different agencies. A total of 22 CCC camps were established on the National Forests in North Carolina. In addition to those camps established in 1933 the following camps were located on the Forests.

Table 60. Civilian Conservation Corps Camps on the Pisgah and Nantahala NFs after 1933

Camp No.	Company No.	Camp Name	Location (Post Office)	Date Occupied
NC F-19	455	Horse Cove	Highlands, Macon	October 6, 1934
NC F-20	3445 JW*	Cowee	Franklin, Macon	April 22, 1935
NC F-22	3402	Bent Creek/Rocky Cove	Asheville, Buncombe	---- 1935 ----
NC F-23	3446 JW*	Coweeta	Otto, Macon	May 20, 1935
NC F-24	3447JW*	Santeetlah	Robbinsville, Graham	July 7, 1936
NC F-25	3455JW*	Sunburst	Canton, Haywood	---- 1935 ----
NC F-27	401JW*	Joseph McDowell	Marion, McDowell	December 17, 1937
NC F-28	428JW*	John Rock	Brevard, Transylvania	May 22, 1938
NC F-29	2450VW	*	Murphy, Cherokee	September 29, 1939

* JW denotes "Junior White" camp, VW denotes "Veteran White" camp

Figure 46. CCC Camp Jim Station Curtis Creek Grandfather RD

Figure 47. CCC Camp Santeetlah Robbinsville, Cheoah RD

The accomplishments of the CCC were monumental. Thousands of acres of NF lands were replanted. Hundreds of acres of seed beds were constructed. Hundreds of miles of road were built, along with culverts and bridges. Fire lookout towers were constructed and enrollees fought fires as well. Many of the first recreation areas and structures, many still in use, were built by the CCC.

Figure 48. Historic postcard and restored Wayah Bald Lookout

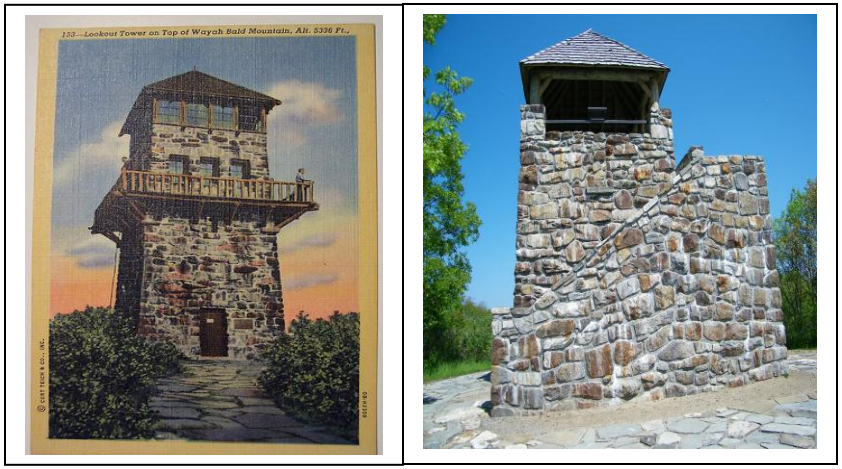


Figure 49. Yellow Mountain Lookout and Albert Mountain Lookout

Figure 50. Cliffside CCC Pavilion

What trends affect the condition of or the demand for cultural and historic resources or cultural uses?

The future discovery, preservation, use, and understanding of the Forests' cultural resources are likely to depend on several factors: project impacts, recreational use, the specific association of a community or ethnic group with an historic site or area, natural forces affecting sites, vandalism of sites, and the development and expansion of archeological research. Research by the scientific community is increasingly expanding study into the uplands, with recognition of the exceptional value of the Forests to the reconstruction and understanding of our cultural resources along with environmental changes. Current and future research will be the basis for more comprehensive statements concerning population movements and the development and/or transmission of cultural traits as well as the environment.

Archeological site looting and artifact collecting continues to adversely impact cultural resources by removing artifacts from their site locations, disturbing previously preserved cultural deposits, accelerating erosion and destroying irreplaceable scientific information.

Natural deterioration caused by weather and environmental conditions over time, sometimes accelerated by catastrophic events, is degrading the structural integrity of historic buildings and structures. It can also change and adversely affect archeological deposits, especially previously preserved organic items, while altering landforms and cultural features which contain significant and rare sites.

Climate change effects can be summarized by the following from the Dublin Institute of Technology and a paper by Cathy Daly titled Climate Change and the Conservation of Archaeological Sites: a Review of Impacts Theory, (2011):

> *"Most of the [climate change] studies take a strategic overview and most focus on the built environment. There are only a few that deal specifically with archaeology and landscapes and even less that take a detailed site specific approach (Howard et al., 2008). Impacts discussed in the literature are frequently divided into direct weathering effects and indirect effects [such as] those caused by mitigation or adaptation strategies. Although most of the studies refer to intact buildings rather than archaeological remains, the theory is often applicable to both. [Site] concerns are for the increased frequency of severe storms and intense rainfall leading to more frequent flood events (possible erosion or subsidence of foundations). Wind throw has also been identified as a danger to ruined buildings and excavated archaeology (Cassar, 2005; 23). The burial conditions under which archaeology can be preserved are sensitive to disturbance and even minor environmental alterations may disrupt the equilibrium of the system thereby triggering deterioration mechanisms. In addition, changes in landscape use and character will impact on the integrity of many archaeological [deposits], both physically and aesthetically. Archaeologists expressed most concern for the vulnerability of [air and oxygen deprived] waterlogged*

environments (associated with high levels of preservation for organic art[i]facts and [paleoecological] evidence) to climate change (Cassar, 2005: 89). Predictions for drier summers are of grave concern for sites with good organic preservation (Howard et al., 2008). [As a result] there will be large regional and local variations in the effects of climate change on groundwater and in turn on archaeological preservation conditions. Drying of soils is likely to compromise stratigraphy [soil layers/levels] through cracking and heave, the most dramatic effects being in areas where differences between summer and winter rainfall volumes are predicted to increase (Cassar 2005)."

Fiscal constraints, budget limitations, are restricting the Forests' ability to address and reduce deferred maintenance issues associated with historic structure management and stabilization of impacted and/or eroding archeological sites. Activities meant to enhance cultural resources, PIT & Windows projects, partnerships and public interpretation cannot be implemented without sufficient available funds.

Non-project inventories are not being conducted and development of refined locational models are not yet completed. Many cultural resources remain unknown and unrecorded. There are incomplete data, documentation and management schemes for resources including TCPs & SSs.

Visitor use and recreation activities are adversely affecting cultural resources by compacting archeological sites, exposing artifacts susceptible to unauthorized collection, and accelerating erosion. In addition, user created trails resulting from activities such as hiking, biking and off-highway vehicle use are also impacting sites.

Wildland fire can destroy historic structures, historic landscapes, and sensitive organic artifacts along with altering the sites environment and inherent environmental data. Fire often accelerates erosion. Suppression activities directly affect cultural resources. Fire lines often expose artifacts and disturb sites, hand line being less disturbing and dozer lines being most impacting. Prescribed fire activities can result in similar impacts, but the requirements for pre-implementation inventories helps to eliminate adverse impacts.

There is a high demand for public use of cultural resources. "Visits to archeological or prehistoric sites: One-fifth of Americans visited a prehistoric or archeological site at least once last year (e.g., 20.1% of the population aged 16 or over). Furthermore, the number of Americans visiting an archeological or prehistoric site also rose very slightly from 1999 to 2008 by 2.4% "(Green et al., 2008). When soliciting volunteers for NFsNC PIT & Windows volunteers there have always been more than triple the applicants for available spaces. There is a high and growing demand from American Indian Tribes to protect and preserve archeological sites, TCPs, SSs, and traditional use and gathering areas.

What is the condition of all known cultural and historic resources, including historic properties in the plan area identified as eligible or listed in the National Register of Historic Places and designated traditional cultural properties?

Effects to cultural resources can result from all activities that disturb the ground, change the environment or condition of an archeological site or historic structure, transfer ownership or increase use in an area. These impacts can destroy site context by exposing, moving, and mixing artifacts, as well as by changing the environmental characteristics associated with cultural resources.

Artifacts are often broken and no longer identifiable. Previously preserved materials and sites can be destroyed by exposure to the

elements and artifacts lost by unauthorized and illegal collection. The latter can also result from increased access to areas.
The cultural resource management program on the National Forests in North Carolina includes monitoring of sites to track their condition and to determine the effectiveness of recommendations for their protection and preservation. Annual monitoring reports are included as part of the Forest's annual report to the public. Table 62 summarizes the number and kinds of sites monitored, as well as the results, for the Nantahala and Pisgah NFs over the period of Fiscal Years 2001 – 2012.

Table 61. Condition of Cultural Resources Based Upon 2001 - 2012 Monitoring

Site Type	Pisgah NF	Nantahala NF	Total
Sites Monitored	283	240	**523**
Prehistoric	196	101	**297**
Historic	87	139	**226**
Stable	223	156	**379**
Impacted	60	84	**144**
Natural	17	42	**59**
Cultural	43	42	**85**

A total of 523 cultural resources have been formally monitored on the two Forests since 2001. Of these, 72% were found to be stable and not adversely affected. The remaining 28% had been impacted, by natural deterioration (weather and climatic conditions) or cultural (human caused) activities. Natural deterioration, including that from hurricanes and tornadoes, affected most historic sites with above ground structural elements as well as cultural resources in areas of flooding and erosion. The incidents of weathering impacts to sites had the most total impacts over the earlier monitoring periods, however, in recent years significant efforts and progress to maintain and stabilize historic sites has lessened this type of impact. Archeological activities causing impacts include Forest Service authorized projects, recreational activities and uses: dispersed camping, mountain biking, off highway vehicle (OHV) use and vandalism or site looting. Forest Service project implementation was found to adversely impact cultural resources in 11 instances. The other archeological impacts documented are all more than double this number. While recreational use impacts are the most documented, OHV and vandalism/looting are slightly lower but result in impacts that are more damaging to cultural resources and result in greater loss of information and greater costs to assess and salvage.

How many Archeological Resources Protection Act (ARPA) violations have there been in the plan area? What is done to stop these impacts?

Currently there is an increase in the theft of prehistoric and historic artifacts from the Nantahala and Pisgah NFs. Site looters are destroying irreplaceable sites and scientific data for personal and increasing monetary gain. Some of the violations are by individuals but many are related to organized and shared activity and profit. $500,000 of archeological site damage is now being investigated on the Pisgah NF. In 2012, costs to the FS to just stabilize looted archeological sites were over $50,000.

More than 20 ARPA violations have been formally documented and investigated annually on the Nantahala and Pisgah NFs since 1995. ARPA regulations pertain to resources over 100 years of age, many incidents of illegal damage to historic sites less than 100 years of age have been documented. This damage includes unauthorized metal detecting and bottle digging/collecting.

One factor leading to increased looting is an increase in illegal OHV use. Artifacts and sites often become more visible by disturbance and erosion caused by OHVs and then they are more easily accessible. Law enforcement and archeologists have seen the increase in unauthorized digging due to the internet market for

artifacts, sluggish economy, television shows promoting looting, and the accessibility to information on the Internet.

To deter and stop site looting FS monitoring of sites with physical surveillance, electronic surveillance and sensors is increasing. The FS continues to attempt to educate employees and the public on the need to preserve cultural resources and increase awareness of laws for protection. Signs and information is posted at USFS ranger stations, trailheads, information centers and USFS websites. The public is invited to participate in the Forest cultural resources program through Passport In Time (PIT) and Windows to the Past projects. The Appletree PIT project continued on the Nantahala Ranger District for 15 years. Volunteers, archeology students, tribal members, university and FS archeologists worked together to document the area's prehistory and history. Limited funding along with increased workloads has limited these opportunities.

The condition of hundreds of cultural resources and historic structures across the plan area varies by resource type, location, and age. Site monitoring and condition assessments of these properties show a range in condition from "excellent, well-preserved" to "rapidly deteriorating, destroyed."

Designated Areas

Key questions addressed in this Section:

- What are the existing designated areas on the Nantahala and Pisgah NFs? What are the associated management areas?
- What published documents identify a potential need and opportunity for additional designated areas?

What are the existing designated areas on the Nantahala and Pisgah NFs? What are the associated management areas?

A designated area is an area or feature identified and managed to maintain its unique special character or purpose. Areas may be designated by statute (i.e. Wilderness and Wild and Scenic Rivers) or administratively in the land management planning process (i.e. Special Interest Areas). Many of the areas described below have their own management area designation in the current Forest Plan while others are managed in accordance with specific national regulations or direction. Approximately 275,000 acres of the Nantahala and Pisgah NFs have one or more special designations. There is a large degree of overlap among some of the designated areas. In situations of overlap, the designation with the more restrictive management is followed. Forest management within designated areas differs depending on the designation, however most areas are not considered suitable for timber production.

National Heritage Area

National Heritage Areas are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. The Blue Ridge National Heritage Area was designated by Congress and the President in November, 2003 in recognition of the unique character, culture, and natural beauty of Appalachia and the Blue Ridge Mountains in western North Carolina. The Blue Ridge National Heritage Area is made up of the 25 western counties of North Carolina, including the 18 counties that contain the Nantahala and Pisgah NFs. This national designation does not have any management implications that supersede the 1987 Plan.

Black Balsam

National Forest Scenic Byways

Driving for pleasure and sightseeing is one of the most popular outdoor-recreation pursuits in the nation and state of North Carolina. National forest scenic byways are administrative designations within the National Forest System and are part of a larger network of scenic routes that exist throughout the country. The concept of providing scenic excursion is rooted in the Parkway development of the early-to-mid 1900s. The concept was revived under the Johnson administration in the mid-1960s. It gained resurgence in popularity with the passage of the Safe,

Cherohala Skyway

Affordable, Flexible, Efficient Transportation Equity Act, a transportation authorization that was enacted in 2005 and expired on September 30, 2012.

The Nantahala and Pisgah NFs provide a number of National Scenic Byways and National Forest scenic byways. National Scenic Byways include the Cherohala Skyway, Forest Heritage National Scenic Byway, and the Blue Ridge Parkway (which is also an "All American Road"). National forest scenic byways include: Mountain Waters Scenic Byway and additional mileage on the Forest Heritage Scenic Byway.

Table 62. Scenic Byways

Scenic Byways	Miles on NF
Cherohala Skyway	14
Forest Heritage National Scenic Byway*	19
Forest Heritage Scenic Byway*	16
Mountain Waters Scenic Byway	12

*The Forest Heritage National Scenic Byway and Forest Heritage Scenic Byway comprise a loop totally 35 miles in length.

Appalachian National Scenic Trail

The Appalachian Trial (AT) is a 2,180 mile long footpath that extends from Georgia to Maine and traverses four ranger districts on the Nantahala and Pisgah NFs. The AT was completed in 1937 and is a unit of the National Park Service that is managed under partnership with the U.S. Forest Service, among other private sectors and government agencies. The AT corridor is managed as Management Area 14 in the existing Forest Plan and covers approximately 17,165 acres. The Trail generally follows the crest of the Appalachian Mountains and is characterized by a predominantly natural appearing environment. The Trail passes through the Southern Nantahala Wilderness and across several balds.

Management emphasis for this area is in accordance with the National Trails System Act (Public Law 90-543) and carried out through the Cooperative Management System as defined in the Appalachian Trail Comprehensive Plan.

National Historic Trails

National Historic Trails are administered by the National Park Service in conjunction with various partners including National Forests, state parks, non-profits, and private landowners.

The 330 mile long American Revolution Overmountain Victory Trail was designated as a National Historic Trail by Congress in 1980. The trail travels through four states, Virginia, Tennessee, North Carolina, and South Carolina and traverses four sections (7.6 miles) of the Appalachian and Grandfather Ranger Districts on the Pisgah NF.

The Trail of Tears National Historic Trail commemorates the removal of the Cherokee and the paths that 17 Cherokee detachments followed westward in 1838-1839. Originally established in 1987 and later extended by Congress in 2008 to include portions in North Carolina, the Trail of Tears is 5,045 miles long from North Carolina to Oklahoma. Seventeen individual sections of the Trail of Tears, totaling 24 miles, are located on the Nantahala, Cheoah, and Tusquitee Ranger Districts of the Nantahala NF.

The Trail of Tears and the Overmountain Victory Trail are managed in accordance with the December 2006 Memorandum of Understanding (MOU) signed by six federal agencies pledging to work closely together to enhance visitor satisfaction, to coordinate trail wide administration and site-specific management, to protect resources, to promote cultural values, to foster cooperative relationships, to share technical expertise, and to fund lands and resources associated with the National Trails. The MOU continues

until 2016 as an active partnership of the Federal Interagency Council on Trails, an interagency group that has met since 1969 to coordinate activities under the authorities of the National Trails System Act (16 U.S.C. 1241-1251).

National Historic Site

The Cradle of Forestry on the Pisgah NF in Transylvania County was designated in 1964, and is also known as the birthplace of American Forestry. The 6,500 acres were set aside by Congress to commemorate the beginning of forestry conservation in the United States and to promote public education and interpretation as well as for its historic preservation. The Cradle of Forestry is designated as Management Area 11 in the current Forest Plan. Development and management activities for this area are detailed in The Cradle of Forestry Management Plan.

Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection.

"It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dams and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes." (Wild & Scenic Rivers Act, October 2, 1968)

Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Congressionally designated rivers are administered by the appropriate federal agency that manages the public lands through which the river flows. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries encompass a river corridor that averages 320 acres per mile, which is approximately 1/4 mile on each side of the river.

Western NC has approximately 3,800 miles of rivers and streams, approximately 37 miles of which are designated as federal wild and scenic. There are three Wild and Scenic Rivers (WSRs) in the Plan Area, Chattooga WSR, Horsepasture WSR, and Wilson Creek WSR. Wild and Scenic Rivers are managed under Management Area 15 in the current Forest Plan.

Table 63. Wild and Scenic Rivers

Wild and Scenic River	Acres within river management corridor
Chattooga WSR	1,339
Horsepasture WSR	441
Wilson Creek WSR	3,836
Total	**5,616**

The Chattooga River was designated a wild and scenic river in 1974. It is one of the longest and most spectacular free-flowing mountain rivers in the Southeast. Over a distance of 50 miles, the river descends an average of 49 feet per mile from its headwaters in North Carolina to the state line between South Carolina and Georgia. The Chattooga offers some of the best whitewater boating and trout fishing in the region.

The Horsepasture River was designated as a wild and scenic river by Congress in 1985. Designation pertains to the section from Bohaynee Road (N.C. 281) downstream to Lake Jocassee, for a total of 4.2 miles. The Horsepasture River is an exceptional example of an escarpment river with five major waterfalls within two miles and numerous cascades, rapids, boulders, and rock outcroppings. For further information see http://www.rivers.gov/rivers/horsepasture.php.

Wilson Creek was designated as a wild and scenic river in 2000. The designation pertains to the section of river from the headwaters of Wilson Creek below Calloway Peak in Avery County to the confluence with Johns River near Collettsville, in Caldwell County for a total of 23.3 miles.

Nine rivers are identified in Amendment 5 of the current Forest Plan as eligible for designation, are recommended for suitability study, and will continue to be protected until they are designated or released from consideration. These rivers include: Nolichucky River, Nantahala River, Snowbird Creek, Mills River System (North Fork, South Fork, Mills), Davidson River, East Fork Pigeon River (including Dark Prong and Yellowstone Prong), Linville River, and Tellico River.

The process for identifying and evaluating potential additions to the National Wild and Scenic Rivers System will occur as part of the plan revision process.

Figure 51. Linville Wilderness. View from Shortoff.

Wilderness

In 1964 Congress passed The Wilderness Act of 1964 (the Act). In section 2(c) of the Act Congress defined wilderness as a place "in contrast with those areas where man and his own works dominate the landscape… 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 undeveloped 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." The Act also created the National Wilderness Preservation System and a process by which to evaluate and add additional wilderness to the system.

In western North Carolina there are approximately 70,369 acres of designated wilderness, all of which are managed by the U.S. Forest Service. The six wildernesses are Ellicott Rock, Joyce Kilmer-Slickrock, Linville Gorge, Middle Prong, Shining Rock, and Southern Nantahala.

Management of existing wilderness areas is guided by a combination of the legislation, policy, and forest plan direction. Additionally, Linville Gorge Wilderness has a fire management plan and all six wildernesses have wilderness education plans.

Table 64. Wildernesses on the Nantahala and Pisgah NFs

Wilderness	Acres	Year Designated	Forest/Ranger District
Ellicott Rock	3,394	1984	Nantahala/Nantahala
Joyce Kilmer-Slickrock	17,418	1984	Nantahala/Cheoah
Linville Gorge	11,893	1984	Pisgah/Grandfather
Middle Prong	7,482	1984	Pisgah/Pisgah
Shining Rock	18,479	1984	Pisgah/Pisgah
Southern Nantahala	11,703	1984	Nantahala/Nantahala
Total Acres	**70,369**		

Designated wildernesses provide for the most restrictive level of management on the Nantahala and Pisgah NFs. In addition to wilderness designation, many of these areas also contain designated old growth restoration areas, US Fish and Wildlife Service critical habitat, and NC significant natural heritage areas.

Linville Gorge, Joyce Kilmer, and Shining Rock are federally mandated Class I areas for air quality under the Clean Air Act Amendments of 1977. These areas are managed to protect the air quality related values (including visibility) and to consider, in consultation with the appropriate State or local air pollution control agencies, whether proposed increases in air pollution at electrical generating facilities or industrial facilities will have an adverse impact on these values (42 U.S.C. 7475(c)). Also, the EPA has implemented the Regional Haze Regulations (40 CFR Parts 51 and 52) to improve visibility at the Class I areas to achieve the Nation's goal of no-man made impairment to visibility at federally mandated Class I areas by 2064.

The process for identifying and evaluating potential additions to the National Wilderness System will occur as part of the plan revision process.

Wilderness Study Areas

Wilderness Study Areas are congressionally designated areas recommended for inclusion in the National Wilderness Preservation System. All existing wilderness study areas will continue to be managed to protect wilderness attributes, under the direction for Management Area 6 in the current Forest Plan, until Congress determines whether or not to include them in the National Wilderness Preservation System. There are five wilderness study areas on the Nantahala and Pisgah NFs; Craggy Mountain, Harper Creek, Lost Cove, Overflow, and Snowbird.

For more information on Congressionally designated Wildernesses and Wilderness Study Areas see the *Assessing Recreation Settings, Opportunities and Access, and Scenic Character* supplemental report.

Inventoried Roadless Areas

The Roadless Area Conservation Rule was published in the Federal Register on January 12, 2001, as a discretionary rule that fundamentally changed the Forest Service's longstanding approach to management of inventoried roadless areas. The rule established blanket, nationwide prohibitions generally limiting, with some exceptions, timber harvest and road construction and reconstruction within inventoried roadless areas on national forests and grasslands across the country. These nationally applied prohibitions superseded the management prescriptions that were applied in the 1987 Plan.

Table 65. Wilderness Study Areas

Wilderness Study Area	Acres	Year Designated	Forest/Ranger District
Craggy Mountain	2,380	1984	Pisgah/Appalachian
Harper Creek	7,140	1984	Pisgah/Grandfather
Lost Cove	5,710	1984	Pisgah/Grandfather
Overflow	3,200	1984	Nantahala/Nantahala
Snowbird	8,490	1984	Nantahala/Cheoah

Inventoried Roadless Areas are NFS lands that were identified in the 2001 Roadless Area Conservation Rule. The rationale for limiting road-building in the inventoried roadless areas was to minimize the negative environmental impacts of roads construction, maintenance, and automobile traffic.

Thirty-three areas on the Nantahala and Pisgah NFs have been administratively designated as inventoried roadless areas. Approximately 87 percent of inventoried roadless acreage on the Nantahala and Pisgah NFs is within management areas currently designated as unsuitable for timber production (see the following table and figure).

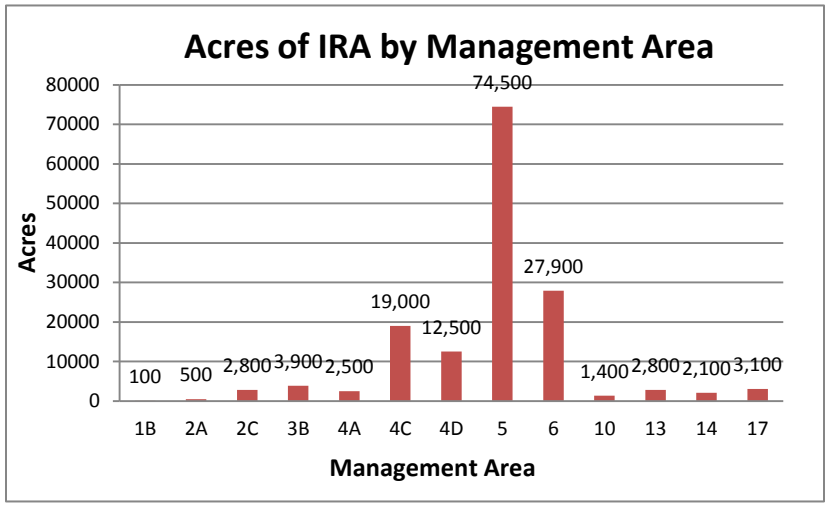
Table 66. Inventoried Roadless Areas

Inventoried Roadless Area	Acres	Forest/Ranger District	Management Area (acres)
Bald Mountain	11,244	Pisgah/Appalachian	5 (8,673), 14 (1,250), 4d (784), 2c (390), 3b (147)
Balsam Cone	10,661	Pisgah/Appalachian	4c (3,828), 13 (2,460), 5 (972), 10 (1,428), 3b (909), 4d (499), 2c (82)
Barkers Creek (Addition)	976	Nantahala/Nantahala	5 (976), 8 (7)
Bearwallow	4,116	Pisgah/Appalachian	5 (3,684), 13 (282), 2a (150)
Big Indian (Addition)	1,154	Nantahala/Nantahala	5 (1,106), 3b (48)
Boteler Peak	4,220	Nantahala/Tusquitee	5 (2,466), 4c (770), 4d (761), 1b (135), 3b (88)
Cheoah Bald	7,808	Nantahala/Cheoah	5 (5,405), 4d (2,001), 14 (357), 4c (45)
Cherry Cove (Addition)	844	Nantahala/Tusquitee	4c (844)
Chunky Gal (Addition)	3,474	Nantahala/Tusquitee	5 (2,074), 4d (891), 14 (318), 19 (138)
Craggy Mountain	2,658	Pisgah/Appalachian	6 (2658)
Deep Creek/Avery Creek	1,896	Nantahala/Cheoah	4d (1,085), 4c (757), 2a (54)
Dobson Knob	6,127	Pisgah/Grandfather	4c (4,780), 2c (577), 4d (414), 3b (356)
Graveyard Ridge (Addition)	1,973	Pisgah/Pisgah	17 (1,260), 5 (713)
Harper Creek	7,351	Pisgah/Grandfather	6 (7,351)
Jarrett Creek	7,499	Pisgah/Grandfather	5 (6,903), 2a (238), 2c (225), 4d (134)
Laurel Mountain	5,682	Pisgah/Pisgah	5 (3,175), 4d (1,312), 4a (939), 4c (256)
Linville Gorge (Addition)	2,800	Pisgah/Grandfather	4c (2,634), 3b (163)
Little Indian (Addition)	647	Nantahala/Nantahala	5 (644)
Lost Cove	5,954	Pisgah/Grandfather	6 (5,954)
Mackey Mountain	5,932	Pisgah/Grandfather	5 (5,797), 2a (101), 2c (34)
Middle Prong (Addition)	1,852	Pisgah/Pisgah	4d (1,323), 4c (528), 2c (1)
Overflow Creek	3378	Nantahala/Nantahala	6 (3,250), 8 (128)

Inventoried Roadless Area	Acres	Forest/Ranger District	Management Area (acres)
Sam Knob (Addition)	2582	Pisgah/Pisgah	17 (1,838), 4c (723), 2c (22)
Sharptop Ridge (Addition)	594	Nantahala/Tusquitee	4d (594)
Slide Hollow	193	Pisgah/Appalachian	3b (193)
Snowbird	8,501	Nantahala/Cheoah	6 (6,501)
South Mills River	8,627	Pisgah/Pisgah	5 (6,104), 4d (2,131), 4c (311), 13 (81)
Tusquitte Bald	13,788	Nantahala/Tusquitee	5 (8,506), 4c (3,519), 2c (1,205), 4d (302), 3b (163)
Wesser Bald	4,093	Nantahala/Nantahala	5 (3,849), 14 (164), 4c (43), 4d (15)
Wilson Creek	4,989	Pisgah/Grandfather	5 (3,193), 4a (1,574), 2c (104)
Woods Mountain	9,604	Pisgah/Grandfather	5 (8,025), 3b (1,199), 2c (207), 4d (172)
Yellowhammer Branch (Addition)	1,271	Nantahala/Cheoah	5 (1,177), 4d (94)
Total	**152,488**		

Note: 2001 Roadless Rule maps can be viewed online: http://www.fs.usda.gov/main/roadless/2001roadlessrule/maps.

Figure 52. Acres of Inventoried Roadless Area by Management Area



Research Natural Areas

Research Natural Areas (RNAs) are National Forest (and other public) lands permanently protected to maintain biological diversity and provide ecological baseline data, education, and research. Only non-manipulative research is allowed in an RNA. The two existing research natural areas on the Nantahala and Pisgah NFs are Walker Cove and Black Mountain. They were identified as virgin forest when they were designated and continue to be managed in an undisturbed state as a baseline for comparison with other forest environments.

Walker Cove Research Natural Area is a 53-acre area that was designated as a research natural area in 1965. It is an area of forest that was left unharvested in the early 20th Century when much of the adjacent forests were cut, and therefore represents a unique species composition and forest age.

Black Mountain Research Natural Area is also referred to as the Middle Creek Research Natural Area and was designated in 1938. It is an approximately 1,400 acre area that represents a wide range of altitude and contains several of the major forest types of the region.

Table 67. Research Natural Areas

Research Natural Area	Acres
Walker Cove	53
Black Mountain	1,400
Total	**1,453**

Experimental Forests

Experimental forests provide places for long-term science and management studies in major vegetation types of the U.S. Beginning in 1908, the Forest Service established a network of Experimental Forests, primarily within National Forests, to research pressing issues regarding the rehabilitation and conservation of depleted forest and rangelands.

The Nantahala and Pisgah NFs have three experimental forests that are managed for forest research: Bent Creek, Coweeta, and Blue Valley. Even though many management activities take place on these lands, they are not a part of usual forest programs. These lands are dedicated to experimentation and education and are designated for special national and international research programs.

The Bent Creek Experimental Forest is the oldest federal experimental forest east of the Mississippi river. It encompasses nearly 6,000 acres within the Pisgah NF near Asheville, NC. It was

established in 1925 for the purpose of conducting research on silvicultural practices that would aid in the rehabilitation of cutover, abused lands and promote sustainable forestry, and also to provide a field demonstration of forest management practices. Long-term and current research conducted at the Bent Creek Experimental Forest provides land managers with science-based information and methods to meet their forest management and restoration goals. Demonstration areas and research studies at the Bent Creek Experimental Forest provide a hands-on way to see the results of different forest management practices and deliver new research findings to land managers, landowners, researchers, students, and the general public. A portion of the Bent Creek Experimental Forest was developed as a regional center for study of trees and other woody plants, in cooperation with the Western North Carolina Arboretum.

Coweeta Hydrologic Laboratory represents the longest continuous environmental study on any landscape in North America, as well as one of the oldest gauged watershed sites in the world. The Coweeta Experimental Forest was set-aside in 1934 with a research emphasis on watershed management; and measurements of rainfall, stream flow, climate, and forest growth began. These have been continuously monitored since. In 1948, the site was renamed Coweeta Hydrologic Laboratory. In the early 1980s, Coweeta was selected by the National Science Foundation as one of 11 sites in the Nation for the Long-Term Ecological Research Program. The Coweeta Basin is ideal for hydrologic research. Local rainfall is usually plentiful 80 to 100 inches per year. Solid bedrock underlying the soils permits hydrologists to account for most of the rainfall that enters the basin. The valley contains numerous small watersheds; many are similar in size, climate, and vegetation.

The Blue Valley Experimental Forest was established in 1964 to provide a focal area for silvicultural research of eastern white pine and associated hardwoods. This 1,200 acre experimental forest is located near Highlands, NC and typifies white pine-dominated portions of the southern highlands escarpment.

Table 68. Experimental Forests

Experimental Forest	Acres
Bent Creek	5,242
Coweeta Hydrologic Laboratory	5,482
Blue Valley	1,400
Total	**12,124**

Special Interest Areas

Special Interest Areas are managed to protect, and where appropriate, foster public use and enjoyment of unique scenic, geological, botanical or zoological attributes. There are 40 special interest areas designated in the current forest plan. Twenty-nine of the areas are in Management Area 13 and 11 are in other management areas that afford protection of the resources for which they were designated. Management Area 13 includes five Forest Service administratively designated Scenic Areas – Looking Glass Rock, Glen Falls, John Rock, Whitewater Falls and Craggy Mountain (Craggy Mountain is also a designated Wilderness Study Area). All 40 special interest areas were recommended for registration by the North Carolina Natural Heritage Program.

Table 69. Special Interest Areas

Special Interest Area	Acres	Ranger District	Management Area
Joyce Kilmer Memorial Forest	3,840	Cheoah	7
Santeetlah Creek Bluffs	495	Cheoah	13
Bonas Defeat Gorge	305	Nantahala	13
Bryson Branch	44	Nantahala	13
Cole Mountain-Shortoff Mountain	56	Nantahala	13
Cullasaja Gorge	1,425	Nantahala	13
Ellicott Rock – Chattooga River	1,997	Nantahala	7 and 15
Kelsey Track	256	Nantahala	13
Piney Knob Fork	32	Nantahala	13
Scaly Mountain and Catstairs	130	Nantahala	13
Slick Rock	11	Nantahala	13
Walking Fern Cove	19	Nantahala	13
Whiteside Mountain	220	Nantahala	13
Whitewater Falls	315	Nantahala	13
Buck Creek	103	Tusquitee	13
Riley Knob/Chunky Gal Mtn	215	Tusquitee	13
White Oak Stamp	450	Tusquitee	13
Camp Branch Falls	2	Tusquitee	13
Nantahala Gorge Blowing Springs	190	Tusquitee	13
Nantahala River Bogs	60	Tusquitee	13
Runaway Knob	140	Tusquitee	13
Standing Indian	2,190	Tusquitee	7 and 14
Wildes Cove	9	Tusquitee	13
Big Laurel Creek	550	Appalachian	13
Paint Rock	96	Appalachian	13
John's Creek	8	Grandfather	13
Linville Gorge	10,195	Grandfather	7
Dismal Falls	206	Pisgah	13
Fork Ridge – Mount Hardy	800	Pisgah	7
John Rock	435	Pisgah	13
Looking Glass Rock	1,600	Pisgah	13
Mount Pisgah	325	Pisgah	13
Pink Bed Bogs	205	Pisgah	11
Scarlet Oak-South Mills River	140	Pisgah	13
North Fork Ivy Creek	15	Appalachian	13
Big Bald Mountain	115	Appalachian	14
Black Mountains	3,800	Appalachian	10 and 13
Craggy Mountains	1,840	Appalachian	6
Roan Mountain (Massif)	7,900	Appalachian	9
Walker Cove	53	Appalachian	10
Total	**40,787**		

Balds

The current Forest Plan designates Management Area 17 for management of mountain balds to perpetuate their unique vegetative communities and scenic qualities, and to provide compatible non-motorized recreation opportunities. These lands are natural appearing mountain balds that are, or were historically, generally treeless openings of grasses or shrubs. They are usually found on the crest of mountains and ridges. Aside from the mountain balds at Roan Mountain (Management Area 9), there are approximately 3,400 acres of balds in MA 17 at Graveyard Fields on the Pisgah Ranger District.

Roan Mountain

Approximately 8,200 acres at Roan Mountain are currently managed under Management Area 9 to maintain distinctive outstanding scenic qualities, wildlife and plant communities, spruce-fir and northern hardwoods. Roan Mountain is one of the highest mountains in the eastern U.S. and contains a unique assemblage of species unparalleled in the Southern Appalachian Region. The Roan Highlands are protected through a landscape-level conservation initiative that was originally established by the Southern Appalachian Highlands Conservancy and the U.S. Forest Service in 1974. Currently, there are over 20 partner agencies, organizations, and universities that are dedicated to ensuring the conservation of the unique ecosystems at Roan Mountain.

Designated Old Growth Restoration Areas

In Amendment 5 of the 1987 Plan, direction was established for delineating old growth restoration areas. The plan outlined the process for selecting large, medium, and small patch old growth areas and established criteria for evaluating areas for old growth management.

Old Growth

An initial old growth inventory was conducted in 1994 and large and medium patches were identified (1994 Monitoring and Evaluation Report). Small patches of old growth restoration are identified at project level analysis with the purpose of increasing biological diversity and providing structural components of old growth at the stand and landscape levels (Amendment 5, p. III-27).

There are approximately 170,000 acres of large and medium patch old growth on the Nantahala and Pisgah NFs.

Designated Critical Habitat

The Director of the U.S. Fish and Wildlife Service has the authority to designate areas of critical habitat for threatened and endangered species. Critical habitat includes specific geographic areas that contain features essential to the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include areas that are not currently occupied by the species but that will be needed for its recovery (http://www.fws.gov/endangered/what-we-do/critical-habitats-faq.html). The Nantahala and Pisgah NFs have critical habitat designations for three species, totaling 4,608 acres.

Mountain golden heather

Table 70. Designated Critical Habitat

Species	District	Acres	Location
Appalachian Elktoe (freshwater mussel)	Appalachian, Cheoah	424	Little Tennessee River
Spruce Fir Moss Spider	Appalachian	2,692	Primarily within the Roan Mountain MA
Mountain Golden Heather (plant)	Grandfather	1,492	Primarily within Linville Gorge Wilderness
Total		**4,608**	

What published documents identify a potential need and opportunity for additional designated areas?

There are a number of designated area proposals that have been submitted to the Forest Service for consideration in the plan revision process. Some of these have been in the form of site-specific written proposals, while others are more recommendations for management consideration in the revised plan.

In 1992, The Wilderness Society published North Carolina's Mountain Treasures: The Unprotected Wildlands of the Nantahala and Pisgah National Forests (McClure 1992). This document was updated and published in 2011 and submitted to the Forest Service during the initial public involvement for plan revision. The Mountain Treasures report highlights seven areas on which The Wilderness Society places highest priority for protection. This report is available online at: www.ncmountaintreasures.org/.

In 2006, WildSouth proposed the creation of a 25,500 acre National Scenic Area on the Grandfather Ranger District. This proposal was revised in April 2013. The proposed area is located in Avery, Caldwell, and Watauga counties and encompasses recreation destinations including Wilson Creek Wild and Scenic River Corridor and the Mountains-to-Sea Trail. The stated purpose for the proposed designation would be to protect and promote the unique scenic, recreational, and ecological resources of the Scenic Area (Benefits of a Grandfather NSA, 2006). More information about this proposal can be viewed online at: http://www.gnsafornc.org/.

In 2013, WildSouth submitted a proposal to the Forest Service to consider Cherokee trails and corridors as part of the National Historic Trails System. This proposal identifies approximately 119 miles of Cherokee trails and corridors that are on the Nantahala, Pisgah, and Cherokee NFs.

In 2013, the North Carolina Natural Heritage Program (NCNHP) submitted a report which summarizes information about Registered Heritage Areas (RHAs) and identifies the state's highest priority Significant Natural Heritage Areas (SNHAs) within the Nantahala and Pisgah National Forests. The SNHAs included in the report are considered to be among the most important areas for biological diversity in North Carolina. The existing forest plan identifies 40 areas that are identified as special interest areas and registered by the NCNHP as SNHAs. The 2013 report prepared by the NCNHP includes additional areas to be considered for special designation in the revised forest plan. Information regarding the NC Natural Heritage Program and the process for identifying and prioritizing SNHAs can be found on their website at: http://www.ncnhp.org/.

In 2013, The Nature Conservancy completed analyses of matrix forests and core forests in the Southern Blue Ridge ecoregion. The objective of the core forest analysis was to delineate and describe potential core forests within the Southern Blue Ridge ecoregion's matrix forest blocks for the purpose of informing acquisition, forest management, and other conservation strategies (TNC 2013). The analysis identified 200 core forests within the Southern Blue

Ridge ecoregion, 75 of which fall at least partially within the Nantahala and Pisgah NF boundaries (TNC 2013).

In addition to the detailed proposals discussed above, a number of recommendations have been made for consideration as special designated areas in the revised Forest Plan. These include designations for the following: rock hounding areas, a National Recreation Area on the Pisgah Ranger District, watersheds that support native brook trout, additional old growth areas, Appalachian bogs and associated wetlands, high-value watersheds, Blue Ridge Parkway viewsheds, other high value viewsheds, and Wild and Scenic Rivers.

Large format maps of designated areas discussed in this chapter, are available online:

www.fs.usda.gov/goto/nfsnc/nprevision.

Figure 53. Designated areas on the Nantahala NF

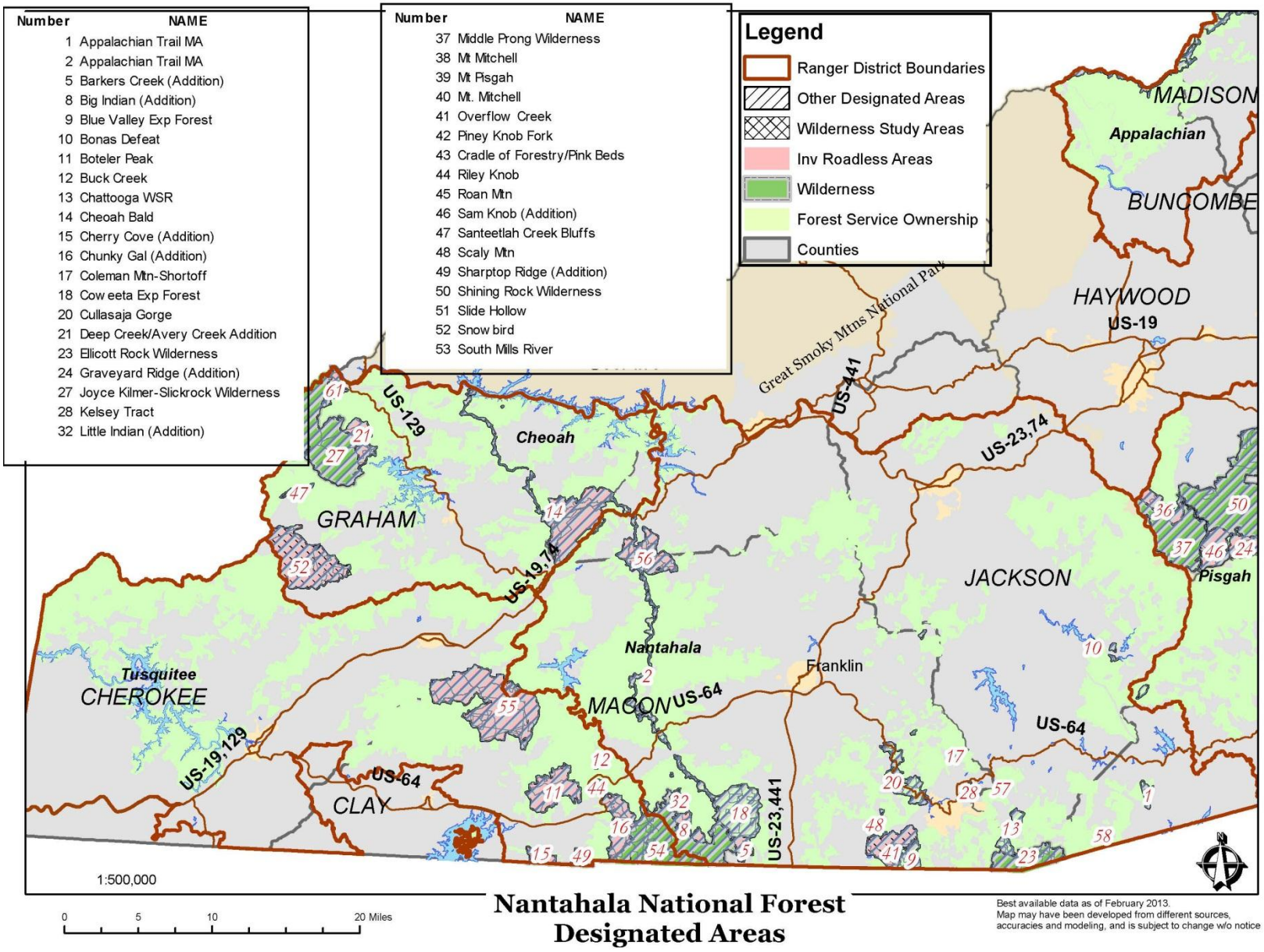
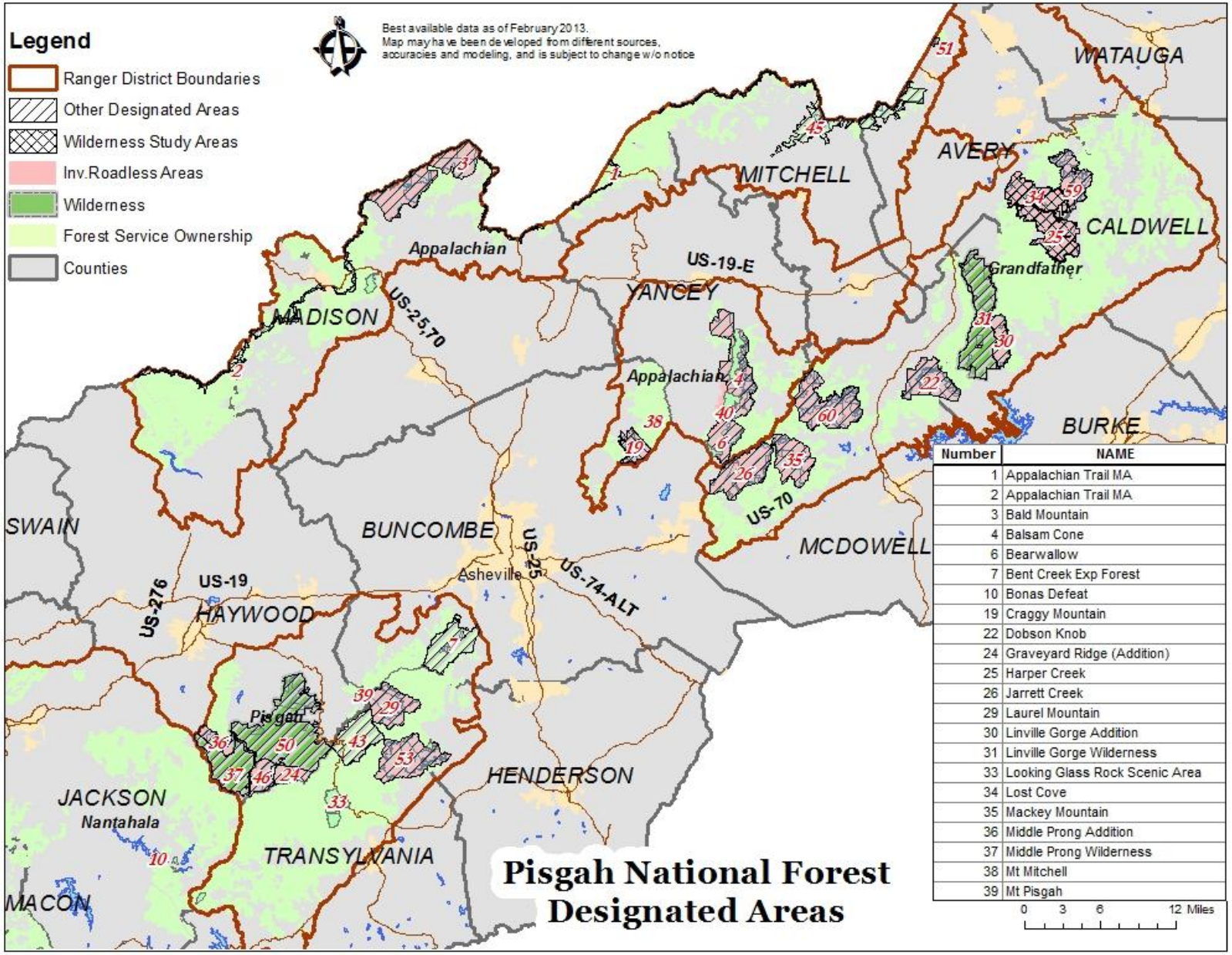


Figure 54. Designated areas on the Pisgah NF



Number	NAME
1	Appalachian Trail MA
2	Appalachian Trail MA
3	Bald Mountain
4	Balsam Cone
6	Bearwallow
7	Bent Creek Exp Forest
10	Bonas Defeat
19	Craggy Mountain
22	Dobson Knob
24	Graveyard Ridge (Addition)
25	Harper Creek
26	Jarrett Creek
29	Laurel Mountain
30	Linville Gorge Addition
31	Linville Gorge Wilderness
33	Looking Glass Rock Scenic Area
34	Lost Cove
35	Mackey Mountain
36	Middle Prong Addition
37	Middle Prong Wilderness
38	Mt Mitchell
39	Mt Pisgah

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Appendix B. Supplemental Reports

Report Title	Status as of 3-12-2014
Ecological Zones	Available on-line
Rare Habitats	Available on-line
Aquatic Ecosystems	Available on-line
Watersheds, Hydrology, Geology, & Soils	Available on-line
Forest Ecosystem Health	Available on-line
Federally Listed Species	Available online
Species of Conservation Concern	Under Development
Air Resources	Available on-line
Energy and Mineral Resources	Available on-line
Geologic Resources	Available on-line
Geologic Hazards	Available on-line
Wildland Fire/Fuels	Available on-line
Economic Conditions and Trends	Available on-line
Recreation Settings, Opportunities and Access, and Scenic Character	Available on-line

Appendix C. Management Area Descriptions and Maps

1987 Nantahala and Pisgah Land and Resource Management Plan, as Amended in 1994 (Amendment 5): Management Areas Descriptions and Approximate Acres

MANAGEMENT AREA 1B
38,577 acres

Emphasize a sustainable supply of timber and providing motorized access into the forest for traditional forest uses such as hunting and gathering, firewood cutting, fishing, and recreational activities including ORV use and camping. These areas have open roads, and the visitor is likely to encounter other forest users and vehicles of all types. A sustainable supply of timber is achieved through regulating the growth and removal of trees through time. Although a regulated forest is desired, natural forest settings will be present. The visitor may encounter forest management activities in progress, including timber harvest, road building, and timber stand improvement. Wildlife compatible with or that benefit from these conditions, such as grouse, deer and songbirds are likely to be present. Timber production is permitted within this management area.

These lands are managed to provide opportunities for public enjoyment of the Forest through motorized recreation--driving for pleasure in conventional and four-wheel-drive vehicles as well as use of machines commonly classified as ORV's. While these uses will be encouraged on appropriate roads and trails, use will not be a11owed to damagethe Forests' environment.

The land will produce a sustained yield of sawtimber and other wood products. Here management practices such as road construction and selection of harvest areas will be as economically efficient as practicable considering short- and long-term environmental quality, the type and condition of the forest, and the other multiple uses of the land.

While providing opportunities for motorized recreation use and efficient timber harvests, the land will provide many opportunities for hunting and access for fishing. Wildlife that thrive m a diverse, young- to middle-aged forest, and which can tolerate human and motorized vehicles disturbance, will be favored through appropriate forest management practices.

On these lands, the method of harvest will be selected based on a site specific analysis. Shelterwood or two-aged system is the preferred regeneration method in visually sensitive areas. [Amendment #4]

MANAGEMENT AREA 2
(2A and 2C)

Emphasis is on providing pleasant scenery for people who experience the forest by driving (or boating) through it. These areas are intended as scenic travelways through the forest. Secondarily, this management area provides an environment of older forests combined with timber management activities designed to manage the scenery. Open roads through a scenic forest is the desired condition. Forest management activities should not be as apparent as in Management Area 1. Wildlife that are compatible with or that benefit from these conditions, such as songbirds, grouse and grey squirrel are likely to be present. Since many of these areas are along well-traveled roads, the visitor is likely to encounter numerous other people and their vehicles.

The lands in Management Area 2 provide opportunities for motorized recreational enjoyment of the Forests. The Forests are managed to promote and maintain a high level of scenic quality and provide habitat for animals which prefer a wide variety of forest conditions and can tolerate human disturbance.

The management area is subdivided into two parts -- A and C.

Management Area 2A
40,673 acres

Management Area 2A provides visually pleasing scenery for forest visitors. Roads are generally open with the adjacent forest land managed to provide that pleasing visual experience. Timber production is permitted, but modified to meet visual quality objectives.

Management Area 2C
37,680 acres

Management Area 2C also provides visually pleasing scenery. Roads are generally open with adjacent forest land managed to provide a quality visual experience. This land is not suitable for timber production because either timber activities could not be conducted in a manner to assure a highly visual experience, or the land is not cost efficient in the long term for timber production. The area, providing for motorized recreation, will favor wildlife species which prefer older forest conditions and yet can tolerate some human disturbance.

MANAGEMENT AREA 3B
233,110 acres

Emphasize sustainable supply of timber, but with few open roads and limited disturbance associated with motorized vehicles. This management area also provides for the habitat needs of wildlife such as wild turkey, deer, a variety of small mammals, and other species that will benefit from a managed forest with limited motorized access. A sustainable supply of timber is achieved through regulating the growth and removal of trees through time. Access to

the forest is desired during the time timber is harvested, though most roads are closed at other times. Although a regulated forest is desired, some natural forest settings will be present. The visitor may encounter forest management activities in progress, including timber harvest, road building and timber stand improvement. Wildlife compatible with or that benefit from these conditions, such as deer, raccoon and other small mammals are likely to be present. Black bear also use these areas, though they do not provide the best black bear habitat. Recreationists use these areas for hiking, mountain biking, horseback riding, hunting and other activities. The visitor may encounter other forest users, but not as frequently as in areas with open roads.

These lands are managed to provide opportunities for nonmotorized recreational uses of the Forests. Yet, some opportunities for motorized use on forest roads and four-wheel-drive ways will be provided.

The land, through appropriate timber harvest, will produce a continuous supply of sawtimber and other wood products. Here, management practices such as road construction and selection of harvest areas will be as economically efficient as practicable considering short- and long-term environmental quality, the type and condition of the forest, and the other multiple uses of the land.

While providing opportunities for nonmotorized recreation use and efficient timber harvests, the land will provide many opportunities for hunting and access for fishing. Wildlife which thrive in a young- to middle-aged forest will be favored through appropriate forest management practices.

Through the restriction of motorized access in this management area, habitat can be provided for wildlife species that are sensitive to human disturbance. Also, the area requires very low-cost road maintenance since most roads are closed to public motorized use.

On these lands, the method of harvest will be selected based on a site specific analysis. [Amendment #4

MANAGEMENT AREA 4
(4A, 4C and 4D)

In Management Area 4 most roads are closed to motor vehicles, and a somewhat remote setting is provided, but with some timber management in 4A and 4D. In Management Areas 4A and 4C, emphasis is placed on managing for quality scenery. In Management Area 4D emphasis is on providing high quality wildlife habitat, particularly for black bear. The preferred habitat for black bear includes freedom from the disturbance of motorized vehicles, some areas of older forest, a sustained supply hard mast (such as acorns from oaks) and den trees, and small, widely dispersed openings providing the soft mast (fruits and berries) typically found in very young forest. Timber management activities should be designed to provide these conditions. Management Area 4C tends to be fairly steep, rugged, often inaccessible terrain usually seen only from a distance by forest visitors. This land is unsuitable for timber production but can provide a scenic backdrop for people viewing the forest from a distance, while providing wildlife habitat. The variety of wildlife likely to be present in management area's include ovenbird, black bear and cerulean warbler. The visitor using these areas for recreation may occasionally encounter other people. Forest management activities are less likely to be encountered than in Management Area 1 or 3.

The lands of Management Area 4 are managed to provide high levels of scenic quality, many opportunities for nonmotorized recreational uses and habitat for animals which prefer a predominance of older vegetation and limited disturbance. In the area, few roads are open for driving; however, some opportunities are available for use by conventional and four-wheel drive vehicles. Timber harvest areas are widely dispersed to provide a wide variety of tree ages and wildlife habitat.

This management area is subdivided into three parts--A, C, and D.

Management Area 4A
55,507 acres

In Management Area 4A, permit timber production, modified to emphasize visual quality and wildlife habitat.

Management Area 4C
179,992 acres

In Management Area 4C, emphasize visually pleasing scenery and habitats for wildlife requiring older forests. This land is not suitable for timber production at this time in order to meet visual quality objectives, or the lands are not cost efficient for timber production.

Management Area 4D
160,296 acres

In Management Area 4D, emphasize high quality habitats for wildlife requiring older forests and freedom from disturbance from motorized vehicles. Allow small widely dispersed openings throughout the management area. Close most roads to private motorized vehicles. Early successional habitat is provided in conjunction with managing suitable timber land in these areas.

MANAGEMENT AREA 5
119,718 acres

Emphasis is on providing large blocks of backcountry where there is little evidence of other humans or human activities other than recreation use. A sizable block of land is necessary to ensure relative freedom from the sights and sounds of modern man. An unroaded forest environment and natural appearing forests with large old trees are desirable. This management area also responds to the need for large blocks of wildlife habitat relatively undisturbed by human developments that some species prefer. Wildlife such

as ovenbird, black bear and cerulean warbler are likely to be present. Visitors using these areas for backcountry activities are unlikely to encounter other people.

These lands are managed to provide a unique forest environment where near primitive settings are provided. Motorized recreational use is not allowed, but forest users can enjoy hiking and hunting or walking. Some opportunities for horseback riding will also be provided.

Wildlife that benefit from old trees and greatly reduced disturbance from humans and motorized vehicles are favored on these lands. Timber production is not appropriate in order to meet resource objectives to provide near primitive recreational settings.

Grass and forb openings of a few acres widely dispersed about the management area will be developed or maintained to provide suitable areas for wildlife requiring this habitat. Roads in the area will be very few and used only for specific projects such as creating or maintaining wildlife openings, access for short-term projects, or fire suppression.

MANAGEMENT AREA 6
8,419 acres

This management area includes Congressionally designated Wilderness Study Areas recommended for inclusion in the National Wilderness Preservation System. All Wilderness Study Areas will continue to be managed to protect wilderness attributes, under the direction for Management Area 6, until Congress determines whether or not to include them in the National Wilderness Preservation System.

MANAGEMENT AREA 7
66,550 acres

This area includes the Congressionally designated Wildernesses of Linville Gorge, Shining Rock and Middle Prong on the Pisgah National Forest and Joyce Kilmer-Slickrock, Southern Nantahala and Ellicott Rock on the Nantahala National Forest.

Wilderness is managed to perpetuate the naturalness of the area while providing for recreational, scenic, scientific, educational, conservation, and historical use compatible with the wilderness resources and attributes.

MANAGEMENT AREA 8
12,250 acres

These lands are experimental forests, and will be managed for forest research. The three designated experimental forests are Coweeta, Bent Creek, and Blue Valley.

Even though many management activities take place on these lands, they are not a part of usual Forest programs. These lands are dedicated to experimentation and education and are designated for special national and international research programs.

The Coweeta Hydrologic Laboratory is a Biosphere Ecological Reserve for long-term ecological research. A portion of the Bent Creek Experimental Forest will be developed as a regional center for study of trees and other woody plants, in cooperation with the Western North Carolina Arboretum.

MANAGEMENT AREA 9
7,900 acres

This area is Roan Mountain on the Toecane Ranger District.

This area will be managed to maintain distinctive outstanding scenic qualities, wildlife and plant communities, spruce-fir and northern hardwoods. Balds within this management area will be maintained through appropriate methods. No land is classified as selected for timber production. The area is a major recreation site and an area of high scientific and natural heritage interest.

MANAGEMENT AREA 10
1,460 acres

These areas are Research Natural Areas, and will be managed for scientific research. The two existing research natural areas are Walker Cove and Black Mountain. They are managed in an undisturbed state as a baseline for comparison with other forest environments.

No planned management actions other than needed fire, insect and disease control are scheduled.

MANAGEMENT AREA 11
6,540 acres

This area is the Cradle of Forestry in America, and will be managed for educational, interpretive, and historical purposes.

Development and management activities for this *unique* area on the Pisgah District are detailed in a complementary document, "The Cradle of Forestry Management Plan", which is available as part of the planning records.

All management activities will be compatible with the interpretive and demonstrative nature of the area.

MANAGEMENT AREA 12
3,096 acres

These lands include developed recreation areas providing camping, picnicking, swimming, boating, viewing of wildlife and scenery, and other Forest recreational activities.

Development ranges from an essentially natural environment with minimal facilities to a high standard of development for user comfort and convenience. All resource

management activities are tailored to be compatible with a pleasing recreational experience for Forest visitors.

MANAGEMENT AREA 13
10,370 acres

These lands are special interest areas that are managed to protect, and where appropriate, foster public use and enjoyment of unique scenic, geological, botanical or zoological attributes.

No land is classified as selected for timber production, and all other resource management activities are modified to be compatible with the special attributes of each area.

Management Area 13 includes 5 Forest Service administratively designated Scenic Areas--Looking Glass Rock, Glen Falls, John Rock, Whitewater Falls and Craggy Mountain (Craggy Mountain is also a designated Wilderness Study Area). This management area includes special interest areas identified for registration by the **NCNHP** of the State of North Carolina. These areas include significant examples of the diverse natural communities of the Southern Appalachians which may also include unique scenic, botanical, zoological or geological features. Specific management direction for each of these areas is presented in last section of this chapter which lists all areas that will be registered with the **NCNHP**.

MANAGEMENT AREA 14
12,588 acres

This management area consists of the Appalachian National Scenic Trail and its foreground zone as mapped through the Visual Management System. The Trail generally follows the crest of the Appalachian Mountains and is characterized by a predominantly natural appearing environment. The total trail distance in North Carolina is approximately 223 miles and encompasses parts of 5 of the 8 Ranger Districts (Toecane, French Broad, Cheoah, Wayah and Tusquitee).The Trail passes through the Southern Nantahala Wilderness and several balds.

The Appalachian Trail is an internationally renowned footpath that extends 2,150 miles from Maine to Georgia. The Trail is administered by the Secretary of Interior, in consultation with the Secretary of Agriculture, and managed in partnership among the Forest Service, local Appalachian Trail Clubs and Appalachian Trail Conference.

Management emphasis for this area is in accordance with the National Trails System Act (Public Law 90·543) and carried out through the Cooperative Management System as defined in the Appalachian Trail Comprehensive Plan. Management practices will strengthen the role of the volunteer and protect the Trail for the conservation and enjoyment of the nationally significant scenic, historic, natural, and cultural qualities of the land through which the Trail passes.

MANAGEMENT AREA 15
5,919 acres

These are existing Wild and Scenic Rivers and the adjacent lands that make up the river corridors. They include the Congressionally designated Chattooga and Horsepasture Wild and Scenic Rivers.

Wild and Scenic Rivers are managed to maintain and enhance the wild, scenic, and riparian features of the river and to provide water-oriented opportunities in a natural setting. All lands are managed as not selected for timber production, and other resource management activities are restricted or modified to be compatible with the river resource.

MANAGEMENT AREA 16
1,269 acres

This land provides support facilities for the Forests and the public. **It** includes District offices and workcenters, Job Corps Centers, the Beech Creek Seed Orchard and other facilities.

MANAGEMENT AREA 17
3,880 acres

These lands are natural appearing mountain balds that are, or were historically, generally treeless openings of grasses or shrubs. They are usually found on the crest of mountains and ridges.

Balds are managed to perpetuate their unique vegetative communities and scenic qualities, and to provide compatible nonmotorized recreation opportunities.

MANAGEMENT AREA 18
101,530 embedded acres

The Riparian Management Area, embedded in other management areas, consists of the aquatic ecosystem, riparian ecosystem and closely associated plant and animal communities. This area includes at a minimum: perennial streams and perennial waterbodies, wetlands, 100-year floodplains and a zone on each side of all perennial streams and lakes.

The area will be actively managed to protect and enhance, where possible, the distinctive resource values and characteristics dependent on or associated with these systems. For example, timber management can only occur in this area if needed to maintain or enhance riparian habitat values.

The area may provide animal travel corridors between disjunct habitat units. Where management includes the establishment of early successional stage plots such as wildlife openings, the riparian area boundary will be expanded to still ensure an adequatetravel corridor. Values and characteristics of the area include, but are not limited to:

Riparian-dependent plant and animal communities;
- Fish populations, including both wild and hatchery supported; Aquatic organisms;
- Stream channels, including banks, pools, riffles and bottom materials; Stream flow quantity, quality and timing of flows;
- Ground water resources;
- Water-based and water-oriented recreation;
- Water-based cultural resources; and Scenery

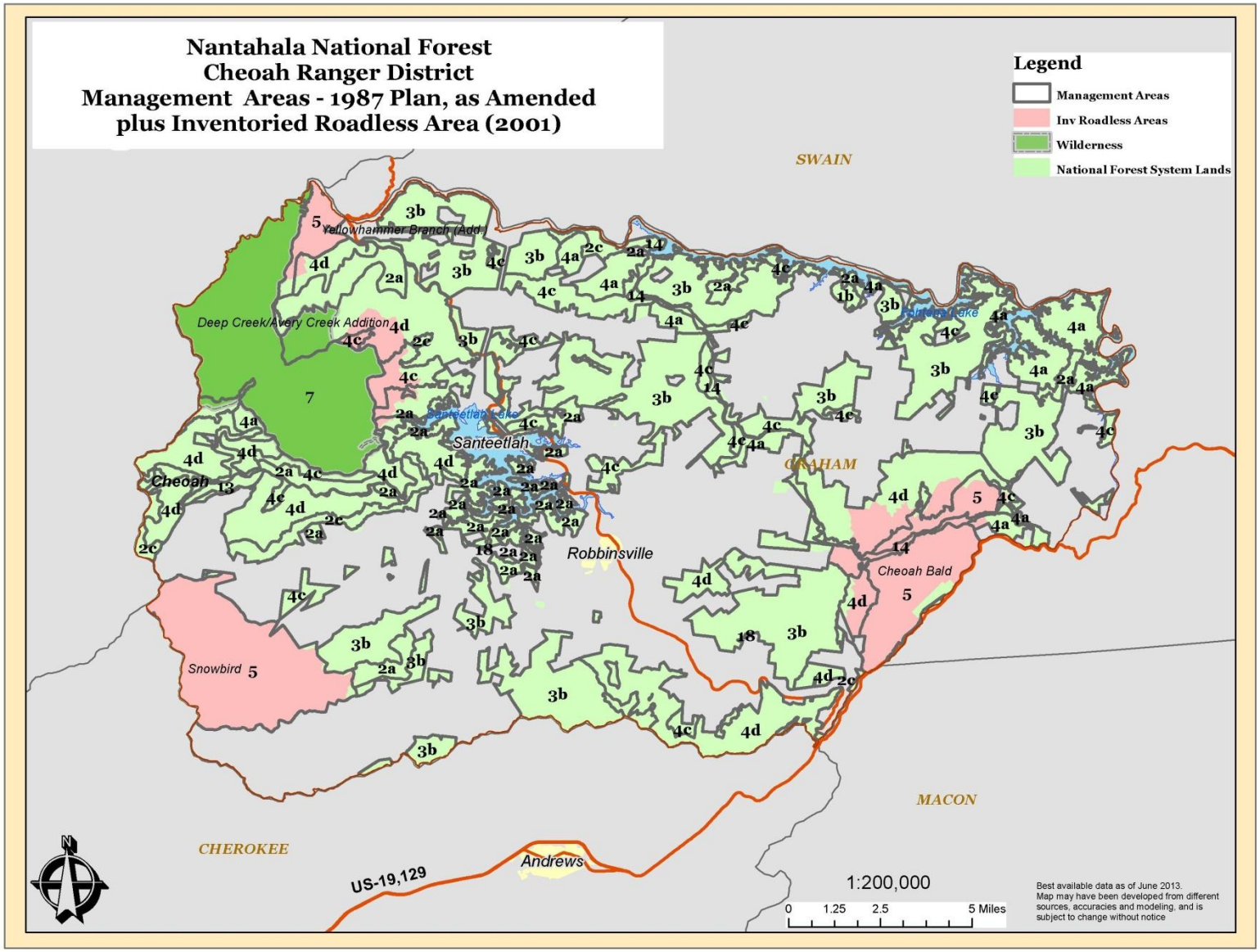
Riparian areas determine the nature, quality, and health of many components of a forest ecosystem because they represent the transition zone between aquatic and terrestrial communities. They are a primary influence on whether water quality is poor or excellent, whether stream fisheries habitat is rich with an abundance of large woody debris, whether high quality food and cover are available for terrestrial animals, and whether stream associated plant communities are maintained.

A high quality riparian area is one that maintains natural hydrologic functioning. It optimizes precipitation infiltration and runoff so as to enhance stream stability and minimize erosion. lnstream flow is maintained at levels necessary to perpetuate diverse communities of aquatic organisms in a healthy state. A high quality riparian area has a diverse assemblage of mature trees which can provide large woody debris for fisheries habitat and suitable conditions for late successional terrestrial plant and animal communities

Because diverse vegetation conditions may favor both aquatic and terrestrial trophic cycles, riparian vegetation may need to be actively managed to favor grasses, forbs, and succulents in selected near stream areas to increase terrestrial insect production available to fish and turkeys, for example, and to provide food for other early successional species of wildlife, thereby increasing biological diversity and productivity in the riparian area. Such vegetation management may involve the creation of near stream wildlife openings or restoration to a more diverse assemblage of species and stand structure. However, the dominant characteristic of riparian areas is predominately undisturbed, natural conditions strongly influenced by the accumulation of woody materials from mature trees. Where species or stand structure is manipulated, silvicultural treatments will be used to favor the diversification of riparian area plant and animal communities without negatively influencing stream temperature, natural hydrologic functioning, or travel corridor quality.

The following pages display, by district, the locations of the various management areas.

District maps are arranged from west to east.


Nantahala National Forest
Cheoah Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
SWAIN
GRAHAM
MACON
CHEROKEE
Yellowhammer Branch (Add.)
Deep Creek/Avery Creek Addition
Santeetlah Lake
Santeetlah
Cheoah
Robbinsville
Cheoah Bald
Snowbird
Andrews
US-19,129
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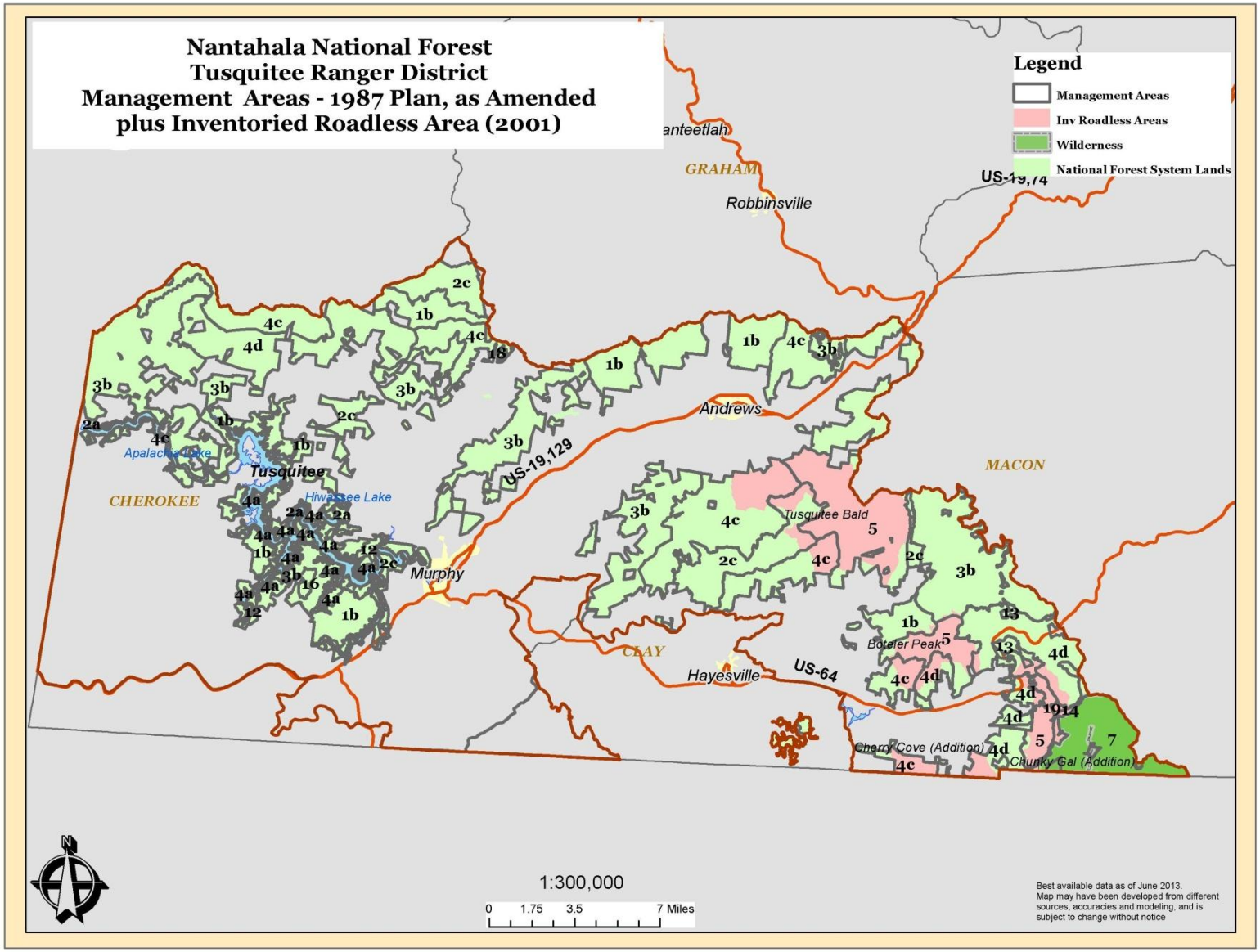
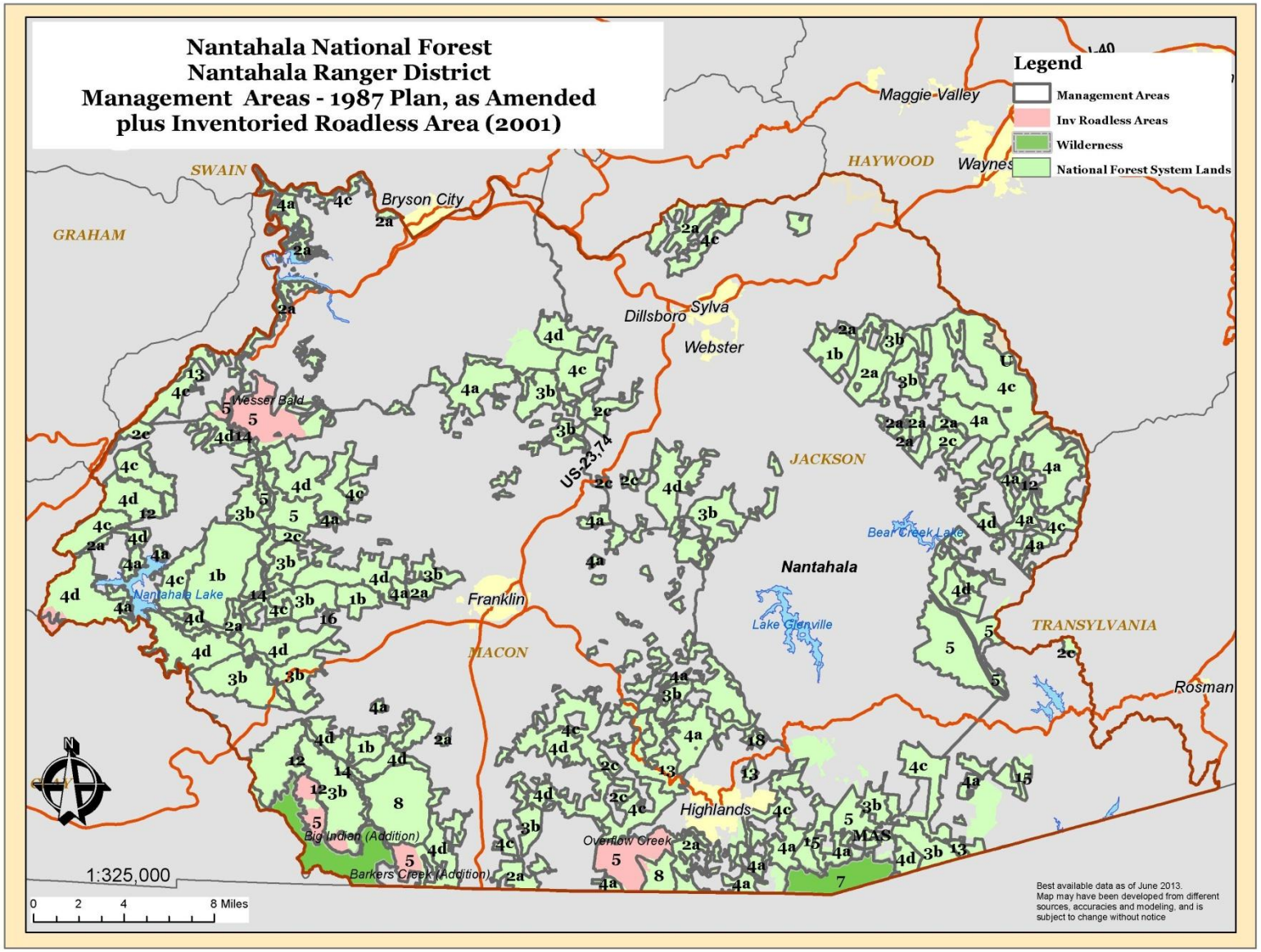
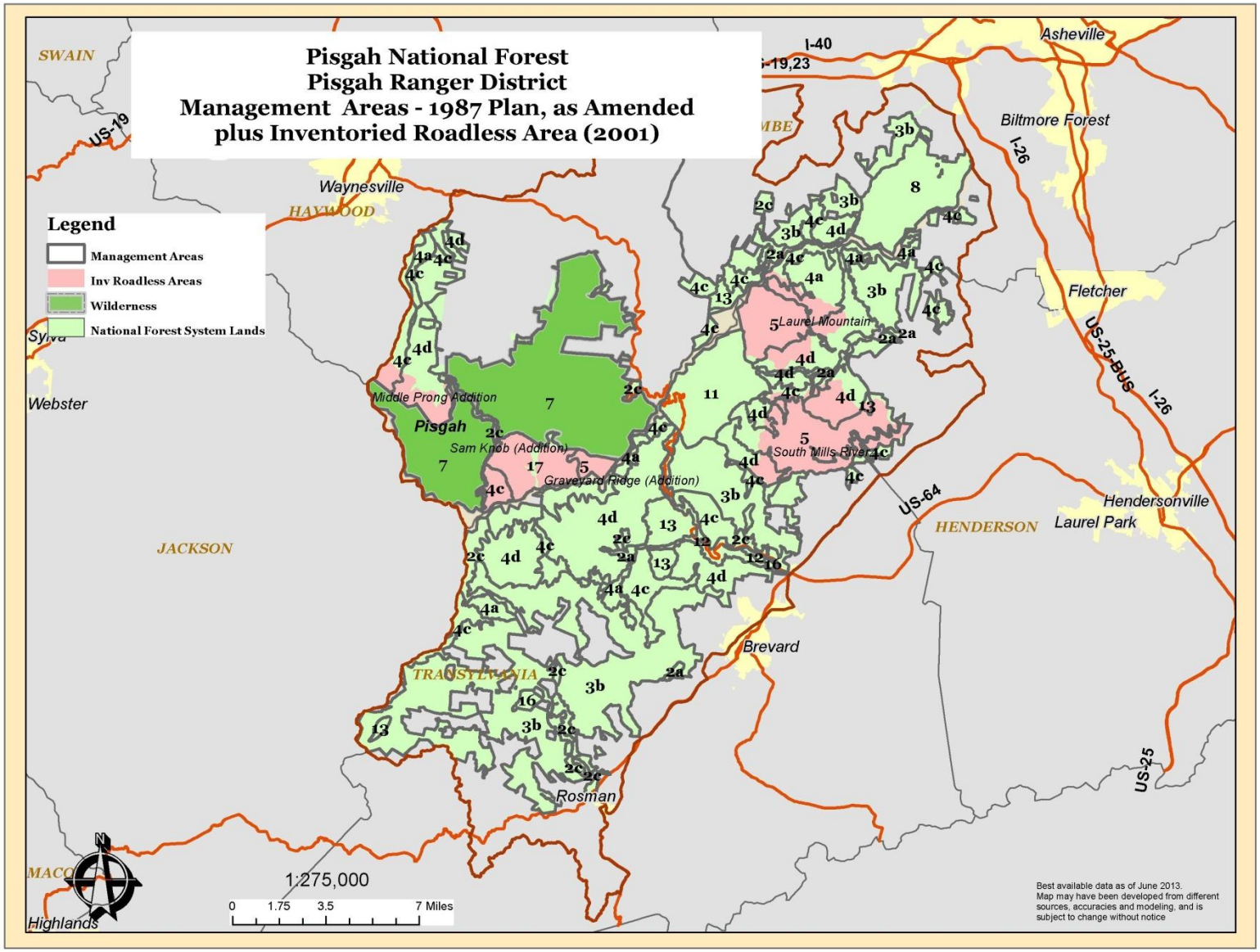
0 1.25 2.5 5 Miles
Best available data as of June 2013.
Map may have been developed from different sources, accuracies and modeling, and is subject to change without notice


Nantahala National Forest
Tusquitee Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
GRAHAM
Robbinsville
US-19,74
Andrews
US-19,129
MACON
CHEROKEE
Tusquitee
Apalachia Lake
Hiwassee Lake
Murphy
Tusquitee Bald
CLAY
Hayesville
US-64
Brasler Peak
Cherry Cove (Addition)
Chunky Gal (Addition)
1914
1:300,000
0 1.75 3.5 7 Miles
Best available data as of June 2013.
Map may have been developed from different sources, accuracies and modeling, and is subject to change without notice


Nantahala National Forest
Nantahala Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
SWAIN
GRAHAM
MACON
JACKSON
HAYWOOD
TRANSYLVANIA
Bryson City
Dillsboro
Sylva
Webster
Maggie Valley
Franklin
Nantahala
Highlands
Rosman
Wesser Bald
Nantahala Lake
Bear Creek Lake
Lake Glenville
Overflow Creek
Big Indian (Addition)
Barkers Creek (Addition)
US-23-74
1:325,000
0 2 4 8 Miles
Best available data as of June 2013.
Map may have been developed from different sources, accuracies and modeling, and is subject to change without notice


Pisgah National Forest
Pisgah Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
SWAIN
JACKSON
HAYWOOD
TRANSYLVANIA
HENDERSON
Waynesville
Webster
Sylva
Asheville
Biltmore Forest
Fletcher
Hendersonville
Laurel Park
Brevard
Rosman
Highlands
Middle Prong Addition
Pisgah
Sam Knob (Addition)
Graveyard Ridge (Addition)
Laurel Mountain
South Mills River
I-40
I-26
US-19
US-25 BUS
US-64
US-25
1:275,000
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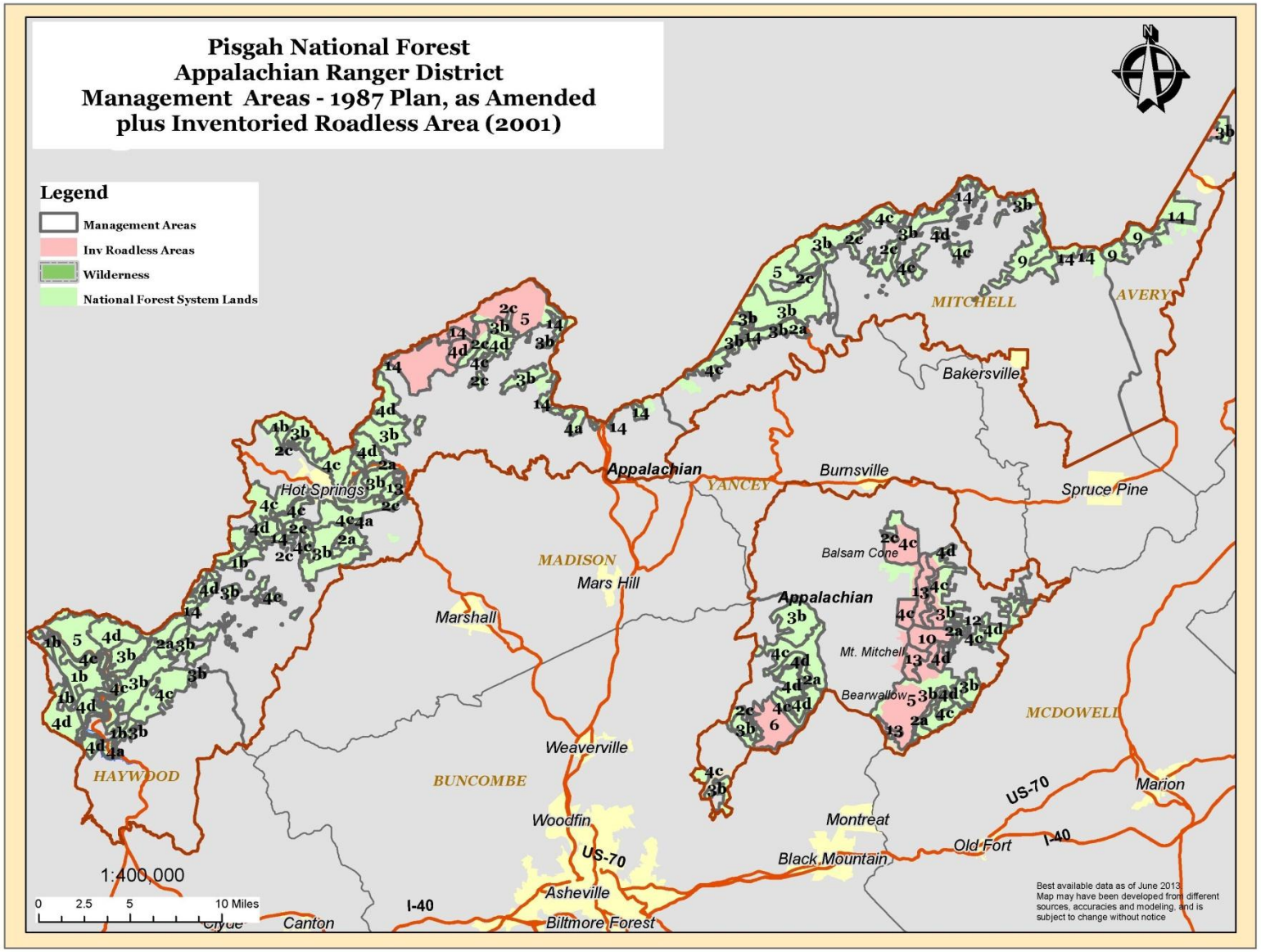
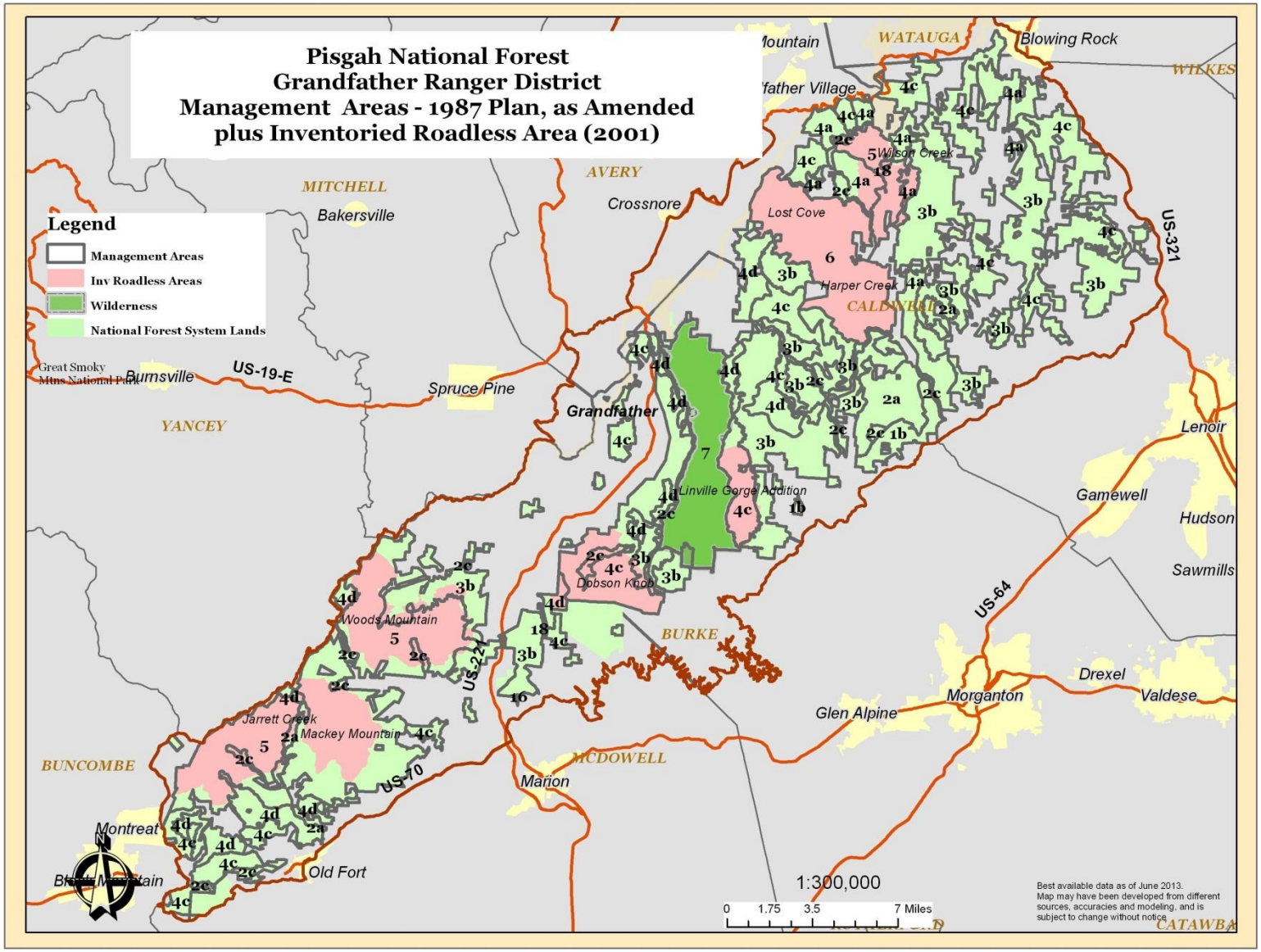
Best available data as of June 2013.
Map may have been developed from different sources, accuracies and modeling, and is subject to change without notice


Pisgah National Forest
Appalachian Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
N
MITCHELL
AVERY
Bakersville
Appalachian
YANCEY
Burnsville
Spruce Pine
Hot Springs
MADISON
Mars Hill
Balsam Cone
Appalachian
Marshall
Mt. Mitchell
Bearwallow
MCDOWELL
HAYWOOD
BUNCOMBE
Weaverville
Woodfin
Montreat
Marion
Old Fort
Black Mountain
Asheville
Biltmore Forest
Canton
Clyde
US-70
I-40
1:400,000
0 2.5 5 10 Miles
Best available data as of June 2013.
Map may have been developed from different
sources, accuracies and modeling, and is
subject to change without notice


Pisgah National Forest
Grandfather Ranger District
Management Areas - 1987 Plan, as Amended
plus Inventoried Roadless Area (2001)
Legend
Management Areas
Inv Roadless Areas
Wilderness
National Forest System Lands
WATAUGA
Blowing Rock
WILKES
AVERY
MITCHELL
Bakersville
Crossnore
Lost Cove
Wilson Creek
Harper Creek
CALDWELL
US-321
Great Smoky Mtns National Park
Burnsville
US-19-E
Spruce Pine
YANCEY
Grandfather
Linville Gorge Addition
Lenoir
Gamewell
Hudson
Sawmills
US-64
Dobson Knob
BURKE
Woods Mountain
US-221
Drexel
Morganton
Valdese
Glen Alpine
Jarrett Creek
Mackey Mountain
BUNCOMBE
US-70
MCDOWELL
Marion
Montreat
Old Fort
1:300,000
0 1.75 3.5 7 Miles
Best available data as of June 2013.
Map may have been developed from different sources, accuracies and modeling, and is subject to change without notice.
CATAWBA