

**Fiscal Year 2015
Monitoring and Evaluation Annual Report**

for the

Revised Land and Resource Management Plan

Cherokee National Forest



U. S. Department of Agriculture
Forest Service
Southern Region

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Forest Supervisor
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2800 Ocoee Street North
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Acronyms

AT	Appalachian Trail
ATV	All-Terrain Vehicle
BMP	Best Management Practices
CFI	Conservation Fisheries, Inc.
CFR	Code of Federal Regulations
CISC	Continuous Inventory of Stand Conditions
CNF	Cherokee National Forest
DBH	Diameter Breast Height
EPA	Environmental Protection Agency
FACTS	Forest Activity Tracking System
FIA	Forest Inventory and Analysis
FEIS	Final Environmental Impact Statement
FSVEG	Forest Service Vegetation
FW	Forest Wide
FY	Fiscal Year
GIS	Geographical Information System
LAC	Limits to Acceptable Change
M&E	Monitoring and Evaluation
MA	Management Area
MCF	Thousand Cubic Feet
MIS	Management Indicator Species
MQ	Management Question
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NFS	National Forest System
NVUM	National Visitor Use Monitoring
OHV	Off Highway Vehicle
PETS	Proposed, Endangered, Threatened and Sensitive species
RARE II	Roadless Area Review and Evaluation (1979)
RD	Ranger District
RLRMP	Revised Land and Resource Management Plan
RX	Prescription
T&E	Threatened and Endangered
TES	Threatened, Endangered and Sensitive
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Forest Supervisor's Certification

I have evaluated the monitoring results and recommendations in this report. I have directed that the Action Plan (Chapter 3) developed to respond to these recommendations be implemented according to the time frames indicated, unless new information or changed resource conditions warrant otherwise. I have considered funding requirements in the budget necessary to implement these actions.

With these completed changes, the *Revised Land and Resource Management Plan* (RLRMP) is sufficient to guide management activities unless ongoing monitoring and evaluation identify need for change.

/s/Derrick JaSal Morris

9/30/16

JaSal Morris
Forest Supervisor

Date



Figure 1. Location of the Cherokee National Forest

Executive Summary of Monitoring and Evaluation Results and Report Findings

The *Revised Land and Resource Management Plan* (RLRMP) provides guidance on how the Cherokee National Forest will be managed. Monitoring is used to assess how well goals and objectives are being met, if standards are being properly implemented, and whether environmental effects are occurring as predicted. The following results are based on the RLRMP signed in January 2004.

Summary of Key Results and Findings:

The 2015 Monitoring and Evaluation (M&E) Report is a valuable tool for the Forest to document the progress we have made toward achieving the goals of the Revised Land and Resource Management Plan. The public will find this M&E Report useful in tracking accomplishments in specific program areas.

Ecosystem Condition, Health and Sustainability

Biological Diversity

The Biological Diversity of the Southern Appalachian Mountains and the Forest is legendary. Nowhere is the diversity greater than in small, rare ecological communities. Emphasis on locating and characterizing rare communities needs to continue; partners are crucial to locating these sites. Once located, identifying, prioritizing, and implementing actions such as; access management, noxious weed control, and application of prescribed fire are essential for rare community management and protection.

Partnerships are crucial to continue emphasis on research, acquisition, survey and characterization of rare communities, and to identify, prioritize, and implement actions such as access management, noxious weed control, application of prescribed fire and other vegetation management, and restoration of ecological functions. The Southern Appalachian Bog Learning Network will be a useful partner in wetlands restoration on the Forest.

Acres acquired in the Rocky Fork tract included biologically significant, high quality rare communities including rock outcrops and cliffs, boulderfields, wetlands, and riparian habitat.

NEPA approved and implemented acreages for 17.01 through 17.09 (except 17.07) are below the minimum RLRMP objectives.

NEPA approved and implemented acreages for 21.01, 21.02 and 21.04 are exceeding the RLRMP minimum objectives; 24.01, exceeded the Forest Plan minimum.

The Forest continues to play a vital role in providing high elevation openings and other openings that are key habitats for many species of greatest conservation needs.

Early successional species including chestnut-sided warbler and prairie warbler show declines within the province; chestnut-sided warbler continues to decline on the Forest as higher elevation forest matures. The Forest plays a vital role in supplying high quality early successional forests of all elevations to species of greatest conservation need.

Harvest trends indicate the black bear population continues to increase, in keeping with a regional trend throughout the Southern Appalachians. Nuisance incident reports remained steady in 2015. Implementation of a variety of Forest management actions including food storage policies, public education and installation of bear resistant trash containers should continue as bear numbers and human encroachment into bear habitat increases across the region. The Forest monitors and adapts to the changing situation-- as the number of daily interactions between people and bears continues to increase, new issues emerge and availability of appropriated funding remains stable or declines.

Future management opportunities on the Forest include: 1) prompt attention to trash storage at all Forest Service facilities including administrative sites and trail shelters 2) increase in efforts to inform and educate Forest visitors and employees with the focus on safety (working in bear country, proper storage of grills, pet food, horse feed, fish coolers); 3) implementation of a consistent food storage policy across the Forest; 4) installing food storage cables for hikers at selected shelters; 5) emphasize and continue the Bear Incident Reporting Program.

Statistically valid protocols should be developed and implemented to the extent possible for every T & E species. However, experience has shown that the intensity of monitoring required to obtain statistically valid trend data may be beyond budgetary constraints and also may adversely impact the target species. Partnerships with other agencies that are monitoring TES species on the Forest have been established and data is being shared.

Ruth's golden aster: While the population of Ruth's golden aster on the Ocoee River appears to be slowly increasing, data from the Hiwassee River and associated field observations there have indicated that suitable habitat is being lost to the encroachment of woody and herbaceous vegetation. An environmental assessment was completed in September 2008 to evaluate the potential effects of using herbicides and alternative methods for removing competing vegetation from these plots. The decision was made to use a combination of mechanical and chemical treatments, the first of which were implemented in Fiscal Year 2009. Monitoring and observations of the treated plots has shown that any clearing effects were very short-lived. While the removal of woody vegetation certainly created more open conditions and allowed more sunlight to the ground, weedy herbaceous species rapidly re-colonized the sites within one season. It would appear that without regular disturbance (flooding) to scour the habitat, weedy native vegetation can colonize any newly exposed habitat faster than the *Pityopsis* in any one season.

All four federally listed Roan Mountain plant species were observed on Cherokee National Forest lands in 2015 and monitoring of each species is ongoing as part of a multi-agency effort. State or National Forest boundaries are not considered in this monitoring.

Spreading avens: No new information to report in 2015. Different monitoring intensity has been implemented across the 22 subpopulations. All have been visited at least once during the last 10 years, most two to three times recording presence and clump numbers. With incorporation in a demographic study administered by Dr. Chris Ulrey, ecologist for the Blue Ridge Parkway, clumps for five of the subpopulations have been tracked for the last six to nine years. Data recorded within the demographic study include clumps, denoted by a separation distance of at least 25 centimeters, number of rosettes per clump, and number of flowers per clump. Four of the five sites do not vary greatly in the number of clumps from year to year. Some declines have been recorded but is primarily a result of two previously separate clumps merging into a single clump or from yearling deaths. One site has a decline, representing less than 10% of the recorded clumps, which is probably a result of impacts from freeze and thawing which dislodged fragmented rocks with adhering *Geum radiatum* clumps off the cliff face during the winter. Rosette numbers tend to be more variable from year to year but did not vary in total by more than 5-10% from the total numbers recorded across the 5 sites. New plants can be produced through sexual or asexual means. Evidence of both types of reproduction is present at some of the sites on Roan Mountain although sexually reproduced seedlings are quite rarely encountered across the five sites.

Roan Mountain bluet: No new information to report in 2015. Two sub-populations (Bus Parking Lot and Cloudland Hotel) on Roan Mountain were monitored in 2012 for the sixth consecutive year. The two sub-populations continue to vary, however both increased in overall extent in 2011. The data for 2012 has not been processed yet but appears to be following the same pattern. The Bus Parking Lot subpopulation increased in extent, area coverage, by 18% from 2009. This is in spite of a 21% decline in the number of occupied plots. The increase in overall coverage is due to greater density within the occupied plots. This increase may not be as large as recorded since it could be an artifact of the sampling design since a slight adjustment of the plot grid along the transect line from year to year could change the number of occupied plots. Long-term monitoring will help to sort the actual or sampling design fluctuations. The Cloudland Hotel sub-population increased dramatically from 2010 to 2011 both in the number of occupied plots and the coverage. As with the parking lot site, the occupied plot numbers could be inflated due to the sampling design.

Rock gnome lichen: No direct monitoring has been completed for rock gnome lichen, however it is observed annually in conjunction with other studies and appears to be stable.

Blue Ridge goldenrod: No new information to report in 2015. As with the other species, sites chosen for monitoring are not based upon relation to state lines or ownership so data does not pertain just to the Cherokee National Forest. In 1996 due to the recreational threats to existing subpopulations at Roan Mountain two closure orders were issued; one for the area at Roan High Bluff and west, the other area from the approach to Eagle Cliff and the

Cliff. Anecdotal observations and post monitoring following the closures indicate these populations have recovered at Roan High Bluff and maintained their abundance at Eagle Cliff.

A limited amount of monitoring has been completed within two of the subpopulations west of Roan High Bluff. For three years, including 2013, two of the smaller subpopulations were tracked by counting the number of clumps and rosettes. During that time this species has remained fairly constant, with the same number of clumps as 2012. Observations in 2012 at all of the sites indicate the persistence of all seven subpopulations on the Pisgah National Forest. Monitoring has been limited across more of the subpopulations since juvenile individuals of a co-occurring species, skunk goldenrod (*Solidago glomerata*), is very difficult to distinguish from mature Blue Ridge goldenrod, which is a shorter species relative to skunk goldenrod.

White Fringeless Orchid: Sampling is done approximately the same time every year during the estimated time of peak flowering, however predicting this is difficult and no two years seem to be the same. The numbers of vegetative plants are counted as a line intercept, while the number of flowering plants are counted within a belt transect. A detailed account of the annual monitoring follows.

There was concern in 2001 with the huge drop in flowering individuals, but it was speculated that this variability was due to differing annual environmental conditions (rainfall amounts, temperatures, etc., which can affect flowering), especially since the vegetative numbers held fairly constant. In 2004 the number of flowering individuals rebounded significantly and remained high through 2007, though dropped slightly with each subsequent year. In 2008 there was another dramatic decline in flowering after two consecutive years of extremely low water levels in the bog. Interestingly, the vegetative count was the highest ever that year, suggesting that the plants are still persisting, just not flowering some years. 2009 was fairly wet in the bog and flowering was late. 2010 was quite the opposite with the water level in the bog being extremely low and most flowering individuals already gone to fruit by the time of monitoring. Total number of reproductive plants was high again in 2010, and vegetative plants continued to hold steady. 2011 was the driest year observed in the bog since monitoring began in 1996. There was no sign of above-ground water anywhere in the bog, and even the stream from Bower's spring that feeds into the site was completely dry. Only three plants with flowers still intact were observed, while any other reproductive plants for the year had fully senesced, making counting very difficult. Likewise, the vegetative plants were showing effects of drought conditions, with some leaves shriveled and brown, which probably contributed to the lowest ever numbers in the vegetative count. Based on previous trends it is expected that this is a temporary decrease based upon two years of drier than normal conditions. 2012 was a highly variable year for climate conditions. There were two weeks of temps in the 80's in March and by June the all-time temperature record in Chattanooga was broken, registering a day of 107 degrees. The summer was mostly hot and dry however heavy rains occurred within a few weeks of the monitoring date. By July 31st (the date of monitoring) there was no standing water, though ditches were saturated to the surface. Only 50 flowering individuals were counted, by far the lowest number ever. While many plants

were in peak flower, some had already senesced and a few were seen with new flowering stalks emerging. Several plants had also been browsed by deer, making the count of flowering individuals difficult. Interestingly, as in 2008, despite record low numbers in flowering individuals, this was the record high numbers in the vegetative counts. This suggests the plants are still persisting at the site, just not flowering in some years, especially it would seem, after periods of long drought. The enclosure fence seems to be effective in keeping out hogs, though deer are continuing to browse on flowering individuals. No other changes were observed in the bog. See pictures above illustrating high water in the bog in 2013. Plants were inundated for at least two weeks, perhaps longer. Any question of whether the extended period of high water in 2013 might negatively affect the plants, was answered immediately upon arrival at the bog in 2014. The 2014 counts represent the highest number of flowering individuals (1,315) counted within the transects to date. It is recommended that population monitoring and maintenance of the enclosure fence continue.

Marsh Marigold: There has been a decline in numbers at the Allan Gap site and it has been observed that shading in portions of the habitat has increased. Some areas have become overgrown with Rhododendron, and multiflora rose and other non-native invasive plant species are also impacting portions of the site. These areas have little or no marsh marigolds, even when adjacent to populations with the same soil and hydrology. If these areas were cleared it would nearly double the habitat available upstream. Habitat improvement work was begun at this site in 2015 and will be enhanced significantly in 2016. Monitoring will continue on a two year schedule to evaluate these treatments on the population.

The transplanted population at Cutshall Bog has increased from two clumps to five and habitat improvement work to restore a more natural hydrologic regime within the bog is in the planning stages.

The **northern bobwhite** displays declines at both the province and Forest scales due to loss of suitable open habitat across its range. Whip-poor-will occupies similar habitat, and is also declining on the Forest. High elevation specialists (common raven, winter wren, and Blackburnian warbler) are declining on the Forest, with the exception of red-breasted nuthatch. The loss of hemlock to hemlock wooly adelgid infestations is expected to result in future impacts to population levels of the wren, Blackburnian warbler, and nuthatch. Although Swainson's warbler is declining within the province, this riparian species appears stable on the Forest.

Forest Health

Forest health issues emerge from both natural and human caused conditions. Natural problems include native and invasive pests and diseases while human caused problems include air quality issues and mechanisms that promote the spread of these vectors.

Non-native invasive plant species are abundant on the Forest and can be found in almost any area that has seen recent disturbance. The forest completed a forest-wide NEPA document in 2008 that authorized treatments in most areas of the forest with the exception of designated wilderness areas. Sites to be treated are prioritized based upon a published forest strategy that takes into consideration species biology and potential risk to natural resources. Highest priority sites are those with invasive species that threaten unique habitats, T&E species, or sites of high public interest.

Recreational Activities

Ginseng

From 1978 to present, statewide ginseng harvests were at their highest from the mid 1980's through the 1990's. While overall ginseng harvest has declined in the state, numbers of permits issued per year on the Cherokee National Forest have fluctuated considerably, high in some years and low in others. It must be noted that for permit data to be meaningful, it must be assumed that all collectors are obtaining permits which is not likely the case. Monitoring data from the two plots on the southern portion of the Forest had shown some increases in numbers and age of plants through 2006. No data were collected from the Ocoee plot in 2007, and in 2010 the site was decimated by collectors. Data from the north zone plots are highly variable and are confounded by two years (2005 & 2007) when no information was collected. In 2011 plots and protocols were shifted to be consistent with statewide monitoring being conducted by the Tennessee Department of Environment and Conservation. While this may add some additional confusion in interpreting the data from these four plots over the past several years, it is hoped it will lead to a better overall assessment of the species in the future as the data can be pooled from all plots across the state. Continued monitoring is recommended to assess trends for ginseng.

Based upon range-wide declines for this species, dramatic changes to the permitting process were implemented in 2013. These changes are designed to set harvest levels at sustainable levels for the long-term. In both 2013 and 2014 only 20 of the 40 available permits were actually sold forest-wide, and only 19 of 40 were sold in 2015. This indicates that half of the lottery winners fail to ever come in and purchase the permit. Additionally, several permittees each year have reported not being able to find the allotted amount of 25 roots. All of this suggests that ginseng is not readily found on the landscape. Monitoring the actual amounts legally harvested each year will help interpret trends for this species into the future.

Ramps

Evidence of collection within the two south zone plots has varied by year with no obvious impacts from over-collecting. Both plots showed declines to their lowest recorded totals in 2007 but then rebounded from those lows in 2008, 2009, and 2011. No data was collected in 2010. Data from the north zone plots are confounded by an inconsistent implementation of protocol (inflated numbers for 2004 at the Iron Mountain site) and a lack of data collection in 2007. It would appear that the Georges Creek site experienced a dramatic decline in 2009, and it was speculated at that time that the cause may be in part related to an active timber sale in the area, however that was not confirmed, and the population showed its highest numbers in 2011. Note that no data was collected in 2010 due to a lack of funding allocated to this monitoring item. All plots were monitored in 2012, 2013, 2014, and 2015. The number of permits issued has increased dramatically in the past few years however there is no real indication that this reflects increased collection, rather, just better information to the public that permits are required. The volumes reported are based upon permitted levels and may not reflect actual pounds collected. Continued monitoring is recommended to assess trends at these four sites.

Fishing

There are approximately 820 miles of streams capable of supporting fish on the Forest. Some of these streams (100 miles) are too small to support game species. Summer temperatures determine whether trout or bass/bream will be the dominate game species. Approximately 550 miles support trout compared to 170 that support bass/bream. Habitat improvement work has focused on the trout waters with about 36 miles of streams improved in 2014. Improvements included installing structures and trimming of rhododendron.

Fish surveys were conducted on about 5.8% of the stream reaches on the Forest; 35% of the fish species known to occur on the Forest were collected indicating that habitat quality is being sustained and aquatic populations are not being adversely impacted by Forest management activities. The stable number of species present in large and moderate sized streams across the Forest supports this premise.

Eight endangered or threatened fish occur on or near the Forest. Critical Habitat exists on the Forest for two of these species - Citico Creek (smoky madtom); and Conasauga River (Conasauga logperch). Endangered and threatened aquatic species are annually monitored through snorkel surveys.

Brook trout are a species of special concern to both local and national audiences. Brook trout numbers are declining across the native range do to environmental and biological impacts. On the Forest, the native or southern strain of brook trout is limited to two streams on the south half of the Forest but occurs in 55 stream reach on the north end. A Southern Appalachian brook trout hatchery was started at the Tellico hatchery in 2011. In 2014 fingerlings (approximately 750) produced by the Tellico hatchery and the Tennessee Aquarium hatchery were released into Sycamore Creek. About twice those numbers of

fingerlings were produced this year at the Tellico hatchery. The Tennessee Aquarium and the Erwin State Fish Hatchery are growing Southern Appalachian brook trout in support of this recovery effort.

Sixteen endangered or threatened mussels occur on or near the Forest; Critical Habitat exists on the Forest for twelve species (ten in Conasauga River and two in Hiwassee River). Eight of these mussel species (seven with Critical Habitat on the Forest) have never been documented on the Forest. Periodic snorkel surveys are conducted on the Forest for mussel species. Based on our surveys and those of other agencies, only the Appalachian elktoe (Nolichucky River) and Cumberland bean pearly mussel (Hiwassee River) are stable. The remaining thirteen mussel species appear to be declining.

Wilderness

The Forest developed and maintained partnerships to make progress on various elements. All Wildernesses managed by the Cherokee National Forest met the minimum stewardship level for applicable elements in FY 2015.

Wild and Scenic Rivers

The Nolichucky suitability study was submitted to congress in 1991 but no action has been taken. The Chattahoochee National Forest is the lead agency for the Conasauga River suitability study. No barriers to the free flowing conditions of the affected rivers have been identified.

Heritage Resources

No significant findings.

Organizational Effectiveness

NEPA approved and implemented volumes for 19.01 and 19.02 are below the RLRMP objectives. With increased efficiency in Inter-Disciplinary teams, through Watershed Analysis, both NEPA approved and implemented projects should bring the volumes closer to the objectives

Chapter 1 Introduction

The Cherokee National Forest manages approximately 640,000 acres in the Southern Appalachian Mountains. Ten counties of eastern Tennessee contain this acreage: Carter, Cocke, Greene, Johnson, McMinn, Monroe, Polk, Sullivan, Unicoi, and Washington. Additionally, approximately 330 acres in Ashe County, North Carolina and 448 acres in Washington County, Virginia are managed by the Forest. A Forest Supervisor located in Cleveland, Tennessee manages the Forest which is administratively divided into four Districts: Ocoee/Hiwassee Ranger District near Benton, Tennessee; Tellico Ranger District near Tellico Plains, Tennessee; Unaka Ranger District near Greenville, Tennessee; and Watauga Ranger District near Unicoi, Tennessee.

The *Revised Land and Resource Management Plan* (RLRMP) approved January 15, 2004, guides management activities in the Forest. These lands are managed to provide goods and services for timber, outdoor recreation, water, wildlife, fish and wilderness following multiple-use goals and objectives.

Monitoring and evaluation of resources and activities is an integral part of the RLRMP and is designed to ensure the goals and objectives are being achieved, standards are being followed, and environmental effects are occurring as predicted. Monitoring and evaluation determines if the Forest is moving toward or achieving the desired conditions for resources.

Monitoring is conducted by field reviews of projects and by inventory and survey work carried out annually. Forest Service resource specialists, universities, state resource agencies, contract specialists and volunteers accomplish this work.

Chapter 2 Monitoring Results and Findings

MQ 1: Are rare communities being protected, maintained, and restored?

Information

This monitoring question is responsive to 9.F-1.01, 9.F-1.02, 9.F-1.04, 9.F-1.05, 9.F-4.01, and 9.F-4.02. Objective 9F-1.01 is to pursue opportunities to acquire lands to ensure and augment ecological viability of these areas. Objective 9F-1.02 is to periodically monitor known rare community sites, identify management activities needed to maintain or restore characteristic structure, composition, and function of these communities, and implement an annual program of work designed to meet these needs. Objective 9F-1.04 is to restore at least 500 acres of table mountain pine forest on lands not currently dominated by table mountain pine over the 10 year planning period. Objective 9F-1.05 is to maintain table mountain pine forests by prescribed burning an average of 160 acres of type each year. The monitoring elements are defined as follows:

1. How many acres of table-mountain pine were established?
2. Which rare community types and how many acres have been acquired through exchange or purchase?
3. Report on accomplishment of completed management plans and completed associated monitoring.
4. Acres of table-mountain pine prescribe burned annually.

Results

1. Less than 2% of the forested acres of the CNF are table mountain pine or table mountain pine-hardwood mix remain on the Forest. The average age of table mountain pine or table mountain pine-hardwood mix is over 100 years old. About 80 percent of the table mountain pine and mixed acres are in unsuitable management prescriptions. There were no acres of table mountain pine established in 2014, however there were acres maintained and improved by prescribed burning (see results # 4).

2. Approximately 938 acres of land were acquired by the Cherokee NF in 2015 (Table 1).

Table 1. Land Acquired by the Cherokee NF in 2015

Tract Name	Acres	County
Rich Mountain – Rocky Fork	100.00	Greene
Elizabeth M. Beaver	22.22	Washington
The Nature Conservancy Tapoco T-4	813.80	Monroe
Michael L. Sams - Easement	1.88	Unicoi

While these lands have not been fully inventoried for significant rare communities or rare elements, they do include some very important habitat components and linkages. In particular, Because of its size (813 acres) and forested condition, the Tapoco purchase would likely have a positive impact on interior dwelling fauna, and the connecting river frontage to the Great Smoky Mountains National Park represents a very important landscape linkage. The Rich Mountain tract contains high elevation habitats (4,800 feet) and could include beech gaps or high elevation seeps that are quite rare on the landscape.

3. Rare communities on the forest are addressed by management prescription 9F and forest-wide standard FW-47. Through a cooperative agreement with USGS and the University of Georgia an assessment was made for each of the 26 sites that are mapped in the RLRMP. Existing conditions, major threats, and recommendations for management were described for each site. In 2014 initial planning for restoration and maintenance of two wetland rare communities were initiated on the north zone of the Forest (Cutshall Bog and Allen Gap Pond). Some treatments of invasive species were begun at Allen Gap Pond in 2015 and additional work is planned for 2016.

4. There were 141 acres of table mountain pine and 20 acres of table mountain pine-hardwood mixed stands prescribe burned in 2014.

Findings

Partnerships are crucial to continue emphasis on research, acquisition, survey and characterization of rare communities, and to identify, prioritize, and implement actions such as access management, noxious weed control, application of prescribed fire and other vegetation management, and restoration of ecological functions. The Southern Appalachian Bog Learning Network is a useful partner in wetlands restoration on the Forest.

Acres acquired in the Rocky Fork tract included biologically significant, high quality rare communities including rock outcrops and cliffs, boulderfields, wetlands, and riparian habitat.

MQ 2: Are landscape-level and stand-level composition and structure of major forest communities within desirable ranges of variability?

Information

This monitoring question is responsive to Goal 11 and Objectives 17.01, 17.02, 17.03, 17.04, 17.05, 17.06, 17.07, 17.08, 17.09, 18.01, 18.02, 18.03, 18.04, 21.01, 21.02, 21.03, 21.04, 24.01 and 24.02. The monitoring elements are defined as follows:

1. Goal 11 Encourage maintenance of forest as a land use on private lands within and surrounding national forests through land acquisition, agreements, and education, in order to maximize benefits of national forest lands to area sensitive forest interior species.

2. Objective 17.01 Over the 10-year period, restore at least 5000 acres of diverse native communities appropriate to sites currently occupied by white pine plantations.

3. Objective 17.02 Over the 10-year period, restore oak or oak-pine forests on at least 9,000 acres per decade of appropriate sites currently occupied by pine plantations or other sites with minimal diversity.
4. Objective 17.03 Over the 10-year period, restore at least 10,000 acres of shortleaf/pitch/table-mountain pine forests.
5. Objective 17.04 Over the 10-year period, restore at least 300 acres to appropriate native communities currently occupied by loblolly pine plantations.
6. Objective 17.05 Over the 10-year period, reduce the acreage of Virginia pine forest by at least 25,000 acres, through restoration of fire-adapted pine or oak communities.
7. Objective 17.06 Restore at least 5700 acres in dry and xeric oak and pine-oak forests to open woodlands, savannahs, and grasslands over a 10-year period.
8. Objective 17.07 For northern hardwood, mixed mesophytic, and river floodplain hardwood, maintain a minimum of 75 percent of total forest-wide acreage in mid- and late-successional conditions, and a minimum of 50 percent in late-successional conditions, including old growth.
9. Objective 17.08 Thin an average of at least 100 acres per year of shortleaf/pitch pine forest, in an effort to maintain a target basal area of 60-80 square feet per acre.
10. Objective 17.09 Convert fescue fields to native grasses.
11. Objective 18.01 Encourage reintroduction of extirpated or declining native species when technologically feasible.
12. Objective 18.02 Promote the health of susceptible forest communities by maintaining site-specific basal area that promotes tree vigor.
13. Objective 18.03 Integrate pest management to protect resources from damage caused by gypsy moth and other forest insects and diseases, utilizing the most appropriate technique.
14. Objective 18.04 Identify and track southern pine beetle infestations and suppress where appropriate and feasible.
15. Objective 21.01 Prescribe burn an average of at least 11,000 acres per decade of shortleaf/pitch/table-mountain pine forest, in an effort to maintain a fire return cycle of 4-12 years.
16. Objective 21.02 Prescribe burn an average of at least 52,000 acres per decade of oak oak-pine forests in an effort to maintain a 4-12 year fire return cycle.

17. Objective 21.03 Prescribe burn an average of at least 26,000 acres per decade of woodlands, savannas, and grasslands, in an effort to maintain a 4-12 year fire return cycle.

18. Objective 21.04 Prescribe burn an average of at least 12,000 acres per decade of pine-oak forests in an effort to maintain a 4-12 year fire return cycle.

19. Objective 24.01 Reduce hazardous fuels between 19,000 and 60,000 acres per year with priority given to areas affected by insects, diseases, storm damage and along NFS boundaries with high property values at risk.

20. Objective 24.02 Minimize the acreage of mixed mesophytic and northern hardwood forest prescribed burned annually, within the constraints of meeting other prescribed fire objectives and without resulting in large increases in plowed or bladed fire line construction.

Results:

1. New land acquisitions of 1,009 acres across the Forest would have little impact on the percentage of forested acres on the CNF. However, the acquisitions help link the Cherokee to other Federal lands in the Southern Appalachians particularly the Towee tract, the Rich Mountain tract and the Tapoco tract. The Rich Mountain tract is at an elevation of 4800 feet ASL and therefore could contain important habitat for high elevation interior species. The Tapoco tract of 813 acres is important because it provides a closer connection between the Forest and the Great Smoky Mountains National Park .

Goal 11 - refer to MQ 4 for a complete discussion of Management Indicator Species (MIS).

The results of management activities for Objectives 17.01, 17.02, 17.03, 17.04, 17.05, 17.06, 17.07, 17.08, 17.09, 18.01, 18.02, 18.03, 18.04, 21.01, 21.02, 21.03, 21.04, 24.01 and 24.02 are presented graphically with the 10 year RLRMP acreage objective, the acres with NEPA approval, and the acreage implemented.

2. Objective 17.01 – Convert White Pine Plantations to Diverse Native Communities

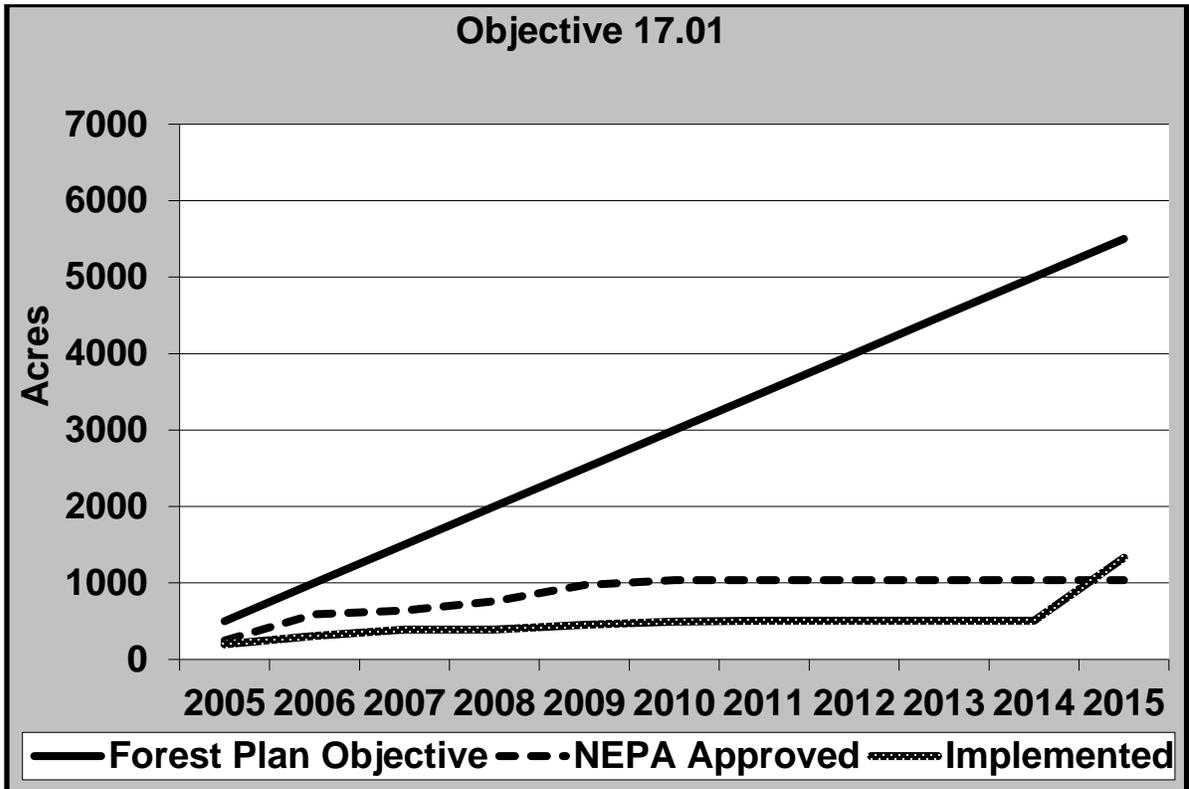


Figure 2. Objective 17.01

3. Objective 17.02 – Pine Plantations Restored to Oak or Oak/Pine Forests

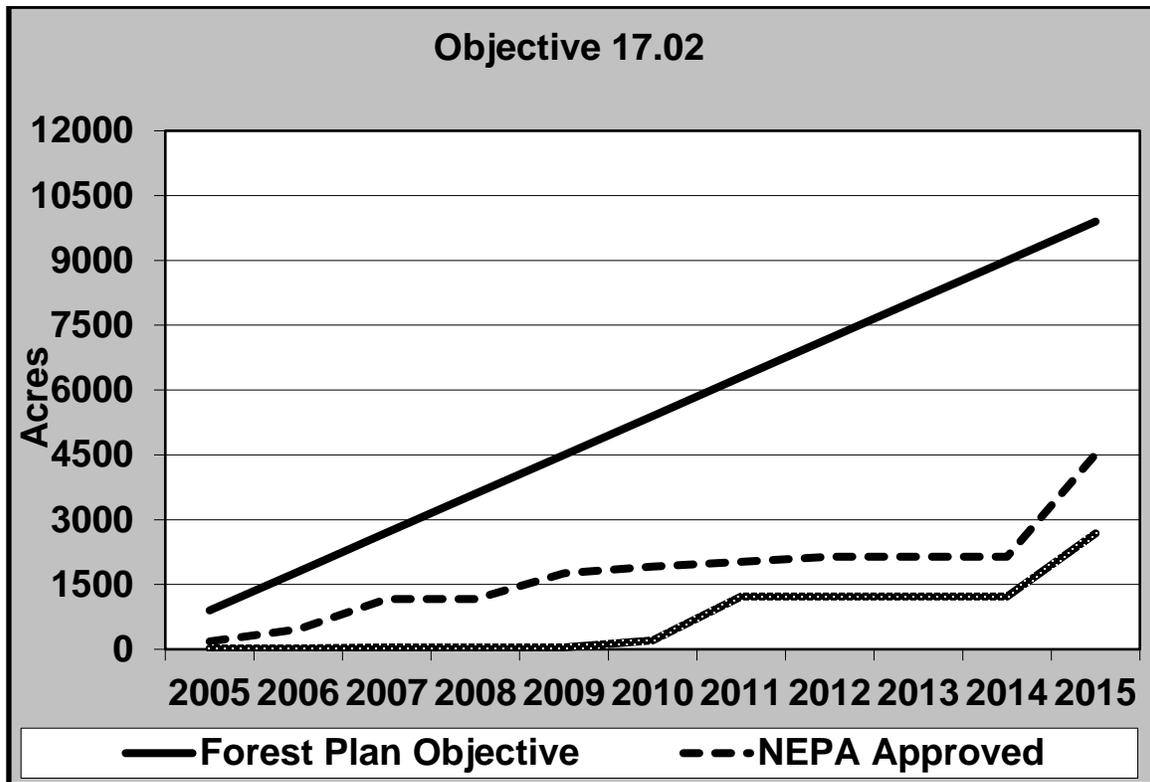


Figure 3. Objective 17.02

4. Objective 17.03 – Restore Shortleaf/Pitch/Table-Mountain Pine Forests

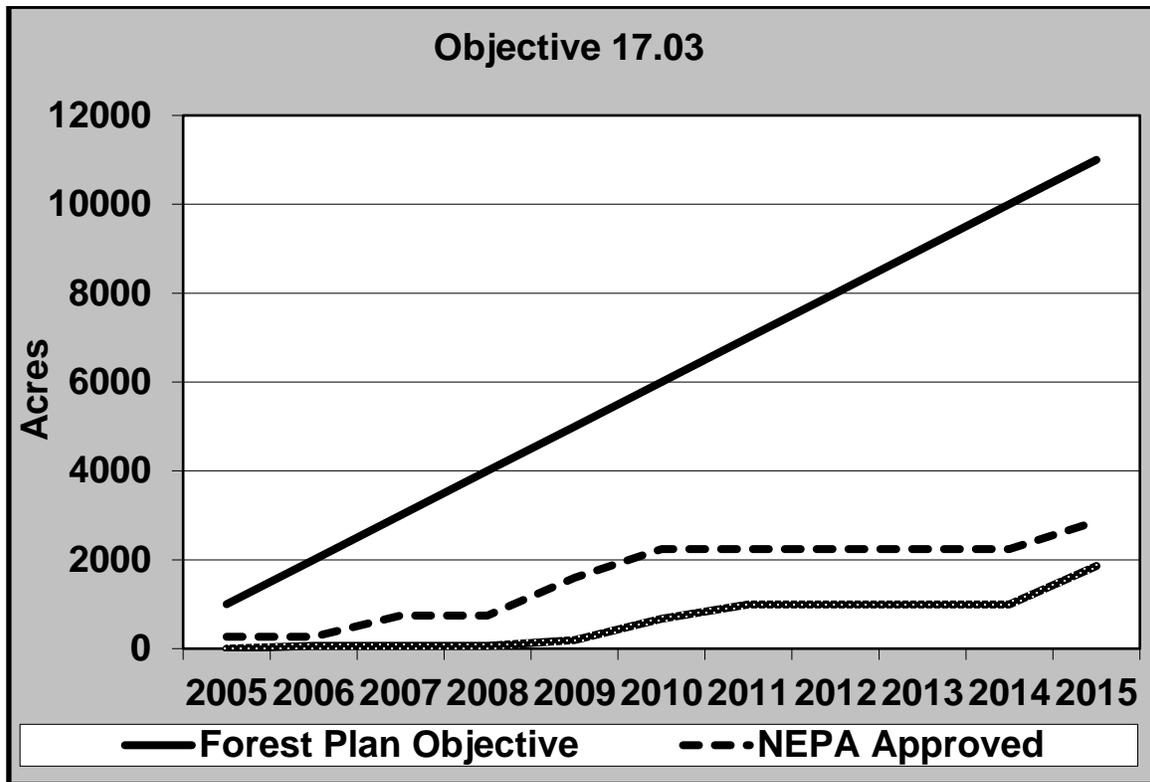


Figure 4. Objective 17.03

5. Objective 17.04 – Loblolly Pine Plantations Restored to Native Communities
No activities have been approved or implemented.

6. Objective 17.05 – Virginia Pine Forests Restored to Fire-Adapted Pine or Oak Communities

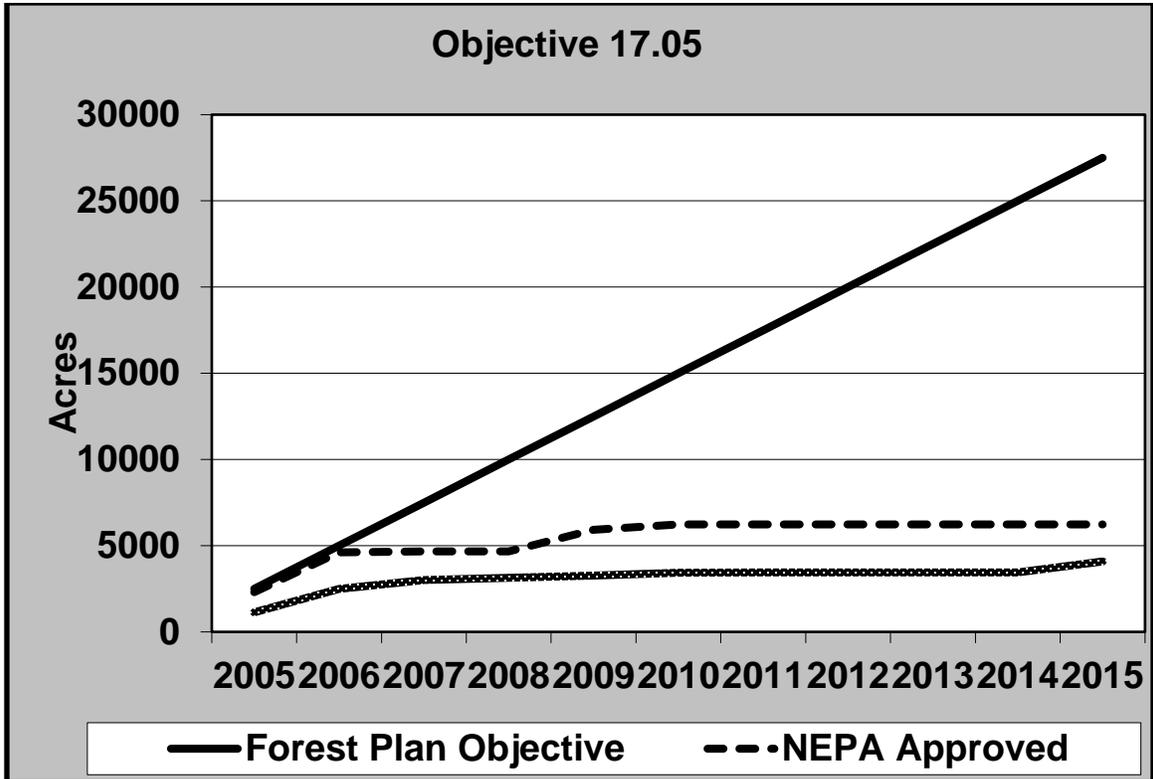


Figure 5. Objective 17.05

7. Objective 17.06 – Restore Dry and Xeric Oak and Pine-Oak Forests to Open Woodlands, Savannahs, and Grasslands

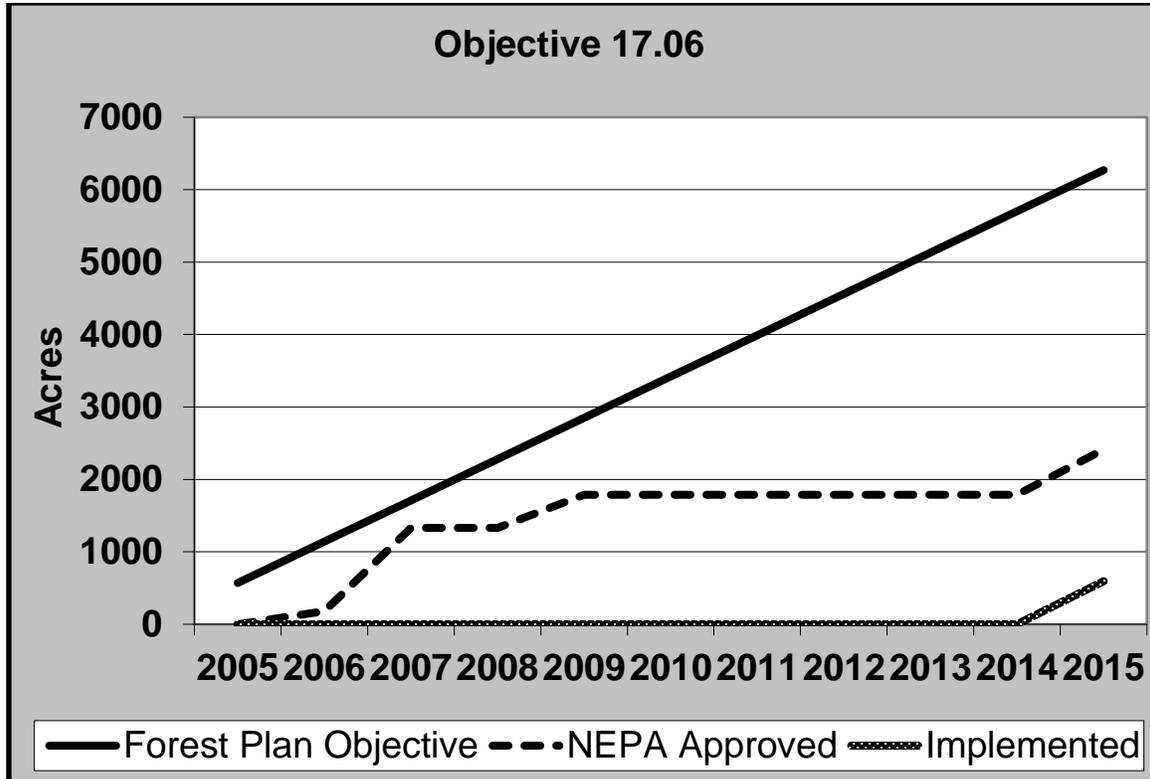


Figure 6. Objective 17.06

8. Objective 17.07 – Maintain a minimum of 75% of northern hardwood, mixed mesophytic, and river floodplain hardwood in mid- and late-succession conditions and a minimum of 50% in late-succession conditions, including old growth.

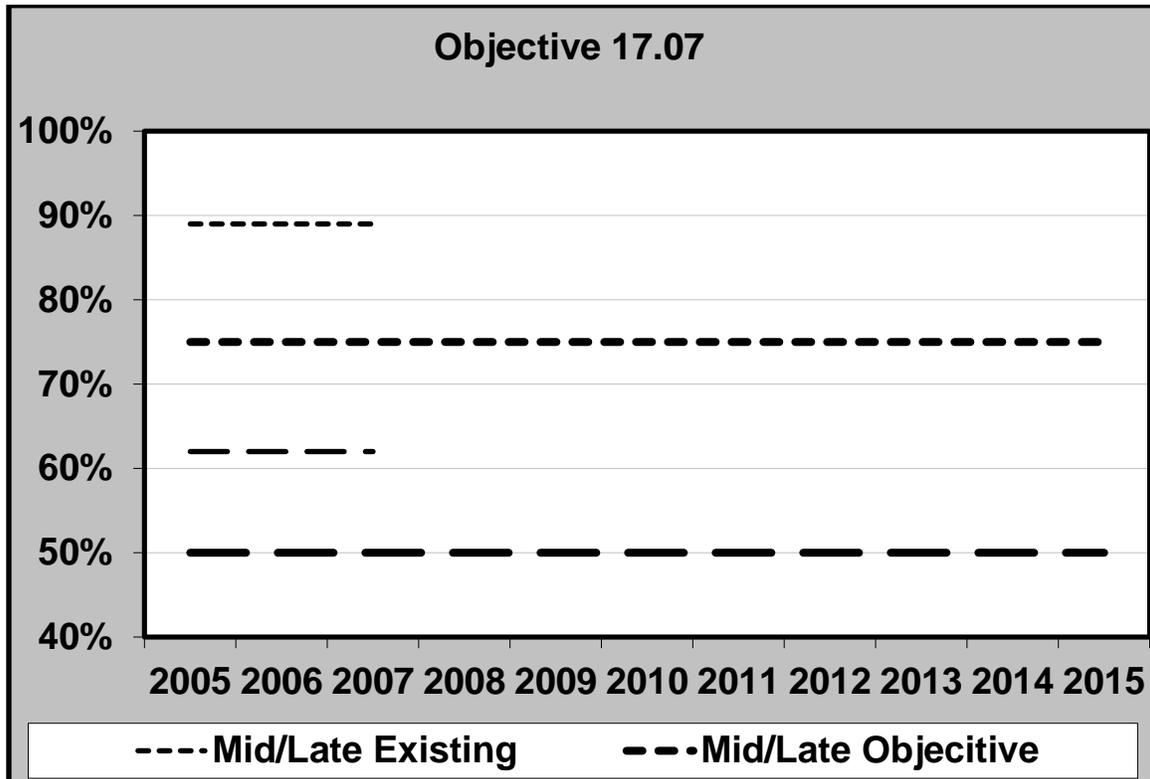


Figure 7. Objective 17.07

9. Objective 17.08 – Thin Shortleaf/Pitch Pine Forest to a Basal Area of 60-80 sq-ft/ac

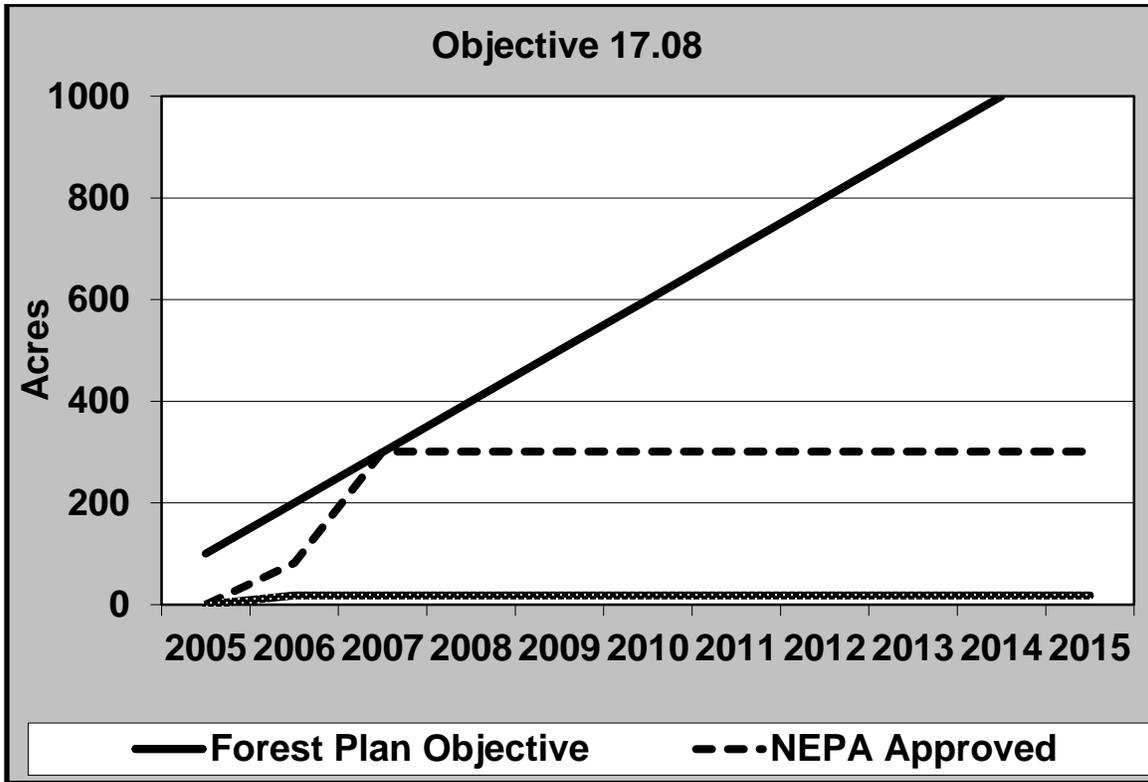


Figure 8. Objective 17.08

10. Objective 17.09 – Convert Fescue Fields to Native Grasses.

The Forest continues to convert fescue fields to native grasses. About 24 acres were treated for fescue in 2015 to add to the 397 acres of native grass fields on the Forest.

11. Objective 18.01 - Encourage reintroduction of extirpated or declining native species when technologically feasible. Refer to MQ's 6 and 7.

12. Objective 18.02 - Promote the health of susceptible forest communities by maintaining site-specific basal area that promotes tree vigor. Refer to Objective 17.08 and MQ 6.

13. Objective 18.03 - Integrate pest management to protect resources from damage caused by gypsy moth and other forest insects and diseases, utilizing the most appropriate technique. Refer to MQ 6.

14. Objective 18.04 - Identify and track southern pine beetle infestations and suppress where appropriate and feasible. Refer to MQ 6.

15. Objective 21.01 – Prescribe Burn Short Leaf/Pitch/Table-Mountain Pine Forests to Maintain a Fire Return Cycle of 4-12 Years.

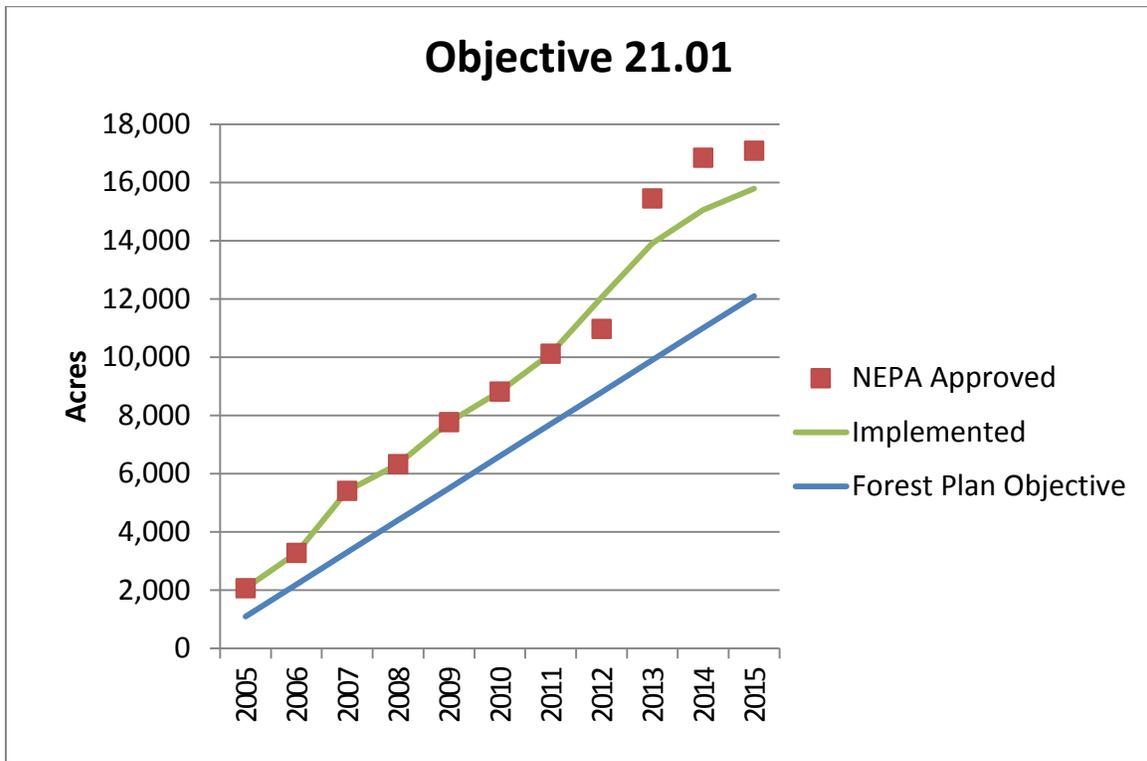


Figure 9. Objective 21.01

16. Objective 21.02 - Prescribe Burn Oak and Oak/Pine Forests to Maintain a Fire Return Cycle of 4-12 Years.

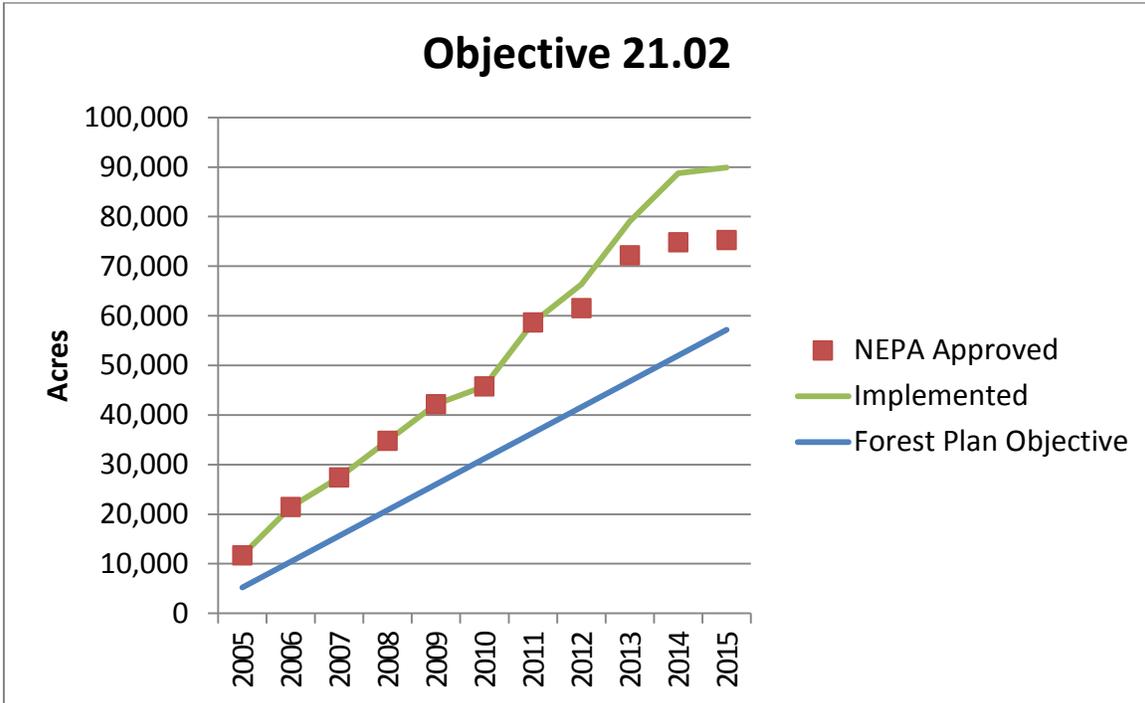


Figure 10. Objective 21.02

17. Objective 21.03 - Prescribe Burn Open Woodlands, Savannahs, and Grasslands to Maintain a Fire Return Cycle of 4-12 Years.

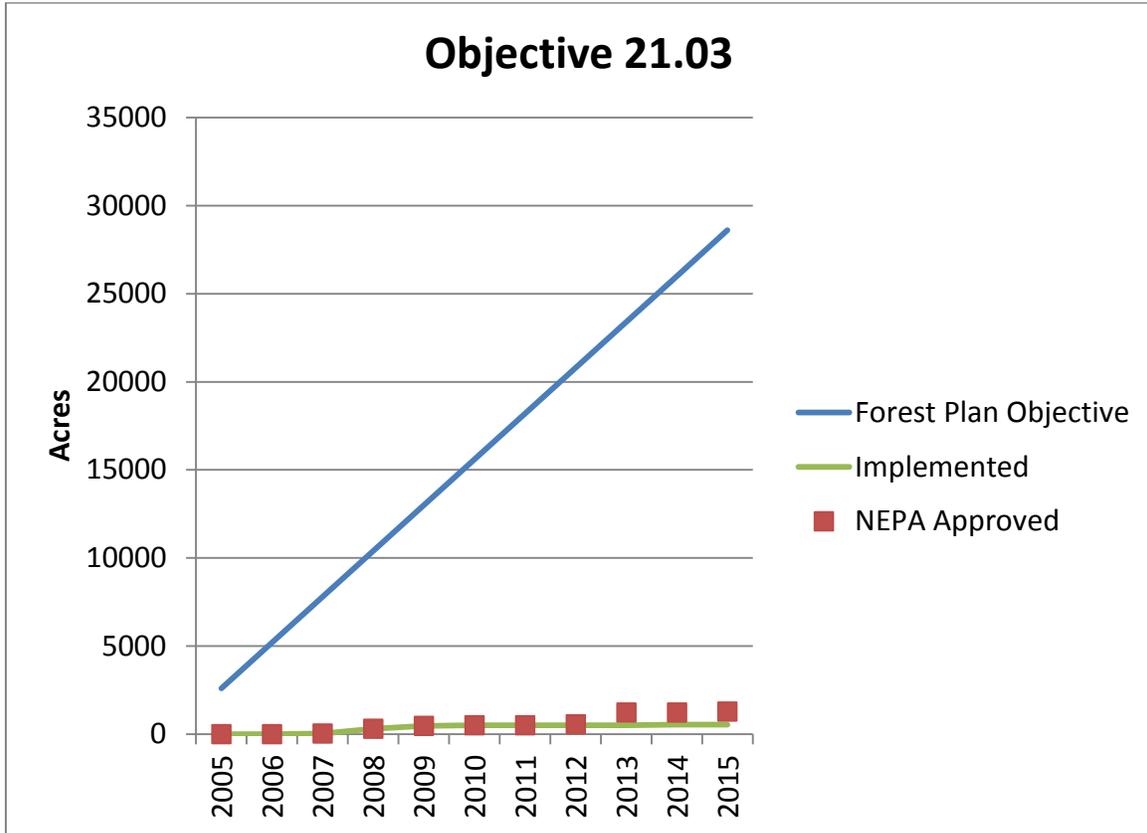


Figure 11. Objective 21.03

Very few forest stands have been typed as open woodlands, savannahs, or grasslands resulting in the low acres of accomplishment.

18. Objective 21.04 - Prescribe Burn Pine/Oak Forests to Maintain a Fire Return Cycle of 4-12 Years.

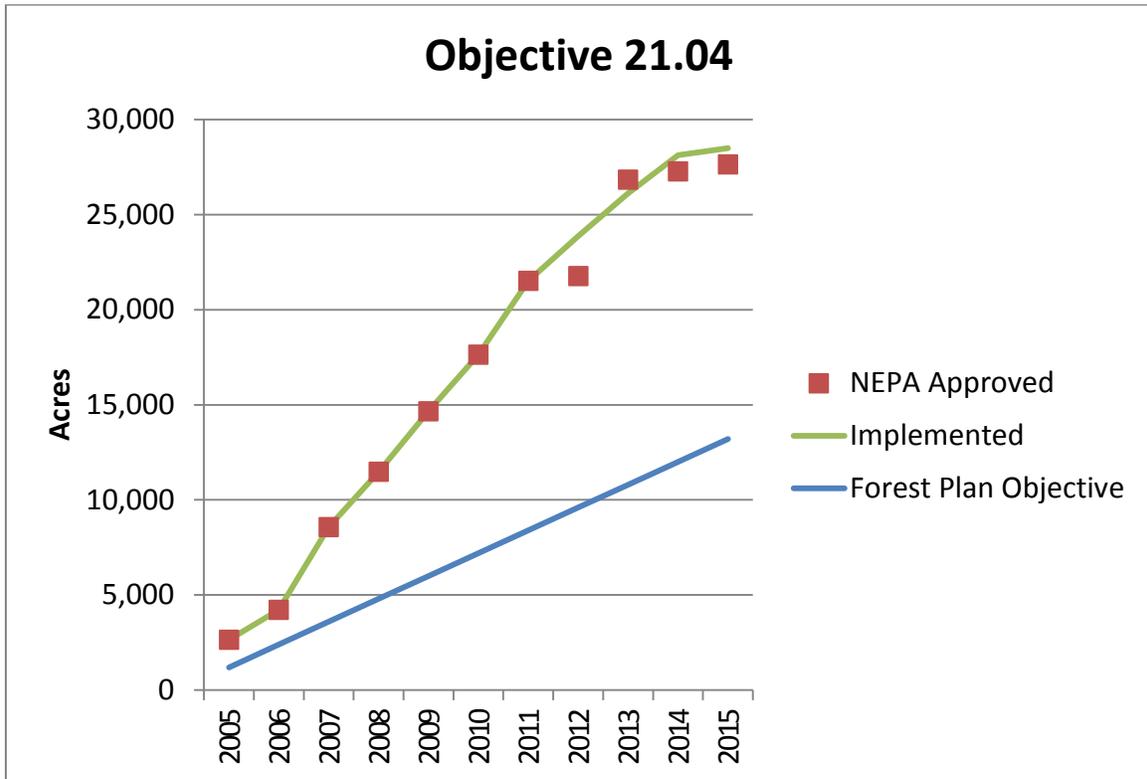


Figure 12. Objective 21.04

19. Objective 24.01 - Reduce Hazardous Fuels in Areas Affected by Insects, Diseases, Storm Damage, and Along NFS Boundaries with High Values of Risk.

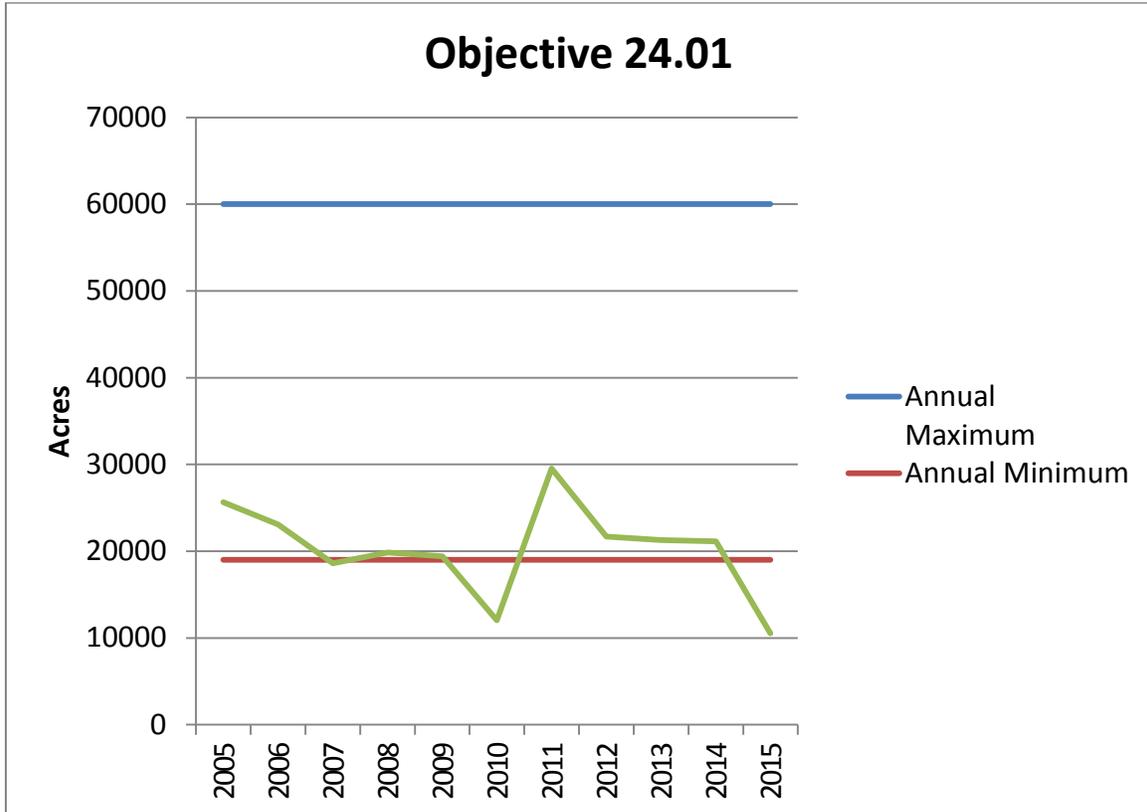


Figure 13. Objective 24.01

20. Objective 24.02 - Minimize the acreage of mixed mesophytic and northern hardwood forest prescribed burned annually, within the constraints of meeting other prescribed fire objectives and without resulting in large increases in plowed or bladed fire line construction.

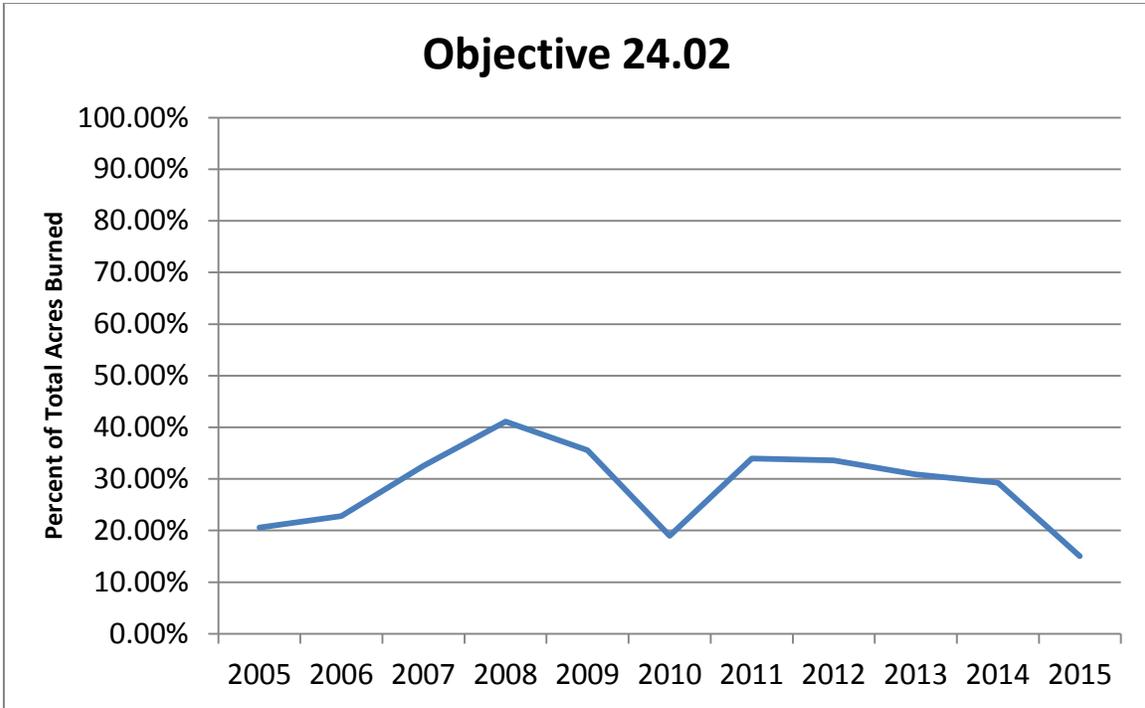


Figure 14. Objective 24.02

Mixed mesophytic or northern hardwood forests are often a significant portion of many burn units. Fires are allowed to burn into these areas but no effort is made to sustain them. Effects to these moist and sensitive communities are minimal.

Findings

NEPA approved and implemented acreages for 17.01 through 17.09 (except 17.07) are below the minimum RLRMP objectives.

NEPA approved and implemented acreages for 21.01, 21.02 and 21.04 are exceeding the RLRMP minimum objectives; 24.01, exceeded the Forest Plan minimum.

MQ 3: Are key successional stage habitats being provided?

Information

This monitoring question is responsive to Objectives 12.01, 16.01, 17.07, 7C-1.01, 7E-1.01, 8A1-1.01, 8B-1.01, 8C-1.01, 9H-1.01, and management of wildlife openings. The monitoring elements are defined as follows:

1. How many field inventories for old growth were conducted and how many small, medium, and large patches were designated?
2. How many acres of old growth have been designated by patch size and old growth community type?
3. Are old growth definitions adequately describing the community and condition?
4. How many partnerships does the Forest have with other agencies or organizations to help with old growth inventories?
5. Acres above 3000 feet elevation in habitats characterized by grassy/herbaceous ground cover and presence/absence of golden-winged warblers in optimal habitats.
6. What is the age class distribution for northern hardwood, mixed mesophytic, and river floodplain hardwood communities (FW Objective 17.07)? Is 75% of the total acreage for these communities in mid and late-successional stages and is a minimum of 50% of the total acreage for these communities in late successional conditions including old growth?
7. In Management Prescription 9.H., are we maintaining at least 50% of forested acres in mid to late-successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?
8. In Management Prescription 8.C, are we maintaining a 125 year rotation and are we maintaining at least 65% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 8% of acres in early successional forest conditions?
9. In Management Prescription 8.B, are we maintaining at least 20% of forested acres in mid to late successional condition, including old growth; at least 10% of forest wide acres in late and old growth condition; and 10% to 17% of acres in early successional forest conditions?
10. In Management Prescription 8.A, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?

11. In Management Prescription 7.E.2, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?

12. In Management Prescription 7.C, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?

13. Acres and number of permanent openings by opening type (wildlife opening, pastures, right-of-way, etc.) and the annual level of activities implemented to maintain them by activity type (burning, mowing, seeding/fertilizing, etc.).

Results

1-4. In 2015, stand exams were conducted in the Gregs Branch, Meadow Creek, Rocky Fork, Stone Pile, Trail of Tears and White Pine watersheds or project areas. Recorded stand exams were done on 154 stands for a total of approximately 5,236 acres. Non-recorded, “walk through” exams include much more area. These stands exams were conducted for resource management support including, but not limited to, forest health, wildlife and old growth. No old growth was identified during this process in 2015.

Table 2. Percentages of Forest areas in successional stages where objectives for successional habitat have been established

Objective	Early Succession		Mid and Late Succession*		Late Succession*	
	FY 2015	Desired	FY 2015	Desired	FY 2015	Desired
17.07	1<%	**	90%	>75%	80%	>50%
7.C-1.01	0%	4% - 10%	90%	>50%	64%	>20%
7.E-2.01	6%	4% - 10%	87%	>50%	76%	>20%
8.A1-1.01	1%	4% - 10%	84%	>50%	71%	>20%
8.B-1.01	1%	10% - 17%	77%	>20%	64%	>10%
8.C-1.01	1%	4% - 8%	84%	>65%	70%	>20%
9.H-1.01	1%	4% - 10%	78%	>50%	62%	>20%

*Includes old growth
 **Mixed mesophytic, northern hardwoods and river floodplain hardwood are components of various management prescription areas and contribute to the succession objectives of these.

5. Golden winged warbler surveys coordinated by organizations from three states (Tennessee, North Carolina and Georgia) took place in 2015. Surveys were conducted by state, federal, non-governmental organizations and volunteers across a wide area of the Southern Appalachians. The effort resulted in a small number of new golden-winged warbler detections. The results of the effort are helping planners, biologists, and land managers identify where to concentrate habitat conversion for golden-winged warbler in the Southern Appalachians.

The Watauga District continues implementation of the Upper Laurel Fork golden-wing warbler project as a result of the important new occurrences in the area. Partners involved in this effort include Tennessee Wildlife Resources Agency, Appalachian Trail Conservancy, and National Wild Turkey Federation. This project is already a success as more golden-wings have been heard in the area.

The Tellico District continues work on Whigg Meadow, a high elevation bald in Monroe County, to expand the habitat potential of golden-winged warbler's.

6-12. The results related to items 6 through 12 in the Information section above are displayed in Table 2. The percentage of acres in each age class following implementation of projects is compared to the RLRMP desired percentage. The successional stage age classes are based on Table 2 of the Final Environmental Impact Statement for the RLRMP.

13. With Forest Service appropriated funds and funding provided by the Tennessee Wildlife Resources Agency, the National Wild Turkey Federation, the Appalachian Trail Conservancy, and other partners the Forest treated over 1,700 acres of wildlife openings by mowing, dicing, applying herbicide, sowing, liming and/or fertilizing.

Findings

The Forest continues to play a vital role in providing high elevation openings and other openings that are key habitats for many species of greatest conservation needs.

MQ 4: How well are key terrestrial habitat elements being provided?

Information

This monitoring question is responsive to Goals 11, 12 and 13; Objectives 13.01 and 17.09; and standards 34, 35, 40, 41, 42 and 43. Goal 11 is to encourage maintenance of forest as a land use on private lands within and surrounding national forests through land acquisition, agreements, and education, in order to maximize benefits of national forest lands to area sensitive forest interior species. Goal 12 is to provide breeding, wintering, and migration staging and stopover habitat for migratory birds in ways that contribute to their long-term conservation. Goal 13 is to maintain or increase habitats for those species needing large, contiguous forested landscapes, where the management of Forest lands can make a difference in their populations and viability. Objective 13.01 states that no new open road access will be provided in bear reserves; no motorized public off road use will

be allowed in bear reserves. Objective 17.09 calls for conversion of fescue fields (140 acres) to native grasses within a 10-year period. Standard FW-34 establishes roost-tree retention for Indiana bat. Standard FW-35 state that during all silvicultural treatments in hardwood forest types, retention priority is given to largest available trees that exhibit characteristics favored by roosting Indiana bats. FW-40 states that known black bear den sites will be protected as long as they remain suitable by prohibiting vegetation management and ground disturbing activities within a minimum of 100 feet around the den. FW-41 states that potential black bear den trees will be retained during all vegetation management treatments. Potential den trees are those greater than 20 inches dbh and are hollow with broken tops. FW-42 provides for no net increase in open roads in each individual TWRA designated bear reserve. FW-43 provides that within TWRA designated bear reserves, no new motorized trail systems will be developed. The monitoring elements are as follows:

1. What is the trend in the abundance and distribution of landscape important for forest interior birds?
2. What are the trends in Management Indicator Species (MIS) populations in relationship to the terrestrial habitat attributes for which the MIS was selected to indicate?
3. Fuelwood permit spotchecks and leave tree spotchecks.
4. Did open road miles in TWRA bear reserves and motorized access trail miles in TWRA bear reserves remain stable or decline each year during the planning period?
5. Establishment of native grass communities.
6. Average snag density by size class, stratified by broad forest types and condition.

Results

1. New land acquisitions across the Forest are important for forest interior bird species. Though these acres have not been fully inventoried their location adjacent to other Federal lands and some at high elevations make them potential hot spots.

2. Management Indicator Species – Birds

Management Indicator Species Table 3 displays the mean number of observations per count and percent annual change in the number of observations per count for avian Management Indicator Species in National Forests of the Southern Blue Ridge (SBR) Physiographic Province compared to Cherokee National Forest (CNF), 1992-2004 (LaSorte et al. 2007). Estimates were based on point count surveys and were generated from marginal Poisson regression models. Estimates based on many points with confidence intervals that exclude zero are more reliable than estimates based on few points with confidence intervals that include zero.

Table 3. MIS trends of Southern Blue Ridge Province to Cherokee National Forest (1992-2004) (LaSorte et al. 2007).

Species (<i>habitat represented</i>)	Scale	Mean obs per count	Total no. of points	Percent annual change	90% Confidence limit	
					Lower	Upper
Pileated woodpecker (<i>snags</i>)	SBR	0.397	746	2.8	1.5	4.1
	CNF	0.310	296	2.1	0.6	3.7
Acadian flycatcher (<i>mature riparian</i>)	SBR	0.146	287	-1.3	-4.2	1.8
	CNF	0.101	88	-0.3	-4.2	3.8
Chestnut sided warbler (<i>early succession</i>)	SBR	0.452	406	-7.5	-9.5	-5.3
	CNF	0.252	94	-2.4	-4.9	0.1
Pine warbler (<i>pine-oak</i>)	SBR	0.122	302	-1.4	-4.2	1.4
	CNF	0.132	136	6.7	4.4	9.0
Prairie warbler (<i>early succession</i>)	SBR	0.085	147	-7.5	-11.8	-3.0
	CNF	0.054	57	4.1	-0.5	8.9
Ovenbird (<i>mature interior</i>)	SBR	0.749	760	-0.1	-1.3	1.2
	CNF	0.744	330	1.4	-0.0	2.8
Hooded warbler (<i>dense mesic midstory</i>)	SBR	0.522	702	-1.5	-3.0	-0.1
	CNF	0.626	327	-1.8	-3.1	-0.4
Scarlet tanager (<i>xeric oak-pine</i>)	SBR	0.417	753	0.1	-1.3	1.6
	CNF	0.433	319	0.5	-1.0	1.9

Bird population trends for the Forest and the Southern Blue Ridge physiographic province continue to be monitored each year using point count data collected in support of the Forest Service Southern Region's R8 Bird database.

The trend results reported here are based on a hierarchical model for population change in the Bird Conservation Region for the Appalachian Mountains. In previous monitoring and evaluation reports, trends were based on the Breeding Bird Survey routes. Patuxent now uses a hierarchical model to produce annual indices of abundance for a region, then estimates trends as the ratio of the annual indices for the first and last year of the interval of interest. The Markov chain Monte-Carlo method used to fit the model is an iterative fitting procedure, which produces a series of replicates from which the estimates and their credible intervals can be derived. This summary program uses these replicates, summarized at the level of stratum within states or Provinces, aggregates them into regional estimates for the selected region, and calculates a trend as a ratio of annual indices corresponding to the first and last years of the selected interval. (Sauer et al. 2012)

As expected, pileated woodpecker showed increasing trends within the province and on the Forest due to the increasing age of the National Forests and abundance of large snags. North America Breeding Bird Survey Summary of Population Change (Sauer et al., 2012) record roadside surveys conducted by skilled volunteers. For the Appalachian Mountains, this data show an increasing trend (trend=1.59) for the pileated woodpecker. Acadian flycatcher trends are declining both within the province and on the Forest, which may be related to loss of habitat at a larger scale or to lack of very old mesic forest with well developed mid-story. Sauer et al. also report declines for this flycatcher (trend=-1.00).

The hooded warbler has an increasing trend in the Appalachian Mountain region (trend=2.42), but decreasing on the Forest. Riparian corridors are managed on the Forest to retain, restore and enhance riparian associated species (includes Acadian flycatcher).

Ovenbird populations seem generally stable across the province and Forest as well as the Appalachian Mountain region (trend=0.59). Although pine warbler is declining at a region scale, both pine warbler and scarlet tanager show positive trends within xeric habitats on the Forest. Sauer et al. report stable regional trends for the pine warbler (trend=0.40) and the scarlet tanager (trend=0.28). As expected, early successional species chestnut-sided warbler and prairie warbler show declines within the province; chestnut-sided warbler continues to decline on the Forest as higher elevation forest matures, and lower elevation prairie warbler is increasing, possibly related to the southern pine beetle epidemic 1998-2002. Sauer et al. report stable trends for the chestnut-sided warbler within the region (chestnut-sided warbler trend=0.51; but steep declines in prairie warbler trends=-3.71).

Data at this time from some models regarding climate change indicate that overall the boreal forest is likely to decrease in area, with major changes occurring along the southern boundaries as ranges of tree species shift northward (North American Bird Conservation Initiative, U.S. Committee, 2010). According to those same models, approximately half of southern tree species will expand northward. Other models show various trends. One of the most notable changes is the predicted expansion of oak-hickory and oak-pine forests. In general, because of their large ranges and high reproductive potential, forest birds are predicted to fare better in a changing climate than birds in other habitats. Important exceptions include species that are specialized on highly seasonal resources, such as aerial insects or nectar, or that are dependent on high-elevation, extremely humid, or riparian forests.

Management Indicator Species – **Black Bear** (*Ursus americanus*)

The black bear population on the Forest has been steadily increasing for the past 25 years, with plenty of preferred habitat available. Black bear populations are difficult to estimate with precision because bears are secretive animals that range over wide areas, and exist in relatively low densities. TWRA bait station data between 2013 and 2015 shows that visitation to bait sites has decreased by 1.7% in counties that include the Cherokee. Tennessee completes bait station surveys every two years. Harvest of black bears during the Tennessee hunting season from 2005-2011 was at a record high. In 2015, total harvest for the North Cherokee and South Cherokee Wildlife Management Areas was 158, while harvest in forest counties was 415 total bears, the second highest harvest since 1950. Tennessee's bear harvest has consistently remained above 300 bears since 2004. Figure 15 represents the number of bears harvested in counties located on the Cherokee National Forest since 1986.

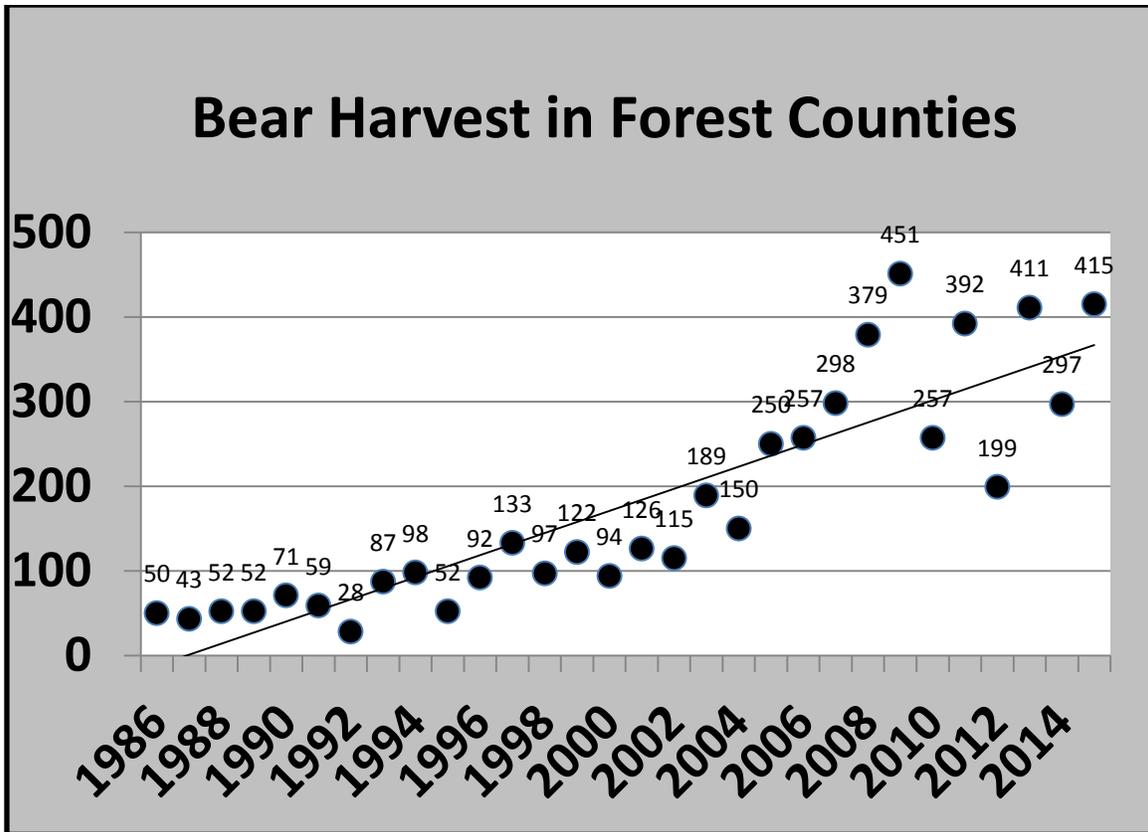


Figure 15. Bear Harvest in CNF Counties

The above data indicates the bear density is at a high level on the forest, suggesting that the forest continues to likely be at or near social carrying capacity.

All suitable habitat in the mountains of Tennessee is likely occupied with bears. We continue to see increases in the urban interface situation and this contributes to bear-human interactions. Reported bear incidents on the Forest were similar to 2014 with increases at developed sites and special use camps including Camp Ocoee. Tennessee Wildlife Resources Agency reports 631 bear incidents in the state; 249 of those in counties with National Forest. The peak time of year for incidents is June and July though they usually occur from April through October.

The Forest Service is working to promote bear awareness to Forest visitors. Bear-proof trashcans continue to be installed in recreation areas on the Forest. A Forest-wide food and trash storage closure order is being prepared. TWRA is also planning a public education campaign called “Bear Wise” that is being rolled out and the north zone is conducting bear programs in campgrounds. The program will educate and challenge the public to take responsibility and recognize their role in bear management

Black bear harvest figures and bait station contacts are used to assess the effects of management activities on bear population trends and meeting hunting demand levels.

Nuisance bear reports are tracked to assess the type of unwanted incidents and develop adaptive management strategies.

Management Indicator Species – **Aquatics**

There are no aquatic MIS. See Management Questions 5 and 7 for a discussion of aquatic viability and threatened and endangered species.

Management Indicator Species – **Plants**

See Management Question 7 for a discussion of Ruth's golden aster

3. No new information
4. Open road miles in TWRA bear reserves and motorized access trail miles in TWRA bear reserves remained stable.
5. Conversion to native grasses continues to occur in several areas.
6. No new information

Findings

Early successional species including chestnut-sided warbler and prairie warbler show declines within the province; chestnut-sided warbler continues to decline on the Forest as higher elevation forest matures. The Forest plays a vital role in supplying high quality early successional forests of all elevations to species of greatest conservation need.

Harvest trends and mast data indicate the black bear population continues to increase, in keeping with a regional trend throughout the Southern Appalachians. Nuisance incident reports have been increasing in the Southern Appalachians despite implementation of a variety of Forest management actions including food storage policies, public education and installation of bear resistant trash containers. For 2015, numbers of reports have remained about the same as in 2014. The Forest monitors and adapts to the changing situation-- as the number of daily interactions between people and bears continues to increase, new issues emerge and availability of appropriated funding remains stable or declines.

Future management opportunities on the Forest include: 1) prompt attention to trash storage at all Forest Service facilities including administrative sites and trail shelters 2) increase in efforts to inform and educate Forest visitors and employees with the focus on safety (working in bear country, proper storage of grills, pet food, horse feed, fish coolers); 3) implementation of a consistent food storage policy across the Forest; 4) installing food storage cables for hikers at selected shelters; 5) emphasize and continue the Bear Incident Reporting Program.

MQ 5: What is the status and trend in aquatic habitat conditions in relationship to aquatic communities?

Information

This monitoring question is responsive to Standards: Prescription (RX) 11-3, RX 11-2, and Forest Wide (FW)-2. Riparian Prescription standard 11-3 states: Habitat requirements for all aquatic Proposed, Endangered, Threatened, and Sensitive (PETS) species are determined. The amount of suitable habitat and the number of potential populations the Cherokee National Forest is capable of supporting is determined for each aquatic PETS species. For PETS species, these attributes are documented in the Cherokee National Forest's recovery objectives for each species. Riparian Prescription standard 11-2 states: Stocking of non-native species in unstocked areas is discouraged where it will adversely impact native aquatic species or communities. Prior to any stocking, coordination with TWRA ensures that populations and habitats of native species are maintained. Forest Wide standard 2 states: Resource management activities that may affect soil and/or water quality will implement Tennessee Best Management Practices (BMPs) as a minimum to achieve soil and water quality objectives. When standards exceed BMPs, standards shall take precedence over Tennessee BMPs. The monitoring elements are defined as follows:

1. Populations of all aquatic TES species are monitored each year. (see MQ 7)
2. What are the trends in results of systematic stream fish community inventories?
3. What are the trends in results of systematic lake fish community inventories?
4. What are the conditions and trends in aquatic macro-invertebrate populations associated with ground disturbing projects?

Results

1. Refer to MQ 7.

2. Stream aquatic animal community monitoring indicates that fish populations are stable with diversity strongly associated with stream size, gradient and elevation. Large streams are more diverse than small streams; low gradient streams are more diverse than high gradient streams; and streams at low elevations are more diverse than streams at high elevations. Streams are often monitored cooperatively with other agencies using boat or backpack electrofishing gear, seines or snorkeling.

Non-fish species are surveyed in conjunction with fish surveys or independently. Salamanders, frogs, snakes, turtles, mussels, and aquatic invertebrates are surveyed. Insufficient data has been collected to evaluate population trends with the exception of hellbenders which are stable and mussels which are declining. A mudpuppy study being conducted in partnership with Stephen Nelson of the Knoxville Zoo and the University of Tennessee at Knoxville, suggests an unnamed species (*Necturus* sp.) may exist in the Hiwassee River.

Figure 16 presents fish diversity in four streams on the Forest. The minor annual variations in species numbers reflect the stability of stream communities. The only significant decline occurred during 2009 as the severe drought was having its greatest effect on aquatic systems. While only these four streams are displayed many fish communities are surveyed each year across the Forest giving a broader picture of the condition of the aquatic communities.

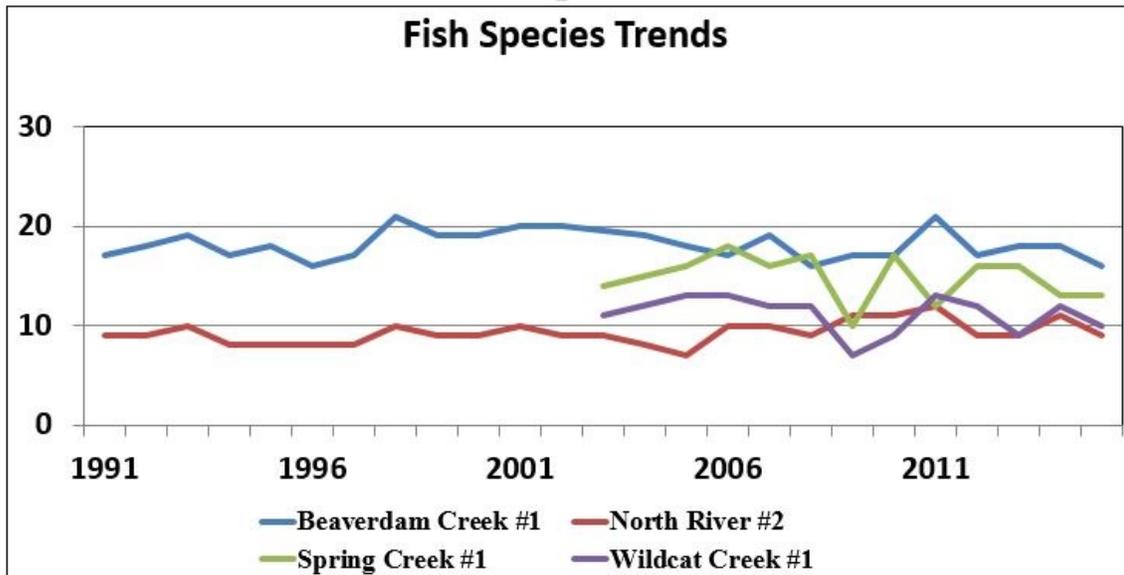


Figure 16. Fish diversity in four streams.

3. No fish surveys were conducted in lakes or ponds in 2015.
4. No aquatic macroinvertebrate sampling occurred in 2015.

Findings

Fish surveys were conducted on about 5.8% of the stream reaches on the Forest; 35% of the fish species known to occur on the Forest were collected indicating that habitat quality is being sustained and aquatic populations are not being adversely impacted by Forest management activities. The stable number of species present in large and moderate sized streams across the Forest supports this premise.

MQ 6: What are the status and trends of forest health threats on the Cherokee National Forest?

Information:

This monitoring question is responsive to Goals 7, 15 and 18; and Objectives 15.01, 15.02, 18.01, 18.02, 18.03 and 18.04. Goal 7 states: management activities will be designed to minimize air pollution originating on the Forest. Objective 15.01 is to document the presence/absence of targeted invasive species during project level inventories. Objective 15.02 is to control non-native and unwanted native species, where they threaten TES elements,

ecological integrity of communities, or habitats created for demand species. Objective 18.01 is to encourage reintroduction of extirpated or declining native species when technologically feasible. Objective 18.02 is to promote the health of susceptible forest communities by maintaining site-specific basal area that promotes tree vigor. Objective 18.03 is to use integrated pest management to protect resources from damage caused by gypsy moth and other forest insects and diseases, utilizing the most appropriate technique. Objective 18.04 is to identify and track southern pine beetle infestations and suppress where appropriate and feasible. The monitoring elements are defined as follows:

Element 6. What are the trends in the number of occurrences and/or acreage of selected non-native species?

Element 7. Are there established populations of target weed species within proposed project areas, adjacent to T&E locations or within wildlife openings?

Results:

3. Southern pine beetle activity continues to be low, as it has been for the past several years. The Forest has completed restoration activities (primarily timber stand improvement – manual release) associated with the southern pine beetle epidemic of 1999-2002. In total, over 4,000 acres of restoration have been completed since 2004. This restoration effort has included a combination of site preparation, burning and planting activities. Planted areas and some of the areas that have regenerated naturally are at or near the age when they can be maintained with prescribed fire. The desired condition to be achieved with this restoration effort is a predominately shortleaf pine-upland oak forest community type.

Since 2004, the hemlock wooly adelgid has become a major insect pest on the Cherokee National Forest. Every county in east Tennessee has reported the occurrence of this adelgid, and hemlock trees are heavily infested on the Forest in Sullivan, Johnson, Carter, Washington, Unicoi, Greene, Cocke, and Monroe Counties; Polk and McMinn Counties are experiencing pockets of infestation. Many trees have succumbed. An environmental assessment that developed strategies for the conservation of hemlock was completed and approved on the Forest in 2005. A supplemental information report was completed in 2010 that permitted limited additional control measures. The Cherokee National Forest received forest health detection flights in September 2010 and 2012 to assess the current conditions, including the extent of hemlock wooly adelgid. An environmental assessment expanding the area and method for HWA control was completed in 2011. Strategies included the release of predator beetles as biological control agents, the limited use of insecticides, and a combination of biological control and insecticide applications. In 2015, treatments were made on 497 acres, which are approximately 150 sites.

Two new forest pests were discovered in 2010 in the vicinity of the forest. Thousand canker disease affects walnut, and emerald ash borer affects ash (EAB). These two pests are not known to be on the Cherokee National Forest at this time, but the buffer area for thousand canker disease includes Monroe County. In 2015 the Forest planned a small scale project using biocontrol for EAB on the Watauga and Unaka Ranger Districts. The project is preemptive and will not be implemented until EAB reaches the planned treatment sites.

4. Restoration efforts associated with southern pine beetle damage are complete. There is visual evidence that a mixed pine-upland oak community type is becoming established where site preparation, planting and burning or a combination of these activities have been used. These sites may require release and periodic burning in the future to achieve the ecologically desired condition. The Forest has made some progress in achieving Objective 18.02 (improve forest health by reducing/maintaining stand basal areas that promote tree vigor). In 2015, 2,465 acres of timber stand improvement were implemented but no commercial thinning.

5. Conservation efforts associated with the treatment of hemlock infested with adelgid are in progress. Chemical treatment of individual hemlock trees in reserve sites has proven to be effective in protecting the trees from the adelgid. The long-term effectiveness of the predator beetle releases cannot be assessed at this time.

Partnerships are crucial to continue emphasis on research, acquisition, survey and characterization of rare communities, and to identify, prioritize, and implement actions such as access management, noxious weed control, application of prescribed fire and other vegetation management, and restoration of ecological functions. The Southern Appalachian Bog Learning Network is a useful partner in wetlands restoration on the Forest.

6. Regionally and nationally, the spread of invasive species is on the increase, despite control efforts. While local treatments may not be stemming the tide of invasive plants on the broad scale, they can have very positive effects on local biodiversity. A very general inventory of the occurrence of non-native invasive plants was completed in 2005. There has been no forest-wide inventory since that time, however many sites have been added to the inventory through project specific work and annual survey targets assigned by the region. Currently, infestations of non-native invasive plant species have been documented on over 2,000 acres across the Forest. It is estimated, however, that at least 13,000 acres of non-native invasive plant infestations occur across the Forest. The Forest treated approximately 638 acres of invasive species infestations in 2015, including sites containing kudzu, autumn olive, tree-of-heaven, Oriental bittersweet, tall fescue, lespedeza, purple loosestrife, Japanese honeysuckle, and Japanese knotweed.



Photos 1 & 2. Before and after photos of Japanese knotweed treatments in the Ocoee River Gorge (2015)

7. Botanical surveys are conducted for all proposed ground disturbing projects on the Forest. The botanical survey includes a list of target weed species that are known to be the worst threats to forest health. A portion of the forest-wide treatment target is specifically directed at wildlife openings management. Numerous occurrences of weeds were encountered and recorded during the above mentioned surveys. Approximately 100 acres of the 638 acres listed above were treatments to control invasive plants in wildlife openings (spot and linear). All documented weed sites are recorded for inclusion in the NRIS Non-Native Invasive Plant Species application

8. There were 17 wildfires that burned 326 acres in 2015.

Findings:

Infestations of non-native invasive plant species continue to increase regionally and nationally. They are abundant on the Forest and can be found in almost any area that has seen recent disturbance. The forest completed a forest-wide NEPA document in 2008 that authorized treatments in most areas of the forest with the exception of designated wilderness areas. Sites to be treated are prioritized based upon a published forest strategy that takes into consideration species biology and potential risk to natural resources. Highest priority sites are those with invasive species that threaten unique habitats, T&E species, or sites of high public interest. While local treatments may not be stemming the tide of invasive plants on the broad scale, they can have very positive effects on local biodiversity and are a very important facet of management on the Cherokee National Forest.

MQ 6-1: What are the trends in air pollution and their effects on forest vegetation, particularly ozone susceptible species?

Air pollution often has a subtle but critical impact on ecosystems and vistas, and can alter ecosystems by harming plants and animals, or changing soil or water chemistry. Ecosystems then become more vulnerable to damage from insects and diseases, drought or invasive species. Additionally since many visitors to National Forests value pristine areas

with magnificent vistas, air pollution can lessen their experience and enjoyment of National Forests.

The air pollutants of most concern on the Cherokee National Forest are particulate matter and ozone. Levels of these two pollutants are measured at air monitoring sites near both the northern and southern ends of the National Forest. Fine particulate matter is the leading cause of regional haze (also known as visibility impairment), while ozone can harm sensitive vegetation within the forest. Additionally, at elevated concentrations these two pollutants can impair the health of both employees of and visitors to the National Forests.

Ozone: Ozone is a pollutant formed by emissions of nitrogen oxides and volatile organic compounds in the presence of sunlight. At elevated concentrations, it causes human health concerns as well as negative impacts to vegetation. The US Environmental Protection Agency (EPA), as directed by Congress, has set a national ambient air quality standard (NAAQS) of 0.075 parts per million (ppm) to protect both human health and the environment.

The following graphs show the ozone concentrations at air monitoring sites close to the Cherokee National Forest (<http://www.epa.gov/airdata/>). The measured concentrations for the years 2010-2015 at sites near the northern and southern ends of the Cherokee National Forest are compared to the ozone NAAQS. Note the ozone monitor at Look Rock in the Great Smoky Mountains National Park (near the southern end of the National Forest) exceeds the three year average ozone NAAQS for 2010-2012 and 2011-2013. The most recent 3-year averages (2013-2015) for all monitors near the Cherokee National Forest are measuring ozone concentrations lower than the standard.

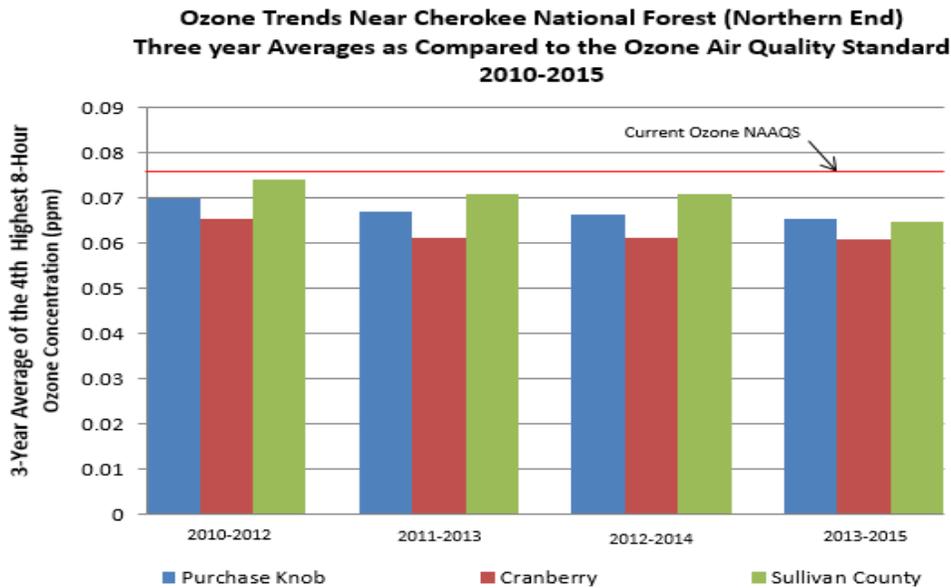


Figure 17. Ozone Trends North End of Cherokee National Forest

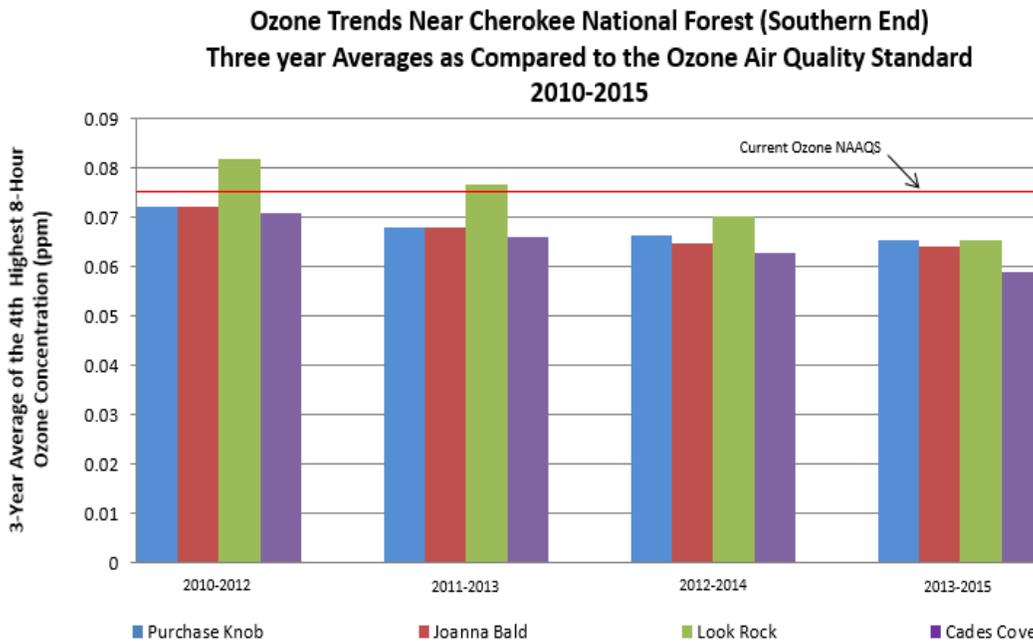


Figure 18. Ozone Trends South End of Cherokee National Forest

Particulate Matter: Particulate matter is a mixture of extremely small particles made up of soil, dust, organic chemicals, metals, sulfates and nitrate acids. The size of the particles is directly linked to health effects, with smaller particles causing the worst impacts to human health. As a result, EPA has set a primary NAAQS for ultra-small (less than 2.5 microns in diameter) particulate matter on both a short-term (24-hour) and annual basis. The 24-hour fine particulate matter (PM_{2.5}) NAAQS is currently set at 35 µg/m³, while the annual PM_{2.5} NAAQS is 12 µg/m³.

The graph below shows the measured fine particulate matter concentrations near the Cherokee National Forest (<http://www.epa.gov/airdata/>) in comparison to the NAAQS. Note that none of the PM_{2.5} monitors near the Cherokee National Forest are exceeding the current fine particulate matter NAAQS. However, EPA is required to reassess the standards every five years, and as a result more stringent standards may be proposed sometime in the future.

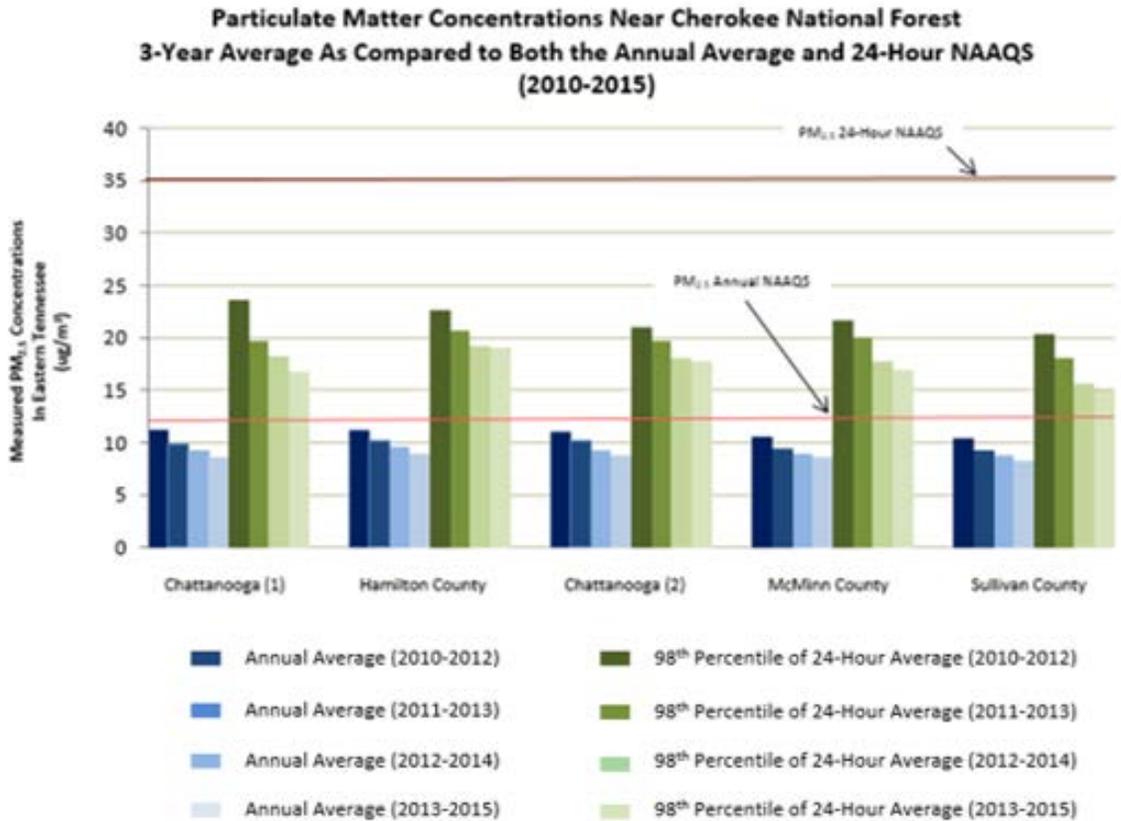


Figure 19. Particulate Matter Concentrations near Cherokee National Forest

MQ 6-2: Coordinate with State & local air quality agencies to track emissions from NFS lands for compliance with National Ambient Air Quality Standards, with emphasis on PM_{2.5} (fine particulate matter) emissions from prescribed fires, ensure NF prescribed fire emissions are considered when they fall within PM_{2.5} non-attainment areas [36 CFR 219.27(a)(12)].

For the prescribed fire program, it is important to assess whether the PM_{2.5} NAAQS could be exceeded due to prescribed fire activity on the forest. During the calendar year of 2015, the Cherokee National Forest burned over 10,500 acres in accordance to their prescribed fire program. The graph above shows the measured PM_{2.5} concentrations near the Cherokee National Forest in comparison to both the annual and 24-hour average NAAQS. None of the 5 fine particulate matter monitors near the National Forest are currently exceeding the fine particulate NAAQS in 2015.

MQ 7: What are the status and trends of federally listed species on the Forest?

Information

This monitoring question is responsive to Forest Wide Objectives 14.01 and 14.03. Forest Wide Objective 14.01 states: In cooperation with partners, develop and implement

monitoring plans for all T&E species during the next 10-year. Develop and implement conservation strategies for sensitive species or groups of species. Forest Wide Objective 14.03 states: The following objectives (Table 3-4 in *RLRMP*) are established to contribute to the recovery of threatened, endangered and candidate-species over the life of the *RLRMP*. The monitoring elements are defined as follows:

1. Do all T&E species tracked by Forest currently have monitoring protocols in place and being implemented?
2. What progress is being made toward recovery of T&E species and conservation of sensitive species?
3. What is the population trend for each T&E and sensitive species?

Results

1. This Forest, in agreement with the U.S. Fish and Wildlife Service, has recovery responsibilities for 38 species federally listed as Threatened or Endangered (Table 4 & 5).

Table 4. T&E Species by Group

Group	Threatened	Endangered	Total
Amphibians			0
Arachnids		1	1
Birds			0
Fish	4	4	8
Insects			0
Mammals		5	5
Mussels	2	14	16
Millipedes			0
Reptiles	1		1
Snails			0
Non-Vascular Plants		1	1
Vascular Plants	3	4	7
Totals	10	29	39

Table 5. Status of T and E species.

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
Arachnid	<i>Microhexura montivaga</i>	Spruce-fir moss spider	E	No Critical Habitat on Forest	Roan Mountain
Fish	<i>Cyprinella caerulea</i>	Blue shiner	T	No Critical Habitat on Forest	Conasauga River
Fish	<i>Erimonax monachus</i>	Spotfin chub	T	No Critical Habitat on Forest	Tellico River
Fish	<i>Etheostoma sitikuense</i>	Citico darter	E	No Critical Habitat on Forest	Citico Creek & Tellico River

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
Fish	<i>Noturus baileyi</i>	Smoky madtom	E	Citico Cr. below Barkcamp Br.	Citico Creek & Tellico River
Fish	<i>Noturus flavipinnis</i>	Yellowfin madtom	T	No Critical Habitat on Forest	Citico Creek & Tellico River
Fish	<i>Percina antesella</i>	Amber darter	E	No Critical Habitat on Forest	Nearest record is 5 miles downstream of Forest
Fish	<i>Percina jenkinsi</i>	Conasauga logperch	E	Conasauga River	Conasauga River from Halway Br downstream
Fish	<i>Percina tanasi</i>	Snail darter	T	No Critical Habitat on Forest	Hiwassee River & Citico Creek
Mammal	<i>Corynorhinus townsendii virginianus</i>	Virginia big-eared bat	E	No Critical Habitat on Forest	Portions of Carter and Johnson Counties
Mammal	<i>Glaucomys sabrinus coloratus</i>	Carolina northern flying squirrel	E	No Critical Habitat on Forest	>4000 feet in Monroe and Carter Counties
Mammal	<i>Myotis grisescens</i>	Gray bat	E	No Critical Habitat on Forest	Coke and Greene Counties; Carter and Sullivan Counties on private lands
Mammal	<i>Myotis septentrionalis</i>	Northern long-eared bat	T	No Critical Habitat on Forest	All counties
Mammal	<i>Myotis sodalis</i>	Indiana bat	E	No Critical Habitat on Forest	Monroe County
Mussel	<i>Alasmidonta raveneliana</i>	Appalachian elktoe	E	No Critical Habitat on Forest	Nolichucky River
Mussel	<i>Epioblasma capsaeformis</i>	Oyster mussel	E	No Critical Habitat on Forest	Nearest record is 5 miles downstream of Forest
Mussel	<i>Epioblasma florentina walkeri</i>	Tan riffleshell	E	No Critical Habitat on Forest	Hiwassee River above Apalachia Powerhouse
Mussel	<i>Epioblasma metastrata</i>	Upland combshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	<i>Epioblasma othcaloogensis</i>	Southern acornshell	E	Conasauga River Reach 1 & 2	Nearest record is 8 miles downstream of Forest
Mussel	<i>Hamiota altilis</i>	Fine-lined pocketbook	T	Conasauga River Reach 1 & 2	Conasauga River
Mussel	<i>Medionidus acutissimus</i>	Alabama moccasinshell	T	Conasauga River Reach 1 & 2	Nearest record is 4 miles downstream of Forest
Mussel	<i>Medionidus parvulus</i>	Coosa moccasinshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	<i>Pleurobema decisum</i>	Southern clubshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	<i>Pleurobema georgianum</i>	Southern pigtoe mussel	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	<i>Pleurobema hanleyianum</i>	Georgia pigtoe	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	<i>Pleurobema perovatum</i>	Ovate clubshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	<i>Pleronia dolabelloides</i>	Slabside pearlymussel	E	Hiwassee River	Hiwassee River above Apalachia Powerhouse
Mussel	<i>Ptychobranchus foramianus</i>	Rayed kidneyshell	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	<i>Ptychobranchus subtentum</i>	Fluted kidneyshell	E	Hiwassee River	Nearest record is 5 miles downstream of Forest
Mussel	<i>Villosa trabalis</i>	Cumberland bean pearly mussel	E	No Critical Habitat on Forest	Hiwassee River above Apalachia Powerhouse
Reptiles	<i>Glyptemys muhlenbergii</i>	Bog turtle	T	No Critical Habitat on Forest	Private land in Johnson and Carter Counties
Nonvasc. Plant	<i>Gymnoderma lineare</i>	Rock gnome lichen	E	No Critical Habitat on Forest	Roan Mountain
Vascular Plant	<i>Geum radiatum</i>	Spreading avens	E	No Critical Habitat on Forest	>4200 feet Carter County
Vascular Plant	<i>Hedyotis purpurea montana</i>	Roan Mountain bluet	E	No Critical Habitat on Forest	Carter County
Vascular Plant	<i>Isotria medeoloides</i>	Small whorled pogonia	T	No Critical Habitat on Forest	Nearest record is in Hamilton County
Vascular Plant	<i>Pityopsis ruthii</i>	Ruth's golden aster	E	No Critical Habitat on Forest	Hiwassee R. above Apalachia Powerhouse; Ocoee R. between Ocoee Powerhouses #2 & #3
Vascular Plant	<i>Platanthera integrilabia</i>	White fringeless orchid	E	No Critical Habitat on Forest	Starr Mt. and tributary of Conasauga River

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
Vascular Plant	<i>Solidago spithamea</i>	Blue Ridge goldenrod	T	No Critical Habitat on Forest	Roan Mountain in Carter County
Vascular Plant	<i>Spiraea virginiana</i>	Virginia spiraea	T	No Critical Habitat on Forest	Nearest record is in Nolichucky River in NC

Annual Forest monitoring protocols are in place and being implemented for 26 T and E species. Twelve species are not monitored because they are not known to occur on the Forest. No protocol has been developed for the spruce-fir moss spider. Table 6 lists the T and E species and the dates their protocols were implemented or the agency responsible for the monitoring.

Table 6. Monitoring Protocols for T&E Species				
Group	Common Name	Scientific Name	Status	First year Protocol Implemented
Arachnids				
	spruce-fir moss spider	<i>Microhexura montivaga</i>	E	No protocol
Fish				
	blue shiner	<i>Cyprinella caerulea</i>	T	2000
	spotfin chub	<i>Erimonax monachus</i>	T	2004
	Citico darter	<i>Etheostoma sitikuense</i>	E	1993
	smoky madtom	<i>Noturus baileyi</i>	E	1986
	yellowfin madtom	<i>Noturus flavipinnis</i>	T	1986
	amber darter	<i>Percina antesella</i>	E	Not on Forest
	Conasauga logperch	<i>Percina jenkinsi</i>	E	2000
	snail darter	<i>Percina tanasi</i>	T	2002
Mammals				
	Virginian big-eared bat	<i>Corynorhinus townsendii virginianus</i>	E	2015
	Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>	E	2008
	gray bat	<i>Myotis grisescens</i>	E	1997
	northern long-eared bat	<i>Myotis septentrionalis</i>	P	2013
	Indiana bat	<i>Myotis sodalis</i>	E	1997
Mussels				
	Appalachian elktoe	<i>Alasmidonta raveneliana</i>	E	2003
	oyster mussel	<i>Epioblasma capsaeformis</i>	E	Not on Forest
	tan riffleshell	<i>Epioblasma florentina walkeri</i>	E	1993
	upland combshell	<i>Epioblasma metastriata</i>	E	Not on Forest
	southern acornshell	<i>Epioblasma othcaloogensis</i>	E	Not on Forest
	finelined pocketbook	<i>Lampsilis altilis</i>	T	2000
	Alabama moccasinshell	<i>Medionidus acutissimus</i>	T	Not on Forest
	Coosa moccasinshell	<i>Medionidus parvulus</i>	E	Not on Forest
	southern clubshell	<i>Pleurobema decisum</i>	E	Not on Forest
	southern pigtoe mussel	<i>Pleurobema georgianum</i>	E	2000
	Georgia pigtoe mussel	<i>Pleurobema hanleyianum</i>	E	2000
	ovate clubshell	<i>Pleurobema perovatum</i>	E	Not on Forest
	slabside pearlymussel	<i>Pleronaia dolabelloides</i>	E	1993
	rayed kidneyshell	<i>Ptychobranhus foraminus</i>	E	2000
	fluted kidneyshell	<i>Ptychobranhus subtentum</i>	E	Not on Forest
	Cumberland bean pearly mussel	<i>Villosa trabalis</i>	E	1993

Reptiles			
bog turtle	<i>Glyptemys muhlenbergii</i>	T	Not on Forest
Non-vascular Plants			
rock gnome lichen	<i>Gymnoderma lineare</i>	E	USFWS
Vascular Plants			
spreading avens	<i>Geum radiatum</i>	E	USFWS
Roan Mountain bluet	<i>Hedyotis purpurea</i> var. <i>montana</i>	E	USFWS
small whorled pogonia	<i>Isotria medeoloides</i>	T	Not on Forest
Ruth's golden aster	<i>Pityopsis ruthii</i>	E	1987
White fringeless orchid	<i>Platanthera integrilabia</i>	E	1996
Blue Ridge goldenrod	<i>Solidago spithamea</i>	T	USFWS
Virginia spiraea	<i>Spiraea virginiana</i>	T	Not on Forest

In addition to T and E species, the Forest monitors 148 Sensitive Species (Table 7).

Table 7. Sensitive Species by Group

Group	Sensitive
Amphibians	6
Arachnids	-
Birds	3
Fish	11
Insects/Millipedes	10
Mammals	4
Mussels	7
Reptiles	-
Snails	6
Non-Vascular Plants	52
Vascular Plants	49
Totals	148

2. Recovery Progress

Plants



Photo 3. Ruth's Golden aster

The worldwide distribution of **Ruth's golden aster** (*Pityopsis ruthii*) is along the Hiwassee and Ocoee Rivers within the proclamation boundary of the Cherokee National Forest. This species has been cooperatively monitored by the Tennessee Valley Authority, Tennessee Department of Conservation, and USDA Forest Service since 1987. The population on the Hiwassee River has been monitored through random quadrants at several key sites, however in the past several years, more comprehensive counts (total census) have also been conducted. The

first detailed census and assessment of the Hiwassee population was completed during Fiscal Year 2000 through a Challenge Cost Share with the Tennessee Department of Conservation. The results of this census indicated a total of 8,235 plants along a four mile section and the overall assessment suggested actions that may improve the habitat and long term viability of the Hiwassee population. A complete census was undertaken again in 2010, 2011, 2012, 2013, 2014, and 2015 this time documenting 10,750, 10,016, 10,582, 11,968, 12,857, and 10,986 plants respectively. Initial comparisons of some key sites where the investigators felt the boundaries of the sub-populations were discreet enough that numbers could be accurately compared to those counted in 2000, indicated substantial loss in numbers of individuals at some sites. Thus the overall increase in the recent census data was considered to be much more likely a result of a more comprehensive count along the entire river population than an actual increase in the overall population.

The Ocoee River population is much smaller (an average of 822 plants) and is monitored through a complete census each year. Figure 20 summarizes the population trend for the Ocoee River population. The upward trend for this population is statistically significant ($R^2 = 0.8$).

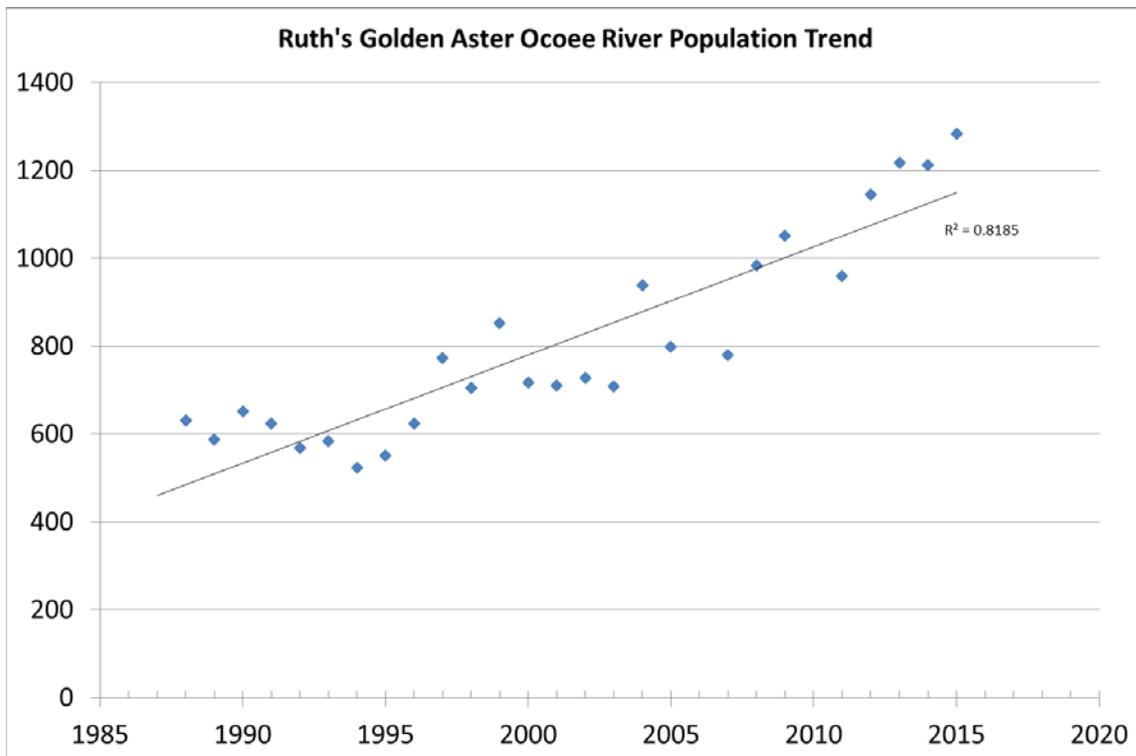


Figure 20. Trend for the Ocoee River population of Ruth's golden aster

Four federally listed plant species occur on Roan Mountain and are monitored cooperatively with the support of several partner agencies (US Fish and Wildlife Service, National Forests in North Carolina, Tennessee Division of Natural Heritage, and North Carolina Natural Heritage) and private individuals.



Photo 4: Spreading avens



Photo 5: Accessing the Spreading avens by rappelling

Spreading avens (*Geum radiatum*) is a federally endangered species that is restricted to rock outcrops, cliff ledges, rock faces, and grassy meadows near the summits of the highest peaks of the Southern Blue Ridge in North Carolina and Tennessee. Three sub-

populations of this species occur on the Tennessee side of Roan Mountain where many plants are inaccessible without the use of rappelling equipment. In all there are 22 sub-populations of this species known from the various summit communities on Roan Mountain. A demographic study administered by Dr. Chris Ulrey (ecologist for the Blue Ridge Parkway) has been implemented for five of the subpopulations (Roan High Bluff West, Roan High Bluff, Reservoir Cliff, Colten’s Cliff, and Grassy Ridge) and data have been tracked for the last six to nine years. Data recorded within the demographic study include number of clumps at each site, number of rosettes per clump, and number of flowers per clump.

Roan Mountain bluet (*Houstonia montana*) is a federally endangered species endemic to high elevation summits in northwestern North Carolina and northeastern Tennessee. The species occurs in crevices of rock outcrops and also in thin, frost-heaved, gravelly soils of grassy balds near summit outcrops. This is a diminutive plant and easily overlooked when not flowering. Two sub-populations for this species are located on the Tennessee side of Roan Mountain though several more occur just over the state line in North Carolina. Two of the North Carolina populations (Bus Parking Lot and Cloudland Hotel) have been monitored since 2007. Data on areal cover have been collected since 2007 and show large variability from year to year as shown below in Figure 21.



Photo 6: Roan Mountain bluet

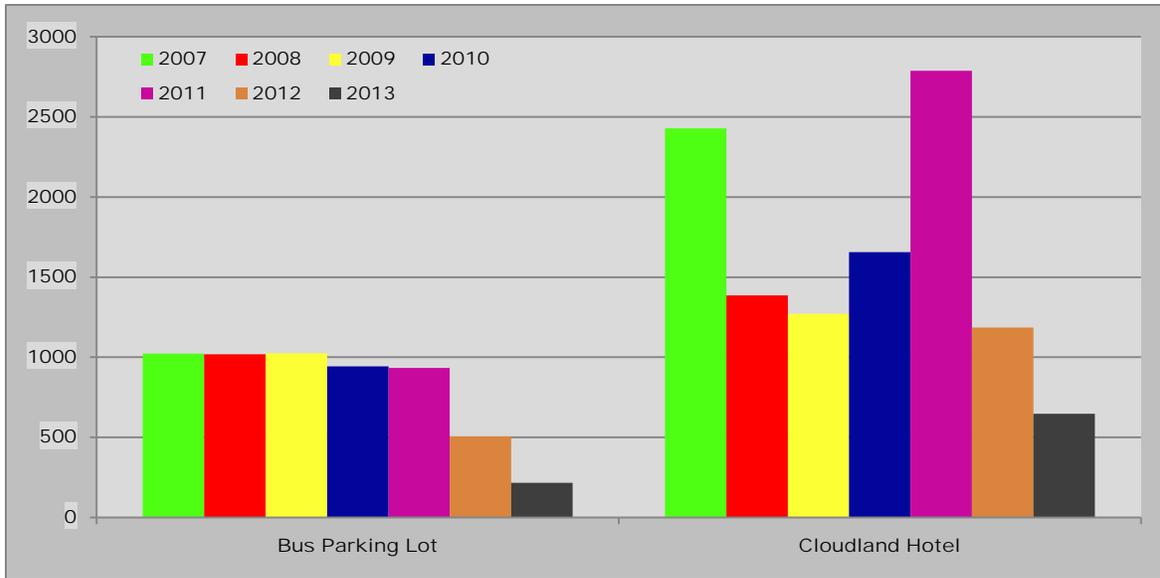


Figure 21. Change in area coverage (centimeters square) from 2007-2013 for *Houstonia montana* within 2 subpopulations on Roan Mountain



Photo 7. Rock gnome lichen

The rock gnome lichen (*Gymnoderma lineare*) is a federally endangered species that is known to occur from Virginia south through the Appalachian mountains of Tennessee, North Carolina, South Carolina, and Georgia. This species occurs on high elevation cliffs and rock faces that are perennially wet from seepage and also on wet or seepy rocks within humid gorges at lower elevations.



Photo 8. Blue Ridge goldenrod

The Blue Ridge goldenrod (*Solidago spithamaea*) is a federally threatened species that is endemic to three mountain-tops in North Carolina and the North Carolina-Tennessee border. Like the afore-mentioned spreading avens, this species occurs primarily on cliff ledges and rock faces and most plants are inaccessible without the use of rappelling equipment. Of the eight sub-populations known from Roan Mountain, one is found on the Tennessee side of the border. Monitoring for this species has included counting clumps in a few of the sub-populations and

general observation of sub-populations on inaccessible sites.

The rare plant monitoring on Roan Mountain has been ongoing for decades but is not well publicized due to the potential for damage to sensitive locations. Individual populations have been extensively monitored by various groups depending upon land ownership, thus data is not always easily compared between populations. Recently, standardized protocols have been developed for these species across the various land ownerships.

Findings

Statistically valid protocols should be developed and implemented to the extent possible for every T & E species. However, experience has shown that the intensity of monitoring required to obtain statistically valid trend data may be beyond budgetary constraints and also may adversely impact the target species. Partnerships with other agencies that are monitoring TES species on the Forest have been established and data is being shared.

Ruth's golden aster: While the population of Ruth's golden aster on the Ocoee River appears to be slowly increasing, data from the Hiwassee River and associated field observations there have indicated that suitable habitat is being lost to the encroachment of woody and herbaceous vegetation. An environmental assessment was completed in September 2008 to evaluate the potential effects of using herbicides and alternative methods for removing competing vegetation from these plots. The decision was made to use a combination of mechanical and chemical treatments, the first of which were implemented in Fiscal Year 2009. Monitoring and observations of the treated plots has shown that any clearing effects were very short-lived. While the removal of woody vegetation certainly created more open conditions and allowed more sunlight to the ground, weedy herbaceous species rapidly re-colonized the sites within one season. It would appear that without regular disturbance (flooding) to scour the habitat, weedy native vegetation can colonize any newly exposed habitat faster than the *Pityopsis* in any one season.

All four federally listed Roan Mountain plant species were observed on Cherokee National Forest lands in 2015 and monitoring of each species is ongoing as part of a multi-agency effort. State or National Forest boundaries are not considered in this monitoring.

Spreading avens: No new information to report in 2015. Different monitoring intensity has been implemented across the 22 subpopulations. All have been visited at least once during the last 10 years, most two to three times recording presence and clump numbers. With incorporation in a demographic study administered by Dr. Chris Ulrey, ecologist for the Blue Ridge Parkway, clumps for five of the subpopulations have been tracked for the last six to nine years. Data recorded within the demographic study include clumps, denoted by a separation distance of at least 25 centimeters, number of rosettes per clump, and number of flowers per clump. Four of the five sites do not vary greatly in the number of clumps from year to year. Some declines have been recorded but is primarily a result of two previously separate clumps merging into a single clump or from yearling deaths. One site has a decline, representing less than 10% of the recorded clumps, which is probably a result of impacts from freeze and thawing which dislodged fragmented rocks with adhering *Geum radiatum* clumps off the cliff face during the winter. Rosette numbers tend to be more variable from year to year but did not vary in total by more than 5-10% from the total numbers recorded across the 5 sites. New plants can be produced through sexual or asexual means. Evidence of both types of reproduction is present at some of the sites on Roan Mountain although sexually reproduced seedlings are quite rarely encountered across the five sites.

Roan Mountain bluet: No new information to report in 2015. Two sub-populations (Bus Parking Lot and Cloudland Hotel) on Roan Mountain were monitored in 2012 for the sixth consecutive year. The two sub-populations continue to vary, however both increased in overall extent in 2011. The data for 2012 has not been processed yet but appears to be following the same pattern. The Bus Parking Lot subpopulation increased in extent, area coverage, by 18% from 2009. This is in spite of a 21% decline in the number of occupied plots. The increase in overall coverage is due to greater density within the occupied plots. This increase may not be as large as recorded since it could be an artifact of the sampling design since a slight adjustment of the plot grid along the transect line from year to year could change the number of occupied plots. Long-term monitoring will help to sort the actual or sampling design fluctuations. The Cloudland Hotel sub-population increased dramatically from 2010 to 2011 both in the number of occupied plots and the coverage. As with the parking lot site, the occupied plot numbers could be inflated due to the sampling design.

Rock gnome lichen: No direct monitoring has been completed for rock gnome lichen, however it is observed annually in conjunction with other studies and appears to be stable.

Blue Ridge goldenrod: No new information to report in 2015. As with the other species, sites chosen for monitoring are not based upon relation to state lines or ownership so data does not pertain just to the Cherokee National Forest. In 1996 due to the recreational threats to existing subpopulations at Roan Mountain two closure orders were issued; one for the area at Roan High Bluff and west, the other area from the approach to Eagle Cliff and the Cliff. Anecdotal observations and post monitoring following the closures indicate these populations have recovered at Roan High Bluff and maintained their abundance at Eagle Cliff.

A limited amount of monitoring has been completed within two of the subpopulations west of Roan High Bluff. For three years, including 2013, two of the smaller subpopulations were tracked by counting the number of clumps and rosettes. During that time this species has remained fairly constant, with the same number of clumps as 2012. Observations in 2012 at all of the sites indicate the persistence of all seven subpopulations on the Pisgah National Forest. Monitoring has been limited across more of the subpopulations since juvenile individuals of a co-occurring species, skunk goldenrod (*Solidago glomerata*), is very difficult to distinguish from mature Blue Ridge goldenrod, which is a shorter species relative to skunk goldenrod.

Aquatic Species

Eight endangered or threatened fish occur on or near the Forest. Critical Habitat exists on the Forest for two of these species - Citico Creek (smoky madtom); and Conasauga River (Conasauga logperch). Endangered and threatened aquatic species are annually monitored through snorkel surveys.

Protocols for monitoring seven of the eight fish species (the amber darter has never been found on the Forest, therefore is not monitored) are implemented annually through a Challenge Cost Share Agreement with Conservation Fisheries, Inc. These biologists

snorkel along transects in likely habitat for each of the species and report the number of observed listed species. An index is produced and compared with indices from previous years. Efforts are in progress to implement surveys that produce statistically valid population trends.

Sixteen endangered or threatened mussels occur on or near the Forest; Critical Habitat exists on the Forest for twelve species (ten in Conasauga River and two in Hiwassee River). Eight of these mussel species (seven with Critical Habitat on the Forest) have never been documented on the Forest. Periodic snorkel surveys are conducted on the Forest for mussel species. Based on our surveys and those of other agencies, only the Appalachian elktoe (Nolichucky River) and Cumberland bean pearly mussel (Hiwassee River) are stable. The remaining thirteen mussel species appear to be declining.

The Hiwassee River harbors a robust population of snail darters. The Tennessee Valley Authority monitors this species annually but no trend data is generated. The snail darter is found in about 12 miles of the Hiwassee River, mostly within the Forest proclamation boundary. A statically valid, systematic monitoring protocol is being developed for this species.

Twenty-nine aquatic species are listed as sensitive on the Forest including: 11 fish; 7 mussels; 3 salamanders; and 8 insects. While not individually monitored, populations of these species are considered to be stable based on the stability of the fish communities.

Findings

Statistically valid protocols should be developed and implemented to the extent possible for every T & E species. However, experience has shown that the intensity of monitoring required to obtain statistically valid trend data may be beyond budgetary constraints and may adversely impact the target species. Partnerships with other agencies that are monitoring TES species on the Forest have been established and data is being shared.

3. Population trends for TES species

Aquatic Species – Fish

The Citico Creek (Figure 22) population trend for the smoky madtom is moderately upward ($R^2=0.54$) over the thirty years of monitoring. The yellowfin madtom ($R^2 = 0.28$) and Citico darter ($R^2=0.22$) populations are weakly upward trending.

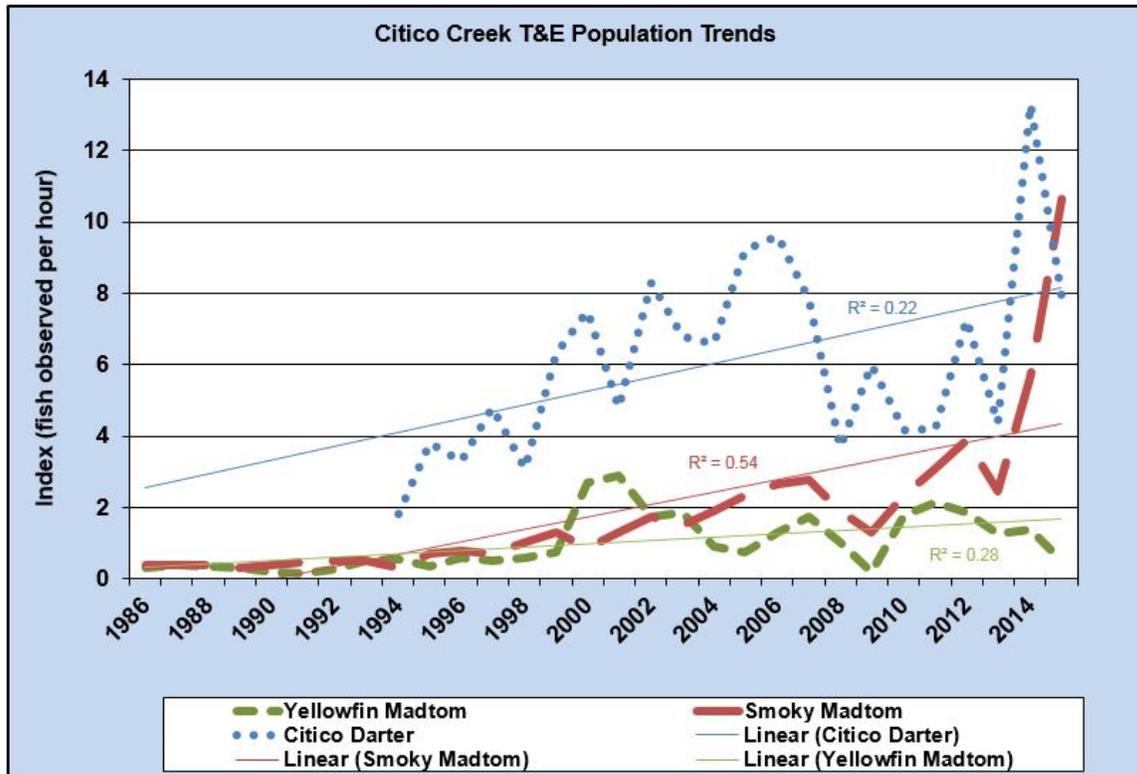


Figure 22. Population trends of Citico darters, Smoky and Yellowfin madtoms in Citico Creek

Experimental populations of four federally listed species were introduced into the Tellico River beginning in 2003. Population trends (Figure 23) are not significantly correlated against years (R^2 values are below 0.2) at this time. Stocking is continuing. It is significant to note that all four species have successfully reproduced in this river.

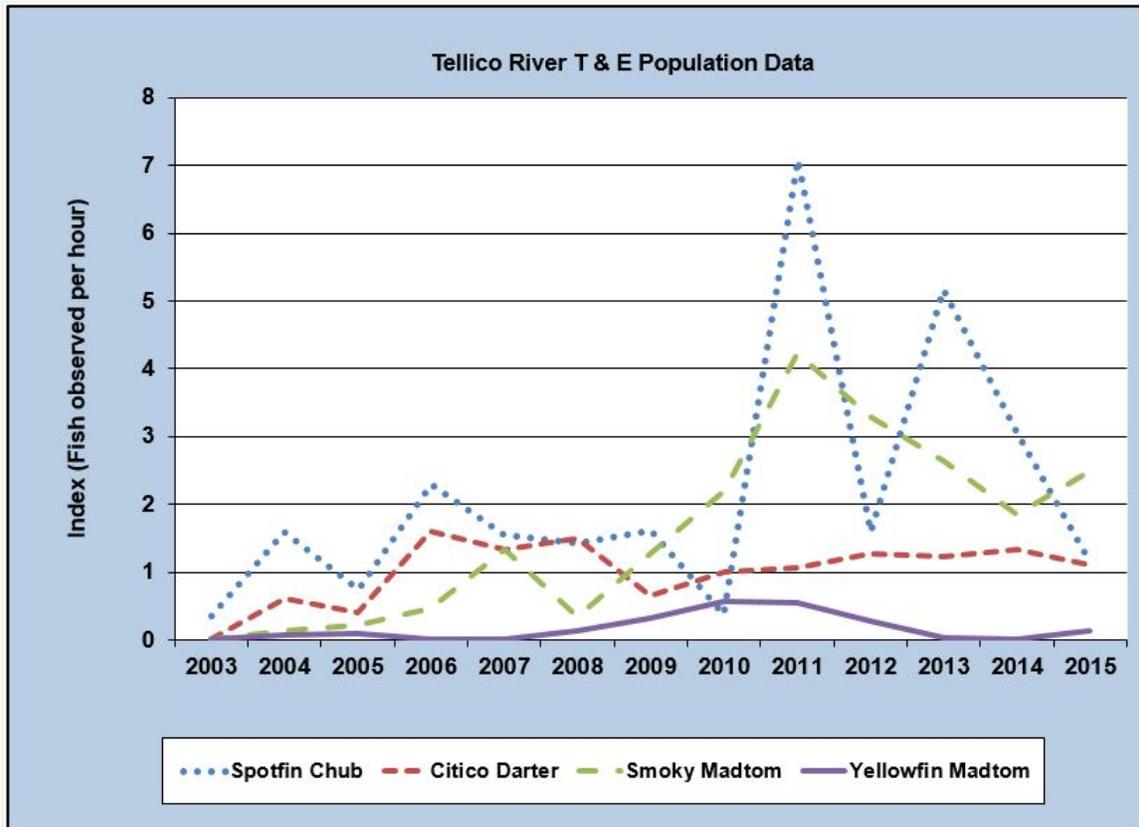


Figure 23. Population trends for four experimental fish populations in Tellico River

Two federally listed fish species are monitored in the Conasauga River: blue shiner and Conasauga logperch. Figure 24 shows the population data for blue shiners. No significant trend is evident; the R^2 value (0.03) is not significant. Eleven Conasauga logperch were captured and taken to Knoxville by CFI in 2011 for propagation. CFI was extremely successful in spawning and rearing the fry; some were released into the Conasauga River in 2012. These fish were tagged but no tagged fish were observed in 2015.

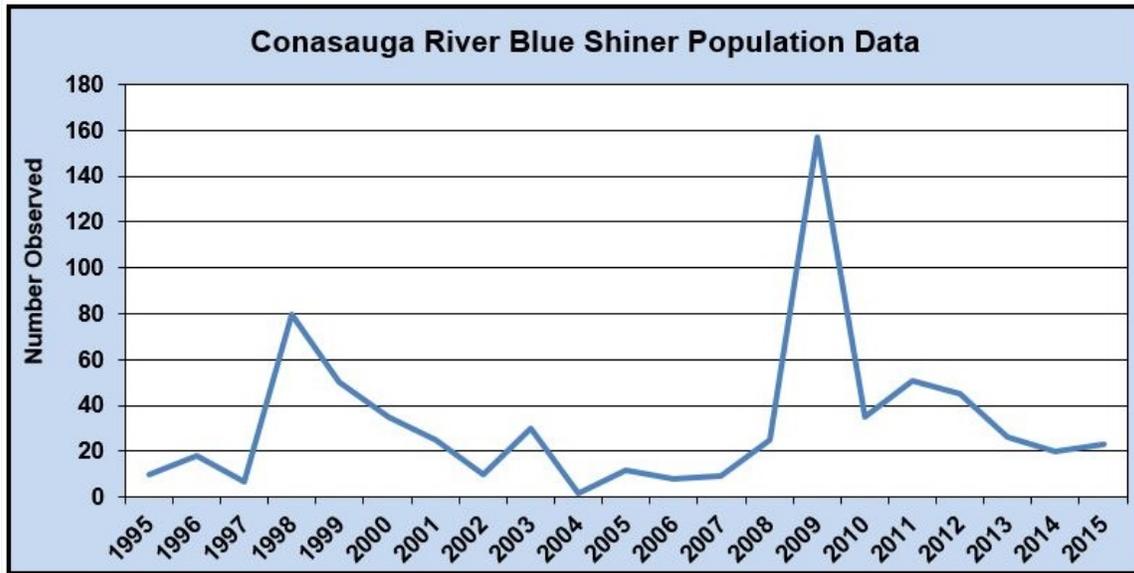


Figure 24. Population data for the blue shiner in the Conasauga River

Mussels

The Conasauga River is home to 11 T&E mussels and is Critical Habitat for 10 of them. The Hiwassee River supports 4 T&E mussels and is Critical Habitat for 2 of them. The Nolichucky River contains 1 Endangered mussel species.

Eight of the sixteen mussel species tracked by the Forest have never been documented within the proclamation boundary. Seven of the eight mussels documented on the Forest are declining rapidly throughout their range. Only the Cumberland bean pearlymussel appears to be stable. No mussel surveys were conducted in the Conasauga and Nolichucky Rivers in 2015.

The Cumberland bean pearlymussel occurs in the Hiwassee River. In 2015 78 individuals were collected. Reproduction is evident. Additionally, several non-listed mussels were collected: spikes (14), rainbows (281), Tennessee clubshells (174), wavy-rayed lampmussel (4) and a pocketbook (1).

Hellbender

The hellbender is the largest salamander in North America. In recent decades it has undergone a range-wide decline. Several populations are documented on the Forest but their distribution, health and reproduction are unknown. An inventory and monitoring Challenge Cost Share agreement was initiated in 2004 with Lee University. Three goals were established: 1) to determine the location of all populations on the Forest; 2) establish monitoring protocols for each population; and 3) identify, through DNA analysis, which populations were associated with each other. Seven populations have been confirmed to occur on the Forest (Table 8).

Table 8. Known populations of hellbenders on the Forest and their status.

Watershed	Stream	Hellbender
		Population Health
Ocoee	Rough Creek	Rarely seen
Ocoee	Tumbling Creek	Stable
Hiwassee	Hiwassee River	Robust
Little Tennessee	Citico Creek	Rarely seen
Little Tennessee	Tellico River	Stable
French Broad	Paint Creek	Rarely seen
South Holston	Beaverdam Creek	Robust

All hellbenders collected are pit tagged and a toe is taken for DNA analysis. Initial genetic analysis suggests that the population in the Hiwassee River is different from those in the Tellico River and Beaverdam Creek.

Mudpuppy

The mudpuppy is another large salamander found on the Forest. While classified as a single species, some research indicates that the population associated with the Hiwassee River may be a distinct species. In 2014 a Challenge Cost Share Agreement was initiated with the University of Tennessee (Stephen Nelson) and the Knoxville Zoo to monitor the populations and determine its genetics. Mudpuppies are uncommon and difficult to find in the Hiwassee River. They utilize the same rocks as hellbenders for cover and searches for both species typically capture about seven hellbenders for each mudpuppy taken. In 2015 we will begin pit tagging mudpuppies in order to track individuals.

MQ 8: What are the status and trends of species with viability concerns and/or their habitats?

Information

This monitoring question is responsive to Objective 12.02 and to the general viability of terrestrial species on the Forest. Aquatic viability is addressed in MQ5. Several different plant species (white fringeless orchid, large round-leaved orchid, marsh marigold, kidney leaf twayblade, ovate catchfly, pigmy pipes, turkey beard) have been monitored over the years to assess status and trends. The monitoring elements are defined as follows:

1. Determine presence or absence of cerulean warbler. Track acres treated for canopy gaps.

2. Trends in recovery of T&E species (see MQ 7), and status and distribution of some viability concern species that are not specifically identified under other elements. Species targeted under this element will be determined through periodic review of each species' status and conservation priority. Priorities will likely vary through the life of the plan as new information is obtained.

Results

1. No cerulean warblers were located in 2015. There have been no reports of acres treated for canopy gaps.

2. Several non T&E plant species with viability concerns have been monitored at varying frequencies over past years to assess status and trends. Not all species are monitored annually. Two species, white fringeless orchid and March Marigold (*Caltha palustris*) were monitored in fiscal year 2015.

White fringeless orchid



Photo 9. White fringeless orchid

After many years of being a candidate for federal listing, in 2015 this species was formally proposed by the US Fish and Wildlife Service to be listed as Threatened under the Endangered Species Act. One of the largest known populations in the world for this species occurs on the Cherokee National Forest. A Conservation Strategy for this species was completed at the end of calendar year 2001 through a Challenge Cost Share with the Tennessee Department of Environment and Conservation. Assessments of the habitat within the botanical area were made in July of 2000. Presence

of the non-native grass species *Microstegium vimineum* has been noted in almost all of the surrounding area, but not in the main part of the bog. It is hoped that the dense native cover of sedges, grasses, and forbs are keeping this unwanted species out. During sampling in 2002, damage from feral hogs was apparent within the enclosed portion of the population and the hog exclusion fence was found to be in disrepair at several locations. Approximately 50% of the flowering plants and many non-flowering plants were uprooted. Repair of the feral hog exclusion fence was completed later that year and maintenance and repair of this exclusion device has remained a priority. During the 2009 monitoring it was noted that the exclusion fence had been deliberately cut in several locations. Repairs to the fence were made in 2010 and it was expanded slightly to enclose a bit more of the population. The 2013 monitoring effort was aborted after encountering very high water levels in the bog (see photo 10 below). In places the line intercept counts would have been impossible to complete due to the plants being completely submerged, and in others, it was so wet and muddy monitoring could not have been completed without causing significant disturbance in the area. The entire perimeter of the fenced area was walked, though it was impossible to do this without wading at least ankle deep in some places. It appeared that it was a good flowering year, easily seeing an estimated 100+ flowering individuals from the perimeter fence.



Photo 10. High water in the bog from a very wet summer made monitoring impossible in 2013

Any question of whether the extended period of high water in 2013 might negatively affect the plants, was answered immediately upon arrival at the bog in 2014. The 2014 and 2015 counts represent the highest number of flowering individuals (1,315 and 1,575 respectively) counted within the transects to date. Figure 25 below displays the total number of flowering and non-flowering individuals within the transects from 1996-2015.

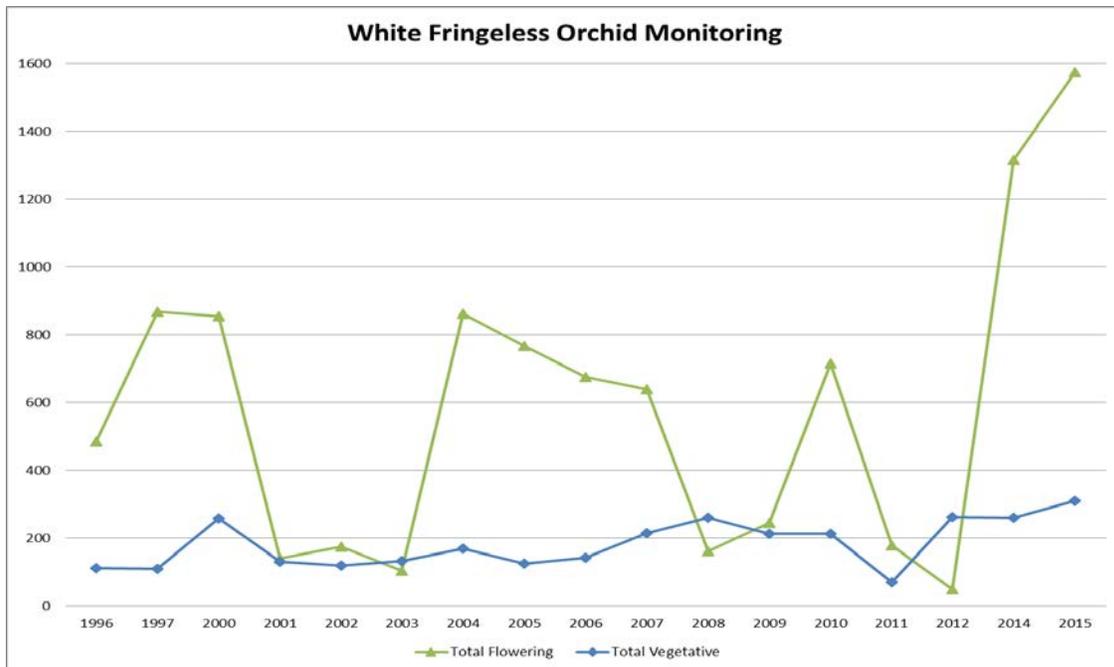


Figure 25. illustrates the monitoring results from Bullet Creek, 1996-2015.

Marsh Marigold



Photo 11: Marsh Marigold

This wetland species is listed as Endangered by the State of Tennessee, and while not meeting the criteria for inclusion on the Regional Forester's sensitive species list, is considered a species of local concern. Monitoring of a population of Marsh Marigold at Allan Gap was initiated in 1997 in cooperation with a local chapter of the TN Native Plant Society (Table 9). The wetland is primarily on the south side of a forest road and is bisected by the Appalachian Trail. The wetland extends approximately 90 meters upstream and 130 meters downstream from the trail. Additionally, in the year

2000 two clumps of *Caltha palustris* totaling 12 individual plants were transplanted into a site at Cutshall Bog.

At the Allan Gap site in 1997, individuals were only counted along a 50-meter transect within the wetland, thus the numbers that first year are really not comparable to subsequent monitoring years. In 1998, the monitoring was expanded to encompass the entire wetland area. The population was monitored annually until 2007 when funding and available personnel were applied to other projects. The site was re-visited in 2012 and 2015 and is now on two year monitoring frequency. The data for all years is presented below.

Table 9. Numbers of Marsh Marigold (*Caltha palustris*) at Allan Gap Monitoring Site, Nolichucky/Unaka Ranger District, Cherokee National Forest, TN, 1997-2015.

Year	Upstream	Downstream	North Side of Road	TOTAL
1997				293*
1998	908	625	3	1536
1999	833	1085	3	1921
2000	1183	1285	0	2468
2001	1330	1194	0	2524
2002	1136	1086	0	2222
2003	8*	1397	0	1405
2004	1203	878	0	2081
2005	-	-	-	-
2006	1297	509	0	1806
2012	1147	301	0	1448
2015	1216	366	1	1583

*Data from 1997 is only partial. Only the first 20M of the upstream transect was counted in 2003

The clumps transplanted into Cutshall Bog remained stable in size and number through 2003 and then roughly doubled in individuals by 2006. An attempt was made to monitor the population in 2012 and 2015 however the water-level was too high to access the clump of plants and visual observation from a distance has been made difficult due to a tree that

has fallen over part of the population. Plants were still seen growing at this site, and it appears that the number of clumps has increased to 5, however no accurate assessment could be made about numbers or health of these individuals. One of the new clumps is within 10 feet of the original population. The other two clumps are downstream from the original clump approximately 50 to 75 feet away.

Findings

White Fringeless Orchid: Sampling is done approximately the same time every year during the estimated time of peak flowering, however predicting this is difficult and no two years seem to be the same. The numbers of vegetative plants are counted as a line intercept, while the number of flowering plants are counted within a belt transect. A detailed account of the annual monitoring follows.

There was concern in 2001 with the huge drop in flowering individuals, but it was speculated that this variability was due to differing annual environmental conditions (rainfall amounts, temperatures, etc., which can affect flowering), especially since the vegetative numbers held fairly constant. In 2004 the number of flowering individuals rebounded significantly and remained high through 2007, though dropped slightly with each subsequent year. In 2008 there was another dramatic decline in flowering after two consecutive years of extremely low water levels in the bog. Interestingly, the vegetative count was the highest ever that year, suggesting that the plants are still persisting, just not flowering some years. 2009 was fairly wet in the bog and flowering was late. 2010 was quite the opposite with the water level in the bog being extremely low and most flowering individuals already gone to fruit by the time of monitoring. Total number of reproductive plants was high again in 2010, and vegetative plants continued to hold steady. 2011 was the driest year observed in the bog since monitoring began in 1996. There was no sign of above-ground water anywhere in the bog, and even the stream from Bower's spring that feeds into the site was completely dry. Only three plants with flowers still intact were observed, while any other reproductive plants for the year had fully senesced, making counting very difficult. Likewise, the vegetative plants were showing effects of drought conditions, with some leaves shriveled and brown, which probably contributed to the lowest ever numbers in the vegetative count. Based on previous trends it is expected that this is a temporary decrease based upon two years of drier than normal conditions. 2012 was a highly variable year for climate conditions. There were two weeks of temps in the 80's in March and by June the all-time temperature record in Chattanooga was broken, registering a day of 107 degrees. The summer was mostly hot and dry however heavy rains occurred within a few weeks of the monitoring date. By July 31st (the date of monitoring) there was no standing water, though ditches were saturated to the surface. Only 50 flowering individuals were counted, by far the lowest number ever. While many plants were in peak flower, some had already senesced and a few were seen with new flowering stalks emerging. Several plants had also been browsed by deer, making the count of flowering individuals difficult. Interestingly, as in 2008, despite record low numbers in flowering individuals, this was the record high numbers in the vegetative counts. This suggests the plants are still persisting at the site, just not flowering in some years, especially it would seem, after periods of long drought. The enclosure fence seems to be effective in keeping out hogs, though deer are continuing to browse on flowering individuals. No other

changes were observed in the bog. See pictures above illustrating high water in the bog in 2013. Plants were inundated for at least two weeks, perhaps longer. Any question of whether the extended period of high water in 2013 might negatively affect the plants, was answered immediately upon arrival at the bog in 2014. The 2014 and 2015 counts represent the highest number of flowering individuals (1,315 and 1,575 respectively) counted within the transects to date. It is recommended that population monitoring and maintenance of the enclosure fence continue.

Marsh Marigold: There has been a decline in numbers at the Allan Gap site and it has been observed that shading in portions of the habitat has increased. Some areas have become overgrown with Rhododendron, and multiflora rose and other non-native invasive plant species are also impacting portions of the site. These areas have little or no marsh marigolds, even when adjacent to populations with the same soil and hydrology. If these areas were cleared it would nearly double the habitat available upstream. Habitat improvement work was begun at this site in 2015 and will be enhanced significantly in 2016. Monitoring will continue on a two year schedule to evaluate these treatments on the population.

The transplanted population at Cutshall Bog has increased from two clumps to five and habitat improvement work to restore a more natural hydrologic regime within the bog is in the planning stages.

Avian Viability Concern Species Trends

Table 10 displays the mean number of observations per count and percent annual change in the number of observations per count for avian Viability Concern Species in National Forests of the Southern Blue Ridge (SBR) Physiographic Province compared to Cherokee National Forest (CNF), 1992-2004 (LaSorte et al. 2007). Estimates are based on point count surveys and were generated from marginal Poisson regression models. Estimates based on many points with confidence intervals that exclude zero are more reliable than estimates based on few points with confidence intervals that include zero.

Table 10. Avian viability concern species trends of Southern Blue Ridge province compared to Cherokee National Forest.

Species	Scale	Mean obs per count	Total no of points	Percent annual change	90% Confidence limits	
					Lower	Upper
Northern bobwhite (F2)	SBR	0.013	66	-17.2	-22.7	-11.4
	CNF	0.009	14	-9.3	-15.1	-3.0
Whip-poor-will (F3)	SBR	0.006	29	2.2	-13.2	20.3
	CNF	0.008	12	-8.8	-13.0	-4.4
Common raven (F1)	SBR	0.046	142	-8.0	-11.7	-4.1
	CNF	0.011	15	-16.1	-22.2	-9.5
Red-breasted nuthatch (F3)	SBR	0.041	94	-5.9	-10.5	-1.1
	CNF	0.016	24	9.3	4.6	14.2
Winter wren (F3)	SBR	0.116	115	-13.5	-16.7	-10.1
	CNF	0.058	55	-4.7	-8.3	-1.0
Blackburnian warbler (F2)	SBR	0.044	110	0.0	-4.8	5.2
	CNF	0.028	35	-11.8	-16.0	-7.4
Swainson's warbler (F3)	SBR	0.011	46	-4.3	-11.9	3.8
	CNF	0.010	19	0.1	-6.8	7.6
F1 = Extremely rare on CNF, generally 1-5 occurrences. F2 = Very rare on CNF, generally 6-20 occurrences. F3 = Rare and uncommon on CNF, generally 21-100 occurrences						

For viability concern species, sample sizes are much smaller and trends are displayed with less confidence. The northern bobwhite displays declines at both the province and Forest scales due to loss of suitable open habitat across its range. Sauer et al. report a trend of -6.8, P=0.0, N=19 for the province. Whip-poor-will occupies similar habitat, and is also declining on the Forest. High elevation specialists (common raven, winter wren, and Blackburnian warbler) are declining on the Forest, with the exception of red-breasted nuthatch. The loss of hemlock to hemlock wooly adelgid infestations is expected to result in future impacts to population levels of the wren, Blackburnian warbler, and nuthatch. Although Swainson's warbler is declining within the province, this riparian species appears stable on the Forest.

Efforts to 1) restore dry and xeric pine-oak forest, including shortleaf/pitch/table mountain pine forest; 2) restore open woodland and grassland conditions at a landscape scale; 3) maintain mature, complex mesic hardwood and riparian forest; and 4) slow the decline of hemlock loss are needed to enhance local populations or slow local population declines for avian species of interest.

Increased emphasis on volunteer agreements gives skilled observers additional incentive to contribute valuable information regarding many terrestrial viability concern species. Volunteers continued to monitor bald eagle activity at Parksville.

Dozens of volunteers donate hundreds of hours each year at two fall migrant bird banding stations at high elevation, open grassy habitats, Whigg Meadow and Big Bald. The banding stations are open to the public and serve as important sources of information on the value of these unique habitats. Volunteers have developed a website providing excellent information on monitoring of songbirds and raptors: <http://www.bigbaldbanding.org/>

Data collected at these two stations and at Carvers Gap banding station have been merged into single databases. Data is being analyzed for species trends and for band return data, including body mass changes during the staging phase as migrants feed along the bald edges.

MQ 9: What are the trends for demand species and their use?

Information

This monitoring question is responsive to the intention supporting desirable levels of demand species discussed in Chapter 2 of the RLRMP (page 28). The monitoring elements are defined as follows:

1. What are the trends in the number of permits issued for selected special forest products?

Results

Based upon a review of all the permitting data on the forest for special botanical products over the past many years, initial work to overhaul the entire permitting process for these products was begun in 2013. The goal was to have new product plans in place that will be more in tune with current market values and most importantly will have sustainable limits imposed for all species collected. This was accomplished for one product (ginseng) in 2013 and the remainder of our special botanical products in 2014.

Ginseng

Within the State of Tennessee, ginseng harvest is regulated through a permit system administered by the Tennessee Department of Environment and Conservation (TDEC). The Tennessee ginseng program arose out of the Ginseng Dealer Registration Act of 1983, and the Ginseng Harvest Season Act of 1985. This program regulates Tennessee's ginseng industry in compliance with the Convention on International Trade in Endangered Species of Wild Fauna and Flora of 1973 (CITES). The Division permits about 50 ginseng dealers annually and certifies the roots for export. The purpose of this program is to monitor the harvest level of wild ginseng to ensure that commercial exploitation does not cause it to become endangered. Statewide harvest data is maintained by TDEC and is available from them by request.

In addition to the state permitting process that is geared at regulating commercial trade in ginseng roots, the Forest further tracks the removal of ginseng from Forest lands through a fee permit system (Table 11). Permits were sold to individuals at a rate of \$20 per pound (green weight) for ginseng collection through fiscal year 2005, and were increased to \$30 per pound in 2006. Beginning in 2013, the permitting process was changed dramatically,

limiting the total annual harvest to a maximum of 10 lbs. This number was derived from calculations that determine how many populations of 50 plants or more would be needed to sustain an annual harvest. Under this new harvest limit, only 40 permits are allowed forest-wide (20 permits on the north half of the forest and 20 permits on the south half) each with a maximum harvest of 25 roots. These permits are sold via a lottery system. Five ginseng collection zones have been designated for the north Cherokee, and five collection zones for the south. Only one zone on each half of the Forest is open for collecting each year. Collection zones will be rotated each year to allow plants a five year recovery period necessary to help ensure populations remain sustainable. Historic, annual permit data from 1999-2012 is shown below followed by data from the new permit system that was initiated in 2013. In the historic data, it is not known if the permittees actually collected the maximum amounts allowed, however, in all years, the permitted amount far exceeded the 10 lbs that is currently estimated for sustainability.

Table 11. Historic ginseng harvest data summary for Forest lands (pounds are wet weight)

Fiscal Year	# Permits	Pounds	Price
1999	41	44	\$880
2000	79	79	\$1,580
2001	41	67.5	\$1,350
2002	78	96	\$1920
2003	69	69	\$1,380
2004	102	102	\$2,040
2005	32	32	\$640
2006	16	16	\$480
2007	26	26	\$780
2008	52	52	\$1,560
2009	36	37	\$1,110
2010	44	45	\$1,350
2011	52	52	\$1,560
2012	53	55	\$1,650

As stated above, new permitting policies were developed and implemented in 2013 with a maximum of 10 pounds to be allowed annually (a total of 40 permits with a maximum of 25 roots each = 1,000 roots maximum harvest). The following table (Table 12) summarizes the ginseng permit data for 2013-2015.

Table 12. Ginseng permit data for 2013-2015.

Year	Forest Zone - Harvest Zone	Roots Harvested (=max from non-reports)	Comments
2013	North – Zone 1	133 (+75)	Only 18 applications. 14 permits sold for a total of 133 reported roots, 3 non-reports (could equal 75 roots). 4 never came in to purchase.
2013	South – Zone 4	83	Only 10 applications. 6 permits sold for a total of 83 reported roots, 4 never came in to purchase.
2014	North – Zone 4	28 (100)	Only 17 applications. 10 permits sold for a total of 28 harvested roots, 4 non-reports (could = 100 roots). 7 never came in to purchase permit.
2014	South – Zone 1	0 (150)	Of the 20 lottery winners, 10 permits sold, 10 never came in to buy. 6 non-reports (could = 150 roots)
2015	North – Zone 2	141 (150)	Of the 20 lottery winners, 9 permits sold for a total of 141 roots, 3 lottery winners never came in to buy permit, 6 purchased but did not report back (could = 150 roots)
2015	South – Zone 3	124 (25)	Only 16 applied for permits. 10 permits sold for a total of 124 harvested roots, with one person failing to report harvest data (could = 25 roots). 6 never came in to buy their permit.

Beginning in 2001, a monitoring protocol was developed on the Forest to evaluate the direct effects of harvesting on ginseng. Four monitoring plots, one on each Ranger District, were established in areas where ginseng was present and likely to be collected. Figure's 26-29 present the count data from these plots from 2001-2014. Beginning in 2011 ginseng monitoring plots and protocols were shifted to be consistent with statewide monitoring being conducted by the Tennessee Department of Environment and Conservation. Data is collected from a permanently marked 30 meter diameter plot. These new plots are in the same general location as the previous plots, however data may not be directly comparable to previous years as the exact plot size and location may have changed. In future years, only the data beginning in 2011 and beyond will be displayed. Note: No monitoring was conducted on the Nolichucky or Watauga plots in 2005 or 2007, nor on the Ocoee Ranger

District plot in 2007. In 2010 all plants from the Ocoee plot had been harvested and consequently no data were collected at the Ocoee site in 2011, 2012, 2013, 2014, or 2015. This site needs to be re-checked to see if there is any recovery.

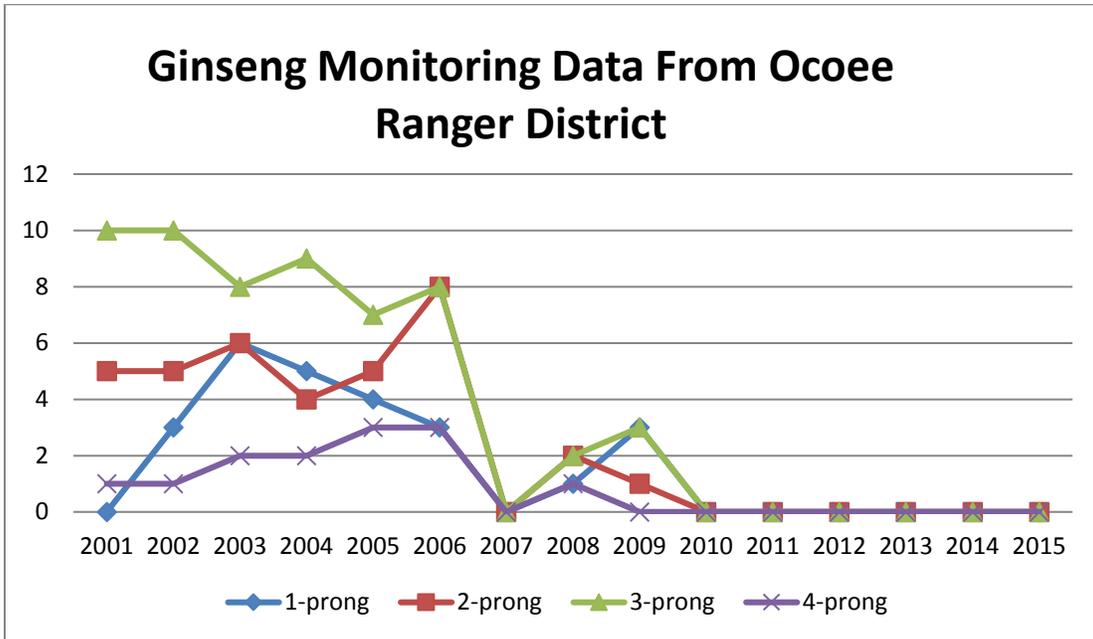


Figure 26. Ginseng Monitoring from Ocoee Ranger District.

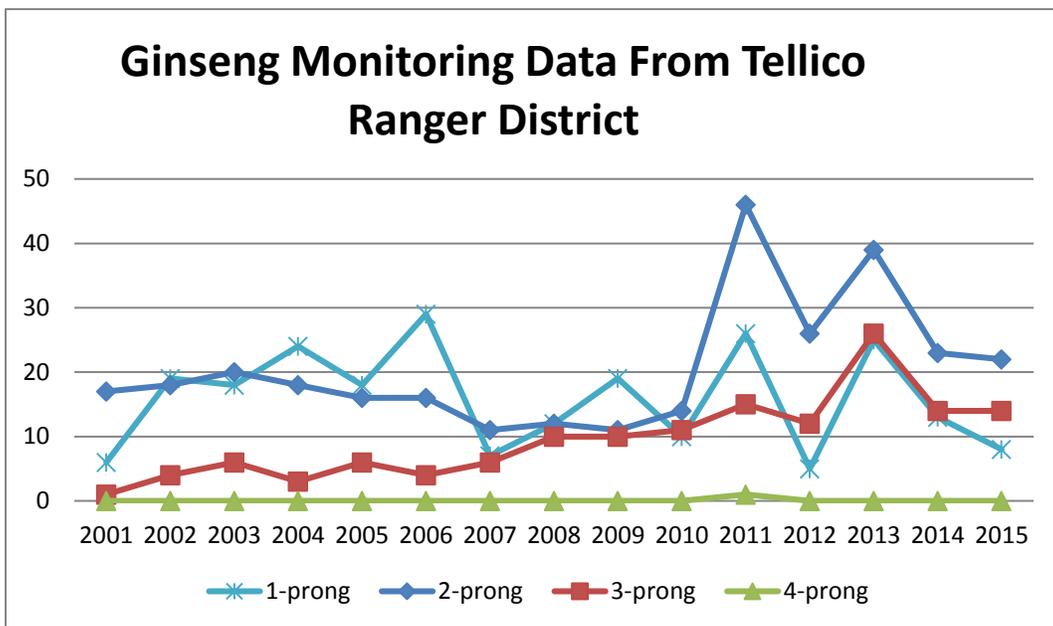


Figure 27. Ginseng Monitoring from Tellico Ranger District.

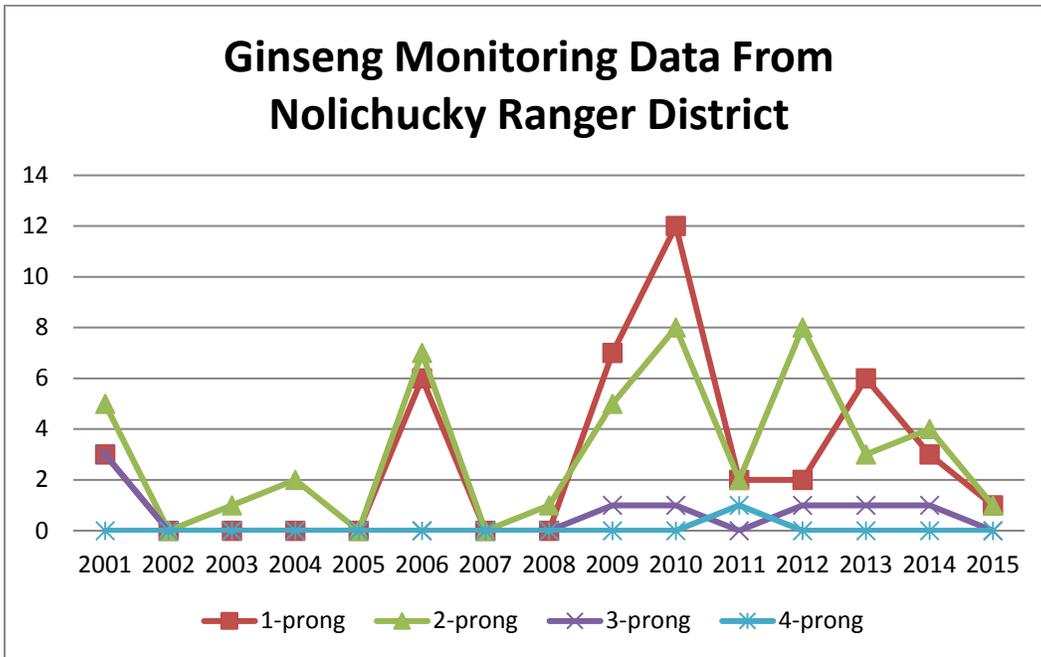


Figure 28. Ginseng Monitoring from Nolichucky Ranger District.

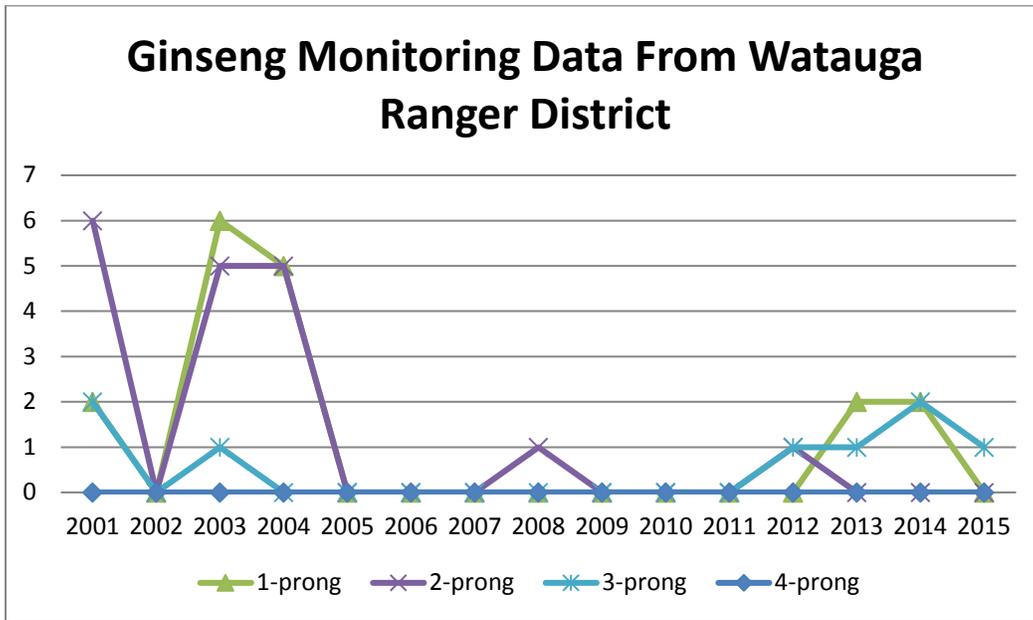


Figure 29. Ginseng Monitoring from Watauga Ranger District.

Ramps

Beginning in 2001, a new monitoring protocol was developed on the Forest to evaluate the effects of harvesting on ramps. Four monitoring transects were established forest wide (two on the north end and two on the south end of the Forest) in areas where ramps were present and likely to be collected. Figure 30 presents the total counts from all four plots. Note: The lack of a data-point for any given site in a given year indicates no data were collected, and the lines were simply connected between the points with data.

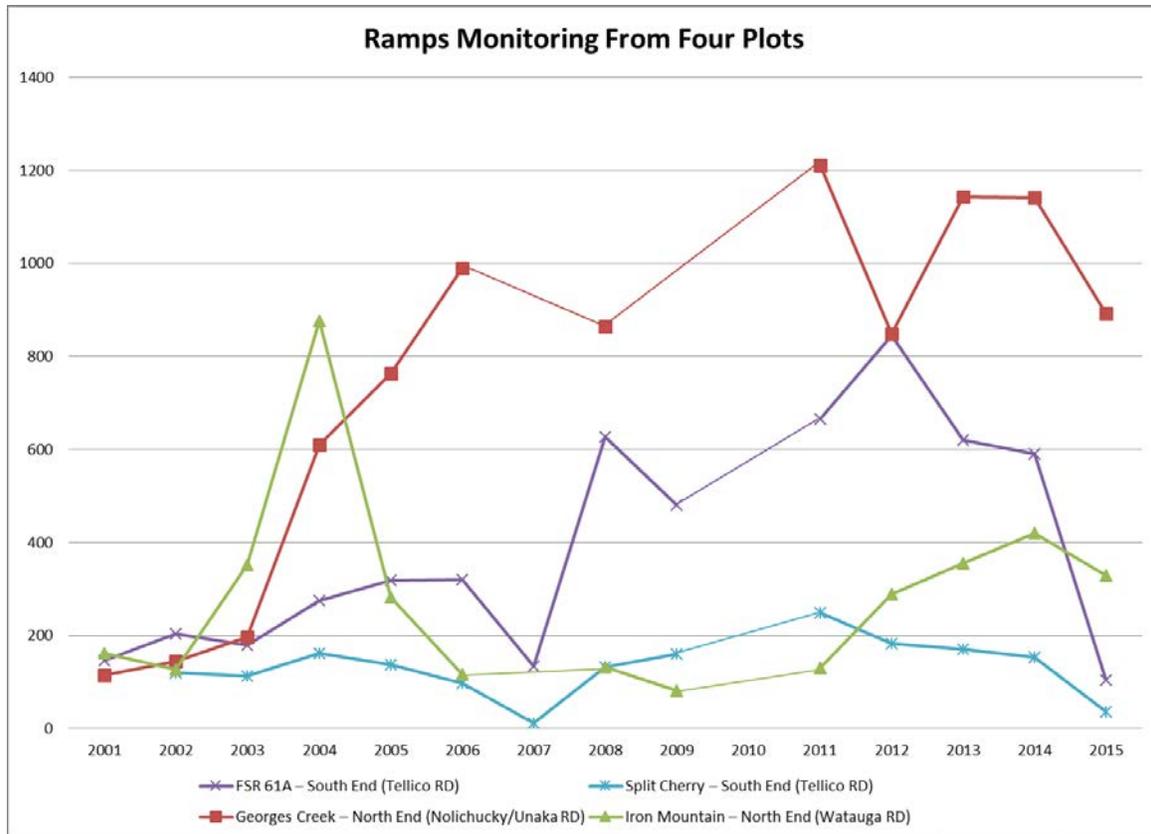


Figure 30. Total ramps counts from four plots on the Forest

The Forest has tracked ramp permits since FY 2002. From 2002-2005, ramps permits were only issued on the northern two districts and they were free-use. In 2006 the forest began issuing free-use permits for the collection of ramps (up to 5 lbs/permit) and began to sell commercial permits at a rate of 40 cents per pound with a maximum of 500 pounds per permit. The number of permits issued for ramps annually may be useful to see any trends in the demand for this species, though this assumes that everyone who collects is actually obtaining a permit. Permit data are shown below for the years 2002-2013 in Table 13.

Table 13. Permit data for years 2002-2013.

Fiscal Year	Free Use Permits	Commercial Permits	Total Pounds	Price
2002	30	0	150	\$0
2003	37	0	185	\$0
2004	50	0	305	\$0
2005	54	0	315	\$0
2006	82	0	410	\$0
2007	178	10 (500lbs)	1,390	\$200
2008	208	17 (850lbs)	1,805	\$340
2009	229	17 (850lbs)	1,995	\$340
2010	182	8 (400lbs)	1,310	\$160
2011	174	8 (390lbs)	1,260	\$156
2012	160	8 (400lbs)	1,200	\$160
2013	169	7 (350lbs)	1,195	\$140

Beginning in 2014, all permits for special botanical products were re-evaluated and revised. The free use permit for ramps was reduced from 5 lbs to 1 lb though no change was made to the commercial permits. In 2015 the commercial permits were also modified with a limit of 400 plants (approx. 10 lbs). All permits now require that the harvest record be completed and returned to the forest. Compliance with this has been an issue, but if followed, provides a better look at actual harvest numbers. Based upon returned permits from the south zone, 11,751 plants (approx. 276 lbs) were harvested on that zone in 2014. In 2015 the forest issued 98 free-use permits and sold 35 commercial permits. If the maximum were taken under each of those permits, that would amount to approximately 448 lbs.

Findings

Ginseng

From 1978 to present, statewide ginseng harvests were at their highest from the mid 1980's through the 1990's. While overall ginseng harvest has declined in the state, numbers of permits issued per year on the Cherokee National Forest have fluctuated considerably, high in some years and low in others. It must be noted that for permit data to be meaningful, it must be assumed that all collectors are obtaining permits which is not likely the case. Monitoring data from the two plots on the southern portion of the Forest had shown some increases in numbers and age of plants through 2006. No data were collected from the Ocoee plot in 2007, and in 2010 the site was decimated by collectors. Data from the north zone plots are highly variable and are confounded by two years (2005 & 2007) when no information was collected. In 2011 plots and protocols were shifted to be consistent with statewide monitoring being conducted by the Tennessee Department of Environment and Conservation. While this may add some additional confusion in interpreting the data from these four plots over the past several years, it is hoped it will lead to a better overall assessment of the species in the future as the data can be pooled from all plots across the state. Continued monitoring is recommended to assess trends for ginseng.

Based upon range-wide declines for this species, dramatic changes to the permitting process were implemented in 2013. These changes are designed to set harvest levels at sustainable levels for the long-term. In both 2013 and 2014 only 20 of the 40 available permits were actually sold forest-wide, and only 19 of 40 were sold in 2015. This indicates that half of the lottery winners fail to ever come in and purchase the permit. Additionally, several permittees each year have reported not being able to find the allotted amount of 25 roots. All of this suggests that ginseng is not readily found on the landscape. Monitoring the actual amounts legally harvested each year will help interpret trends for this species into the future.

Ramps

Evidence of collection within the two south zone plots has varied by year with no obvious impacts from over-collecting. Both plots showed declines to their lowest recorded totals in 2007 but then rebounded from those lows in 2008, 2009, and 2011. No data was collected in 2010. Data from the north zone plots are confounded by an inconsistent implementation of protocol (inflated numbers for 2004 at the Iron Mountain site) and a lack of data collection in 2007. It would appear that the Georges Creek site experienced a dramatic decline in 2009, and it was speculated at that time that the cause may be in part related to an active timber sale in the area, however that was not confirmed, and the population showed its highest numbers in 2011. Note that no data was collected in 2010 due to a lack of funding allocated to this monitoring item. All plots were monitored in 2012, 2013, 2014, and 2015. The number of permits issued has increased dramatically in the past few years however there is no real indication that this reflects increased collection, rather, just better information to the public that permits are required. The volumes reported are based upon permitted levels and may not reflect actual pounds collected. Continued monitoring is recommended to assess trends at these four sites.

A summary of permit data from 2008-2012 indicates approximately 75% of the amounts permitted has been under free-use permits while only 25% has been commercial (purchased). From NC State 2013 report, diggers report receiving between \$1.50 and \$3.00 per bunch (10 plants) and retail prices average between \$15 and \$20 per pound.

Table 14. Ramps Harvest Data for Forest Lands

Year	Product	Nolichucky	Ocoee	Tellico	Watauga	Total
2008	Ramps – Free	115	-	840	85	1,040 lbs
	Ramps - Comm	50	-	800	-	850 lbs
2009	Ramps – Free	95	-	930	120	1,145 lbs
	Ramps - Comm	55	-	800	-	855 lbs
2010	Ramps – Free	90	-	735	85	910 lbs
	Ramps - Comm	-	-	400	-	400 lbs
2011	Ramps – Free	75	-	705	90	870 lbs
	Ramps - Comm	40	-	350	-	390 lbs
2012	Ramps – Free	90	10	615	85	800 lbs
	Ramps - Comm	50	-	350	-	400 lbs

The previous 3 years show an average permitted volume of a little over 1,200 pounds. At the high-end of retail cost (\$20/lb) that is \$24,000 of product, most of which is being given away for free. Looking at the FSH definition of free use, this does not seem appropriate:

FSH 2409.18 Chapter 80 Section 87.51 – Free Use

When supply is not limited and value is low, free use of special forest products may be granted to individuals for personal use, which may include customary and traditional uses by rural residents for direct personal or family consumption (sec. 82). Prohibit individuals from selling or exchanging material harvested or gathered under free use, except for customary trade and barter, as defined in the Alaska National Interest Lands Conservation Act.

Based upon the above numbers, and due to the limited habitat for this species on the forest and the relatively high value of the product, an argument could be made for no free use, however, there is a long history of local, cultural use for this product and thus the following permit structure was implemented.

Personal Use – Free

- 1 permit per person per year
- Maximum of 40 ramps per permit
- Maximum of 200 permits issued per zone (N&S) per year
- Permit valid for 15 days from date issued

Commercial Use – Charge (\$20 minimum fee)

- 1 permit per person per year
- Maximum of 400 ramps per permit
- Maximum of 50 permits issued per zone (N&S) per year
- Permit valid for 15 days from date issued

Based on our permitting data the average pounds permitted over the past 5 years was approximately 1,500 pounds. Because it is unlikely that everyone collects the maximum amount their permit allows, that is likely an overestimate of what was actually legally harvested. If you assume 40 ramps (whole plant) = one pound, that equates to 60,000 ramps. The newly imposed levels would permit 16,000 ramps free (40 x 400permits) and 40,000 commercially obtained (400 x 100permits). When added together these numbers are close to the previously permitted amount (56,000 instead of 60,000), but now 71% of the permitted product would be commercial instead of 2/3 being given away. This provides a low (and reasonable) level of free use, but shifts most of the harvest to a commercial base.

Based upon returned permits from the south zone, 11,751plants (approx. 276 lbs) were harvested on that zone in 2014, of which 10,430 plants were sold under commercial permits. This represented a shift from free use to commercially sold product, moving exactly the direction we wanted with 89% of the product harvested on the south zone falling into a paid-for category. In 2015 the numbers reflect a similar trend, with 98 free use permits (3,920 ramps) and 35 commercial permits (14,000 ramps) issued forest-wide. For 2015, those permitted totals represent 22% of the ramp harvest as free-use, while 78% of the harvest was commercial.

Game Species

Bear (addressed in MQ 4), deer, turkey and grouse are the most popular game species managed on this Forest.

Deer

The number of deer harvested in counties containing Forest Service lands is tracked for deer and turkey to provide insight into the demand level for hunting opportunities. Figure 31 shows the very strong upward trends in deer harvest.

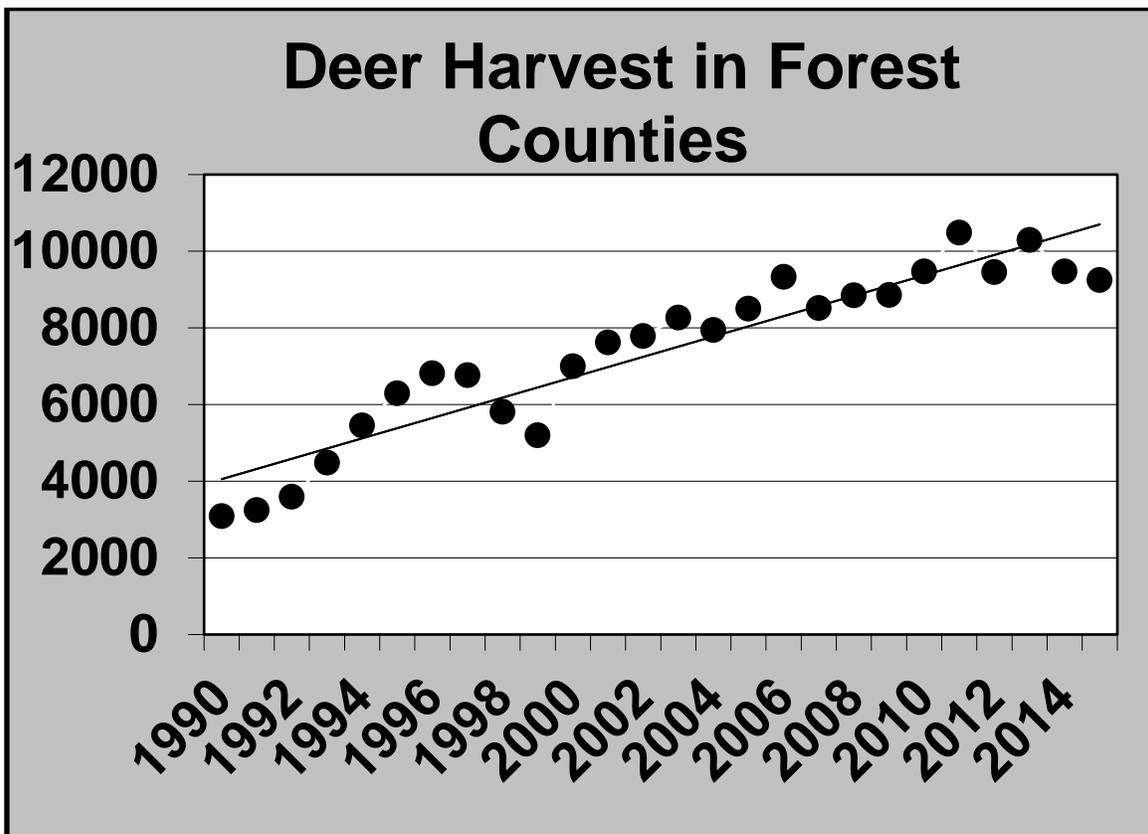


Figure 31. Deer harvest numbers from Tennessee counties with Forest lands.

Eastern Wild Turkey

Wild turkeys occupy a wide range of habitats, with diversified habitats providing optimum conditions (Schroeder 1985). This includes mature mast producing stands during fall and winter, shrub-dominated stands for nesting, and herb-dominated communities, including agricultural clearings for brood rearing. Habitat conditions for wild turkey can be enhanced by management activities such as prescribed burning and thinning and the development of herbaceous openings.

Wild turkey populations on the Forest have expanded in the last 25 years (Fig. 32). As with deer, this increase likely is related to both non-habitat factors such as extensive restoration efforts, protection, and conservative harvest strategies as well as increased acorn capability resulting from the increase in mid-to late-successional oak forests. Although Forest management will strongly influence habitat conditions for turkey, in large part, their populations are regulated by factors outside the control of Forest management such as weather conditions during the nesting season and to a lesser degree, harvest regulations established by TWRA.

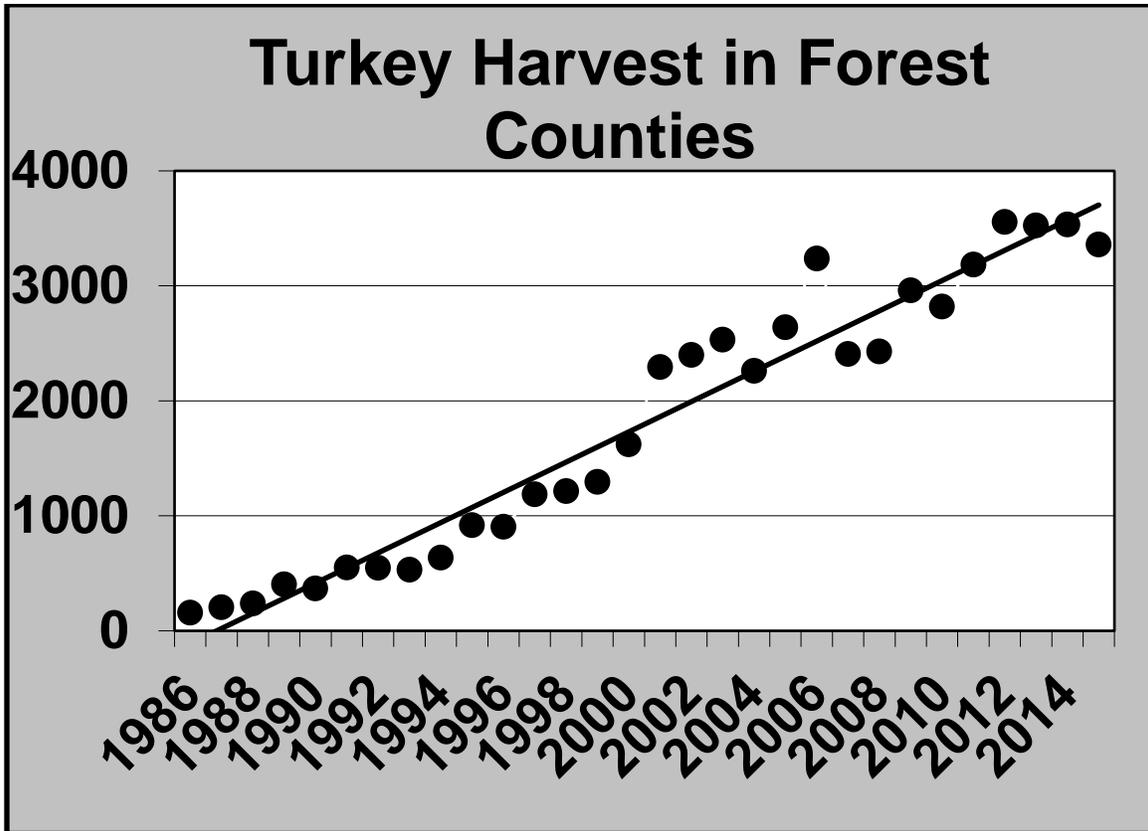


Figure 32. Turkey harvest numbers from Tennessee counties with Forest lands

Ruffed Grouse

Adult cover, including drumming habitat usually consists of young regenerating forest (6-15 year-old) or shrub cover (Thompson and Dessecker 1997). The dense cover provides protection from both avian and mammalian predators. Secure cover is provided in habitats with good vertical structure (8,000+ stems/acre) of 15-20 foot saplings (Kubisiak 1989). Dimmick et al. (1996) reported that males began to orient their drumming sites around or in clearcuts within 3 years post-harvest.

According to Breeding Bird Surveys, ruffed grouse populations have been in decline throughout the Appalachian region over the past 35 years. The declining trend likely is largely due to the reduction of forest cover in the sapling-pole successional class, which is important to this species. Ruffed grouse populations on the Forest generally have declined during the last two decades, as they have throughout the Southern Appalachians. Implementing projects that create or maintain suitable habitat will continue to be a priority for the Forest.

MQ 9: Elements 2-3

Catchable-size trout

Fishing for catchable-size trout is a popular recreational pastime. The hours spent in pursuit of hatchery raised trout far exceeds other fishing venues such as wild trout or smallmouth bass on the Forest. TWRA annually stocks twenty-nine stream reaches totaling 58 miles with catchable-size trout on the Forest. Stocked streams are listed in the TWRA fishing regulations. Stocking, typically, occurs once every two weeks from late February until June. Creel surveys on these streams have shown high catch rates and excellent quality of trout.

Special Fishing Regulations

Tellico River, Citico Creek and Green Cove Pond require a TWRA daily permit (\$6.50). The funds are used to fund trout production.

Portions of Paint Creek, Tellico River and Hiwassee River are managed as delayed harvest streams during the winter months. Sub-catchable size trout are stocked and allowed to grow. While angling is allowed, no trout may be harvested during the specified period. Horse Creek has a creel limit of two trout per day from May 1 through September 30. Dillard Ponds have a daily limit of four trout per day.

Wild trout regulations are applied to 157 miles of streams on the Forest. These streams have restrictions on the number and size of trout that may be harvested; on the lures that may be used; and on time of day when fishing is allowed. Approximately 385 additional miles of streams support trout but have no special designations. The Tellico River has a protected size (13 to 17 inches) range for smallmouth bass.

There are approximately 820 miles of streams capable of supporting fish on the Forest. Some of these streams (100 miles) are too small to support game species. Summer temperatures determine whether trout or bass/bream will be the dominate game species. Approximately 550 miles support trout compared to 170 that support bass/bream. Habitat improvement work has focused on the trout waters with about 36 miles of streams improved in 2015. Improvements included installing structures and trimming of rhododendron.

Brook trout are a species of special concern to both local and national audiences. Brook trout numbers are declining across the native range do to environmental and biological impacts. On the Forest, the native or southern strain of brook trout is limited to two streams on the south half of the Forest but occurs in 55 stream reach on the north end.

A Southern Appalachian brook trout hatchery was started at the Tellico hatchery in 2011. In 2015 fingerlings, approximately 1500, produced by the Tellico hatchery and released into Sycamore Creek.

MQ 10: Are opportunities for high quality, nature-based recreation experiences being provided and what are the trends?

1. What are the results and trends in user satisfaction ratings?
2. Are semi-primitive recreation settings and backcountry recreation opportunities maintained or increased?
3. Are there any changes in the supply of developed and dispersed recreation opportunities including the provision of interpretive media?
4. Have ranger districts maintained volunteer agreements with AT clubs?
5. User conflicts within the AT Corridor.

Results:

National visitor use monitoring (NVUM) is conducted for each national forest once every five years based on nationally established protocol. Survey data was collected in FY 2012 for the Cherokee National Forest in cooperation with the University of Tennessee. Proxy data was collected for specialized activities and locations in the national forest where the numbers of visitors could be more accurately determined than extracted from sample day counts, i.e. developed campgrounds and boat launches that support commercial whitewater rafting. Field data was collected on approximately 250 randomly selected sample days throughout the fiscal year. The visitor use surveys were conducted at national forest exit locations identified for general forest areas, Wildernesses and developed recreation facilities.

Findings:

1. A variety of Cherokee National Forest visitor use reports can be generated based on the results from the FY12 National Visitor Use Monitoring. Reports on demographics (gender, age, etc.), economics, sampling strata, satisfaction, visit descriptions, and visitation estimates are available at <http://apps.fs.usda.gov/nrm/nvum/results/A08004.aspx/Round3>.

Another indicator of current recreational use and trends is the Cherokee National Forest recreation fee program. This program includes the collection and expenditure of fee revenue from users of developed campgrounds, developed swim areas, developed boat launches, a cabin rental, reservation services for group picnic areas/pavilions, developed shooting ranges, Buffalo Mountain ATV trail and the Ocoee Whitewater Center.

Fee revenue was primarily expended in fiscal year 2015 to support fee collections, basic operations and general facility maintenance at more than 60 developed recreation sites. Routine activities included mowing, trimming, leaf removal, hazard tree removal, facility cleaning, litter pick-up, trash disposal, utility payments, septic/vault pumping, minor facility repairs, updating information boards, collecting fee envelopes and patrolling recreation sites. The US Forest Service is more dependent on the use of these funds to sustain recreation routine operations in the Cherokee National Forest than when the fee program was initiated. This has resulted in an increase in deferred maintenance and a reduction of visitor services, especially in remote recreation sites and corridors where fees are not charged for dispersed recreation. For example, trash collection services were halted in the Conasauga River Corridor and toilet buildings were closed due to the Forest's reduced capacity to operate recreation facilities to standard. Visitor satisfaction has decreased for users of these affected areas.



Photos 12 & 13: Condition of toilet building located in the Conasauga River Corridor after being closed for a year (left) and the same building after being closed for multiple years (right)

2. Semi-primitive recreation settings and backcountry recreation opportunities have been maintained. The recent acquisition of the Rocky Fork Tract added approximately 10,000 acres to the Forest's semi-primitive recreation settings and opportunities. Management decisions in regard to motorized vehicular access have generally not affected these settings and opportunities. All changes to motorized access have been documented on the Motor Vehicle Use Map (MVUM).

3. The process continued in FY 15 to determine a "Priority Investment List" for developed recreation sites in the Cherokee National Forest and Region 8. The development of this list will help the forest determine priorities for addressing deferred maintenance and potentially decommissioning or reducing facilities that cannot be sustained. These actions would be aligned with Goal 30 of the Revised Land and Resource Management Plan -

"Provide a spectrum of high quality nature-based recreation settings and opportunities that reflect the unique or exceptional resources of the CNF and interests of the recreating public on an environmentally sound and financially sustainable basis. Adapt management

of recreation facilities and opportunities as needed to shift limited resources to those opportunities.” (RLRMP p. 56)

4-5. The Watauga and Unaka Ranger Districts have maintained volunteer agreements with Appalachian Trail maintaining clubs in FY 2015. Two maintaining clubs, Tennessee Eastman Hiking & Canoeing Club and Carolina Mountain Club, continue to help maintain and improve the Appalachian Trail through the Cherokee National Forest. Setting a limit of stay for A.T. shelters within the Southern Region was established.

MQ 11: What are the status and trends of recreation use impacts on the environment?

This monitoring question corresponds to Goal 32, Objectives 31.01, MA1.1.02, MA3.1.05, MA6.1.03, MA7.1.02, MA8.1.06, MA10.1.104, MA12.1.03, MA13.1.02, MA14.1.02, MA15.1.02, and Standard 8C-5. The monitoring elements are defined as follows:

1. Have bear-resistant recreation facilities, services, information and law enforcement actions reduced the number of nuisance bear incidences reported annually?
2. Are the plan decisions on OHV use designations, determining whether an area is open or closed to OHV use, still valid?
3. Is dispersed recreation along priority streams/rivers resulting in accelerated sediment delivery and bank instability, and where necessary, are improvements being made to reduce these impacts?

Results:

1. Reported bear incidences have remained steady though numbers fluctuate each year due most likely to habitat conditions. Continued diligence and caution should be exercised in reporting and dealing with bears across the Forest.

Statewide there were a total of 631 black bear incidents reported by TWRA Regions III and IV in 2015. Black bear incidents peaked in the state in May 2015. Sevier County reported the highest number of incidents.

2. At present, the Cherokee NF manages approximately 20 miles of designated motorized trails that allow ATV and/or motorcycle use including the 12-mile Buffalo Mountain ATV trail. During FY 2008 extensive surveys were conducted on Buffalo and Cherokee Mountains located near Johnson City, TN to determine the status and trends of recreation use impacts on the environment. Results of the monitoring determined that unauthorized motorized vehicle use is presently sprawling beyond the designated 12-mile Buffalo Mountain ATV Trail.

Findings:

The Forest Service conducted periodic inspections of the Buffalo Mountain ATV Trail in FY 2014 to evaluate the effectiveness of improvements made in previous years. The US Forest Service and a local riding club implemented a formalized agreement for

cooperatively maintaining and sustaining the existing 12-mile trail. The on the-ground success of this cooperative effort will be monitored and evaluated.

2. The Forest Service conducted periodic inspections of the Buffalo Mountain ATV Trail in FY 2015 to evaluate the effectiveness of improvements made in previous years. The US Forest Service and a local riding club implemented a formalized agreement for cooperatively maintaining and sustaining the existing 12-mile trail. The on the-ground success of this cooperative effort will continue to be monitored and evaluated.

MQ 12: What is the status and trend of wilderness character?

This monitoring question is responsive to Goal 22 and Objectives 36.01, 36.02, and 1.A.3.01. The monitoring elements are defined as follows:

1. Is wilderness visitor use within limits that do not impair the values for which the wilderness was established?
2. Trends in fire regimes and effects on fire dependent communities.
3. What are the trends in air quality related values in Class 1 Wilderness areas?
4. What is the status and trend of visibility in Class1 areas and relationship to landscape visibility across the Forest?

Results:

1. The 10-Year Wilderness Stewardship Challenge (10-YR WSC) was developed by the Chief's Wilderness Advisory Group (WAG) as a quantifiable measurement of Wilderness stewardship. It was completed in 2014 and a new performance system was introduced to monitor the status and trend of wilderness qualities and character in FY 2015. Ten new Wilderness Stewardship Performance Elements were selected and assigned to designated wilderness areas within Cherokee National Forest: Bald River Gorge, Big Frog, Big Laurel Branch, Citico Creek, Gee Creek, Little Frog Mountain, Pond Mountain, Sampson Mountain, and Unaka Mountain.

The following draft performance elements were selected by the Forest Leadership Team for each category:

Natural Quality

- Invasive Species
- Air Quality Values
- Natural Role of Fire

Undeveloped Quality

- Recreation Sites
- Trails

Untrammelled Quality

- Agency Management Actions

Solitude Quality

- Opportunities for Primitive and Unconfined Recreation

Administration

- Workforce Capacity
- Education
- Wilderness Character Baseline

Future wilderness stewardship activities and accomplishments will be reported as they relate to these elements.

Visitor use of Wildernesses in the Cherokee National Forest was surveyed as part of the National Visitor Use Monitoring in FY 2012. The results include an estimate of 64,000 annual visits to Wilderness areas.

Results are posted at <http://apps.fs.usda.gov/nrm/nvum/results/A08004.aspx/Round3>.

2. No prescribed burning took place in wilderness in 2015. Fire regimes in wilderness remain unchanged.

MQ 12-3: What are the trends in air quality related values in Class 1 Wilderness areas?

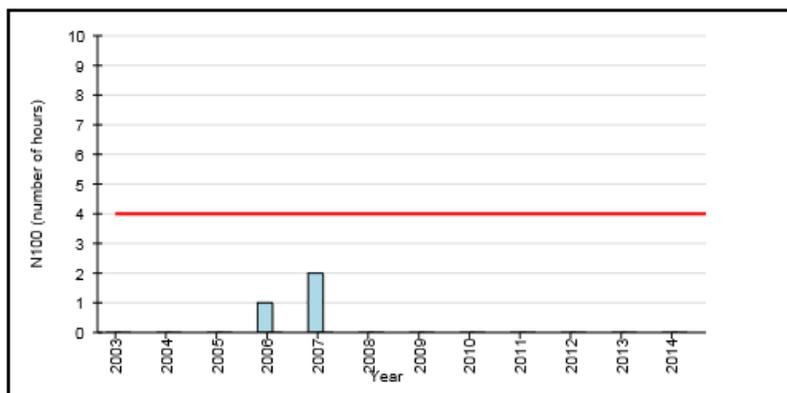
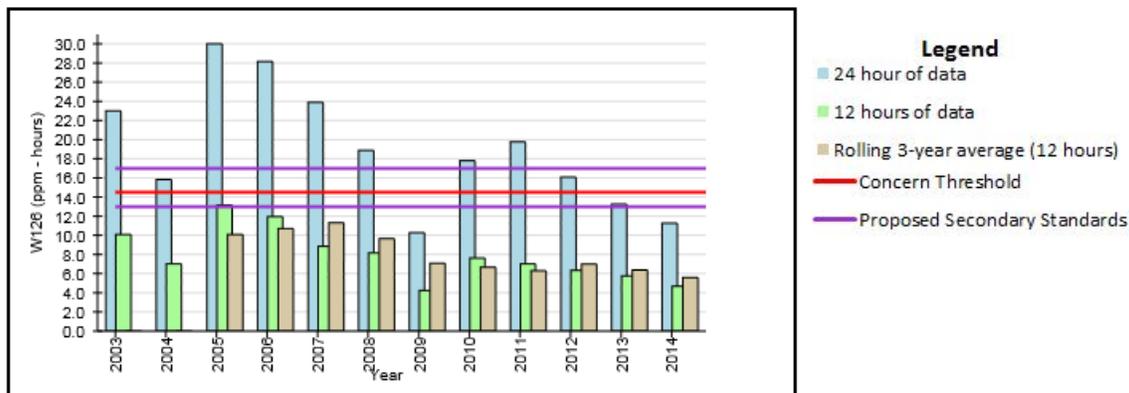
Joyce Kilmer-Slickrock Wilderness Area, situated in Monroe County, TN and Graham County, NC, has been designated a Class I Wilderness Area, and as such there are special protections in place to limit the air quality impacts on the wilderness. The Air Quality Related Values (AQRVs) for Joyce Kilmer-Slickrock include flora, visibility, and water.

Flora: Air quality impacts to sensitive flora can be caused by both acute and chronic exposures to elevated concentrations of ground-level ozone. Lefohn and Runeckles (1987) described the W126 as a biologically meaningful way to summarize hourly average ozone data. If annual ozone exposures remain high then the long-term effects may lead to a reduction in photosynthesis and ecological impacts.

The graphs below provide a historical summary of the two ozone exposure indices (N100 and W126) over the past 12 years for the Joyce Kilmer-Slickrock Wilderness Area. The N100 is the number of hours greater than or equal to 0.100 parts per million. The W126 is a weighted function, where the results place a greater emphasis on peak concentrations and the values decrease to zero below 0.020 ppm.

The annual W126 results in Figure 33 below show three bars of the data and these include: 1) the three consecutive months with the greatest W126 using 24 hours of available data, 2) the three consecutive months with the greatest W126 using 12 hours of available data between 0800 - 1600, and 3) a rolling three year average of the 12-hour W126 results. The

red line in the W126 and N100 graph is the 24-hour concern threshold that (when both are exceeded for a specific year) experimental trials have predicted a 10 percent or greater loss in biomass.



Source: <http://webcam.srs.fs.fed.us/graphs/o3calc/vegetation.php>

**Figure 33. Annual W126 Results, and
Figure 34. Annual N100, respectively**

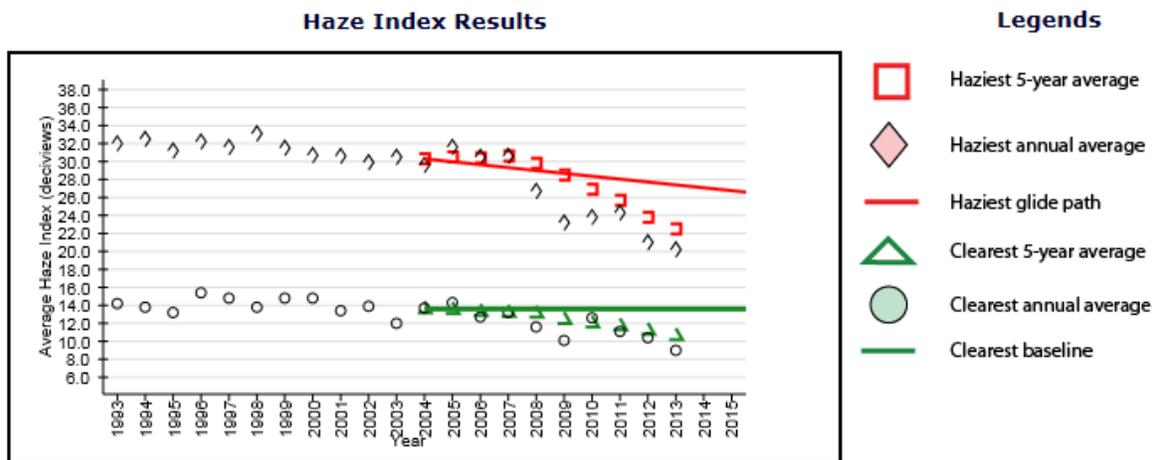
In 2015, an ozone biomonitoring survey was conducted on four plots surrounding the Joyce Kilmer-Slickrock Wilderness. Three ozone sensitive species were evaluated (yellow poplar, black cherry and blackberry) for foliar ozone symptoms. Out of the 353 individual plants surveyed, including 72 yellow poplar, none of the plants showed any visible signs foliar ozone symptoms.

Visibility: One of the most noticeable forms of air pollution is haze, a veil of smog that blurs the view of many urban and rural areas. As part of the Clean Air Act, Congress has established a goal to prevent future and remedy existing visibility impairment in 156 protected national parks and wildernesses, known as Class I Areas. Federal rules require state and federal agencies to work together to improve visibility in these areas so that natural background conditions are achieved by the year 2064. Within a wilderness area such as Joyce Kilmer-Slickrock, visitors expect to find pristine conditions and magnificent views unobscured by manmade air pollution.

Visibility has been monitored at this federally mandated Class I area since 1990 following the Interagency Monitoring of Protected Visual Environments (IMPROVE) protocols. The chart below is based upon the analysis of particulate matter data that include estimates of visibility conditions and the amount of light extinction attributed to different types of particulate matter measured at this IMPROVE monitoring site.

The Regional Haze Program relies upon the haze index to track two different trends: visibility on the haziest days annually and visibility on the clearest days annually. Both trends are measured beginning with the 2000-2004 "baseline" period. The haziest days are also compared to the goal of no manmade impairment in 2064. The haze index has a unit of measure called deciview. Higher deciview values correspond to hazier scenes.

Below in figure 35 is a representation of the haziest and clearest annual deciview values for the past ten years. The red line represents the haziest day "glide path" connecting the baseline conditions to the 2064 goal, and is intended to be a guide in gauging progress at this Class I area. The 2009 through 2013 5-year average (of available data) indicates the haze index is below the glide path, with all of the past 5 years below the red line in the graph below. On the clearest days, all of the past 5 years have been below the 13.58 deciview baseline (green line below). Furthermore, the 5-year average on the clearest day is below the baseline.



Source: <http://webcam.srs.fs.fed.us/graphs/vis/index.php>

Figure 35. Haze Index Results

Water/Acidic Deposition: Deposition of sulfates and nitrogen compounds from anthropogenic sources can negatively impact sensitive ecosystems. These compounds can acidify soil and surface waters, affect nutrient cycling and impact the ecosystem services provided by forests. Sulfates and nitrogen compounds are deposited in precipitation (known as wet deposition), as well as particulates and aerosols (known as dry deposition), or directly from clouds/fog vapor.

In the United States, there are many locations where measurements are taken of wet deposition, as opposed to dry or cloud deposition. However, not all National Forests or wildernesses are monitored directly. For this reason, statistical models, using monitored wet acidic deposition, precipitation amounts, and topographic data are being used to provide a spatial estimate of wet acidic deposition for the eastern United States (Grimm and Lynch, 2004). The results presented in the two graphs below show the estimated trend in wet deposition (red line) along with the distribution (box plots) in the modelled estimates for Joyce Kilmer – Slickrock Wilderness.

Since 1983 sulfate wet deposition has decreased on average about 0.6795 kilograms per hectare (kg/ha) each year while total nitrogen wet deposition has decreased on average about 0.055 kg/ha each year. Both models are highly significant with less than 1 in 1000 cases where there is actually no relationship between the mean of the annual wet total nitrogen deposition as predicted by the years since 1983 and the mean of the annual precipitation. Overall, 78% of the variation in the estimated mean of the annual wet sulfate deposition and 52% of the total nitrogen deposition can be accounted for with the two predictors.

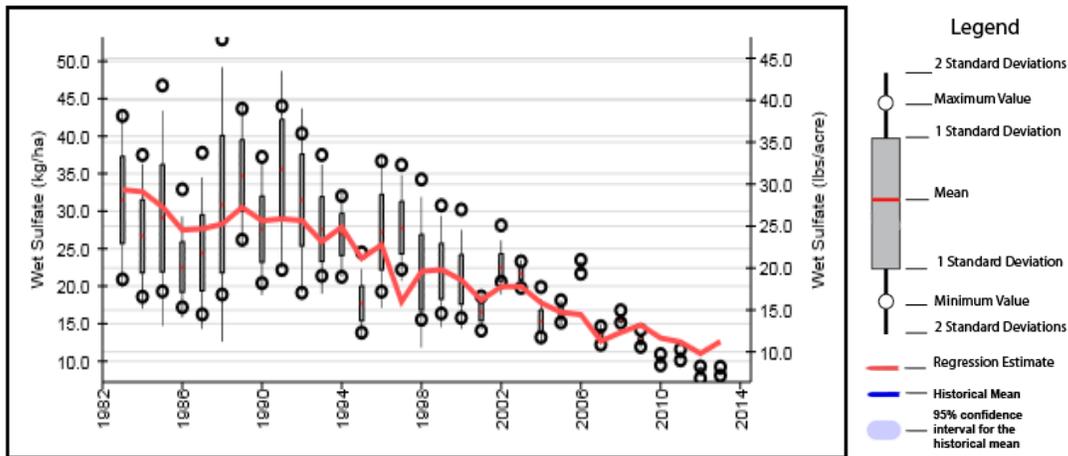


Figure 36. Wet Sulfate (Source: <http://webcam.srs.fs.fed.us/graphs/dep/index.php>)

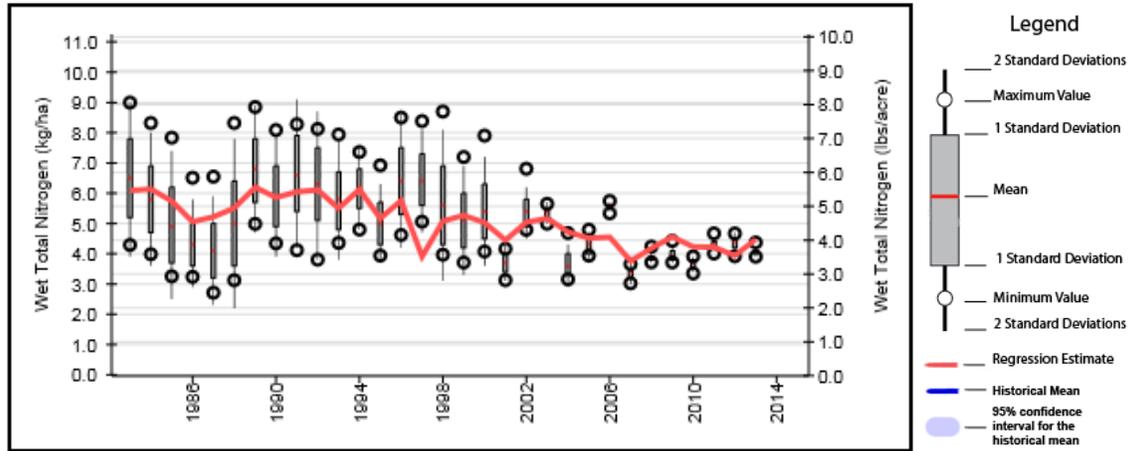


Figure 37. Wet Total Nitrogen (Source: <http://webcam.srs.fs.fed.us/graphs/dep/index.php>)

MQ 13: What are the status and trends of Wild and Scenic River conditions?

This monitoring question is responsive to Objectives 38.01 and 38.02. The monitoring elements are defined as follows:

1. Have suitability studies been completed for eligible rivers?
2. Are free flowing conditions and Outstandingly Remarkable Values being protected?

Results:

Six waterways are currently eligible for the Wild and Scenic River study. They are Nolichucky River, Conasauga River, Hiwassee River, Tellico River, Beaverdam Creek, and Elk River. A suitability study has been completed for the Nolichucky River recommending that a 1.3 mile portion be classified as scenic.

Findings:

The Nolichucky suitability study was submitted to congress in 1991 but no action has been taken. The Chattahoochee National Forest is the lead agency for the Conasauga River suitability study. No barriers to the free flowing conditions of the affected rivers have been identified.

MQ 14: Are the scenery and recreation settings changing and why?

This monitoring question is responsive to Objectives 40.01, 40.2, 40.03 and Standard 111. The monitoring element is defined as follows:

1. Is the scenic inventory maintained, refined and updated?

Results:

The scenic inventory is maintained and refined on a project specific basis.

Presently, Hemlock Woolly Adelgid continues to be the primary cause of changes to scenery and recreation settings in Cherokee National Forest. Because hemlock is a component of many desirable water-based and backcountry recreation settings, the increasing number dead and dying hemlocks due to the invasive, non-native adelgid is creating more noticeable impacts. The corridor along Spring Creek, a tributary to the Hiwassee River, is a good example of decreasing scenic integrity with in the visible foreground.

Findings:

Informal field monitoring shows that hemlocks are fading from the landscape. The removal of infested trees for safety reasons often leaves voids in affected landscapes and developed recreation sites. Slash and debris created during the removal process is noticeable and minimized where feasible.

Non-native, invasive plant species such as kudzu are also changing the natural character of the landscape. Aggressive treatments have short-term negative visual impacts, but they are necessary to achieve the desired landscape character, which does not include invasive plant species.

Implementation of planned vegetation management projects continued in FY 2015. Changes in scenery were most noticeable in areas where temporary and permanent road improvements and log landings were made in plain view. Below, the photos 14, 15, and 16 taken from Chilhowee Mountain Overlook illustrate how noticeable the color contrasts created by soil disturbances are more noticeable than the surrounding changes in vegetation density. Changes in vegetation would most likely go unnoticed to the casual forest visitor except for the soil disturbances that attract attention. Re-vegetation within the affected skid roads areas remains to be a slow process, but visual impacts are fading with each passing year.



Photos 14, 15, 16: Views from Chilhowee Mountain Overlook across Parksville Lake (Ocoee River) of timber sale road over the last fiscal years.

The frequency and volume of graffiti is also changing the integrity of developed recreation facilities in Cherokee National Forest.



Photos 17 & 18: The masonry wall at Chilhowee Mountain Overlook on the Ocoee Scenic Byway had to be completely coated in paint to remove the graffiti.



Photo 19: Graffiti at Boyd Gap Overlook on the Ocoee Scenic Byway

MQ 15: Are heritage sites protected?

Information

This monitoring question is responsive to Objectives: 43.01, 43.02, 43.03 and 43.04. The Forest manages areas with special paleontological, cultural, or heritage characteristics to identify, maintain and restore these resources. The monitoring elements are defined as follows:

1. Are protective measures effective?
2. Are preservation and maintenance plans being developed for historic administrative and recreational facilities?

3. Are opportunities being provided for the public to observe or participate in all phases of Forest Service heritage management?

4. Are protective measures effective?

Results

1. Significant cultural resources of the Forest are protected pursuant to and in compliance with 36 CFR 800 as stipulated in a Programmatic Agreement between the Forest Service and the Tennessee State Historic Preservation Office, and a forest wide closure to metal detecting.

Findings

The Forest Service is in full compliance with all regulations, laws, and agreements for the identification, monitoring, protection and enhancement of cultural resources located on the Cherokee National Forest.

MQ 16: Are watersheds maintained (and where necessary restored) to provide resilient and stable conditions to support the quality and quantity of water necessary to protect ecological functions and support intended beneficial uses?

Information

This monitoring question is responsive to Goals 1, 2, 3, 5 and 6 and Objectives 1.01, 1.02, 1.04, 2.01, 5.01 and 5.02. Objective 1.01 deals with soil and water improvement needs and their prioritization. Objectives 1.02 and 1.04 involve impaired waters located within 5th level watersheds and Total Maximum Daily Load (TMDL) development. Objective 2.01 involves instream flows needed to protect stream processes, aquatic and riparian habitats and communities, and recreation and aesthetic values. Objective 5.01 and 5.02 involve the management of channeled ephemeral streams. The monitoring elements are defined as follows:

1. Does the particle size distribution of streambed material in watersheds where projects are occurring differ significantly from the particle size distribution of streambed material in reference watersheds?

2. Is management activity in project watersheds altering the texture of stream channel bed material?

3. Does the range of stream water temperatures in watersheds where projects are occurring (maximums and minimums) differ significantly from the range of temperatures in reference watersheds?

4. Biological, chemical and physical stream reference conditions will be determined in partnership with Tennessee Department of Environment and Conservation and other interested parties.

5. What is the condition and trend of chemical resilience of watersheds across the Forest as indicated by chemical parameters of pH and Acid Neutralizing Capacity?
6. Are Forest standards being implemented to protect and maintain soil and water resources?
7. Do implemented standards comply with state BMPs?
8. Are standards (BMPs) effective in minimizing non-point source pollution?
9. Do streams on National Forest land meet state water quality standards and beneficial uses?
10. Is any specific soil and water mitigation needed (in addition to RLRMP direction and BMPs) for source water protection watersheds in a project area?
11. Are management prescriptions affecting soil quality and site productivity?
12. Treatments of dispersed recreation areas and trails to reduce sediment.
13. Treatments of roads to reduce sediment.
14. Minimum instream flow
15. Soil and water improvement needs
16. Partnerships in impaired watersheds.
17. TMDL development in impaired watersheds
18. Are temporary roads being re-vegetated within 10 years of contractor or permit termination?

Results

1-5. No new information

6-8. In 2015, the Forest Hydrologist worked with a Hydrologist Contractor to provide expert planning and implementation of BMP monitoring by doing the following:

- a) Develop Water quality BMP inventory protocol and form based on standards contained in the CNF RLRMP and TN BMPs. The evaluation was modeled on protocols described in the Southern Group of State Forester's (SGSF) Silvicultural Best Management Practices Implementation Monitoring Framework for State Forestry Agencies (2007);
- b) Implement monitoring protocol to document the level of success of standards for water quality protection stated in the CNF's Land Resource Management Plan. A

representative sampling of units was selected from each Zone of the forest. Evaluating a variety of units across the forest is important since the zones have separate planning teams, timber sale management teams, and purchasers. Highest priority units were selected for inspection from the pool of all units that closed between February 1, 2014 and January 31, 2015. Highest priority units are defined as those that closed within the past 12 months and contain the greatest number of the following risk factors:

- Soils of Concern
- Steep Slopes
- Regeneration Harvest
- Ground Based Logging

Direct measurement of select indicators in highest priority units using standard protocols is highly accurate in evaluating overall compliance: and

- c) Write and submit a summary report of data collected.

2015 Best Management Practices Monitoring Report Executive Summary

In 2015, Best Management Practices (BMPs) were monitored on the Cherokee National Forest. The monitoring was done to determine whether or not BMPs were being implemented and effective in controlling sediment and other pollutants during timber sale and road reconstruction and maintenance activities. Twenty-two harvest units were selected for review. Of these, all were tractor logging units. Thirteen system roads associated with these units were also inspected. Logging units and roads were associated with the Big Jacob, Bunton, Twisting Two, Hopper Branch, Greasy Creek, Island Creek, Hawkins Branch, Pace Gap and Buck Gap timber sales. Specific BMPs were selected from the *Revised Land and Resource Management Plan, Cherokee National Forest, January 2004* and the *Guide to Forestry Best Management Practices in Tennessee, Tennessee Department of Agriculture, Division of Forestry, 2003*.

A total of 420 BMPs were checked for implementation and effectiveness. Of these, 297 BMPs were related to sediment delivery to streams. By determining implementation rates, we are attempting to answer the question, “Have the rules been properly applied?” By determining effectiveness, we are attempting to answer the question, “Were the rules effective in preventing sediment or other pollutants from impacting water quality?”

The overall implementation rate in 2015 was 93.1%. There was a minor departure from the rules 4.3% of the time and a major departure from the rules 2.6% of the time. A gross departure from the rules did not occur in 2015. The overall effectiveness rate was 92.2%. There was a minor or temporary impact 5.0% of the time; a major short-term impact 2.4% of the time and a major long-term impact 0.5% of the time. Visible sediment did not enter streams 98.3% of the time while non-critical visible sediment reached streams 1.7% of the time in 2015. Critical visible sediment flow was not detected in 2015. A non-critical amount of visible sediment is a low volume, short-term sediment source that

does not adversely affect aquatic habitats. A critical amount of visible sediment is a large volume, which may be deposited over a long term. The component structure of the stream is altered, which adversely affects aquatic habitats. A stream that has a critical sediment source is obvious, even to the casual observer.

Implementation and effectiveness rates for the BMP category *Harvest Area Including Skid Trails/Log Decks* were 97.2% and 95.4%, respectively. This implementation and effectiveness rate indicates the application of BMPs is working in this category and sediment or other pollutants are generally not reaching streams. A minor departure from the rules was given 2.3% of the time because (1) A landing was constructed within the streamside filter zone (Rules 1 & 4) on one unit; and (2) Waterbars had been improperly constructed and were not revegetated (Rules 8 & 9) on two units. A major departure from the rules was given 0.5% of the time because excessive skid trails were constructed on three units that were better suited for skyline logging (Rule 6). In ten instances (4.6%), BMPs were considered ineffective and contributed to a “minor” or “major” impact to the resource. These instances were generally related to seeding that did not take on Junaluska soils.

The implementation and effectiveness rates for *Skid Trail Stream Crossings* were 100%. This year, only one unit had a skid trail that utilized a single stream crossing. The low number of skid trail stream crossings indicates the layout of timber harvest units properly avoids ground disturbance near streams. Stream crossings with skid trails are frequently avoided to protect water quality and fish habitat.

Implementation and effectiveness rates for the BMP category *Roads* was 97.5%. Non-critical or critical visible sediment was not observed. This is a high implementation and effectiveness rate for roads. The three problems identified were related to controlling runoff from roads before it reached the stream (Rule 21) and constructing temporary roads on slopes greater than 12% without providing adequate drainage (rule 26).

The last category monitored was *Road Stream Crossings*. Implementation and effectiveness rates were 65.5%. Problems identified were primarily associated with inadequate stream crossings (Rules 29 and 31), road grades allowed to sag over the stream channel thereby directing road runoff directly into the stream channel (Rule 34), failure to use broad-based dips and wing ditches (Rule 35), crossings that contributed to stream bank erosion (Rule 36) and barriers to aquatic organism passage (Rule 40). These problems were always associated with legacy roads and can only be corrected as funding becomes available.

Table 15 displays the implementation, effectiveness and visible sediment rates for all BMP categories in 2015.

TABLE 15 – BEST MANAGEMENT PRACTICE SUMMARY in 2015

BMP Category	Implementation %				Effectiveness %					Visible Sediment %		
	Meets or Exceeds 4	Minor Departure 3	Major Departure 2	Gross Departure 1	Improvement Over Past 5	Adequate Protection 4	Minor/Temp. Impact 3	Major Short-Term Impact 2	Major Long-Term Impact 1	No Visible Sediment 3	Non-Critical Visible 2	Critical Visible 1
Harvest Area Including Skid Trails/Log Decks	97.2%	2.3%	0.5%	0.0%	0.9%	94.5%	3.7%	0.9%	0.0%	100%	0.0%	0.0%
Skid Trail Stream Crossings	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Roads	97.5%	2.5%	0.0%	0.0%	0.0%	97.5%	2.5%	0.0%	0.0%	100.0%	0.0%	0.0%
Road Stream Crossings	65.5%	17.2%	17.02%	0.0%	0.0%	65.5%	17.2%	13.8%	3.4%	79.2%	20.8%	0.0%
Total Percent	93.1%	4.3%	2.6%	0.0%	0.5%	91.7%	5.0%	2.4%	0.5%	98.3%	1.7%	0.0%

9-10. No new information

11. While the BMP monitoring described above is intended to evaluate protection of water quality, soil disturbance monitoring is intended to evaluate protection of soil quality/productivity. In 2015, the CNF conducted soil disturbance monitoring on 9 timber sale units. Units were selected for inspection from the pool of all units that closed between February 1, 2014 and January 31, 2015. The number of units selected on the North Zone and the South Zone was proportional to the total number of units closed on that zone in the specified time period. Evaluating a variety of units across the forest is important since the zones have separate planning teams, timber sale management teams, and purchasers. Highest priority units are defined as those that contain the greatest number of the following risk factors:

- Soils of Concern
- Steep Slopes
- Regeneration Harvest
- Ground Based Logging
- Excessive skid trails identified during water quality BMP monitoring

Monitoring was implemented using the Forest Soil Disturbance Monitoring Protocol, a national inventory and monitoring protocol described in General Technical Report

RMRS-GTR-WO-82a (Page-Dumroese et. at. 2009). The protocol uses standard methods to quantify the amount of detrimental soil disturbance in an area. For each unit, an appropriate number of points for measurement was selected to achieve a 70% confidence level based on unit size and a visual assessment of homogeneity/variability of disturbance throughout the unit.

Data gathered from this monitoring effort were then screened against regional criteria for allowable soil disturbance. FSH 2509.18 (USDA Forest Service 2003) states: “Minimum soil quality standards are met when the physical, chemical, and biological properties of the soil are not significantly impaired. Soil impairment does not occur when...At least 85 percent of an activity area is left in a condition of acceptable potential soil productivity following land management activities.” Data and screening results are presented in Table 16.

TABLE 16 – Soil Disturbance Classes 2 & 3 in Timber Harvest Units Monitored using SDMP in 2015

	Skid Trails and Landings			Unit Interior			Total Disturbance Classes 2 & 3		Notes
	Acres	Acres	% of Unit	Acres	% Disturbed (Class 2 & 3)	Interior Acres affected	(Acres)	(%)	
South Zone									
Island Creek									
Unit 1	40	4.60	11.5%	35.4	6.6%	2.3	6.9	17%	Approx 0.73 (2.4 %) acres of skid trail located in stream management zone
Unit 3	37	5.04	13.6%	31.96	0%	-	5.0	14%	Unit is well brushed.
Unit 7	32	5.62	17.6%	26.4	11%	2.9	8.5	27%	Potential impact to SMZ from fill slope failure on lowermost trail. May be caused by drainage from upper portion of unit. Need to field verify.
Hopper Branch									
Unit 1	12	1.50	12.5%	10.5	0%	-	1.50	13%	% Disturbed is ok, but need to get disturbed areas either brushed or growing grass to be in compliance with BMPs. Seed did not take.
Unit 2	15	2.84	18.9%	12.16	3%	0.4	3.2	22%	Seed did not take.
Unit 3	16	2.65	16.6%	13.4	0%	-	2.7	17%	Seed did not take.
Buck Gap									
Unit 4	28	1.73	6.2%	26.3	0%	-	1.7	6%	
Unit 6	22	0.56	2.5%	21.4	0%	-	0.6	3%	

North Zone

Bunton

Unit 3	43	3.78	8.8%	39.2	0%	-	3.8	9%	
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12-16. No new information.

Findings

Best Management Practices are generally being applied and are generally working properly on the Cherokee National Forest. Overall BMP implementation in 2015 was 93.1% (Table 15). Overall BMP effectiveness was 92.2%. The overall “no visible sediment to stream channels” rate in 2015 was 98.3%. The 2015 BMP monitoring indicates the Cherokee National Forest needs to (1) promote and encourage skyline logging systems for the steeper units; (2) Use erosion control methods other than seeding and fertilizing; such as spreading of logging slash, on skid trails in Junaluska soils; and (3) Improve the many culvert-stream crossings on forest system roads as funding becomes available. Applying the BMP “feedback loop” by involving timber sale planners, administrators, and forest engineers in annual BMP monitoring should improve the BMP implementation and effectiveness rates in the coming years. It will also protect and improve stream integrity and water quality.

2015 Soil Disturbance Monitoring revealed that 4 out of 9 units monitored had greater than 15% detrimental soil disturbance and were therefore out of compliance with regional standards. It should be noted that the 8 units selected for soil disturbance monitoring on the South Zone were those with the highest number of risk factors for increased detrimental soil disturbance (Soils of Concern, Steep Slopes, Regeneration Harvest, Ground Based Logging, and BMP implementation or effectiveness issues with the potential to affect soil quality identified during water quality BMP inspections). Thus, it is not anticipated that exceedance of allowable disturbance limits is a widespread problem on the units not monitored. It should also be noted that in all cases, exceedances were related to excessive skid trails and landings. For all of the areas surveyed, there was barely any discernable soil disturbance off the skid roads and landings. It thus follows that exceedances could be reduced through a reduction in skid trail density.

The sole unit monitored on the North Zone of the CNF was in compliance with regional soil quality criteria. In general, the pool of units on the North Zone had fewer risk factors than the units on the South Zone - all were thinnings. Thus, it is anticipated that all North Zone units were in compliance with regional soil quality criteria.

Increased attention to BMPs and soils of concern in the planning, silvicultural prescription, effects analysis, decision, marking, layout, contract administration, implementation, and closure of timber sale units on the CNF is needed to ensure that soil disturbance thresholds are not exceeded on any timber sale units in the future. This is already occurring on timber sale planning interdisciplinary teams on both zones. In addition, restoration actions have begun on Island Creek Unit 1 and are planned for the other 3 units that have been identified as out of compliance. Restoration actions are

intended to bring the units identified as out of compliance back into compliance using recontouring, revegetation, and other techniques to ensure that the effects associated with those units are within the bounds described in the applicable NEPA.

MQ 17: What are the conditions and trends of riparian area, wetland and floodplain functions and values?

Information

This monitoring question is responsive to Goals 11-1, 11-2 and 11-3, and Objectives 11-1.01 and FW 5.01. There are numerous resource-specific standards that are associated with this question. Monitoring elements associated with this question include:

1. Are riparian areas or corridors providing necessary shade and cover for aquatic habitats?
2. Are soils in riparian areas being maintained and ground cover protected?
3. Are riparian areas being inventoried for condition (i.e. woody debris needs, presence of non-native invasive species, other improvement needs)?
4. Are wetlands being protected, maintained during project planning and implementation?

Results

Riparian condition is generally assessed during project planning. Aspects of riparian condition that are typically evaluated include existing disturbance impacts such as roads, trails and recreation use, insect and disease impacts to vegetation and the presence of noxious, non-native plant species.

The greatest threat to riparian shade and cover on the Forest is the Hemlock Woolly Adelgid (HWA). Much of the hemlock on the Forest has been infested. In some cases, homogeneous stands of hemlock have been infested in riparian areas. Conservation strategies were implemented in FY 2008 to save refuge areas of hemlock. These strategies included the treatment of individual trees by the injection of insecticide in the soil around selected trees and predator beetle releases.

Findings

No significant findings to report.

MQ18: How do actual outputs and services compare with projected?

Information

This monitoring question is responsive to Objectives: 19.01, 19.02, and 49.01. The monitoring element is defined as follows:

1. Are forest products being produced within predicted ranges?
2. What are the trends in demand for mineral resources in relationship to national forest mineral resource availability?
3. Determine if acquired surface rights are adequate to meet the Desired Future Condition and provide for the exercise of subsurface rights.
4. Determine if adequate access is maintained to explore and develop mineral resources of domestic compelling significance.
5. Are roads being maintained, constructed or reconstructed to reduce sediment deliver to water bodies and to provide a transportation system that supplies safe and efficient access for forest users while protecting forest resources. [36 CFR 219.27 (a)(10)]
6. Are constructed roads designed according to standards appropriate for the planned uses?
7. Are needed transportation corridors designed to established standards?
8. How do estimates and actual costs of plan implementation compare?

Results

1. Objective 19.01 – Provide 33,726 MCF of sawtimber per decade.

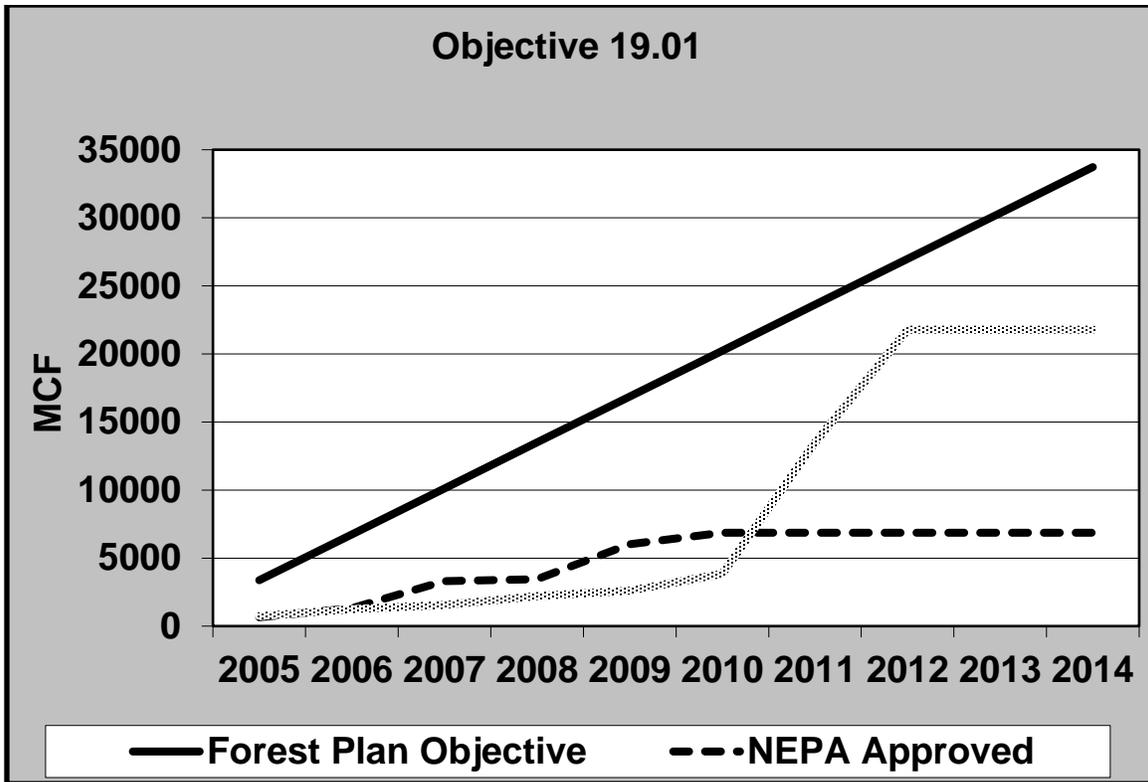


Figure 38. Objective 19.01

Objective 19.02 – Provide 6,242 MCF of pulpwood per decade.

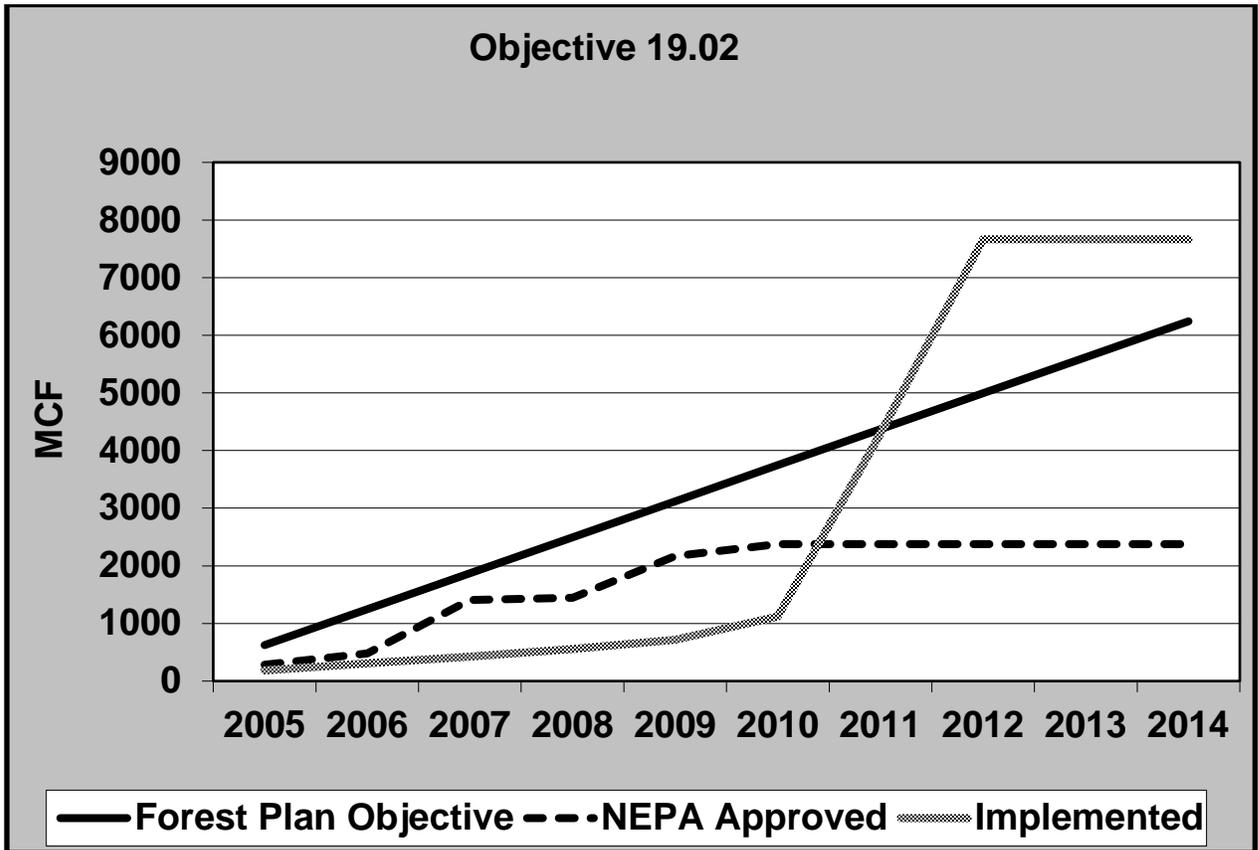


Figure 39. Objective 19.02

2 – 4. There is currently little demand for mineral resources on the Cherokee National Forest. The public’s interest in landscape rock for non-commercial use is the only mineral interest on the Forest. In 2010, the Cherokee National Forest issued a total of 19 mineral material permits for 72 tons of non-commercial, surface landscape rock. No other demands or requests were received.

The Cherokee National Forest is working on acquiring all dormant subsurface minerals rights. From the 640,000 managed acres, the Cherokee has acquired approximately 85% of all dormant subsurface mineral rights. The desired future condition is 100% U.S. ownership of subsurface rights.

The Cherokee has received no recent inquiries for mineral exploration or development of mineral resources. Adequate access is not an issue at this time but will be addressed if the need arises.

5-7. Yes

The Federal Register Notice (73 FR 74689) for the final travel management directives was published on December 9, 2008. The directives became effective January 8, 2009.

Travel Management Rule (36 CFR 212, Subpart B, Designation of Roads, Trails, and Areas for Motor Vehicle Use)

Highlights of the Rule

- The rule requires each national forest or ranger district to designate those roads, trails, and areas open to motor vehicles.
- Designation will include class of vehicle and, if appropriate, time of year for motor vehicle use. A given route, for example, could be designated for use by motorcycles, ATVs, or street-legal vehicles.
- Once designation is complete, the rule will prohibit motor vehicle use off the designated system or inconsistent with the designations.
- Designation decisions will be made locally, with public input and in coordination with state, local, and tribal governments.
- Designations will be shown on a motor vehicle use map. Use inconsistent with the designations will be prohibited.

On June 8, 2006, Forest Service Chief Dale Bosworth approved the agency's schedule for implementation of the travel management rule. The schedule will guide local efforts to designate those roads, trails, and areas open to motor vehicle use through a collaborative travel planning process emphasizing public involvement and coordination with state, local, and tribal governments. The schedule also contains important information on the current status of travel planning on each national forest and grassland across the country.

In accordance with 36 CFR 212.5(b)(1) the Forest is conducting travel analysis to inform decisions related to:

- Identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System (NFS) lands by conducting the Road Analysis Process or the Travel Analysis Process as part of large-scale watershed assessments. As of 2009, the Forest has conducted travel analysis on approximately 55% of the Forest. In July of 2014, the Forest completed the interdisciplinary travel analysis process on all its system roads as well as on many unauthorized roads. This process identified both system and unauthorized roads that are likely not needed for future use and could possibly be decommissioned or converted to other uses such as trails or wildlife openings. The final report will be issued in late FY15. The TAP report is not a decision document, but is intended to assist in possible future road management planning efforts, resource management projects, and other planning decisions made in compliance with the National Environmental Policy Act (NEPA).
The Forest will continue the Travel Analysis Process on large scale watershed levels with the intent of having the remaining 45% of the Forest analyzed by 2015.
- Designation of roads, trails and areas for motor vehicle use by producing and posting on its web site the Forest's Motor Vehicle Use Map in 2007. The Forest annually updates the map.

As previously stated, the minimum road system is being determined by the Travel Analysis Process. The primary need for new roads is for vegetation management. New system roads are seldom needed, so access is usually accomplished by the construction of temporary roads as part of a timber sale or stewardship contract.

Funding for road maintenance has fluctuated over the years, but the road maintenance costs have increased, so decisions must be made concerning the maintenance levels of the roads; for example

- Some roads that have been maintained to accommodate passenger cars are being maintained for high clearance vehicles instead.
- Some roads may be closed to the public during bad weather to prevent damage to the roads.
- Safety related work such as roadside brushing is still taking place, but primarily on roads with higher traffic volumes.

Road reconstruction and deferred maintenance is accomplished by the following:

- Legacy Road and Trail Program
- Timber sale contracts
- Stewardship contracts

8. The actual costs for road work (reconstruction, construction, maintenance) are within 10% of the estimates, but road work is only one part of plan implementation.

Findings

NEPA approved and implemented volumes for 19.01 and 19.02 are above the RLRMP objectives.

Road maintenance is being done on only about 30% of Forest roads; however, emphasis is being placed on those most heavily used roads.

MQ19: Are silvicultural requirements of the RLRMP being met?

Information

This monitoring question is responsive to Objectives 17.03, 19.01, 19.02, 19.03 and 19.04. The monitoring elements are defined as follows:

1. Are lands being adequately restocked within 5 years of regeneration treatments?
2. Are lands not suited for timber production classified as such?
3. Have lands identified as not suitable for timber production become suitable?
4. Are harvest unit sizes within the allowable limits?

5. Are silvicultural practices in compliance with the Forest Plans?
6. Are appropriate harvest methods used on the Forest?

Results

1. Lands are being adequately restocked within 5 years of regeneration treatments with a mixture of planted and natural regeneration. First year survival exams for areas planted in FY 2015 and third year survival exams for areas planted in FY 2013 were completed during the winter of 2016. The results of these exams are displayed in the Table 17. Seedling survival was fair for seedlings planted in 2015 and fair for seedlings planted in 2013.

Table 17. Survival Exams for FY 2013 and FY 2015

Species	Cherokee NF--First Year Exam – Planted in 2015	Cherokee NF--Third Year Exam – Planted in 2013
Shortleaf Pine	85%	75%
Northern Red Oak	89%	80%
White Oak	None planted	55%
American Chestnut	None planted	80%

2. A timber land suitability analysis was completed during the development of the RLRMP. The Stage I, II, and III analysis determined that 351,988 acres were not suitable for timber production. The (FSVEG) database is monitored during the project development process to ensure that lands not suited for timber production are classified correctly.
3. No lands identified as not suitable for timber production have become suitable during FY 2015.
4. The maximum harvest size for even aged and 2 aged regeneration units on the Cherokee National Forest is 40 acres. No even aged or 2 aged regeneration harvest area exceeded 40 acres in FY 2015.
5. All silvicultural practices implemented in FY 2015 were in compliance with the RLRMP. The Plan allows a variety of regeneration, timber stand improvement and restoration treatments to accomplish silvicultural needs.

Regeneration was accomplished by planting 120 acres and completing site preparation on 1,619 acres for natural regeneration.

Timber stand improvement was completed on 2,465 acres in FY 2015 to manage species composition in regenerated stands and ensure an adequate number of healthy trees for the new stand.

6. Appropriate harvest methods are used on the Cherokee National Forest.

Findings

Silvicultural requirements of the RLRMP were met in FY 2015.

MQ 20: Are RLRMP objectives and standards being applied and accomplishing their intended purpose?

Information

This monitoring question is responsive to desired conditions, goals, objectives, and standards in the RLRMP as well as to changes that occurred since the RLRMP was signed. The monitoring elements are defined as follows:

1. Are project plans and environmental analysis for projects effectively and consistently implementing objectives and standards (including state BMPs)?
2. Is vegetation being managed according to requirements and making progress toward achievement of Desired Future Condition for vegetation?
3. Evaluate how diversity is affected by planned activities and whether expected results are being achieved.
4. Determine whether standards, guidelines, and management requirements are being met and are effective in achieving expected results.
5. Ensure operations processed and administered meet the specified standard.
6. Determine when changes in GPRA (Government Performance and Response Act), policies, or other direction would have significant effects on RLRMPs.
7. Determine if planning information or physical conditions have changed.
8. Identify changes in ability of the planning area to supply goods and services in response to society's demands.
9. During monitoring determine research needs.
10. Determine effects of NF management from management activities on nearby lands.
11. Have title claims and encroachments affecting NFS lands been documented, prioritized for resolution each fiscal year, and resolved within the constraints of the applicable authority?
12. Have boundary lines been surveyed and marked to standard, and maintained on an 8-10 year rotational basis?
13. What is the trend in law enforcement incidents?

Results

1-7. A Quality Assurance Plan review was conducted on two districts. Reviews occurred during environmental assessment process and after project implementation. Reviews consisted of reviewing the NEPA project records and field assessment to verify compliance with the decision. Areas reviewed include timber harvesting, scenery, recreation, wildlife, soil and water, and roads.

National Environmental Policy Act (NEPA) documents produced since the RLRMP was implemented are shown in Figure 40.

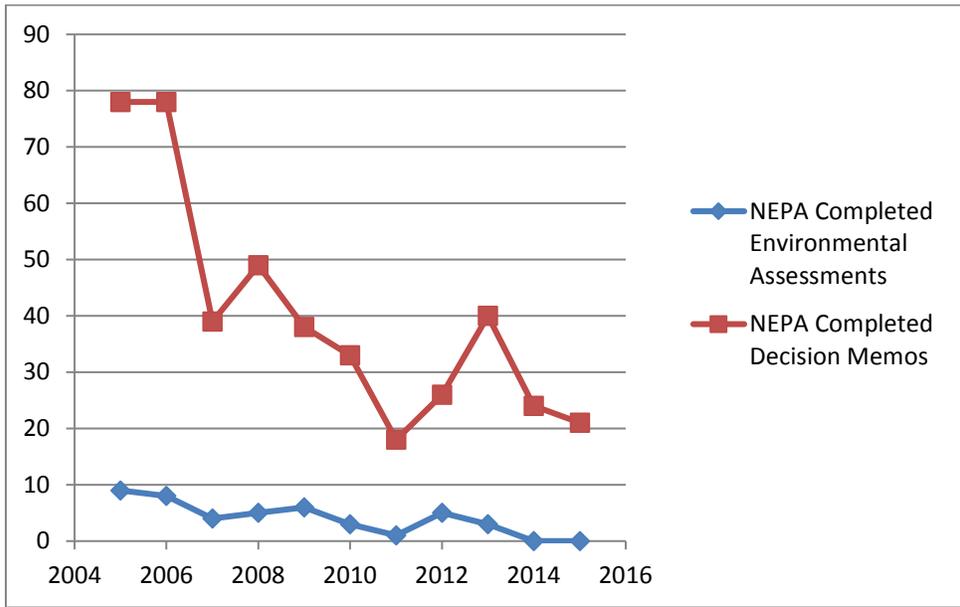


Figure 40. NEPA documents completed on the Forest

The types of projects on which NEPA was conducted are shown in Table 18. Many NEPA documents have more than one project purpose.

Table 18. Project purposes for NEPA documents

Project Purpose	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Facility Mangement	1	1	0	2	4	2	2	2	2	7	0
Forest Products	11	3	0	0	4	5	7	12	8	0	7
Fuels Management	11	20	21	18	20	19	9	16	30	18	8
Heritage Resource Mgmt	1	1	1	1	3	3	1	1	1	0	0
Recreation Management	25	24	21	19	21	17	22	21	15	2	2
Research	2	1	2	2	0	0	0	0	0	0	1
Road Management	8	9	6	4	9	5	6	8	8	5	5
Special Use Management	37	26	18	21	19	15	16	13	8	3	10
Vegetation Mgmt (not For. Prod.)	23	20	21	16	24	23	20	27	31	16	14
Watershed Management	2	2	2	1	2	3	6	6	5	1	2
Wildlife, Fish, Rare Plants	21	20	25	23	24	17	16	23	37	0	12
Grazing Management	0	1	2	2	1	1	1	1	0	0	0
Land Acquisition	0	0	1	1	0	0	0	0	0	1	3
Land Ownership Management	0	0	1	1	0	0	0	0	0	1	2
Special Area Management	0	0	1	0	0	0	0	0	0	0	0

8. There is currently little demand for mineral resources on the Cherokee National Forest.

9-10. No changes detected.

11-12. The National Forests in Georgia and National Forest in North Carolina have experienced heavy recreation-home development and land prices have escalated dramatically. This growth is spreading across the state lines into Tennessee, and increasing land values are being reflected in the market. As areas develop, managing adjacent forest lands is becoming more difficult, and the demand for land use authorizations to support private land development is increasing. Some management, such as prescribed burning and timber harvest, will become difficult because of opposition from neighbors. Forest lands may lose their national forest character as the land is encumbered with special uses and development occurs on private land next to the forest property line.

Encroachment, trespass and title claims continue to pose a serious threat to national forest management, specifically for forest health, protection of threatened and endangered species, and multiple use-land management objectives. Numerous non-system roads within the forest are used to access private lands without benefit of an easement. Meanwhile private landowners are less willing to allow public access across their land, bringing conflict for several NF easements. Reduced ability to maintain boundary marks and posting will result in increased potential for trespass, encroachments and other boundary conflicts.

From FY06-FY14, thirty one land purchases and conveyances (Table 19) totaling 14,201.30 acres were acquired for \$34,245,141 consolidating NFS lands, providing protection for the Appalachian Trail, watershed, cultural resources, wilderness, and critical wildlife and plant habitat.

Many new acquisitions may be similar to the adjacent national forest lands with regards to management objectives; however larger tracts may need close examination to make that determination. Potential for management issues such as road use, soil and water concerns and non native invasive plants may exist on any acquired property.

In 2007, the forest finalized its Land Ownership Adjustment Strategy (LOAS), which is tiered to the forest plan. Specific acquisition and conveyance strategies were developed for each ranger district addressing areas of concern within the proclamation boundary. Non-federal lands identified for acquisition and national forest lands identified for conveyance are also recognized. These lands represent a long-range program of land ownership adjustment designed to accomplish some of the goals and objectives of the Forest Plan. The ability of the forest to continue processing land adjustments will have a direct and lasting impact on other management efforts, from timber and fire management to recreation and public access.

Table 19. Land Purchases and Conveyances, FY06-14

<u>YEAR</u>	<u>NAME</u>	<u>TRACT NO.</u>	<u>ACRES</u>	<u>AMOUNT</u>
2006	Charles Byrd, et al	1526	92.61	\$179,400
2006	Richard Campbell	1554, a	1.36	\$14,000
2007	Carl Lee Hazelwood, et al	1177	9.05	\$40,725
2007	Daniel A. Johnson, et ux	1480a	11.44	\$177,320
2007	William C. Moody	1562	283.69	\$766,000
2007	R.L. Street, et al	1567	18.77	\$56,200
2007	Anna Sue Carter	1572	267.29	\$534,580
2007	Wallace Seay, et al	1549	85.03	\$185,300
2007	Willhem Williams, et al	1571, a, b, c, d, e	6.38	\$49,500
2007	Franklin Kirkland	1577	1.30	\$429,000
2007	Etowah Admin Site (Conveyance)	K-713	-0.28	

<u>YEAR</u>	<u>NAME</u>	<u>TRACT NO.</u>	<u>ACRES</u>	<u>AMOUNT</u>
2008	TNC/APGI	1559, a	4,876.92	\$648,900
2008	Mike Proffitt, et al	1570	90.35	\$190,000
2008	Mike Proffitt, et al	1570a	53.35	\$112,000
2008	William Crawford Estate	1568	16.90	\$22,000
2008	Citico Miss. Bapt Church	1539	1.60	\$0
2009	Joseph M. Bible, et ux	1579	54.92	\$137,000
2009	New Forestry, LLC	1241, a, c	2,237.33	\$8,406,716
2009	The Conservation Fund	1241d	1,278.11	\$5,000,000
2010	The Conservation Fund	1241e	1,533.74	\$6,000,000
2011	The Conservation Fund	1241f	1,428.57	\$5,000,000
2011	Monroe county board of Education	K-1547	102.52	\$215,000
2011	April Ruth Watson	1581	14.14	\$155,000
2012	Monroe Co. Board of Educ.	K-1547	102.52	\$215,000
2012	Goodwin/Carr (ROW)	Z-709	0.02	\$500.00
2012	The Conservation Fund (Rocky Fork)	U-1241g	1,199.67	\$5,000,000
2013	Lorreta Lyle, et al	U-1595	40.90	\$123,000
2013	C.G Shelton	Z-710f	0.80	\$0
2013	Watauga Work Center (Conveyance)	U-705	-2.62	\$151,101
2014	The Conservation Fund	K-1593	170.00	\$255,000
2014	The Conservation Fund	K-1593a	222.02	\$333,000
Total			12,465.37	\$28,318,641

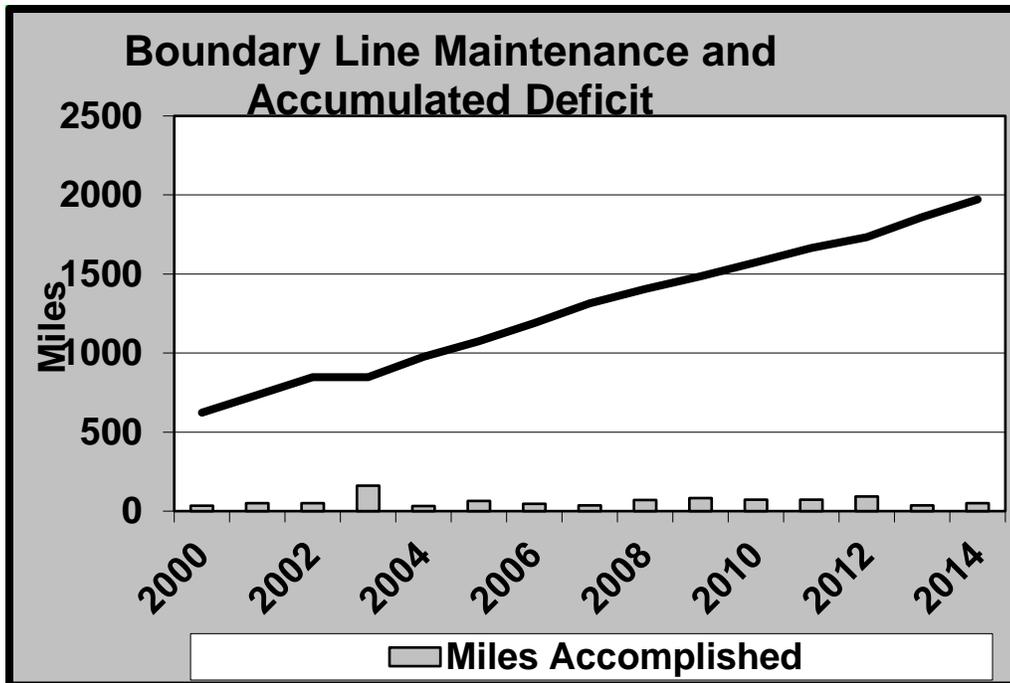


Figure 41. Boundary Line Data

13. Law enforcement incidents vary by level of severity and type of activity.

Findings

No significant findings to report.

Chapter 3 FY2016 and 2017 Action Plan and Status

Actions Not Requiring Forest Plan Amendment or Revision

- a) **Action:** Habitat management, through timber harvest and prescribed fire, needs to be increased to meet the objectives for stand restoration, age class distributions, and timber production.

Responsibility: District Interdisciplinary Teams

Date: Ongoing

Status: Watershed assessments are being conducted to accelerate the rate of project development.

- b) **Action:** Destruction of hemlock trees by the hemlock wooly adelgid could greatly alter the ecology of the forest and needs to be monitored and aggressive treatments need to be implemented.

Responsibility: Forest and District Silviculturists

Date: Ongoing

Status: New sites are being documented; chemical and biological treatments are being employed.

Actions That Require Forest Plan Amendment or Revision

No actions require a Forest Plan Amendment.

Appendix A List of Preparers

The following individuals contributed to this report:

Dan Stratton	Multi-Forest Air Quality Specialist
Doug Byerly	Forest Recreation and Wilderness Specialist
Gary Hubbard	Forest Engineer
Jim Herring	Forest Aquatic Biologist
Mark Pistrang	Forest Botanist/Ecologist
Bob Lewis	Forest Silviculturist & Fuels Specialist
Mary Miller	Forest Wildlife Biologist
Quentin Bass	Forest Archeologist
Scotty Myers	Forest Land Surveyor
Stephanie Medlin	Forest Environmental Coordinator

Appendix B Amendments to the RLRMP

Since the Cherokee National Forest Plan was revised in January 2004, one amendment, Fort Armistead, was completed August 2009.

Appendix C Summary of Research Needs

See Appendix I of the RLRMP for a complete listing of the current research needs. The extensive drought that began in 2006 may be having an adverse effect on aquatic species especially those dependent on low elevation, small streams.

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Cherokee National Forest Fiscal Year 2015 Monitoring and Evaluation Annual Report

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 Cleveland, Tennessee 37312
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