



United States Department of Agriculture

Biennial Monitoring Evaluation Report (2018 – 2019)

for the Cherokee National Forest



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Summary of Findings and Results

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.

Twenty-six monitoring questions were updated based on the current evaluation period October 1, 2015 to September 31, 2017. Monitoring discussion and finding are disclosed in detail for the monitoring questions. Table 1 is a summary of findings documenting progress toward plan targets.

Table 1. Summary of findings

Monitoring Item (MQ =Monitoring Question)	Year Updated	Do monitoring results demonstrate intended progress or trend toward Plan targets?	Based on the evaluation of monitoring results, may changes be warranted?	If a change may be warranted, where may the change be needed? ²
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<i>MQ 1: Are rare communities being protected, maintained, and restored?</i>	FY 2020	Yes	No	N/A
<i>MQ 2: Are landscape-level and stand-level composition and structure of major forest communities within desirable ranges of variability?</i>	FY 2020	Yes	Yes	N/A
<i>MQ 3: Are key successional stage habitats being provided?</i>	FY 2020	Yes	Yes	Increase early successional
<i>MQ 4: How well are key terrestrial habitat elements being provided?</i>	FY 2020	Yes	No	N/A
<i>MQ 5: What is the status and trend in aquatic habitat conditions in relationship to aquatic communities?</i>	FY 2020	Yes	No	N/A
<i>MQ 6: What are the status and trends of forest health threats on the Cherokee National Forest?</i>	FY 2020	Yes	No	N/A

<p><i>MQ 6-1: What are the trends in air pollution and their effects on forest vegetation, particularly ozone susceptible species?, and</i></p> <p><i>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 PM2.5 (fine particulate matter) emissions from prescribed fires, ensure NF prescribed fire emissions are considered when they fall within PM2.5 non-attainment areas [36 CFR 219.27(a)(12)], and</i></p> <p><i>Monitoring Question 12-3: What are trends in Air Quality Related Values (AQRV) in Class I Wilderness Areas?</i></p>	FY 2020	Yes	No	N/A
<i>MQ 7: What are the status and trends of federally listed species on the Forest?</i>	FY 2020	Yes	No	N/A
<i>MQ 8: What are the status and trends of species with viability concerns and/or their habitats?</i>	FY 2020	Yes	No	N/A
<i>MQ 9: What are the trends for demand species and their use?</i>	FY 2020	Yes	No	N/A
<i>MQ 10: Are opportunities for high quality, nature-based recreation experiences being provided and what are the trends?</i>	FY 2020	Yes	No	N/A
<i>MQ 11: What are the status and trends of recreation use impacts on the environment?</i>	FY 2020	Yes	No	N/A

<i>MQ 12: What is the status and trend of wilderness character?</i>	FY 2020	Yes	No	N/A
<i>MQ 13: What are the status and trends of Wild and Scenic River conditions?</i>	FY 2020	Yes	No	N/A
<i>MQ 14: Are the scenery and recreation settings changing and why?</i>	FY 2020	Yes	No	N/A

<i>MQ 15: Are heritage sites protected?</i>	FY 2020	Yes	No	N/A
<i>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?</i>	FY 2020	Yes	No	N/A
<i>MQ17: What are the conditions and trends of riparian area, wetland and floodplain functions and values?</i>	FY 2020	Yes	No	N/A
<i>MQ18: How do actual outputs and services compare with projected?</i>	FY 2020	Yes	Yes	N/A
<i>MQ19: Are silvicultural requirements of the RLRMP being met?</i>	FY 2020	Yes	No	N/A
<i>MQ 20: Are RLRMP objectives and standards being applied and accomplishing their intended purpose?</i>	FY 2020	No	Yes	N/A
<i>MQ 21 – How has climate variability changed and how is it projected to change across the region?</i>				
<i>MQ 22 – How is climate variability and change influencing the ecological,</i>				

<i>social, and economic conditions and contributions provided by plan areas in the region?</i>	Regional Broad-Scale Monitoring			
<i>MQ 23 – What effects do national forests in the region have on a changing climate?</i>				
<i>MQ 24 – What changes are occurring in the social, cultural, and economic conditions in the areas influenced by national forests in the region?</i>	Regional Broad-Scale Monitoring			
<i>MQ25 – Are the number of populations and miles of occupied habitat of Southern Appalachian brook trout (SABT) increasing across the range in Tennessee?</i>	N/A	N/A	N/A	N/A
<i>MQ 26 – What are the trends in both populations and associated habitats for federally listed threatened and endangered species, proposed and candidate species, and selected species of viability concern on the Cherokee National Forest?</i>	FY 2020	Yes	No	N/A

Table 2. Summary of Where Changes May be Warranted

Changes may be warranted for the:	Yes	Uncertain	No
Forest Plan			x
Management Activities	x		
Plan Monitoring Program			x
Forest Assessment			x

Introduction

Purpose

The purpose of the biennial monitoring evaluation report is to help the responsible official determine whether a change is needed in forest plan direction, such as plan components or other plan content that guide management of resources in the plan area. The biennial monitoring evaluation report represents one part of the Forest Service's overall monitoring program for this national forest unit. The biennial monitoring evaluation report is not a decision document—it evaluates monitoring questions and indicators presented in the Plan Monitoring Program chapter of the forest plan, in relation to management actions carried out in the plan area.

Monitoring and evaluation are continuous learning tools that form the backbone of adaptive management. For this reason, we will produce an evaluation report every two years. This is our first written report of this evaluation since the Cherokee National Forest Revised Land and Resource Management Plan since the administrative change (signed April 27, 2016) which complies with the 2012 planning Rule (36 CFR 219.12(a)(5)). This report discloses whether a change to the forest plan, management activities, monitoring program or forest assessment may be needed based on the new information.

Objectives

There are several objectives for this report, including:

- Assess the current condition (i.e., status) and trend of selected forest resources.
- Document implementation of the Plan Monitoring Program, including changed conditions or status of key characteristics used to assess accomplishments and progress toward achievement of the selected 2004 Revised Land and Resource Management Plan components.
- Evaluate relevant assumptions, changed conditions, management effectiveness, and progress towards achieving the selected desired conditions, objectives, and goals described in the Forest Plan
- Assess the status of previous recommended options for change based on previous monitoring & evaluation reports.
- Document any scheduled monitoring actions that have not been completed and the reasons and rationale why it has not.
- Present any new information not outlined in the current plan monitoring program that is relevant to the evaluation of the selected monitoring questions.
- Incorporate broader scale monitoring information from the Regional Broader Scale Monitoring Strategy that is relevant to the understanding of the selected monitoring question.
- Present recommended change opportunities to the responsible official.

Intent of this Report

This report is a tool and a resource for the Forest Service to assess the condition of forest resources in relation to Forest Plan direction and management actions. This report is part of the adaptive management process to determine if changes are needed to the: forest plan, management activities, monitoring program, or whether an assessment may be needed to determine if there is a preliminary need for change. It is also a tool and a resource for the public to learn more about how the Forest Service is managing forest resources.

The biennial monitoring evaluation report is designed to help the public, as well as Federal, State, local government, and Tribal entities anticipate key steps in the overall monitoring program. The biennial monitoring evaluation report is also intended to help people better understand reported results in relation to past monitoring reports, future monitoring reports and the broader-scale monitoring strategy that is issued at the Forest Service Regional level.

The Importance of Public Participation

We informed the public of the availability of the biennial monitoring report for the Cherokee National Forest in April 2016 on through the Administrative Change -- 2012 Planning Rule Monitoring Program Transition.

The intent is to provide the results of the plan monitoring to the public demonstrating implementation, effectiveness, and validation monitoring. The monitoring and evaluation report is updated every two years by the end of the respective fiscal year. The report will be published to the webpage. Hardcopies may be requested to Jonathan Lampley at 423.783.2416 or via email, jonathan.lampley@usda.gov.

About Our Forest Plan Monitoring Program

Roles and Responsibilities

The Forest Plan Monitoring Program requires a coordinated effort of many people, from the people who collect the data, to the people outside the Forest Service who provide feedback and assistance, to the decision maker.

The Responsible Official for the forest plan is the Forest Supervisor:

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How Our Plan Monitoring Program Works

Monitoring and evaluation requirements have been established through the National Forest Management Act (NFMA) at 36 CFR 219. Additional direction is provided by the Forest Service in Chapter 30 – Monitoring – of the Land Management Handbook (FSH 1909.12).

The Cherokee National Forest monitoring program was updated in April 2016 for consistency with the 2012 planning regulations [36 CFR 219.12 (c)(1)]. The Cherokee National Forest Plan was administratively changed to include the updated monitoring program (Chapter 5).

Monitoring questions and indicators were selected to inform the management of resources on the plan area and not every plan component was determined necessary to track [36 CFR 219.12(a)(2)].

Providing timely, accurate monitoring information to the responsible official and the public is a key requirement of the plan monitoring program. This summary, along with the full [insert year] biennial monitoring evaluation report for the [name of National Forest] is the vehicle for disseminating this information.

In the context of forest planning there are three main monitoring goals:

- Are we implementing the Forest Plan implemented properly? Are we meeting our management targets and project guidelines? (implementation monitoring)
- Are we achieving our Forest Plan management goals and desired outcomes? (effectiveness monitoring)
- Does our hypothesis testing indicate we may need to change the Forest Plan? (validation monitoring)

Implementation monitoring is important for tracking progress and accomplishments. However, it is effectiveness and validation monitoring that drive and support the adaptive management process. Effectiveness monitoring evaluates condition and trend relative to desired conditions. Validation monitoring tests hypotheses and provides information that might necessitate changes to desired conditions in the plan (e.g. is what we think the desired state should be really accurate?)

Providing timely, accurate monitoring information to the responsible official and the public is a key requirement of the plan monitoring program. This biennial monitoring evaluation report for the Cherokee National Forest is the vehicle for disseminating this information.

Biennial Monitoring Evaluation Report (2018– 2019) for the Cherokee National Forest

Monitoring and Evaluation

Monitoring Activities

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

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 with respective responses:

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

Monitoring Discussion and Findings

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 forest or Table Mountain pine-hardwood mixed forest 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 planted in FY 2018-2019; however, there were acres where Table Mountain pine regeneration, recruitment, and maintenance were promoted by prescribed burning (see results for MQ1 E4 below).

1. Approximately 2164 acres of land were acquired by the Cherokee NF in 2018 and 2019. (Table 28).

Table 28. Land acquisition for 2018-2019

Tract Name	Acres	County	Year
Buffalo Mountain	488	Washington	2018
Conasauga River	616	Polk	2018
Hump Mountain	324	Carter	2018
Divided Mountain	186.5	Johnson & Grayson (VA)	2019
Dry Fork	549	Cocke	2019
TOTAL	2163.5		

While these tracts have not been fully inventoried for significant rare communities or rare elements, they do include some very important habitat components. The Conasauga tract includes the headwaters of Taylor Branch which may include suitable habitat for white fringeless orchid in wet stream bottoms. The Hump Mountain tract includes habitat for golden winged warbler and has some northern hardwood/rich cove habitats which are high probability habitats for some rare species. The Divided Mountain tract adjoins the Whetstone Branch rare community, potentially adding to that 9F plan prescription area.

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 in 2007, 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 was completed in both areas through 2019. Additionally, the north zone of the forest has been taking the lead in conducting focused survey and monitoring efforts within selected rare communities (bio blitzes). In 2018 and 2019, bio blitzes were conducted in rare communities associated with the Osborne Farm and Roan Highlands, respectively.

4. There were 150 acres of Table Mountain pine and 20 acres of Table Mountain pine-hardwood mixed stands prescribed burned in 2018-2019.

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. Active partnerships with various state, federal, and private and non-profit agencies have been critical to conservation and restoration efforts on the Forest.

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

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.

Monitoring Discussion and Findings

1. New land acquisitions of 2,163 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 Howell, Hump Mountain, Divided Mountain, and Dry Fork acquisitions.

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

Chart shows cumulative acres over time

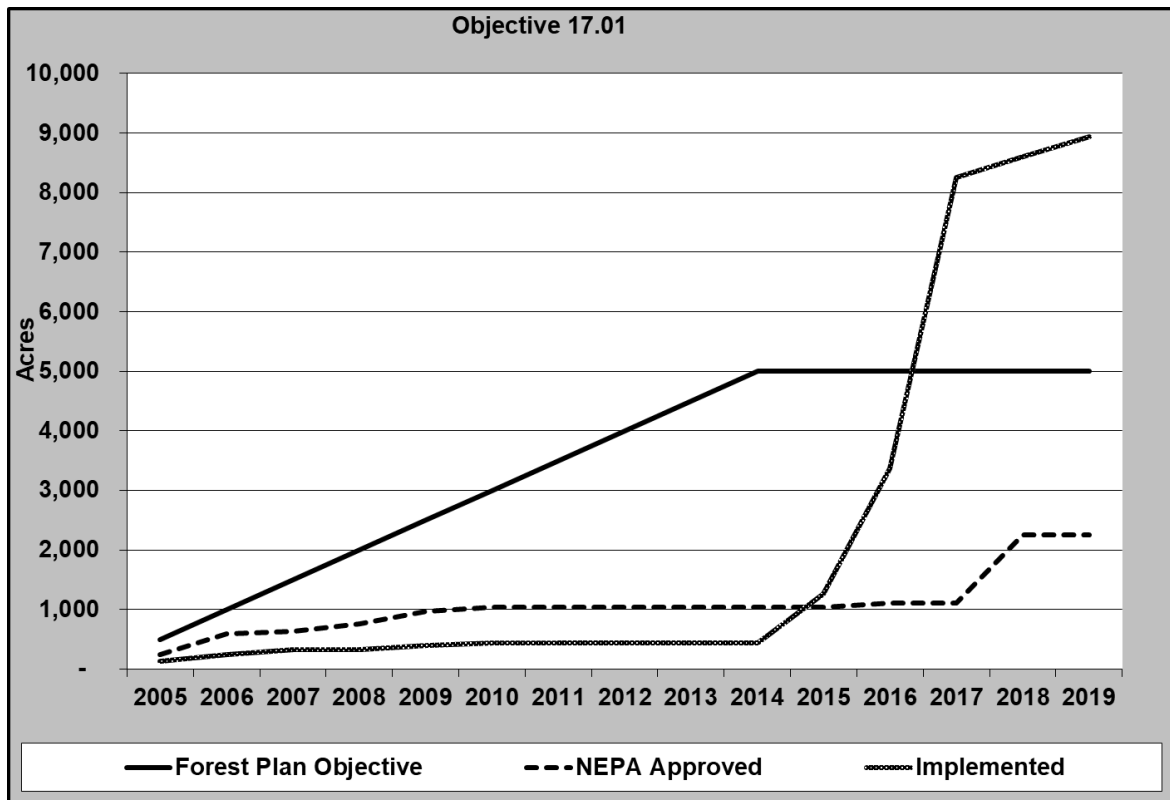


Figure 1. Objective 17.01

3. Objective 17.02 – Over the 10-year period, restore oak or oak-pine forests on at least 9,000 acres of appropriate sites currently occupied by pine plantations or other sites with minimal diversity.

Chart shows cumulative acres over time.

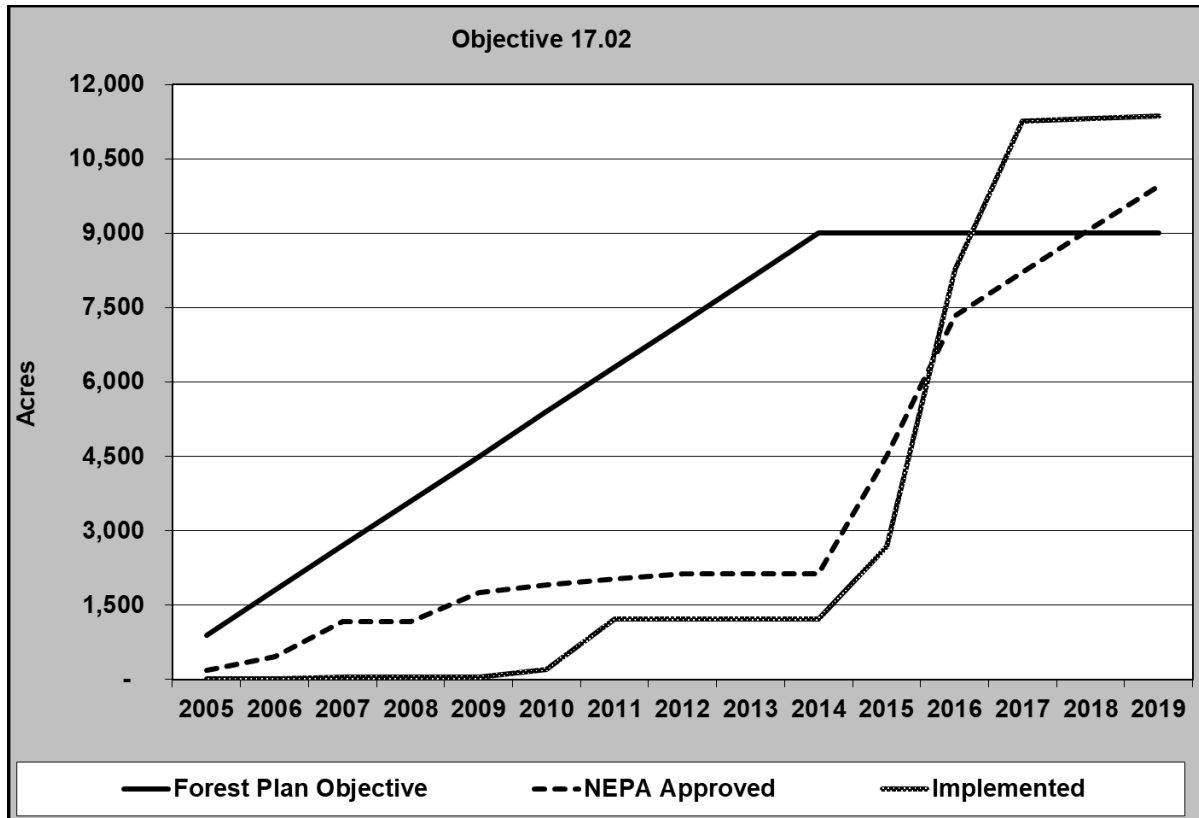


Figure 2. Objective 17.02

4. Objective 17.03 – Over the 10-year period, restore at least 10,000 acres of shortleaf/pitch/table-mountain pine forests.

Chart shows cumulative acres over time

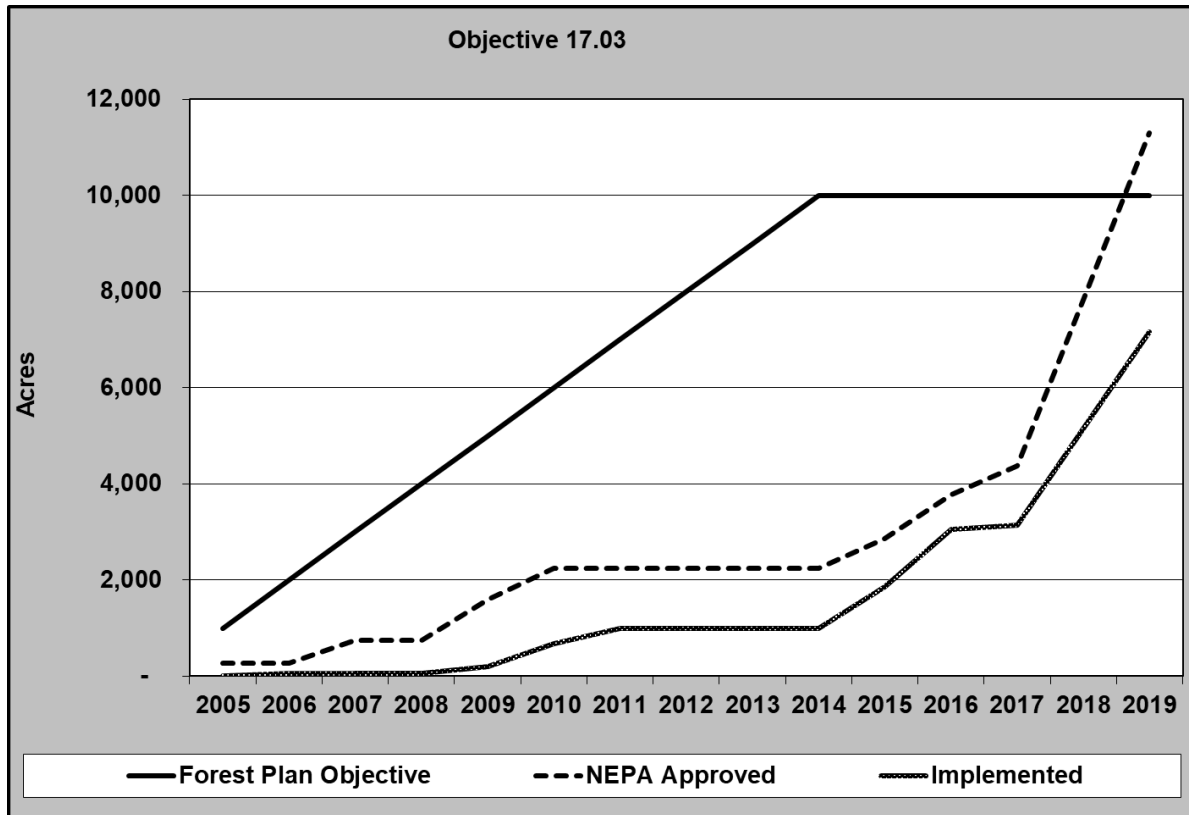


Figure 3. Objective 17.03

5. Objective 17.04 – Over the 10-year period, restore at least 300 acres to appropriate native communities currently occupied by loblolly pine plantations.

Chart shows cumulative acres over time

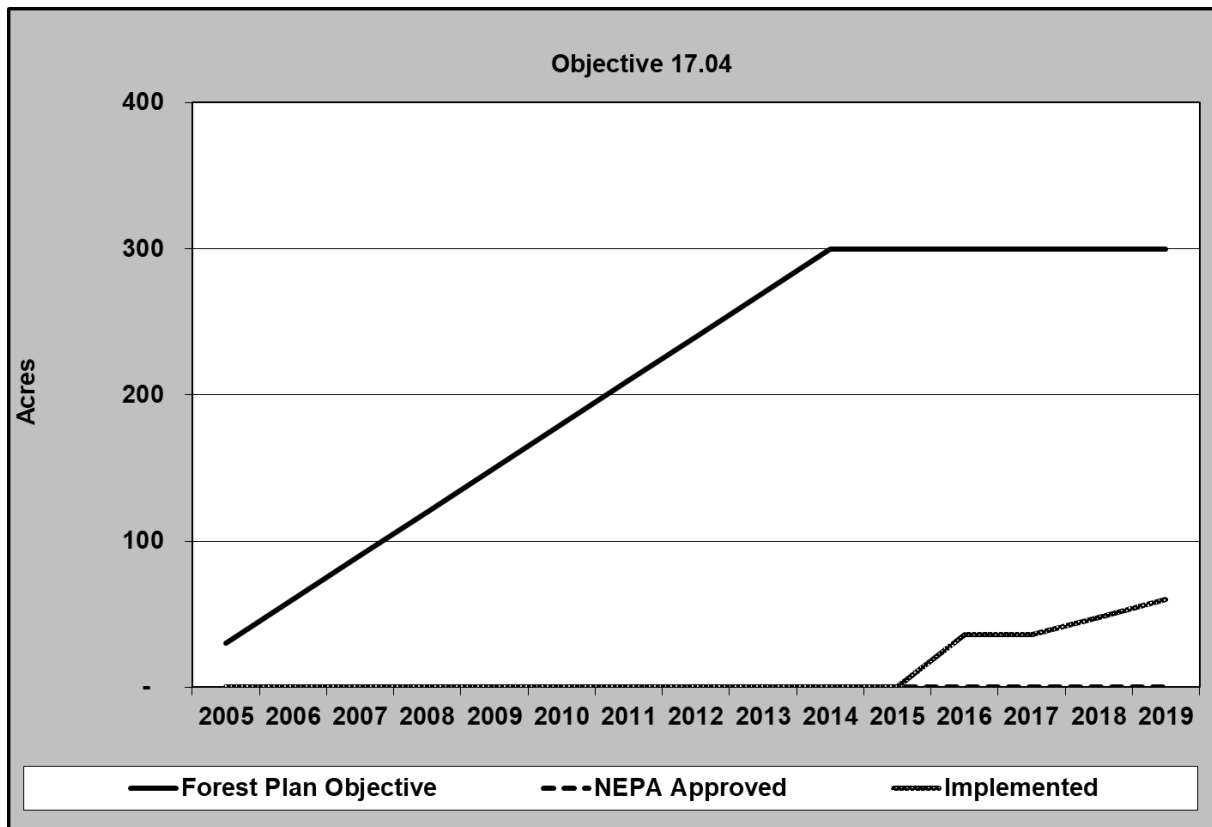


Figure 4. Objective 17.04

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.

Chart shows cumulative acres over time

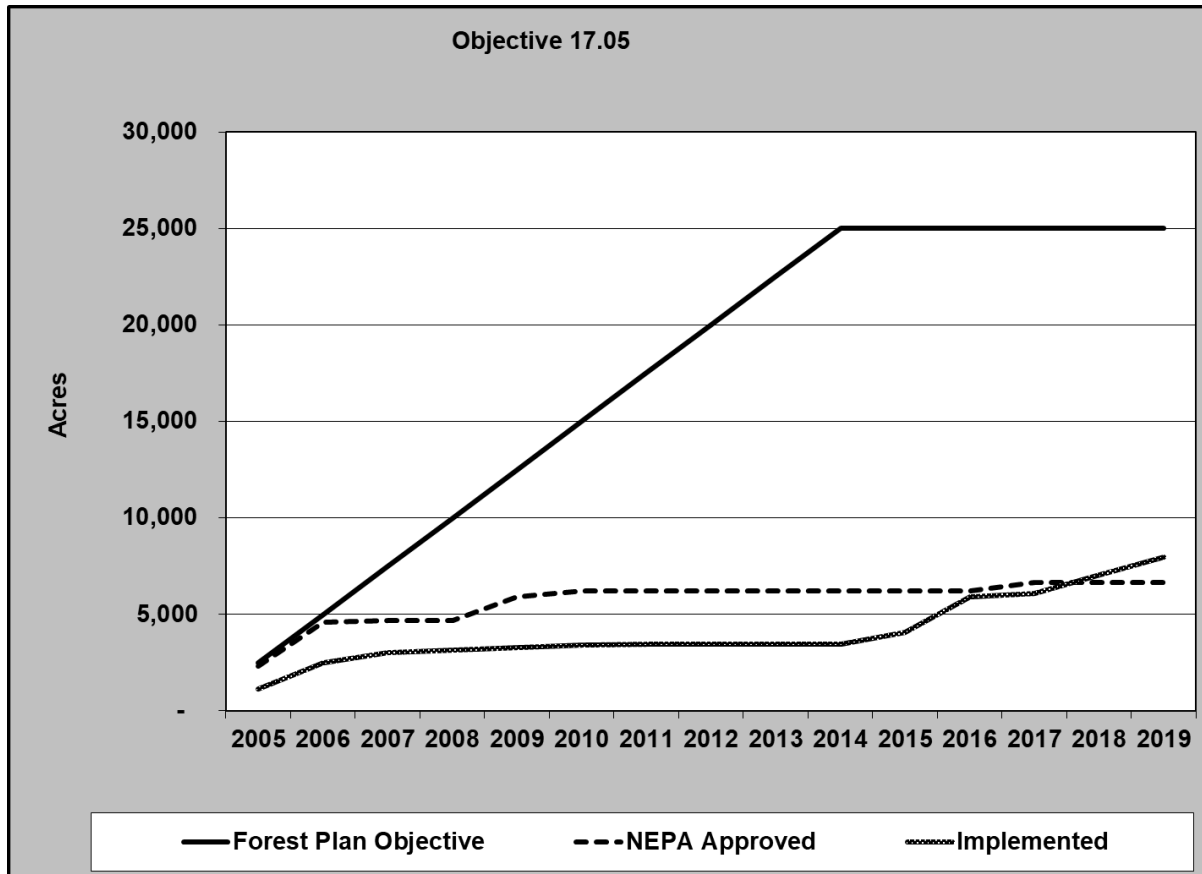


Figure 5. Objective 17.05

7. Restore at least 5,700 acres in dry and xeric oak and pine-oak forests to open woodlands, savannas, and grasslands over a 10-year period.

Chart shows cumulative acres over time

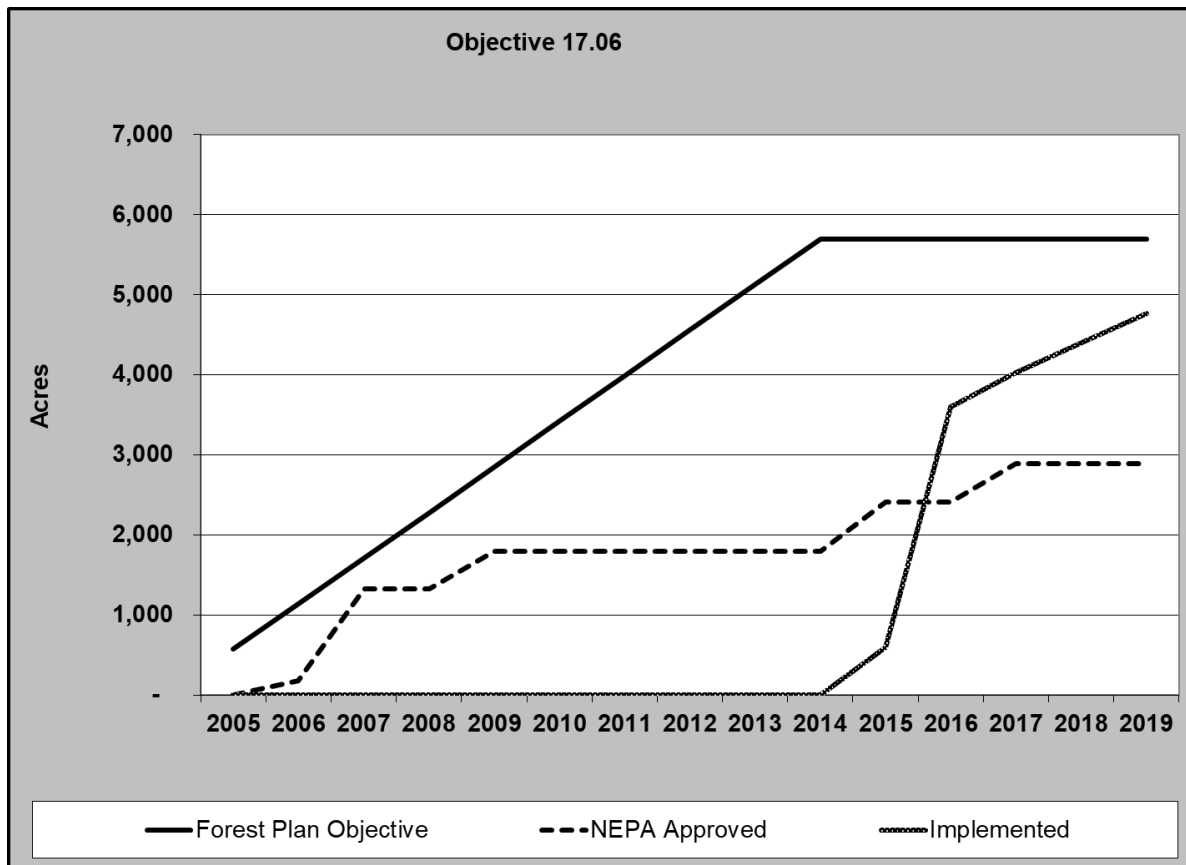


Figure 6. Objective 17.06

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.

Chart shows the proportion of each forest type in each successional stage

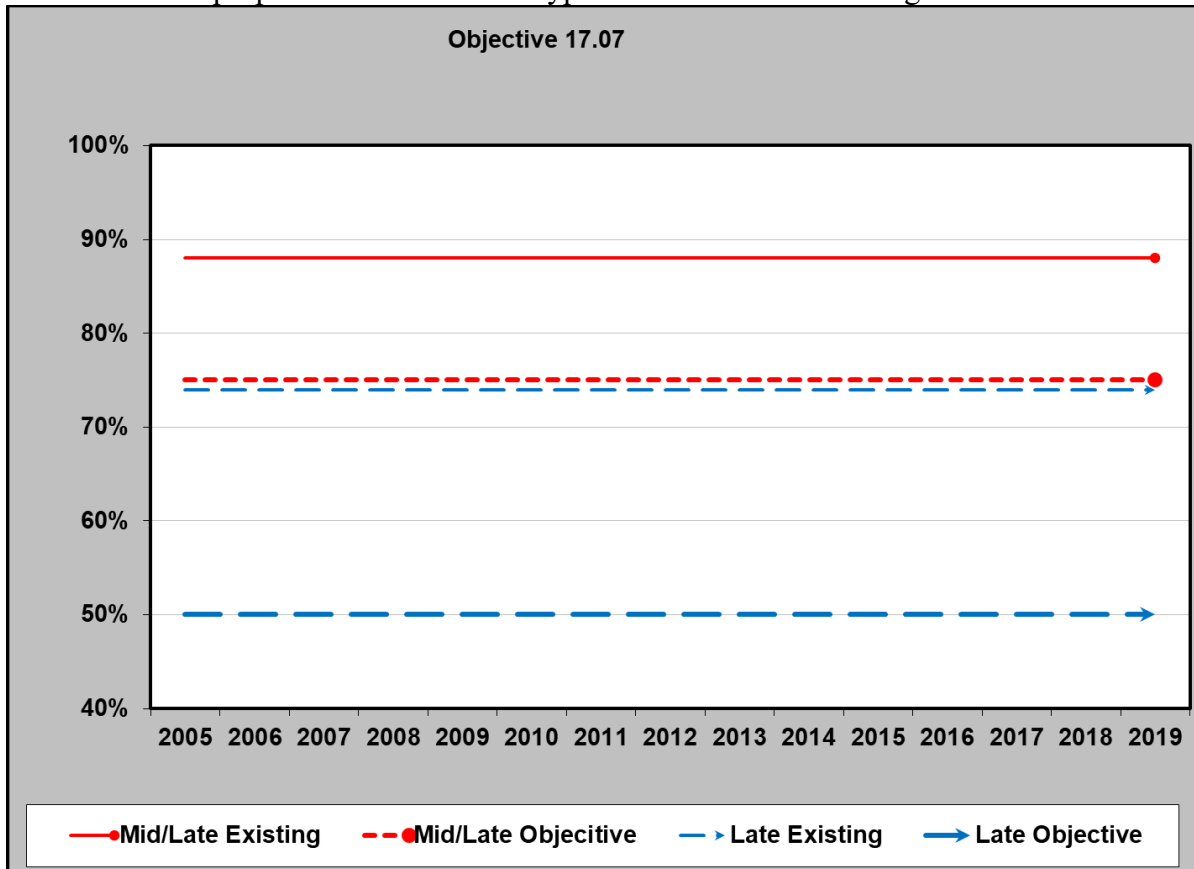


Figure 7. Objective 17.07

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 approximately 60-80 square feet per acre.

Chart shows acres treated each year and it includes tree release work in young stands

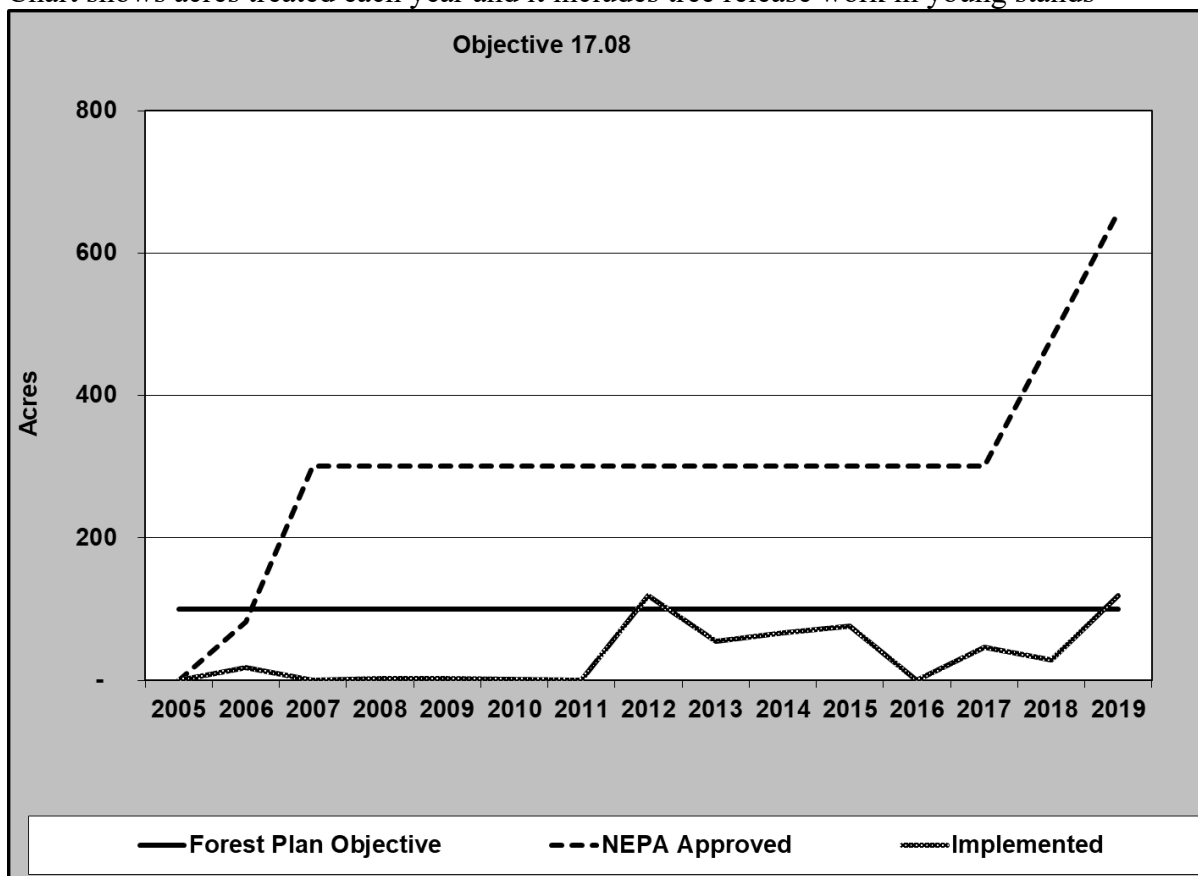


Figure 8. Objective 17.08

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 2018 and 2109 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 a site-specific basal area that promotes tree vigor. Encourage advanced regeneration of oak species.

The first chart depicts acres that received a commercial or precommercial thinning across all forest types each year. The second chart depicts acre that received a commercial, precommercial thinning, or release treatment across all forest types each year

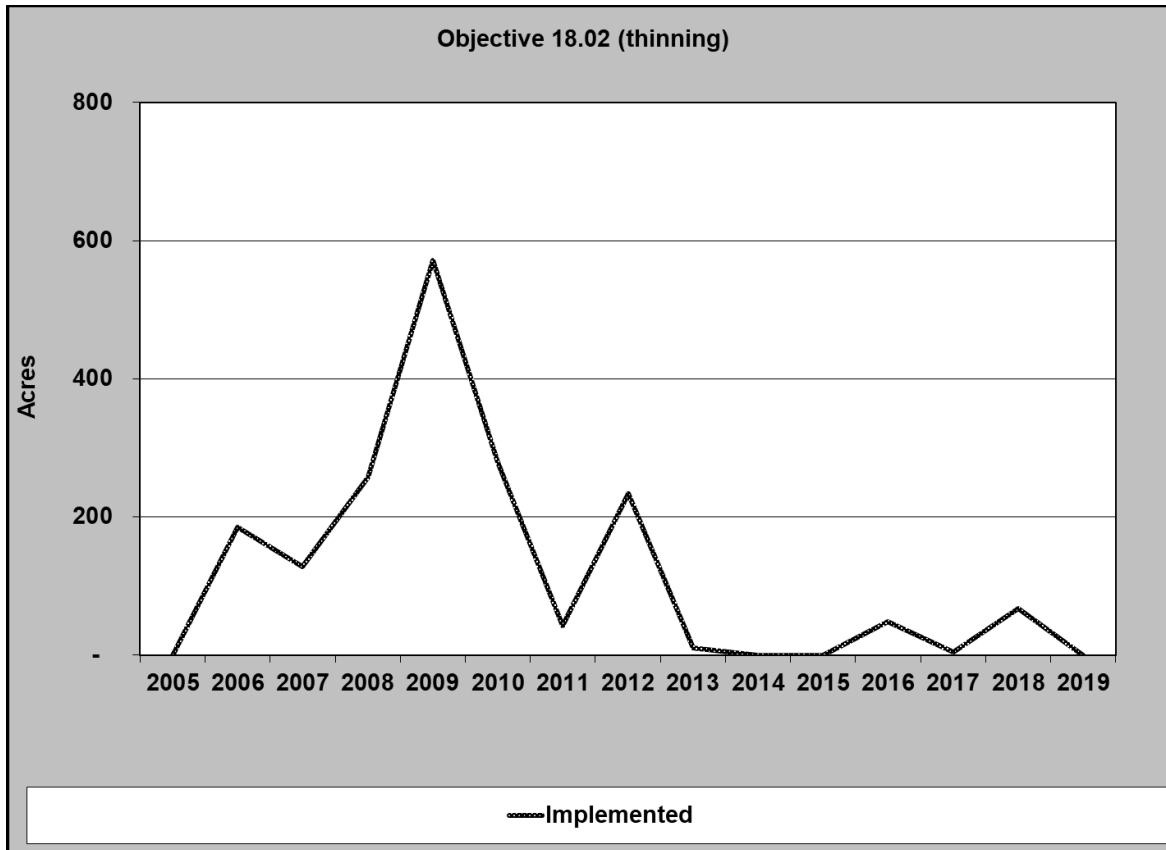


Figure 9. Objective 18.02

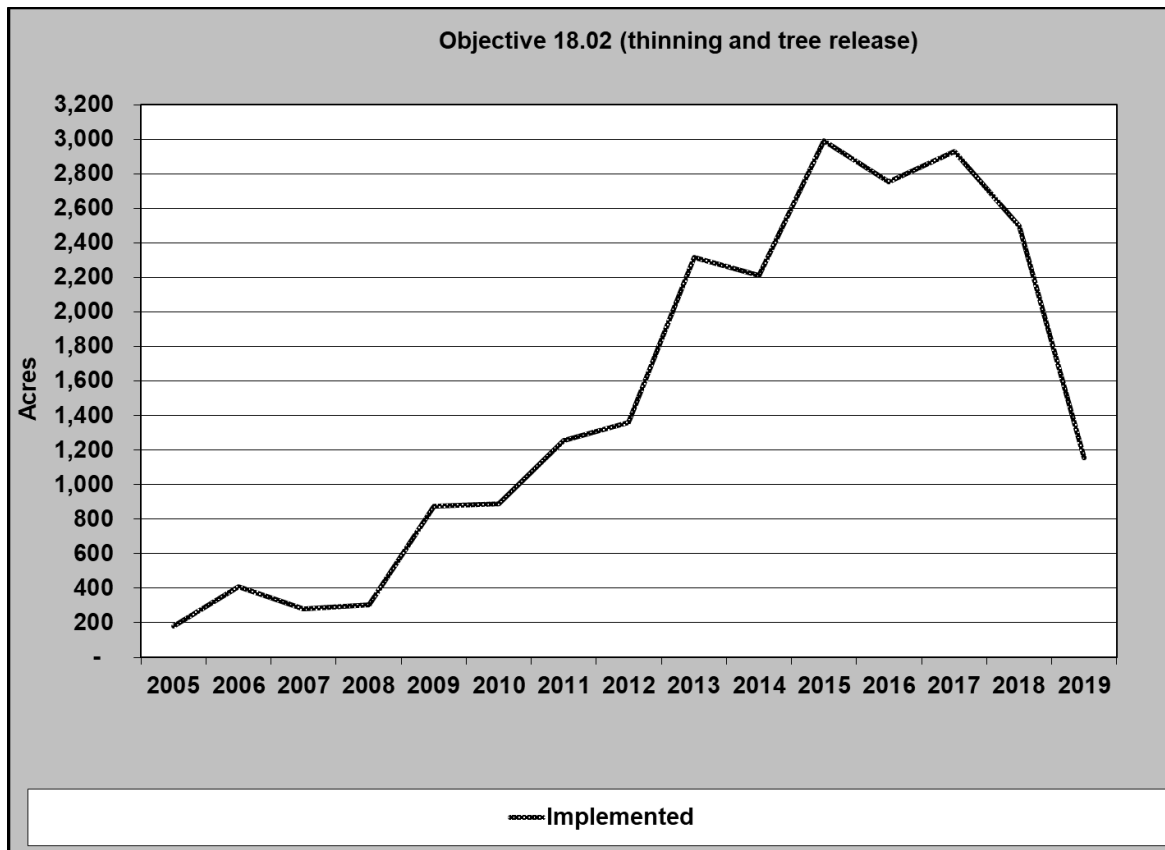


Figure 10. Objective 18.02

13. Objective 18.03 - Use IPM (see Gypsy Moth EIS, 1995) 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 an average of at least 1,100 acres per year of shortleaf/pitch/table-mountain pine forest, in an effort to maintain a fire return cycle of 4-12 years.

Chart shows acres treated each year.

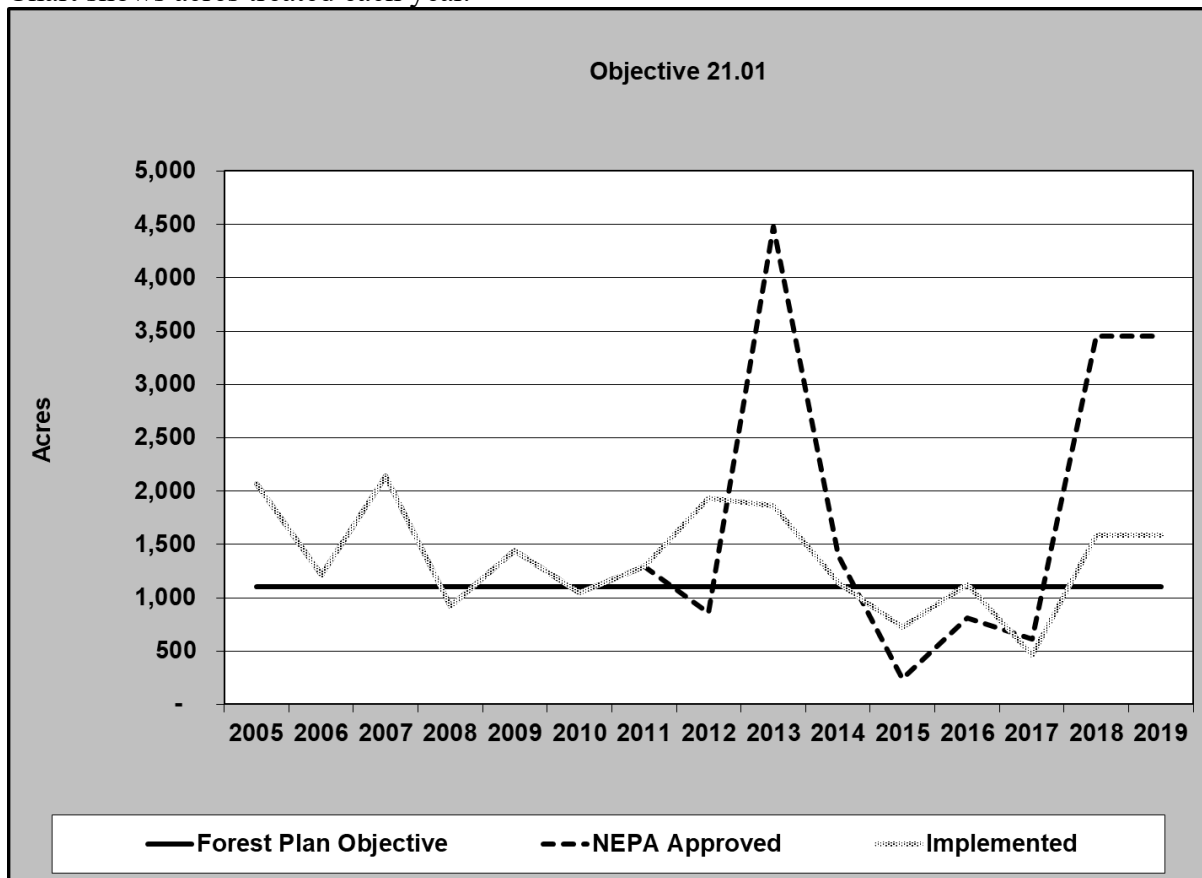


Figure 11. Objective 21.01

16. Objective 21.02 - Prescribe burn an average of at least 5,200 acres per year of oak and oak-pine forests in an effort to maintain a 4-12 year fire return cycle.

Chart shows acres each year.

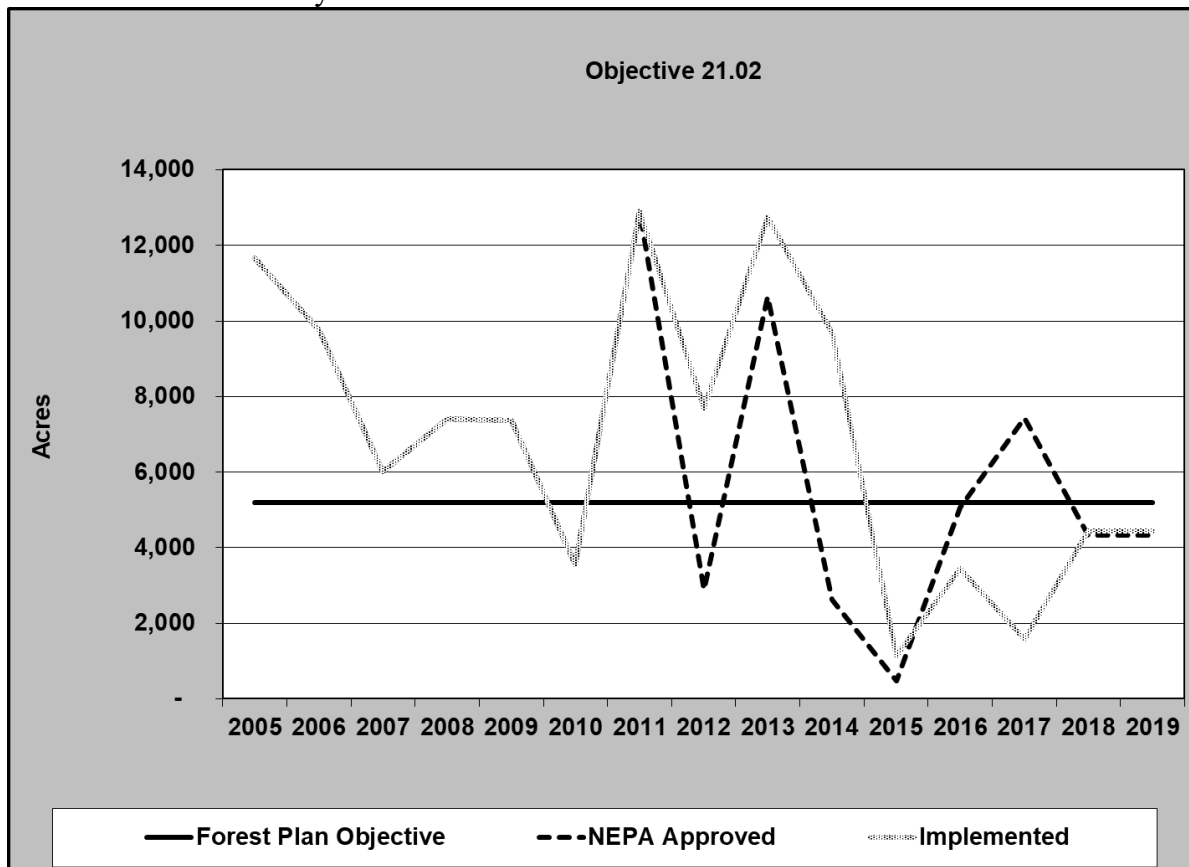


Figure 11. Objective 21.02

17. Objective 21.03 - Prescribe burn an average of 2,600 acres per year of open woodlands, savannas, and grasslands, in an effort to maintain a fire return cycle of 4- 12 years in dry and xeric oak forests, woodland, grasslands, and savannas.

Chart shows acres each year.

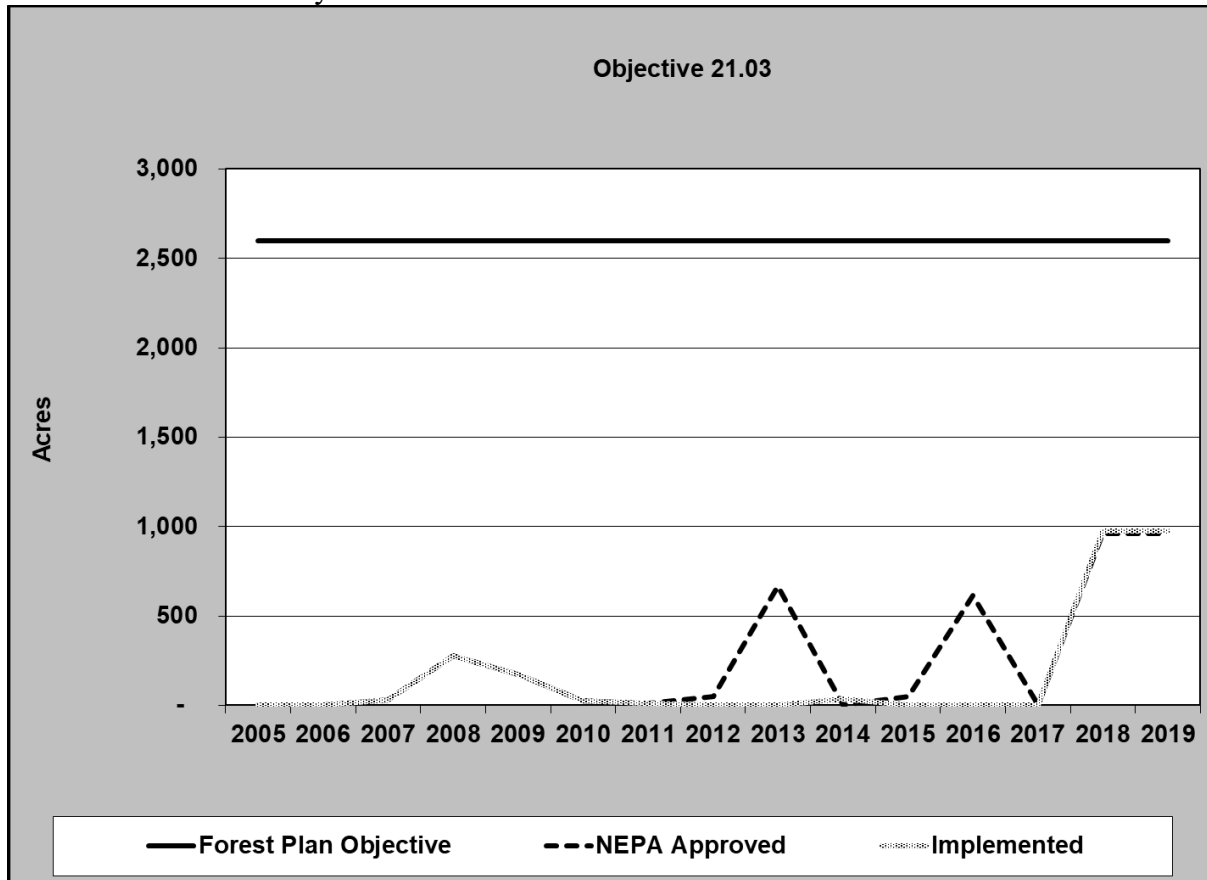


Figure 12. Objective 21.03

18. Objective 21.04 - Prescribe burn an average of at least 1,200 acres per year of pine-oak forests, in an effort to maintain a fire return cycle of 4-12 years.

Chart shows acres each year.

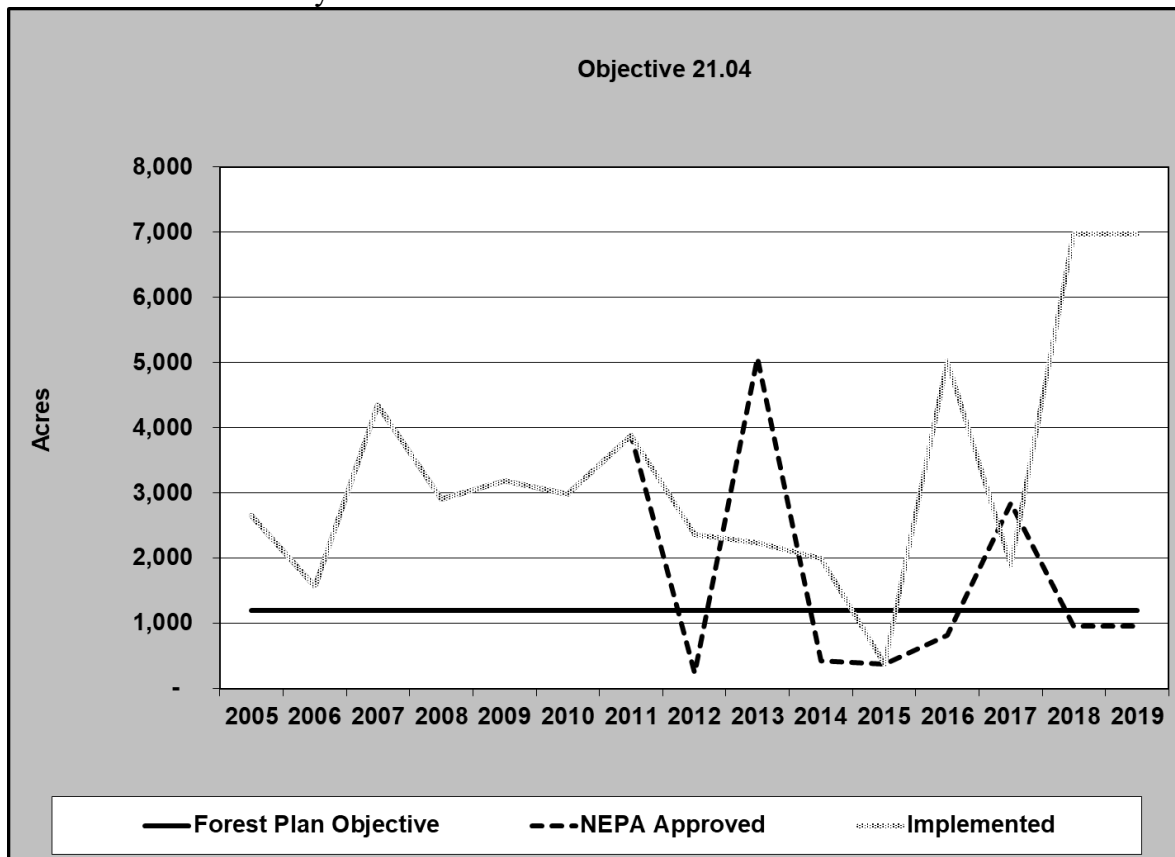


Figure 13. Objective 21.04

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 values at risk.

Chart shows annual acres over time

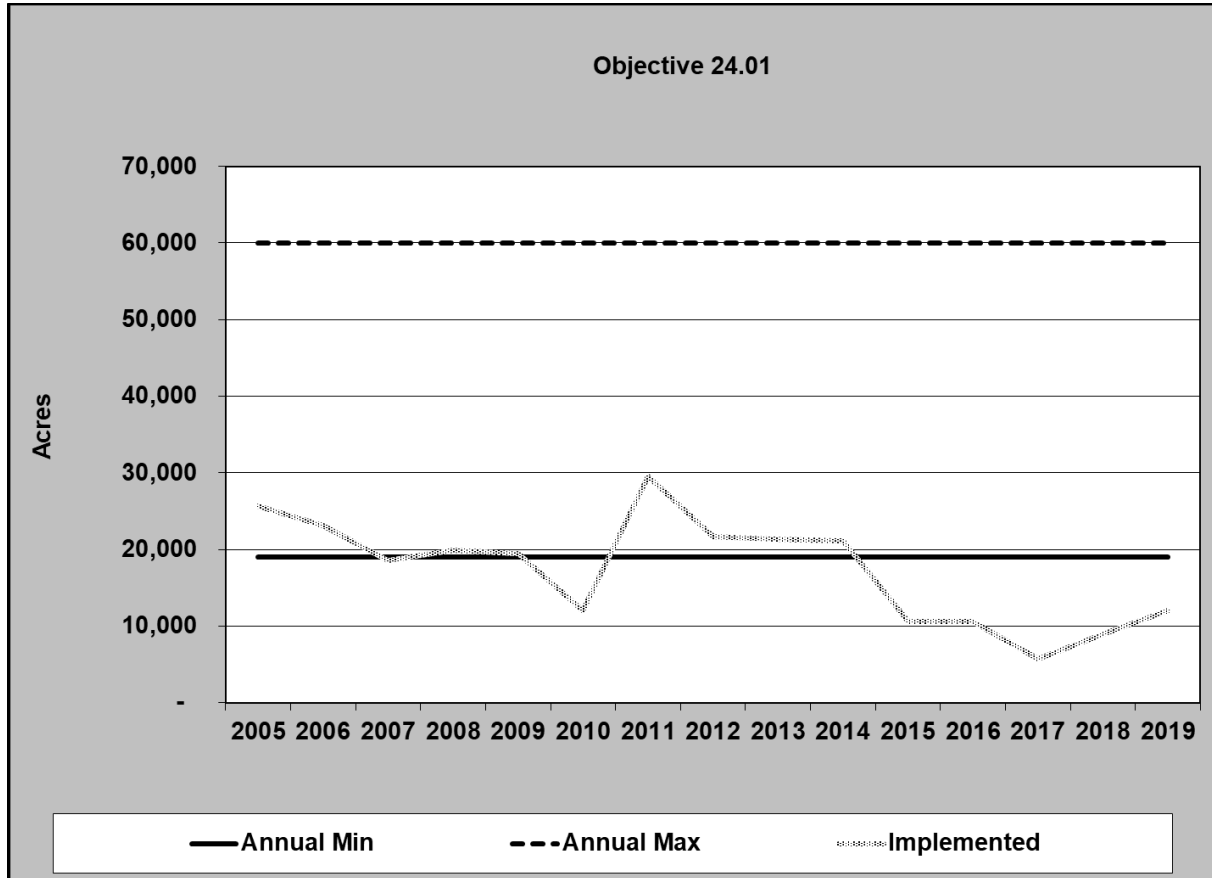


Figure 14. Objective 24.01

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

Chart shows % of total acres burned each year.

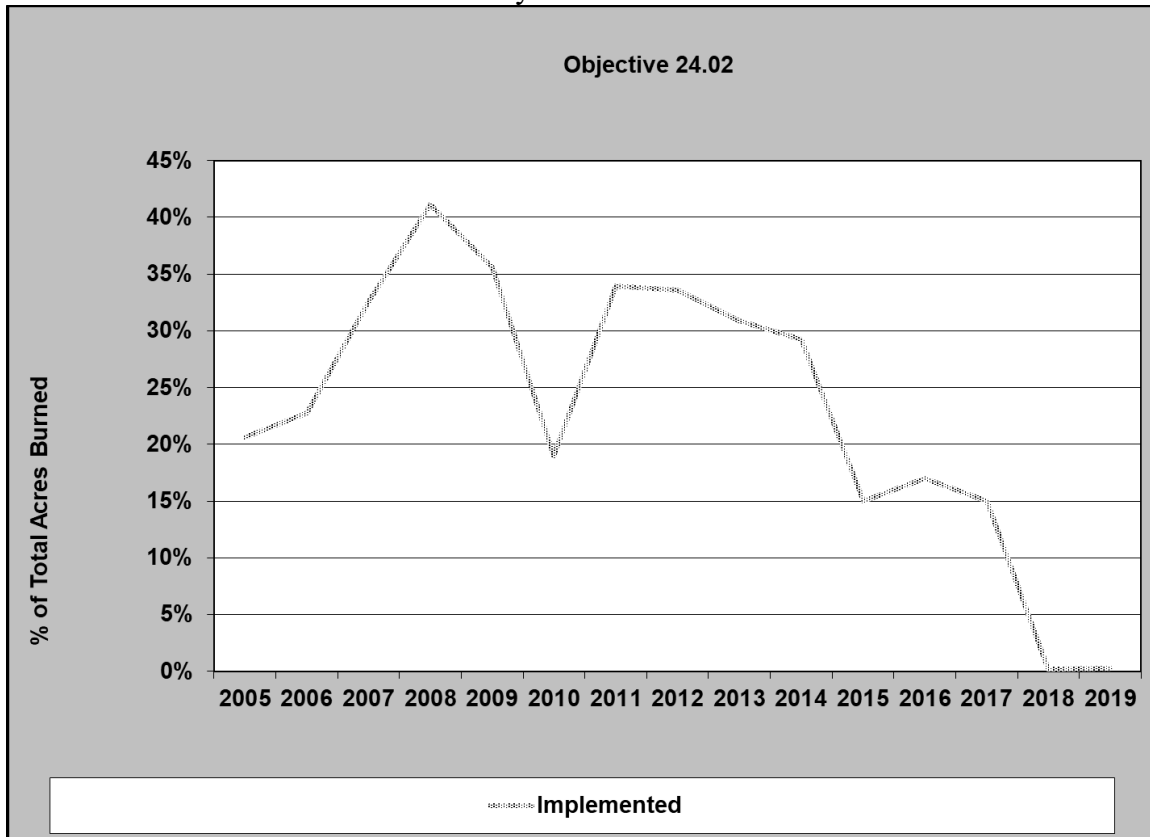


Figure 15. Objective 24.02

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.

MQ 2 - Monitoring Elements and Findings

MQ 2 E1. How many acres of shortleaf/pitch pine forests were thinned?

In 2018 and 2019, no acres were thinned; however, approximately 150 acres did receive a crop tree release treatment.

MQ 2 E3. How many acres occupied by white pine plantations were restored to appropriate native vegetation?

Between 2018 and 2019, approximately 348 acres of white pine forest were prescribe burned, 3 acres were commercially thinned, 28 acres were regenerated, and 276 acres received a release treatment. These efforts are moving conditions to more appropriate native plant communities.

MQ 2 E4. How many acres occupied by pine plantations or other sites with minimal diversity were restored to mixed oak or mixed oak- pine?

Refer to MQ2 E3.

MQ 2 E5. How many acres were restored to shortleaf/pitch/table- mountain pine type?

Between 2018 and 2019, the following restoration treatments occurred within shortleaf, pitch, and Table Mountain pine forest types:

- Prescribed burning: 3,174 acres
- Invasive plant treatments: 291 acres
- Regeneration harvests: 5 acres
- Planting: 73 acres
- Release treatments: 387 acres

MQ 2 E6. How many acres occupied by loblolly pine plantations were restored to appropriate, native vegetation?

There are approximately 1,300 acres classified as loblolly pine forest and an additional 298 classified as loblolly pine-hardwood forest on the Cherokee National Forest. Between 2018 and 2019, approximately 24 acres of loblolly pine and loblolly pine-hardwood stands were

prescribe burned. The chart below depicts the cumulative acreage treated over time (related to Objective 17.04)

MQ2 E7. How many acres occupied by Virginia pine were restored to fire adapted upland oak/mixed southern yellow pine?

Between 2018 and 2019, the following restoration treatments occurred in Virginia pine and Virginia pine-oak forests:

- Prescribed burning: 4,125 acres
- Invasive plant treatments: 321 acres
- Regeneration harvests: 1 acre
- Planting: 16 acres
- Release treatments: 239 acres

MQ2 E8. How many acres of dry and xeric oak and pine- oak forest were treated to shift stand conditions to open woodlands, savannas, and grasslands?

Between 2018 and 2019, the following restoration treatments were implemented in chestnut oak, chestnut oak-scarlet oak, chestnut oak-scarlet oak-yellow pine, chestnut oak-white oak-scarlet oak, post oak-black oak, southern red oak-yellow pine, Virginia pine-oak, shortleaf pine-oak, loblolly pine-oak, and white oak-black oak-yellow pine forest types:

- Prescribed burning: 8,871 acres
- Invasive plant treatments: 577 acres
- Tree planting: 54 acres
- Regeneration harvests: 3 acres
- Tree release: 1,160 acres

MQ2 E9. Are there existing agreements/partnerships with universities, other agencies, or USFS research branch to maintain or reintroduce extirpated or declining native species?

The Cherokee National Forest has agreements/partnerships in place with the US Forest Service Southern Research Station, the University of Tennessee, Tennessee Department of

Agriculture Division of Forestry, Tennessee Wildlife Resources Agency, The Nature Conservancy, and the American Conservation Experience.

MQ2 E10. How many acres were treated for advance growth regeneration for oak?

In 2018 and 2019, approximately 2,537 acres of oak dominated stands received a tree release treatment and 13,943 acres were prescribed burned. These treatments promote the recruitment and development of advanced oak regeneration and native plant communities.

MQ2 E11. How many acres were treated to suppress gypsy moth infestations?

The Cherokee NF has the following number of gypsy moth traps per district that are checked each year:

- Watauga- 22
- Ocoee- 32
- Tellico-30
- Unaka- 15

No areas were treated for gypsy moth in 2018 and 2019. In 2011, there was a treatment with *Bacillus thuringiensis kurstaki* (Btk, also known as Foray 48, 76) used to target the caterpillar stage. Three infested blocks of forest totaling 1,629 acres across Bledsoe, Cumberland, and Roane Counties received two aerial treatments of this naturally occurring biological insecticide. This area included portions of the Cherokee National Forest.

In 2020, approximately 3,100 acres of public and private land were treated near Mountain City, TN and 5,500 acres around Laurel Bloomery, TN. This aerial treatment was implemented by the Tennessee Division of Forestry in coordination with the Cherokee National Forest. The treatment used was a mating disruptant called Specialized Pheromone & Lure Application Technology gypsy moth-organic (SPLAT GM-O). SPLAT GM-O uses the pheromone of the gypsy moth (*Lymantria dispar*), to disrupt adult moth mating and thus reduce larval damage to trees.

The Slow the Spread (STS) Program is a national program designed to limit the spread of the gypsy moth specifically in a transition zone between the uninfested area (managed through detection and eradication) and generally infested areas (managed through suppression). In this transition zone, populations are low and somewhat discontinuous. Male moths are the primary population indicators, and other life stages are rarely found. The project attempts to meet its goals by conducting intensive monitoring with pheromone-baited traps in order to detect isolated or low-level populations in the transition zone.

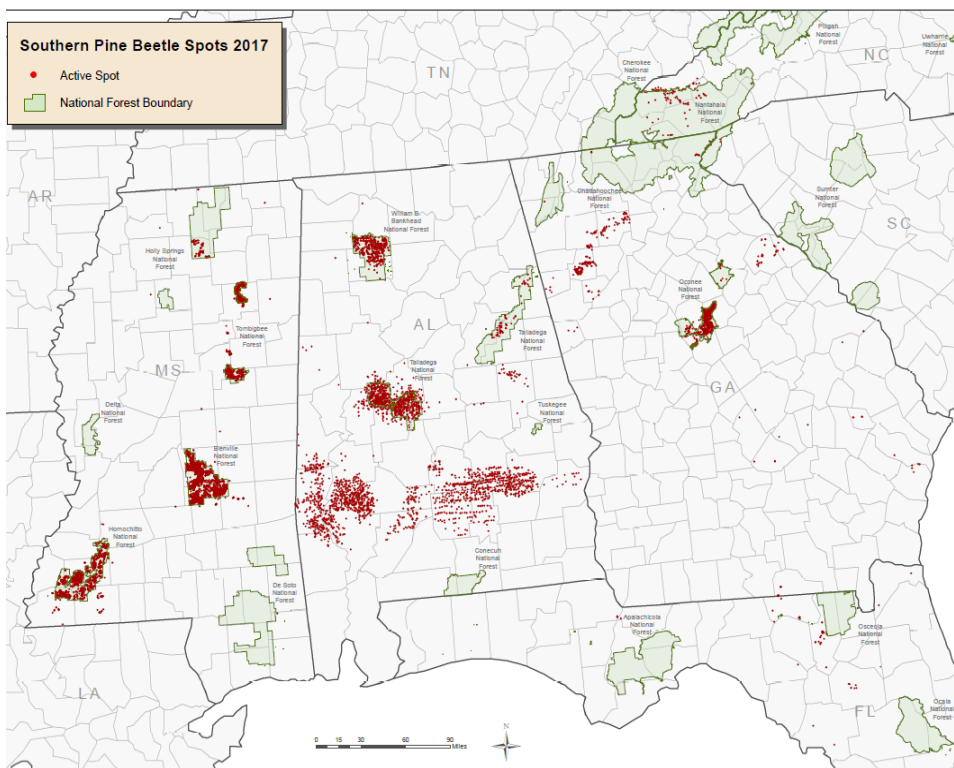
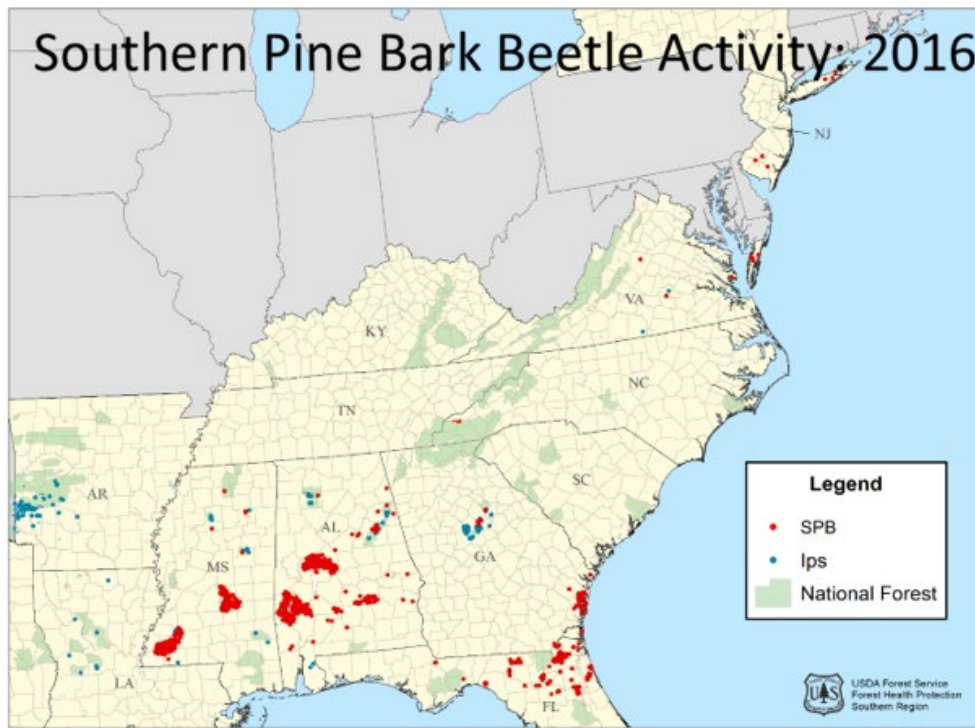
The STS area bisects Washington, Unicoi, and Sullivan Counties in Tennessee and manages gypsy moth trapping on the North Zone of the National Forest. STS traps are placed on a 2 km or 3 km grid throughout the STS action area on the northern part of the forest, managed by the Tennessee Division of Forestry (TDF). TDF also has a statewide trapping program

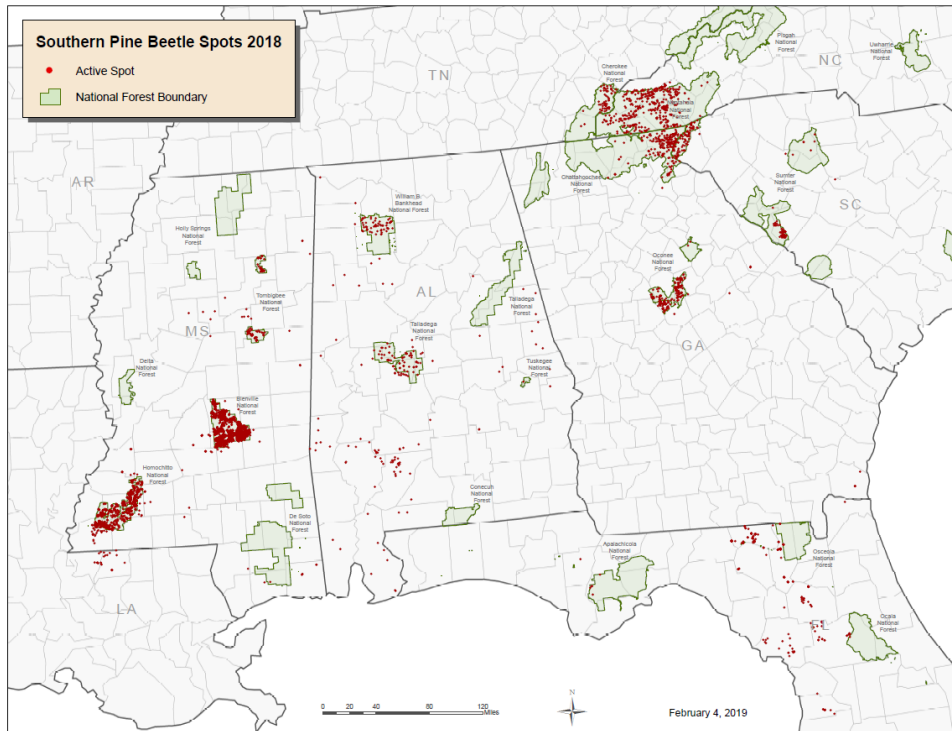
whereby delta traps are installed on a 1x4 grid in each county, this includes Polk and Monroe counties, adjacent to the Cherokee National Forest South Zone.

MQ2 E12. What are the population trends for southern pine beetle and how many acres were treated for suppression?

The Cherokee NF monitors southern pine beetle traps on each district every year. Populations have been low throughout the Appalachians for several years, although there were a few spots in Western NC in the past couple of years, refer to the maps for 2016-2019 below. 2018 had the most spots, but this activity is still fairly light compared to the outbreak that occurred back in 1998-2002. For SPB trapping, Forest Service Forest Health Protection (FHP) traps for 4 weeks each spring – starting when the dogwoods bloom. The Cherokee NF has 3 traps per district, and while this is not an extensive survey, USFS Forest Health Protection feels that it gives an earlier indication of activity for the year. No acres have been treated for suppression

purposes per se, although ongoing thinning and other stand improvement work serves to reduce the risk for southern pine beetle infestation.





MQ2 E13. How many acres of shortleaf/pitch/table- mountain pine forest types were prescribe burned?
Refer to MQ2 E5.

MQ2 E14. How many acres of oak and oak-pine forest are prescribe burned annually?
In 2018 and 2019, approximately 6,971 acres of oak and oak-pine forest were burned on average each year (refer to MQ2 E10.)

MQ2 E15. How many acres of open woodlands, savannas, and grasslands are prescribe burned annually?

There is not a clear number of acres of woodlands, savannas and grasslands that are burned annually. There is a need to improve how woodlands, savannas, and grasslands are classified in the FS Veg database.

MQ2 E16. How many acres of pine- oak forest type have been burned?
Refer to MQ2 E14.

MQ2 E17. Acres of mixed mesophytic and northern hardwood forest prescribe burned annually.

Between 2018 and 2019, no northern hardwood forests were burned, and approximately 6,017 acres of mixed mesophytic forests were prescribe burned. Burns on more mesic sites are intended to be low intensity backing fires that will burn out against these natural fire breaks.

MQ2 E19. How many acres of hazardous fuels forest land are treated through wildland fire use, prescribed fire, and mechanical treatment annually?

In 2018, 8,980 acres were treated, in 2019, 12,007 acres were treated. Refer to the chart for objective 24.01

MQ 3: Are key successional stage habitats being provided?

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?

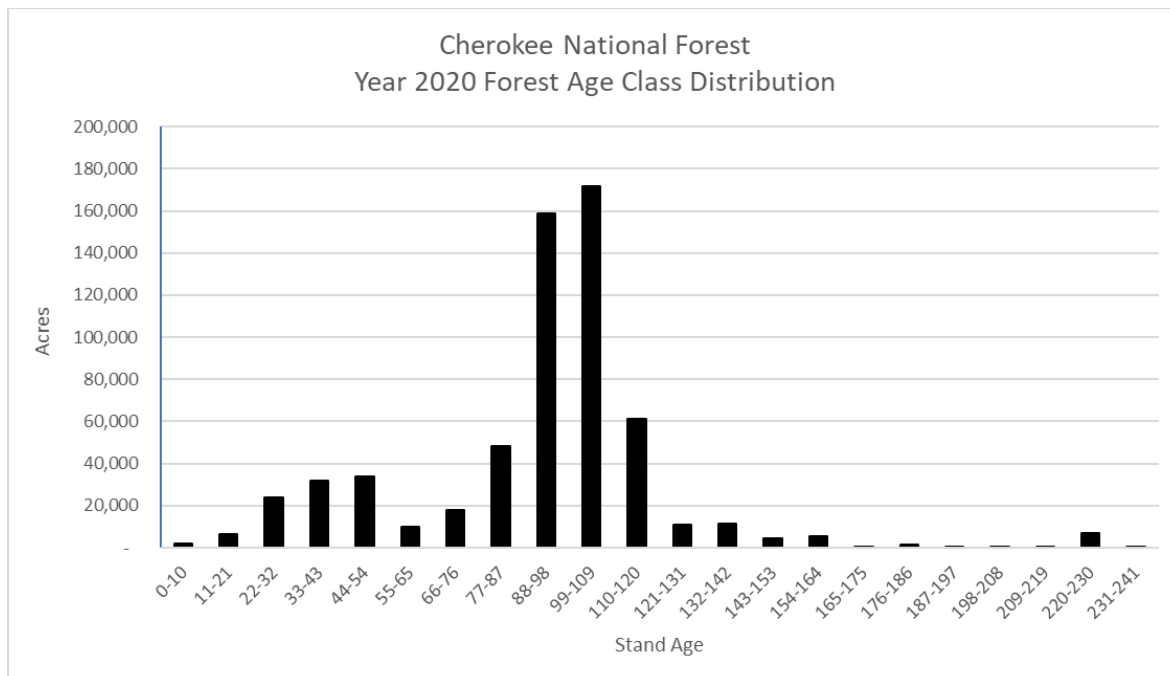
11. In Management Prescription 7.E.2, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?

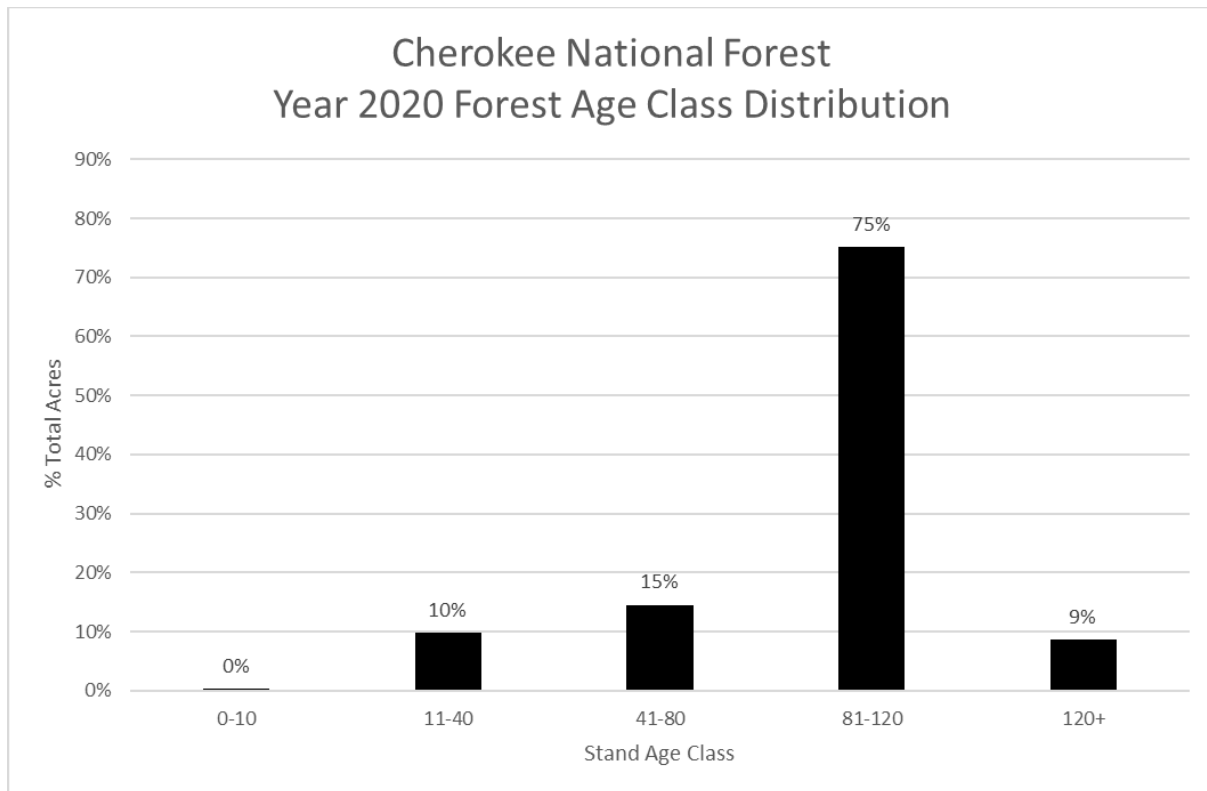
12. In Management Prescription 7.C, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4% to 10% of acres in early successional forest conditions?

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.)

Monitoring Discussion and Findings

The charts below depict the age class distribution of all forested stands across the Cherokee National Forest, regardless of Prescription.





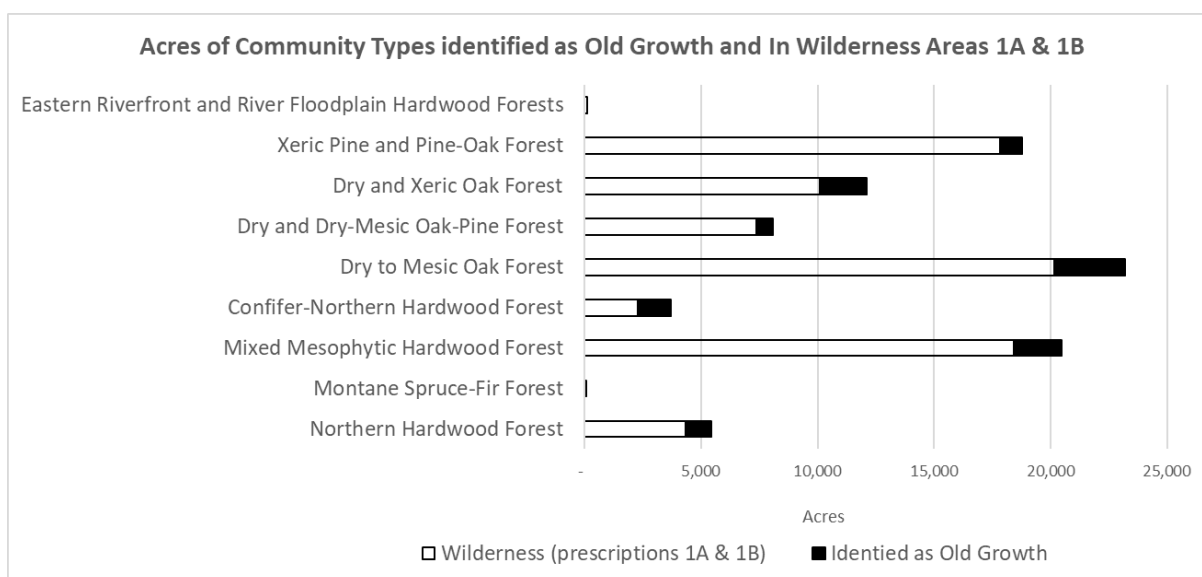
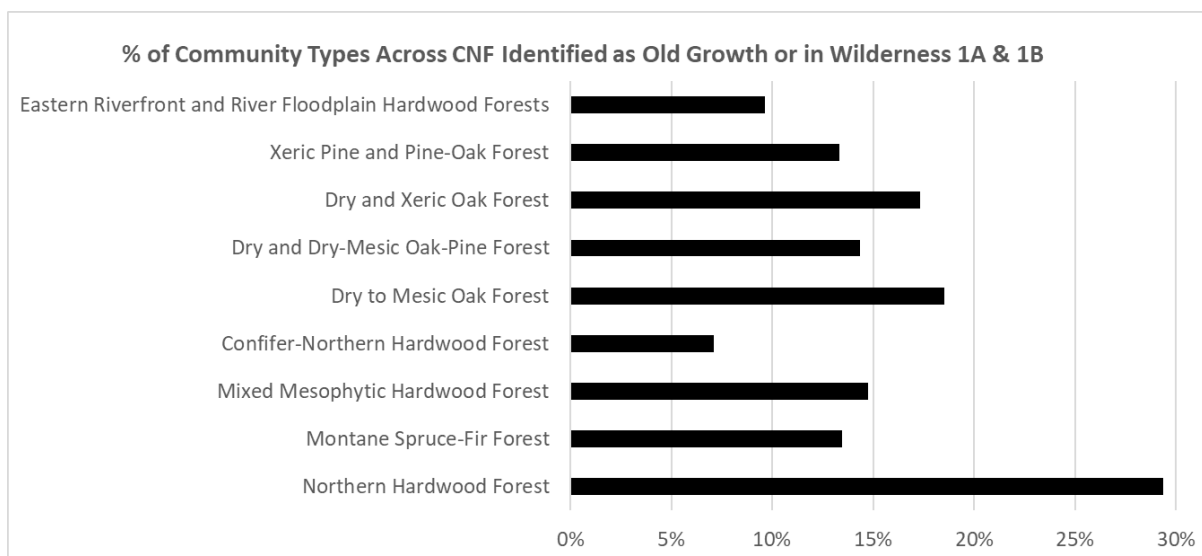
MQ3 - Monitoring Elements and Findings

MQ3 E1. How many field inventories for old growth were conducted and how many small, medium, and large patched were designated?

In 2018 and 2019, stand exams were conducted across approximately 1,200 acres in the Dicks Creek, Greg Branch project areas on the North Zone and approximately 4,000 acres in the Restoration of Dry Forests on the South Zone project. 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 designated during fiscal years 2018 and 2019.

MQ3 E2. How many acres of old growth have been designated by patch size and old growth community type?

The charts below depict the acres of old growth community types identified as old growth (existing or future) and those in wilderness areas (RLRMP prescription areas 1A and 1B).



MQ3 E3. Are Old Growth definitions adequately describing the Community and condition?
 Old Growth definitions are adequately describing the Community and condition

Inventories of old growth are based on the report of the Region 8 Old Growth Team entitled *Guidance for Conserving and Restoring Old-Growth Forest Communities on national forests in the Southern Region (Old Growth Guidance)*. The age, disturbance, basal area, and tree size criteria described in the operational definitions for the 16 forest community types in the Old Growth Guidance serve as the basis for these inventories. These criteria vary by forest community type and can be found in the following table (note that disturbance is not reflected in this table but is also used as an evaluation criteria).

Table D-1. CRITERIA FOR OLD GROWTH TYPES FOR THE CHEROKEE NATIONAL FOREST			
<i>Old Growth Type</i>	<i>Minimum Age</i>	<i>Minimum Basal Area</i>	<i>DBH of Largest Trees (minimum)</i>
Northern Hardwood	100	40	14
Montane Spruce-Fir	120**	40	20
Mixed Mesophytic	140**	40	30
Conifer Northern Hardwood	140	40	20
Dry to Mesic Oak	130**	40	20
Dry & Dry Mesic Oak & Pine	120**	40	19
Dry & Xeric Oak	110**	10	16
Xeric Pine & Pine Oak	100**	30	20
Eastern Riverfront	100**	40	25
** Based on half life (typical mortality) of dominant tree species			

MQ3 E4. How many partnerships does the Cherokee NF have with other agencies or organizations to help with Old Growth inventories?

The Cherokee has partnerships with The University of Tennessee Knoxville and the Tennessee Department of Agriculture's Division of Forestry for conducting stand exams.

MQ3 E5. Golden winged warbler surveys coordinated by organizations from four states (Tennessee, North Carolina, Virginia, and Georgia) took place in 2018 and 2019. 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 Unaka District continues the Wolf Creek project, a high elevation grassy and early successional restoration project. In 2018 and 2019, stumps and slash were removed from 10 acres of old fields that were recently harvested. This work is improving high elevation golden-winged warbler habitat.

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.

MQ3 E6. What is the age class distribution for northern hardwood, mixed mesophytic, and river floodplain hardwood communities? Is 75% of the total acreage for these communities in mid

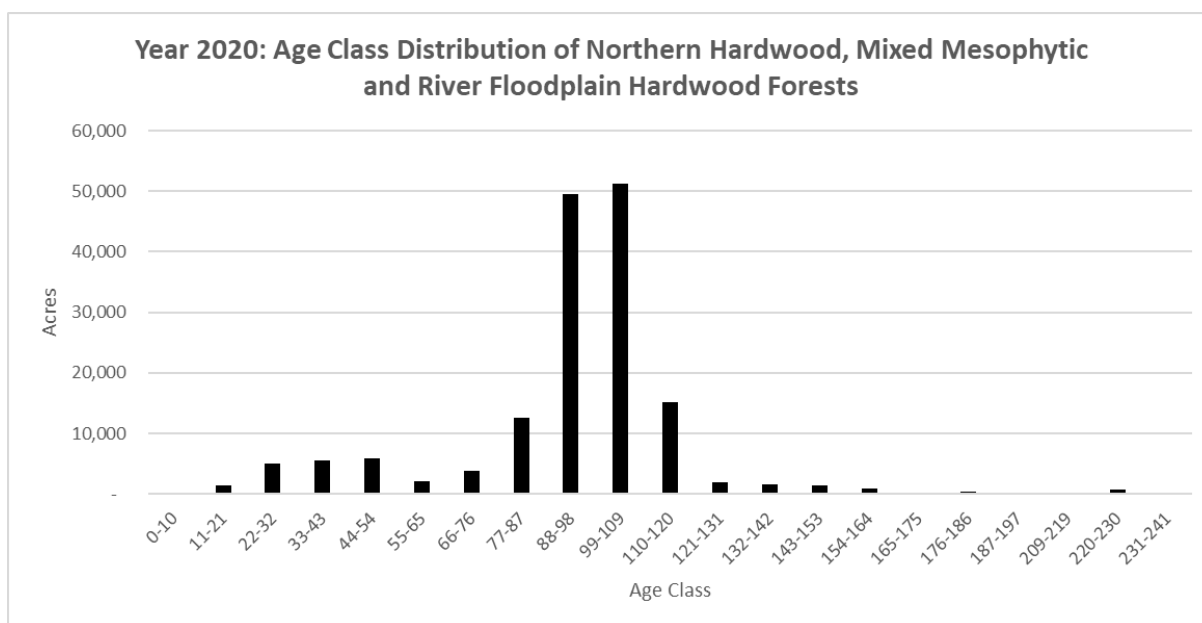
and late-successional stages and is a minimum of 50 percent of the total acreage for these communities in late successional conditions?

Overall, the Cherokee National Forest is meeting objectives for mid to late successional conditions in northern hardwood, mixed mesophytic, and river floodplain hardwood communities.

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 163,000 acres of northern hardwood, mixed mesophytic, and river floodplain hardwood forest communities. The revised LRMP Table 2-4 defines the forest types found in these communities.

The chart below depicts the age class distribution for northern hardwood, mixed mesophytic, and river floodplain hardwood forest communities.

Successional Class	Age Class	Acres	% of Total
Seedling	0-10	194	0.1%
Sapling/Pole	11-40	10,642	7%
Mid-Successional	41-90	37,795	23%
Late-Successional (incl. old)	91-120	103,597	64%
Old Forest	120+	9,176	6%



MQ3 E7. 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?

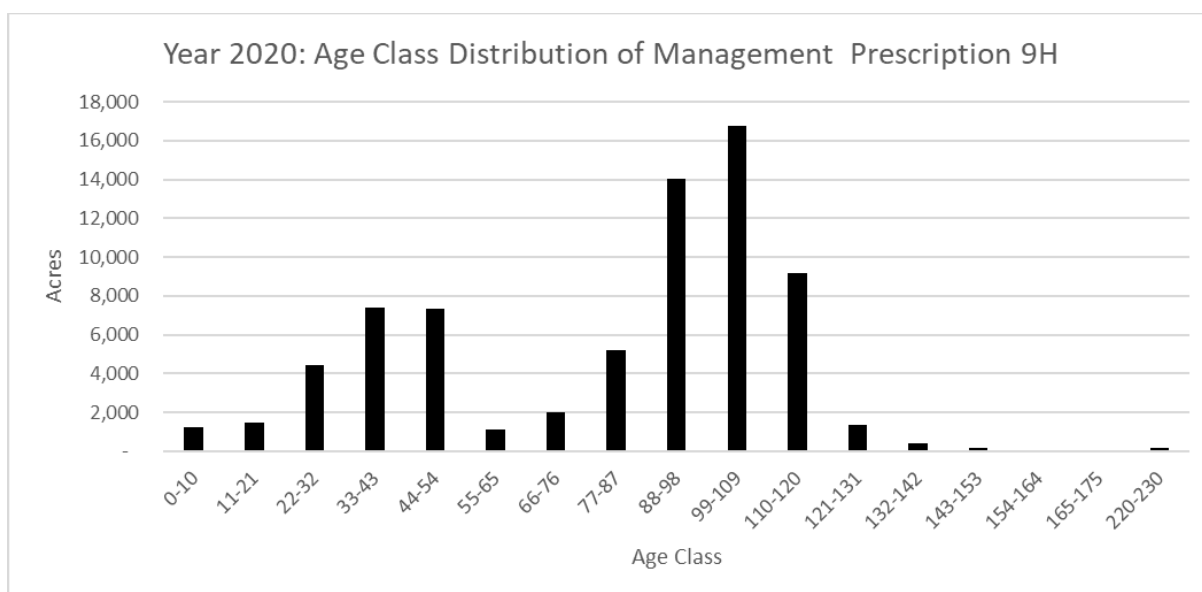
Overall, the Cherokee National Forest is meeting objectives for mid to late successional conditions but is not meeting early successional forest objectives in Prescription 9H (Management, Maintenance, and Restoration of Plant Associations to their Ecological

Potential). There is a need to increase the proportion of early successional habitat from 2% to 4-10%.

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 73,000 acres of land in Management Prescription 9H.

The chart below depicts the age class distribution in Management Prescription 9H.

Successional Class	Age Class	9H Acres	% of Total
Seedling	0-10	1,202	2%
Sapling/Pole	11-40	11,761	16%
Mid-Successional	41-90	19,450	27%
Late-Successional (incl. old)	91-120	37,599	52%
Old Forest	120+	2,925	4%



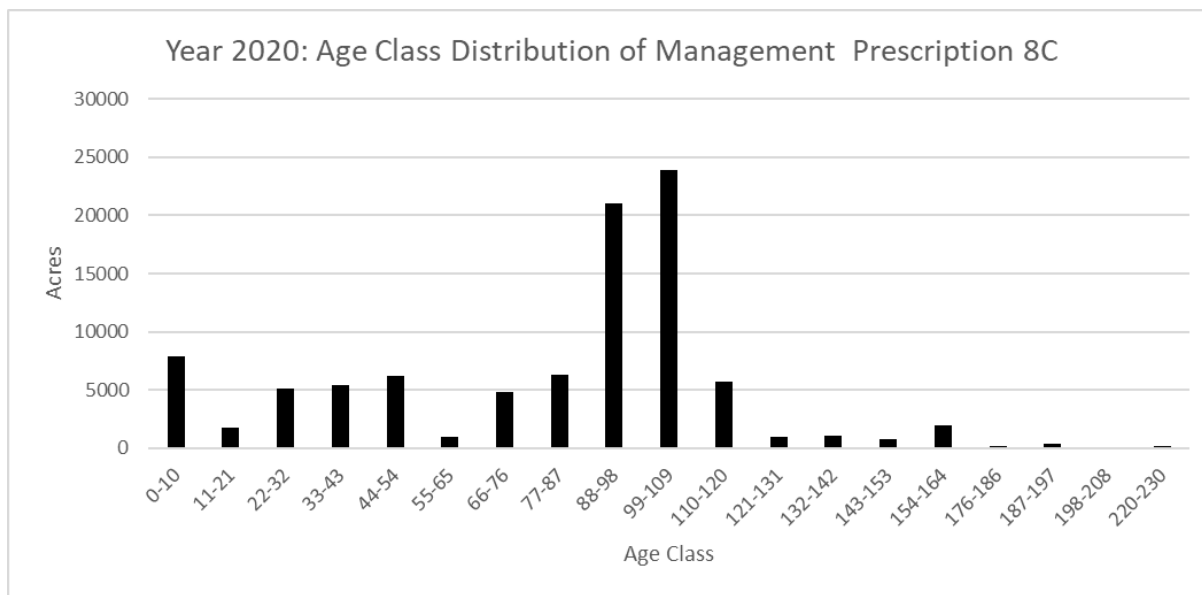
MQ3 E8. In Management Prescription 8.C, are we maintaining a 125 year rotation and are we maintaining at least 65% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4 to 8% of acres in early successional forest.

Overall, the Cherokee National Forest is meeting objectives for early, mid, and late successional conditions in Prescription 8C (Black Bear Management).

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 166,000 acres of land in Management Prescription 8C

The chart below depicts the age class distribution in Management Prescription 8C.

Successional Class	Age Class	8C Acres	% of Total
Seedling	0-10	7,877	8%
Sapling/Pole	11-40	10,862	12%
Mid-Successional	41-90	24,721	26%
Late-Successional (incl. old)	91-120	45,515	48%
Old Forest	120+	5,468	6%

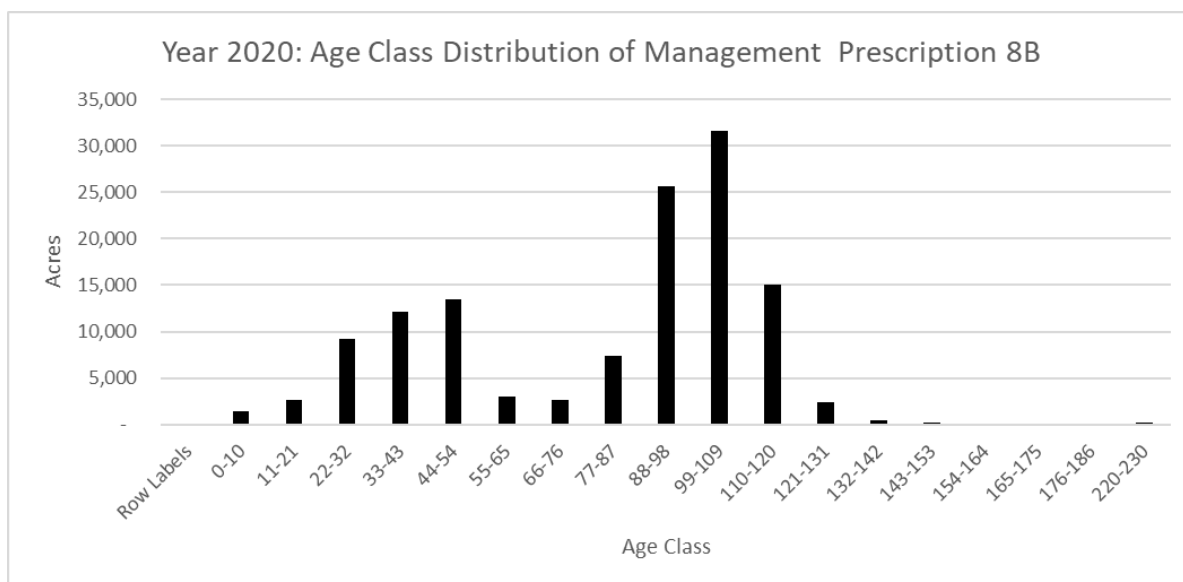


MQ3 E9. In Management Prescription 8.B, are we maintaining at least 20% of forested acres in mid to late successional condition, including old growth; at least 10% of forest wide acres in late and old growth condition; and 10 to 17% of acres in early successional forest conditions? Overall, the Cherokee National Forest is not meeting objectives for early successional forest conditions in Prescription 8B (Early Successional Habitat Emphasis) but is meeting objectives for mid to late successional conditions. There is a need to increase the proportion of early successional habitat from 0.5% to 10-17%.

The table below depicts the acres and percentage of land for the roughly 56,00 acres of land Management Prescription 8B in each of the successional classes.

The charts below depicts the age class distribution in Management Prescription 8B.

Successional Class	Age Class	8B Acres	% of Total
Seedling	0-10	271	0.5%
Sapling/Pole	11-40	9,727	17%
Mid-Successional	41-90	14,600	26%
Late-Successional (incl. old)	91-120	29,647	53%
Old Forest	120+	1,707	3%

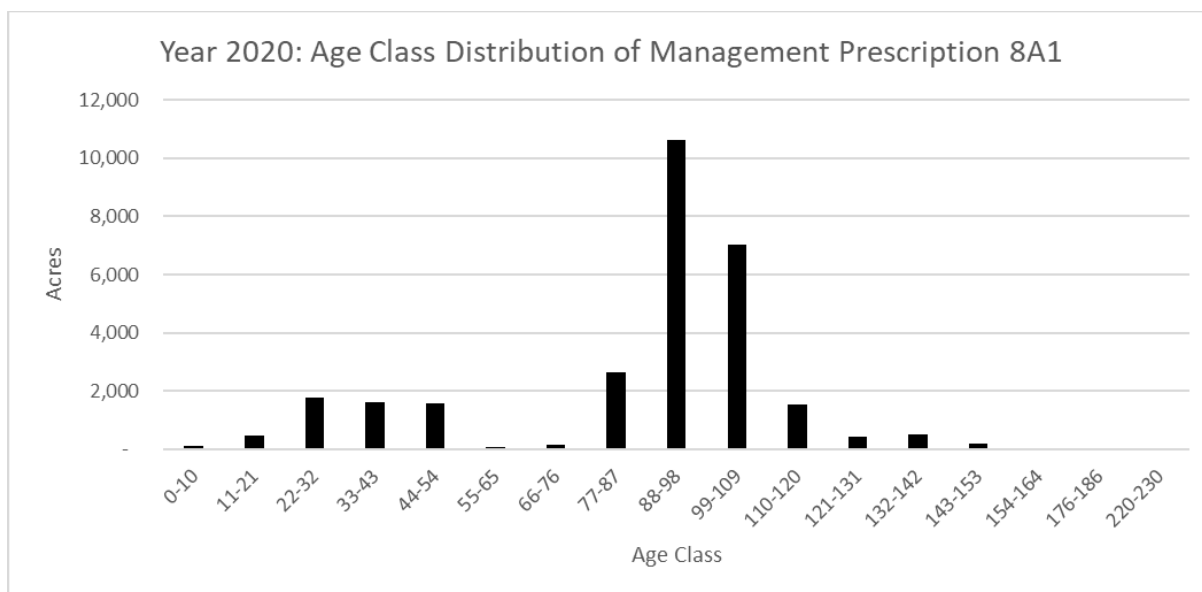


MQ3 E10. In Management Prescription 8.A, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4 to 10% of acres in early successional forest conditions? Overall, the Cherokee National Forest is not meeting objectives for early successional forest conditions in Prescription 8A1 (Mixed Successional Habitats) but is meeting objectives for mid to late successional conditions. There is a need to increase the proportion of early successional habitat from 0.3% to 4-10%.

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 29,000 acres of land in Management Prescription 8A1.

The chart below depicts the age class distribution in Management Prescription 8A1

Successional Class	Age Class	8A1 Acres	% of Total
Seedling	0-10	94	0.3%
Sapling/Pole	11-40	3,630	13%
Mid-Successional	41-90	7,654	27%
Late-Successional (incl. old)	91-120	16,171	56%
Old Forest	120+	1,143	4%

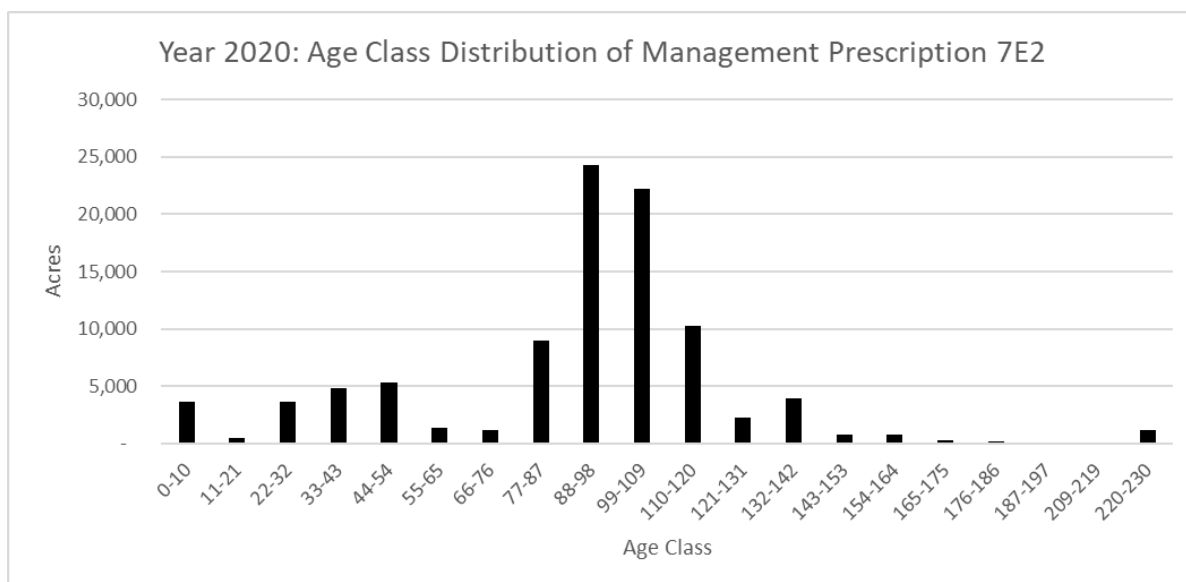


MQ3 E11. In Management Prescription 7.E.2, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4 to 10% of acres in early successional forest conditions. Overall, the Cherokee National Forest is not meeting objectives for early successional forest conditions in Prescription 7E2 (Dispersed Recreation Areas - Suitable) but is meeting objectives for mid to late successional conditions. There is a need to increase the proportion of early successional habitat from 0.37% to 4-10%.

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 97,000 acres of land in Management Prescription 7E2.

The chart below depicts the age class distribution in Management Prescription 7E2.

Successional Class	Age Class	7E2 Acres	% of Total
Seedling	0-10	3,617	3.7%
Sapling/Pole	11-40	7,554	8%
Mid-Successional	41-90	26,105	27%
Late-Successional (incl. old)	91-120	48,827	50%
Old Forest	120+	10,968	11%



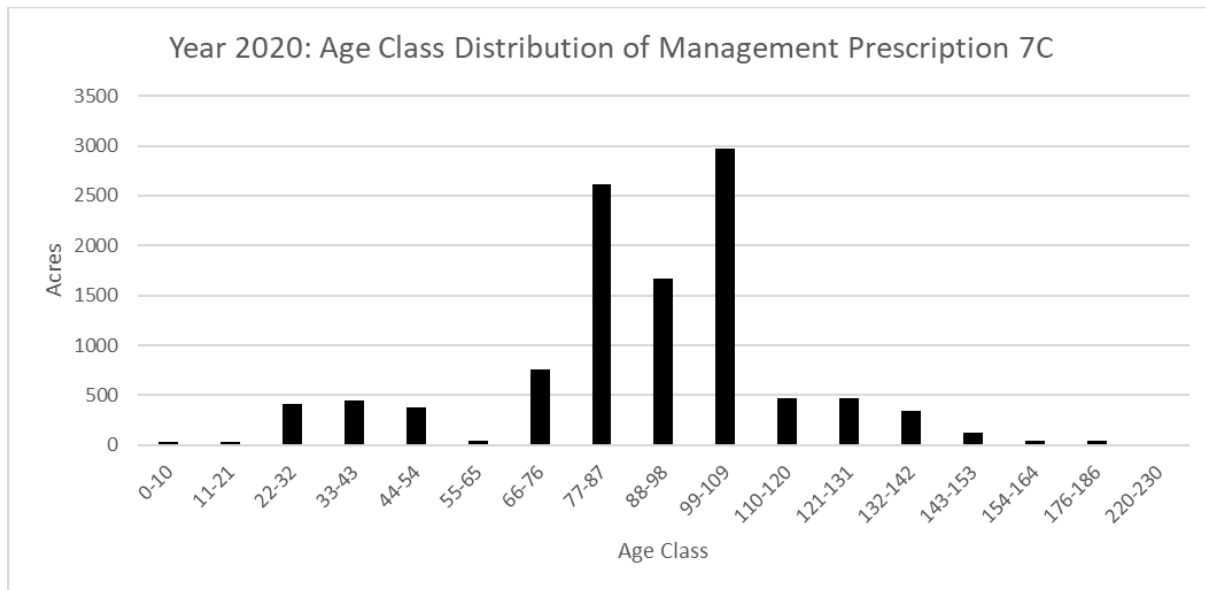
MQ3 E12. In Management Prescription 7.C, are we maintaining at least 50% of forested acres in mid to late successional condition, including old growth; at least 20% of forest wide acres in late and old growth condition; and 4 to 10% of acres in early successional forest?

Overall, the Cherokee National Forest is not meeting objectives for early successional forest conditions in Prescription 7C (Off-Highway Vehicle Use Areas) but is meeting objectives for mid to late successional conditions. There is a need to increase the proportion of early successional habitat from 0.2% to 4-10%.

The table below depicts the acres and percentage of land in each of the successional classes across the roughly 11,000 acres of land in Management Prescription 7C.

The chart below depicts the age class distribution in Management Prescription 7C.

Successional Class	Age Class	7C Acres	% of Total
Seedling	0-10	26	0.2%
Sapling/Pole	11-40	834	8%
Mid-Successional	41-90	4,371	40%
Late-Successional (incl. old)	91-120	4,589	42%
Old Forest	120+	1,035	10%



MQ3 E13. 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, discing, applying herbicide, sowing, liming and/or fertilizing.

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

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.

Monitoring Discussion and Findings

MQ 4 E 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.

MQ 4 E 2. Management Indicator Species – Birds

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. Point counts were set up using a stratified random sampling design that allocated a minimum of 30 points either equally among habitat groups or in proportion to group composition. To be able to compare data in this report to previous Monitoring and Evaluation Reports, North America Breeding Bird Survey (BBS) trend estimates from 1966-2017 in the Appalachian Region (<https://www.mbr-pwrc.usgs.gov/> and used in previous reports) will be discussed as well as recent analysis of the R8 Bird database. Matseur et al. (2020) used data from the bird point-count surveys from 1992 through 2017 on the Cherokee National Forest to model abundance and trends of 102 individual bird species at points over time, using time-removal models within a hierarchical Bayesian framework. Models included both detection (observation) and abundance (ecological) processes as well as trend estimates. They estimated species trends in the same model as year-specific abundance by calculating the geometric mean of the changes in estimated abundance from one year to the next across the entire time period. This estimate is a true population trend and is analogous to the geometric mean trend estimate from hierarchical models now reported for the BBS (Sauer and Link 2011). Although annual trend estimates may be more variable, they stem directly from the estimated annual abundances and provide a realistic idea of the year-to-year changes that managers would observe for a species on the national forest. Another common method of estimating trends is based on a linear regression through annual abundance estimates (Sauer

and Link 2011), and this is displayed in the table as well. The linear trend is not a true estimate of growth and is less representative of the variation in abundance from year to year. However, it can provide a conservative estimate of the general trend of a species in a national forest over the long term. Linear trends are reported to provide some sense of growth or decline when uncertainty exists in the former. All trend estimates are reported as the mean annual percent change.

Species with the highest average abundances in Matseur et al.'s (2020) study included red-eyed vireo (1.44 birds/point), ovenbird (0.80 bird/point), and American crow (0.77 bird/point). Species with the lowest average abundances were great horned owl (0.01 bird/point), green heron (0.01 bird/point), and northern mockingbird (0.01 bird/point). More species had positive than negative annual trends; 25 species had significant positive annual trends and 4 species had significant negative annual trends. Red-breasted nuthatch had the greatest annual trend (15.97 percent), followed by eastern phoebe (13.15 percent) and American robin (9.19 percent). Some woodland-breeding species with positive annual trends included downy woodpecker (7.78 percent), cedar waxwing (7.60 percent), blue-gray gnatcatcher (6.94 percent), eastern wood-pewee (6.79 percent), red-bellied woodpecker (5.86 percent), northern parula (4.95 percent), eastern tufted titmouse (4.77 percent), and white-breasted nuthatch (4.58 percent). Some early-successional, scrub-breeding species with positive annual trends were Carolina wren (3.43 percent), American goldfinch (3.26 percent), and northern cardinal (2.22 percent). Red-eyed vireo and ovenbird had some of the highest average abundances and had small positive annual trends, 0.45 percent and 0.50 percent, respectively. Of the species with significant negative annual trends, common grackle had the greatest negative trend (-29.27 percent), followed by rose-breasted grosbeak (-6.56 percent) and Canada warbler (-4.55 percent).

Matseur et al. (2020) found that chestnut-sided warbler (a Management Indicator Species) was the only early-successional, scrub-breeding species that had a negative annual trend (-4.18 percent). Linear trends were generally similar to annual trends, but smaller. Trends for Management Indicator Species are listed in Table 5.

Table 5.—Management Indicator Species number of detections, annual trend, linear trend, 95-percent credible interval defined by LCI and UCI, and average abundance for Management Indicator Species on the Cherokee National Forest, 1992–2017 (Matseur et al. 2020).

Species name (habitat represented)	Detections	Annual trend			Linear trend			Abundance (birds/point)
		Trend (percent)	LCI (2.5 percentiles)	UCI (97.5 percentiles)	Trend (percent)	LCI (2.5 percentiles)	UCI (97.5 percentiles)	
Acadian flycatcher (mature riparian)	692	2.07	-0.29	4.75	3.10	1.44	4.76	0.14
Chestnut-sided warbler (early succession)	1,058	-4.18	-6.45	-1.99	-3.65	-5.06	-2.23	0.22
Hooded warbler (dense mesic midstory)	3,542	1.06	0.07	2.06	1.16	0.43	1.88	0.71
Ovenbird (mature interior)	4,027	0.50	-0.42	1.45	-0.03	-0.77	0.71	0.80
Pileated woodpecker (snags)	1,653	2.14	0.62	3.72	0.88	-0.36	2.12	0.39
Pine warbler (pine-oak)	690	-0.47	-2.55	1.68	2.14	-1.52	5.81	0.14
Prairie warbler (early succession)	345	3.10	-1.66	8.24	4.43	1.90	6.95	0.09
Scarlet tanager (xeric oak-pine)	2,339	1.78	0.62	3.01	1.07	-0.18	2.33	0.47

As expected, pileated woodpecker showed increasing trends due to the increasing age of the National Forests and abundance of large snags. BBS data also show an increasing trend for the pileated woodpecker (1.351). Acadian flycatcher trends are increasing according to Matseur, however, BBS data show a decrease (-0.799). Riparian corridors are managed on the Forest to retain, restore and enhance riparian associated species (includes Acadian flycatcher). The hooded warbler has an increasing trend in Matseur's data as well as in BBS data (1.79).

Ovenbird populations seem generally stable across the Forest as well as the Appalachian region (trend=0.569). Pine warbler data show slight declines in Matseur's data but steady in BBS data (0.975). Scarlet tanager show positive trends on the Forest but steady in BBS data (-0.002). As expected, early successional species chestnut-sided warbler show steep declines on the Forest according to Matseur, while showing steady numbers in BBS data (-0.001). Prairie warbler show increases on the Forest but declines in the region (-3.16). Chestnut-sided warbler likely

continues to decline on the Forest as higher elevation forest matures, and lower elevation prairie warbler is increasing, possibly related to pest outbreaks impacting trees.

A recent study by Isenhower (2017) analyzed R8Bird point count data as well as BBS route data from 1992-2015 using Poisson regression analysis to determine trends in relative abundance over time (years) and in response to various forest management and climate variables for 18 species. Twelve of 18 species he examined on the CNF and 3 of 18 species on adjacent BBS routes had significant change (7 decline, 5 increase- CNF; 3 decline- BBS) in abundance over the 24-year period. Six of 18 species abundance trends differed depending on if the BBS route was on public land vs. private land. Most species abundances were related to a complex interaction of temperature and precipitation covariates. Based on the Beta estimates of the base model with the univariate year effect for each species, on the CNF, hooded warbler, red-eyed vireo, prairie warbler, Carolina chickadee, and tufted titmouse all showed positive trends in relative abundance by year, whereas Canada warbler, black-throated blue warbler, winter wren, worm-eating warbler, chestnut-sided warbler, indigo bunting, and yellow-breasted chat showed negative trends in relative abundance by year.

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.

Isenhower (2017) found that forests on the CNF in general are maturing, with an 83% reduction in timber harvest over the monitoring period (0.2%/year in 1992, 0.03%/year-2015). That trend has continued into this monitoring period. Consistent with these conditions, mature forest bird abundances on the CNF are generally stable, reflecting the continued availability of mature forest breeding habitat. In contrast, the amount of young forest has decreased over time, consistent with the decline in relative abundance of 3 of 4 young-forest species in Isenhowers's study. Matseur et al. also found declines in chestnut-sided warbler. The declines of Canada warbler, black-throated blue warbler, winter wren, and worm eating warbler on the CNF are of interest because the general maturation of the forest should be providing more available habitat for these species. All of these species, however, require dense understories for breeding habitat. Their apparent decline may reflect the lack of canopy gaps concurrent with understory development in middle-aged closed-canopy forests that lack natural disturbance. Canada warbler is a species of greatest conservation concern because of declining populations in the northern part of their range. All four of these species are Nearctic-Neotropical migrants, such that their population status could be affected by non-breeding season events. Canada warbler is particularly vulnerable because their non-breeding season range in northern South America has been highly affected by deforestation.

The lack of response by birds in Isenhower's study to prescribed burning may be largely attributed to the nature of the burning that is being conducted. Most often low-intensity, dormant-season fires for fuel reduction, albeit at times in large burn blocks (e.g., 100s of ha) are prescribed. Although the fires may meet the fuel-reduction goals, they aren't prescribed to affect overstory structure and thus are not expected to significantly benefit or harm avian species. The 2 species that had negative relationships with the amount of prescribed burning both select forest stands with high understory densities, which may have been affected by the prescribed burning program. For 5 of 6 species that showed relationships with timber harvest or prescribed burning, the best-supported models also included an interaction term of the two sources of disturbance. Thus, it may not be just one form of disturbance certain species are responding to but instead they are responding to the cumulative amount of disturbance. Although the ecological effects of timber harvest and prescribed burning can differ, each disturbance has the ability to affect understory and midstory structure and composition.

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

The black bear population on the Forest is estimated to be steadily increasing for the past 30 years, with 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 2017 and 2019 shows that visitation to bait sites has decreased by 4.0% in counties that include the Cherokee. Tennessee completes bait station surveys every two years. Harvest of black bears during the Tennessee hunting season from 2005-2017 was at a record high. That declined in 2018. Total harvest for the North Cherokee and South Cherokee Wildlife Management Areas was 310, while harvest in forest counties was 209 total bears. In 2019, total harvest for the North Cherokee and South Cherokee Wildlife Management Areas was 286, while harvest in forest counties was 161 total bears. Harvest in forest counties is displayed in Figure 26 and shows a marked decrease in numbers the last two years. However, bear harvest on the WMA is steady.

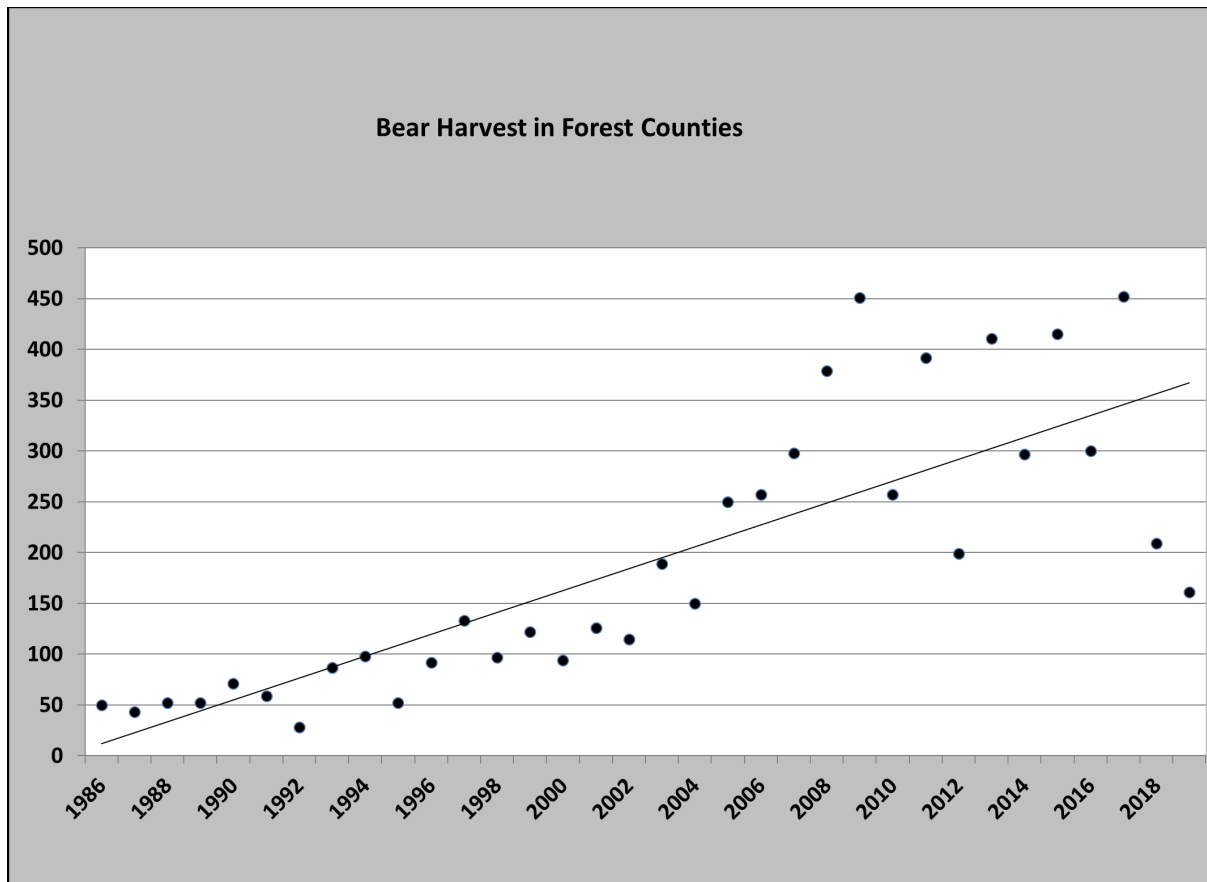


Figure 26. Bear harvest in Tennessee on national forest lands.

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. Nuisance bear reports are tracked to assess the type of unwanted incidents and develop adaptive management strategies. In 2018, a total of 38 incidents were reported, 28 more than in 2017. In 2019, a total of 18 were reported. Most of these were attributed to improper food and trash storage. 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. A Forest-wide food and trash storage closure order went into effect December 2017. TWRA is also implementing a public education campaign called “BearWise” which will educate and challenge the public to take responsibility and recognize their role in bear management.

For bear management, future 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 the 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.

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

MQ 4 E 3. No new information

MQ 4 E 4. Open road miles in TWRA bear reserves and motorized access trail miles in TWRA bear reserves remained stable.

MQ 4 E 5. Conversion to native grasses continues to occur in several areas.

MQ 4 E 6. No new information

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

Trend in Aquatic Habitat Conditions

The current condition of stream habitat across the CNF is variable and many sites are degraded due to impacts from historic logging operations, fire, and ongoing anthropogenic disturbances. Historic impacts include loss of large wood recruitment, unstable banks and head cutting, erosion and sedimentation, disconnection from the floodplain, and lack of deep pool habitat. However, quality stream habitat does exist and the CNF is a stronghold for a number of threatened, endangered, R8 sensitive, and species of viability concern (AQ-TESV) aquatic species. The distribution of many of these species is limited to small sections of larger rivers and small sections of headwater streams that are often disjointed because of physical barriers or degraded habitat limitations. Ongoing threats to aquatic habitat include the invasion of noxious weeds, increased erosion and sedimentation from dispersed areas and roads, and a decline in the distribution of rare aquatic species across the landscape due to disconnected and isolated populations and invasion by non-native aquatic species. The CNF Aquatics Program implements stream habitat improvements annually with the propose to improve and restore aquatic habitat by enhancing instream habitat complexity, reconnecting streams to their floodplains, reducing sedimentation, improving fish passage, restoring riparian function, eliminating non-native invasive species, and expanding the distribution and genetic diversity of at risk aquatic species. In 2018 and 2019 stream habitat improvement activities focused on adding instream structure (large wood), the removal of fish passage barriers and the installation of aquatic organism passage structures (AOP), rock dam removal, sediment control, and bank stabilization. Work on the north zone focused on streams with occupied Brook Trout populations (see section 25), and the south zone focused on streams benefiting a number of AQ-TESV species (see section 7). Overall, activity that directly improved physical habitat characteristics totaled approximately 25 miles in 2018 and 12 miles

in 2019. No known management activities or new disturbances to stream habitat were documented in this reporting period and stream habitat across the forest was maintained in its existing condition. No increasing or decreasing trends in aquatic habitat conditions as a whole can be determined at this time.

MQ 5 E1: Populations of all TES species are monitored each year

Metric – T&E species are monitored through snorkel surveys; sensitive fish species may be sampled with electrofishing; other aquatic snails, insects and mussels are sampled with nets, surber samplers, and other gear using defined protocols.

Aquatic TESV Species Monitoring

AQ-TESV species are monitored by a number of various agencies and partners across the CNF annually. Monitoring during the reporting period was conducted by Conservation Fisheries Inc. (CFI), Tennessee Department of Environmental Control (TDEC), Tennessee Wildlife Resources Agency (TWAR), Tennessee Valley Authority (TVA), Universities, and CNF Aquatic Biologists. The CNF has never held a USFWS Section 10 permit for monitoring and relies on partner agencies to lead or conduct monitoring for threatened and endangered aquatic species. Not all AQ-TESV species are monitored annually due to the number of species present and the intensity of monitoring required to obtain statistically valid trend data that may be beyond budgetary constraints and may adversely impact the target species. Additionally, the CNF has not established a monitoring/sampling schedule for many of the AQ-TESV species found on the Forest. CNF Aquatic Biologists are working to establish new monitoring protocols and schedules for many AQ-TESV species. This will entail selecting and establishing long term monitoring sites, establishing a monitoring schedule, and generating data that can be used in future trend analysis. It is estimated for some species that this may take 3-5 years to collect enough data to display any trend in populations. In 2020 monitoring protocols, schedules, and long-term monitoring sites are being developed for TN Dace and Hellbender. It is anticipated that the remaining species that do not currently have established monitoring protocols or schedules be completed by the next report date. Table AQ1 lists the current AQ-TESV species on the Forest and indicates if they have been sampled in the last reporting period and if not, the last monitoring event on record.

Table AQ1. Monitoring of AQ-TESV species that occurred during the reporting period. Species monitored using quantitative or semi-quantitative protocols are indicated in **bold**. Qualitative presence/absence monitoring is indicated with an * and is collected while conducting educational snorkeling program events. Qualitative data should not be used to determine population estimates or indicate trends over time.

Group	Common Name	Scientific Name	Rank	2018	2019	Last Monitoring Record
Amphibia	Hellbender	<i>Cryptobranchus alleganiensis</i>	S	Yes	Yes	2019
Crustacea	Mountain Crayfish	<i>Cambarus conasaugaensis</i>	S	No	No	UNK (1959)

Fish	Amber Darter	<i>Percina antesella</i>	E	N/A	N/A	Not on Forest
Fish	Blotched Chub	<i>Erimystax insignis</i>	S	Yes	Yes	2019
Fish	Blotchside Logperch	<i>Percina burtoni</i>	S	Yes	Yes	2019
Fish	Blue Shiner	<i>Cyprinella caerulea</i>	T	Yes*	Yes*	2019
Fish	Bridled Darter	<i>Percina kusha</i>	S	Yes*	Yes*	2019
Fish	Bronze Darter	<i>Percina palmaris</i>	V	Yes*	Yes*	2019
Fish	Citico Darter (Duskytail Darter)	<i>Etheostoma sitikuense (Etheostoma percunurum)</i>	E	Yes	Yes	2019
Fish	Coldwater Darter	<i>Etheostoma ditrema</i>	V	N/A	N/A	Not on Forest
Fish	Conasauga Logperch	<i>Percina jenkinsi</i>	E	Yes*	Yes*	2019
Fish	Fatlips Minnow	<i>Phenacobius crassilabrum</i>	V	No	No	1987
Fish	Frecklebelly Madtom	<i>Noturus munitus</i>	V	N/A	N/A	Not on Forest
Fish	Holiday Darter	<i>Etheostoma brevirostrum</i>	S	Yes*	Yes*	2019
Fish	Lake Sturgeon	<i>Acipensor fulvescens</i>	S	No	No	UNK
Fish	Lined Chub	<i>Hybopsis lineapunctata</i>	V	N/A	N/A	Not on Forest
Fish	Mountain Brook Lamprey	<i>Ichthyomyzon greeleyi</i>	S	No	No	2009
Fish	Olive Darter	<i>Percina squamata</i>	S	No	No	1995
Fish	Redeye Bass	<i>Micropterus coosae</i>	S	Yes*	Yes*	2019
Fish	Sharphead Darter	<i>Etheostoma acuticeps</i>	S	No	No	1991
Fish	Smoky Madtom	<i>Noturus baileyi</i>	E	Yes	Yes	2019
Fish	Snail Darter	<i>Percina tanasi</i>	T	Yes	Yes	2019
Fish	Spotfin Chub	<i>Erimonax monachus</i>	T	Yes	Yes	2019
Fish	Tennessee Dace	<i>Phoxinus tennesseensis</i>	V	Yes*	Yes*	2019
Fish	Trispot Darter	<i>Etheostoma trisella</i>	T	N/A	N/A	Not on Forest
Fish	Wounded Darter	<i>Etheostoma vulneratum</i>	S	Yes*	Yes*	2018
Fish	Yellowfin Madtom	<i>Noturus flavipinnis</i>	T	Yes	Yes	2018
Gastropod	Christy's Elimia	<i>Elimia christyi</i>	S	No	No	2009
Gastropod	Smooth Mudalia	<i>Leptoxis virgata</i>	S	No	No	2009
Gastropod	Spiny Riversnail	<i>Io fluviialis</i>	S	N/A	N/A	Not on Forest

Insect	Allegheny Snaketail	<i>Ophiogomphus incurvatus alleghaniensis</i>	S	No	No	UNK
Insect	Appalachian Snaketail	<i>Ophiogomphus incurvatus</i>	V	No	No	2000
Insect	Cherokee Clubtail	<i>Gomphus consanguis</i>	S	N/A	N/A	Not on Forest
Insect	Edmund's Snaketail	<i>Ophiogomphus edmundi</i>	S	No	No	1999
Insect	Green-faced Clubtail	<i>Gomphus viridifrons</i>	S	No	No	2001
Insect	Helma's Net-spinning Caddisfly	<i>Cheumatopsyche helma</i>	V	No	No	1982
Insect	Mountain River Cruiser	<i>Macromia margarita</i>	V	N/A	N/A	Not on Forest
Insect	William's Giant stonefly	<i>Megaleuctra williamsae</i>	V	N/A	N/A	Not on Forest
Mussel	Alabama Creekmussel	<i>Strophitus connasaugaensis</i>	S	No	No	2007
Mussel	Alabama Moccasinshell	<i>Medionidus acutissimus</i>	T	N/A	N/A	Not on Forest
Mussel	Alabama Rainbow	<i>Villosa nebulosa</i>	S	No	No	2014
Mussel	Alabama Spike	<i>Elliptio arca</i>	S	N/A	N/A	Not on Forest
Mussel	Appalachian Elktoe	<i>Alasmodonta raveneliana</i>	E	No	No	2014
Mussel	Coosa Creekshell	<i>Villosa umbrans</i>	S	No	No	2005
Mussel	Coosa Moccasinshell	<i>Medionidus parvulus</i>	E	N/A	N/A	Not on Forest
Mussel	Cumberland Bean Pearly Mussel	<i>Villosa trabalis</i>	E	No	No	2016
Mussel	Delicate Spike	<i>Elliptio arctata</i>	S	No	No	2003
Mussel	Fine-lined Pocketbook	<i>Hamiota altilis</i>	T	No	No	2010
Mussel	Fluted Kidneyshell	<i>Ptychobranhus subtentum</i>	E	N/A	N/A	Not on Forest
Mussel	Georgia Pigtoe	<i>Pleurobema hanleyianum</i>	E	No	No	2005
Mussel	Green Floater	<i>Lasmigona subviridis</i>	V	N/A	N/A	Not on Forest
Mussel	Ovate Clubshell	<i>Pleurobema perovatum</i>	E	N/A	N/A	Not on Forest
Mussel	Oyster Mussel	<i>Epioblasma capsaeformis</i>	E	N/A	N/A	Not on Forest
Mussel	Purple Lilliput	<i>Toxolasma lividus</i>	V	N/A	N/A	Not on Forest
Mussel	Rayed Kidneyshell	<i>Ptychobranhus foramianus</i>	E	No	No	2000
Mussel	Slabside Pearlymussel	<i>Pleronaia dolabelloides</i>	E	No	No	2002

Mussel	Southern Acornshell	<i>Epioblasma othcaloogensis</i>	E	N/A	N/A	Not on Forest
Mussel	Southern Clubshell	<i>Pleurobema decisum</i>	E	N/A	N/A	Not on Forest
Mussel	Southern Pigtoe	<i>Pleurobema georgianum</i>	E	No	No	2014
Mussel	Tan Riffleshell	<i>Epioblasma florentina walkeri</i>	E	No	No	1993
Mussel	Tennessee Clubshell	<i>Pleurobema oviforme</i>	S	No	No	2016
Mussel	Tennessee Heelsplitter	<i>Lasmigona holstonia</i>	S	No	No	1998
Mussel	Tennessee Pigtoe	<i>Pleurobema barnesiana</i>	S	No	No	No Record
Mussel	Upland Combshell	<i>Epioblasma metastriata</i>	E	N/A	N/A	Not on Forest
Reptiles	Bog Turtle	<i>Glyptemys muhlenbergii</i>	T	N/A	N/A	Not on Forest

MQ 5 E2: What are the trends in results of systematic stream fish community inventories?

Metric – Number of populations of each mussel, aquatic snail, and aquatic insect species that are tracked relative to previous years. Stream fish species are sampled with electrofishing; other aquatic snails, insects and mussels are sampled with nets, surber samplers, and other gear using defined protocols.

With the exception of threatened and endangered (TE) fish, and occupied trout streams, trend data is limited for most aquatic species on the Forest since long term monitoring sites and schedules have not been developed. Trends to TE fish are reported in monitoring question 7 and trout monitoring surveys are reported in either question 9 Demand Species (all trout) or question 25 Focal Species (Brook Trout).

Mussels and aquatic snails have not been monitored since 2016 (Hiwassee River only). Aquatic insects are reported in MQ5: Element 4.

Several streams have been monitored on the south zone of the forest since 2004. None of these streams are known to have populations of AQ-TESV species but rather track the diversity of other common native fish species. The data collected is qualitative and standard reach lengths, catch per unit area, catch per unit effort, or standing crop are not recorded. Only number of species is consistently recorded at these sites and can be reported as a measure of richness for an individual stream temporally. Charts AQ1 and AQ2 presented below display fish species richness at eight sites from three south zone watersheds over a ten year period. No strong increasing or decreasing trend in species richness is apparent and fish communities appear to be stable over time. There may be some variability in the richness at each site due to the fact that some monitoring stations have changed over the years and there is not a standard reach length. This may influence surveyor bias by including or excluding habitats from year to year. This work was discontinued in 2020 and will be replaced with long term monitoring sites on AQ-TRESV streams and Brook Trout streams.

Chart AQ1. Fish species richness at four streams in the Hiwassee River watershed: Big Lost Creek, Coker Creek, Spring Creek, and Conasauga Creek.

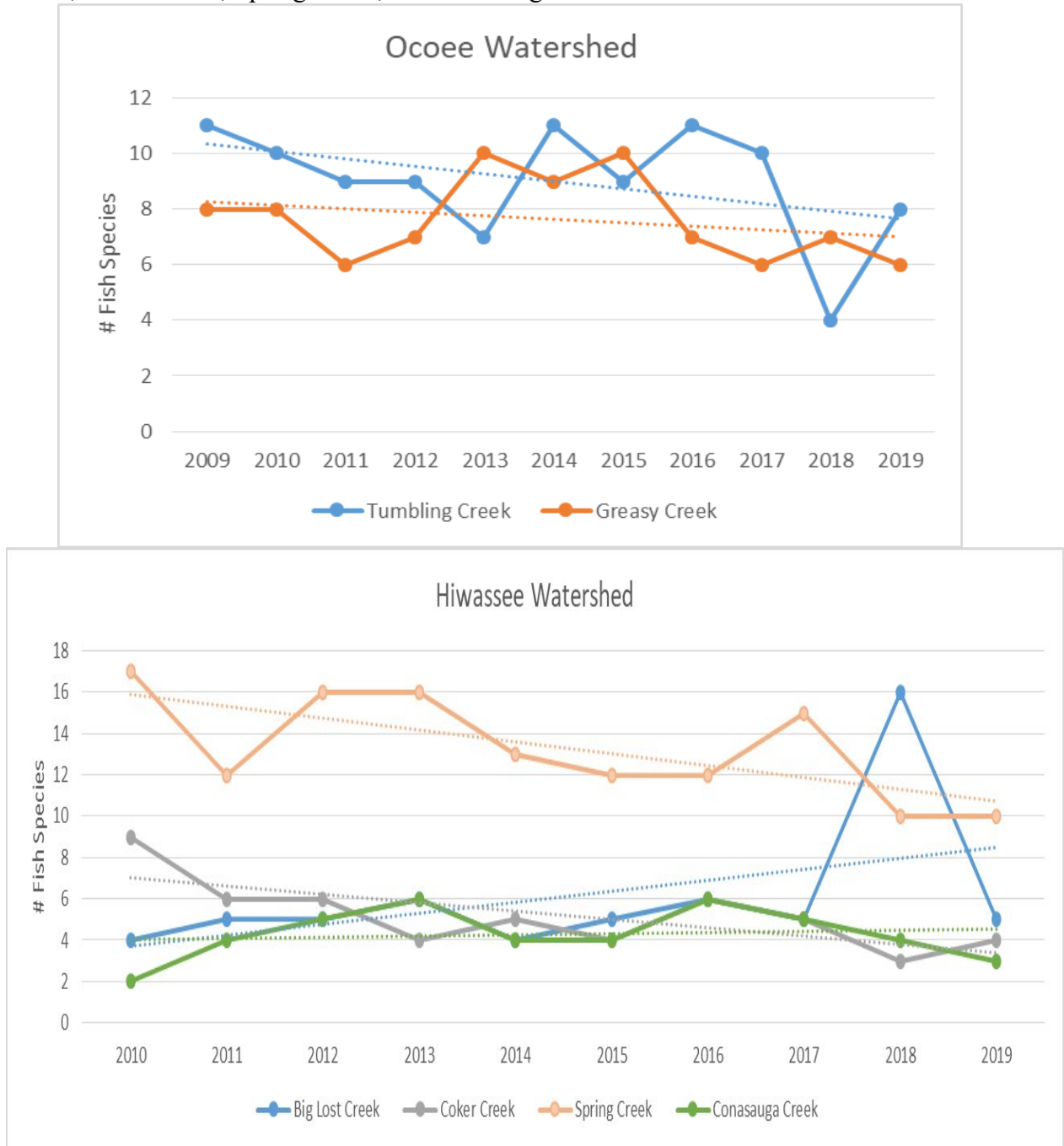
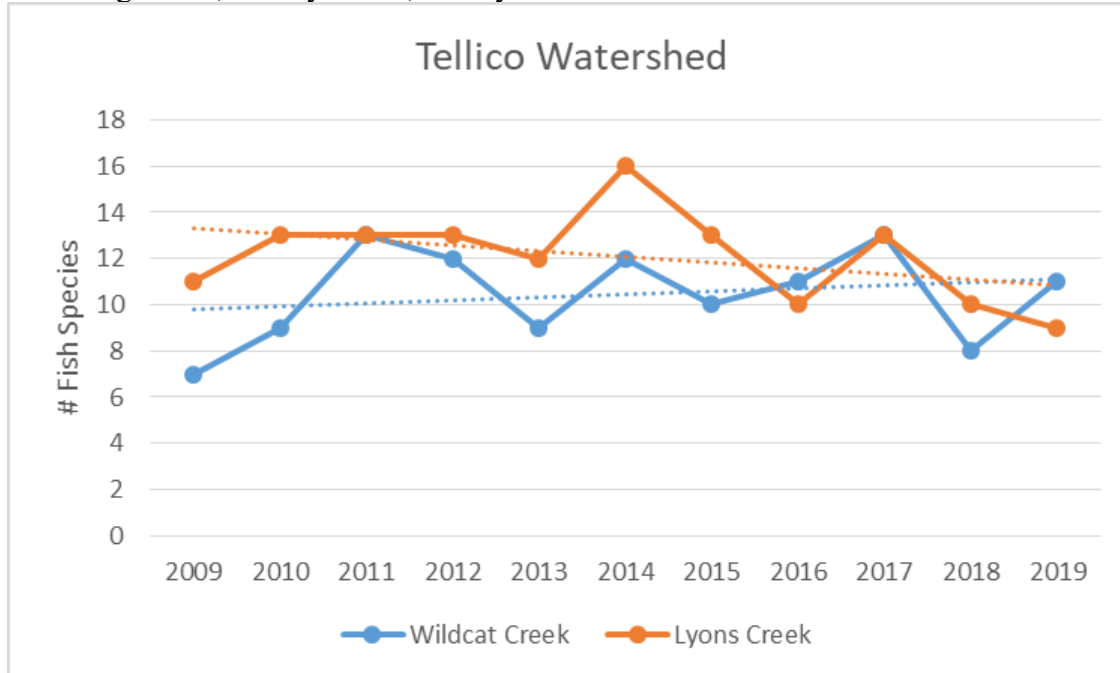


Chart AQ2. Fish species richness at four streams in the Ocoee and Tellico River watersheds: Tumbling Creek, Greasy Creek, and Lyons Creek.



MQ 5 E3: What are the trends in results of systematic stream fish community inventories?

Metric – Lake fish are sampled with seine nets.

Lake surveys were not conducted in 2018-2019. The CNF has not conducted surveys in lakes or ponds since at least 2003, or if ever, in the last 20 or more years. Only 13” lakes” or ponds are found on the CNF and the majority of these waterbodies are man-made reservoirs. Most of these reservoirs are stocked with a number of non-native game fish and other fish used to control invasive aquatic vegetation by TWRA and TVA. Furthermore, TWRA and TVA stocks these waterbodies predominately with non-native fish for recreational fishing purposes and/or aquatic vegetation control which makes trends extremely difficult to assess. The lack of monitoring and data for the last 20 years makes it impossible to assess systematic trends in lake fish for the purposes of this report. Trends in lake fish do not reflect positive or negative management practices or habitat quality on the CNF and it is recommended that this monitoring element question be removed from future reports due to the simple fact that the CNF does not currently or has not historically monitored these waterbodies.

MQ 5 E4: What are the conditions and trends in aquatic macroinvertebrate populations associated with ground disturbing projects?

Metric – Aquatic macroinvertebrate sampling (EPA’s Rapid Bioassessment Protocol II (EPA 1989) with modifications by Smith & Voshell (1977).

Aquatic macroinvertebrates were not monitored in 2018-2019. The CNF has not conducted surveys for aquatic macroinvertebrates since 2000 with one exception in the McNabb Creek watershed in 2005 when 4 sites were sampled in relation to an acid rock mitigation project. No further monitoring or trend data is available for this specific project.

Macroinvertebrate communities are known to respond to stream bottom conditions, as well as other factors (e.g., temperature, water velocity, chemistry). Organic enrichment, excess fine sediment, and anthropogenic stress, will often reduce the diversity of intolerant insect taxa in a stream. It has been demonstrated that macroinvertebrate community metrics are minimally variable between years and over time and are a robust indicator of overall stream health conditions. Future monitoring efforts will include a quantitative monitoring approach which gives us a rigorous multi variate dataset that evaluates biological stream health over time. This approach is comparable to the monitoring and protocols currently used by TDEC using a Semiquantitative Riffle Kick method. TDEC annually samples two long term monitoring stations on the CNF as part of a statewide climate change study. A summary of the taxa richness and abundance among the insect Orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) and Ephemeroptera richness is presented in charts AQ3, and AQ4 below. These orders are commonly considered sensitive to pollution and EPT richness is a good overall indicator of stream health conditions. The richness of Ephemeroptera (mayfly) taxa indicates the ability of a stream to support this generally intolerant insect order. Environmental and anthropogenic stress will often reduce the diversity of mayflies at a site. Overall trends in EPT and Ephemeroptera richness at these sites is stable and does not indicate a strong increasing or decreasing trend. EPT richness greater than 20 taxa typically indicates robust stream health conditions. A sharp drop in EPT richness can be observed in fall 2016 and was likely caused by increased temperature and low flow from severe drought conditions. The macroinvertebrate communities quickly rebounded in 2017 and have been maintained at baseline levels.

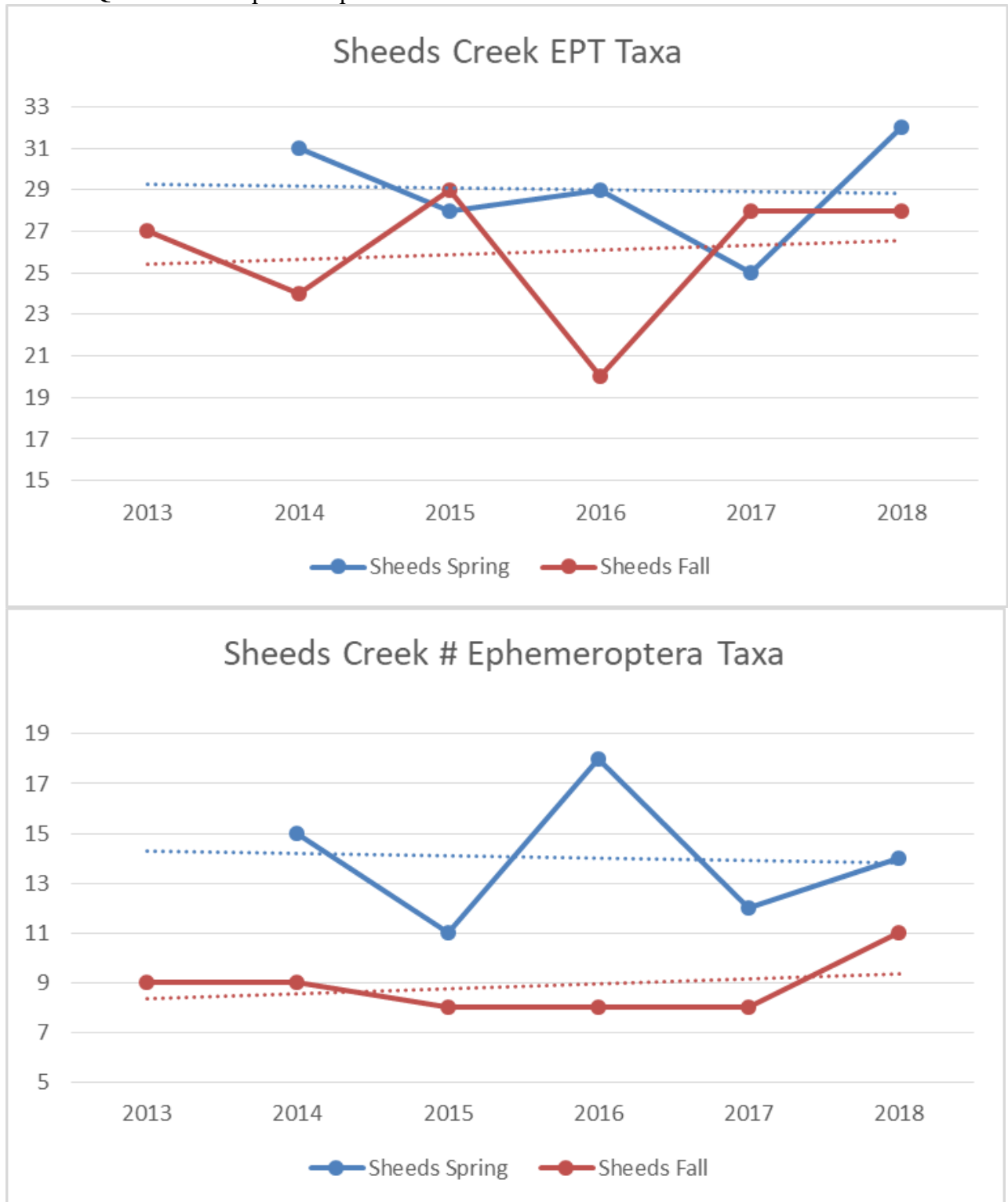
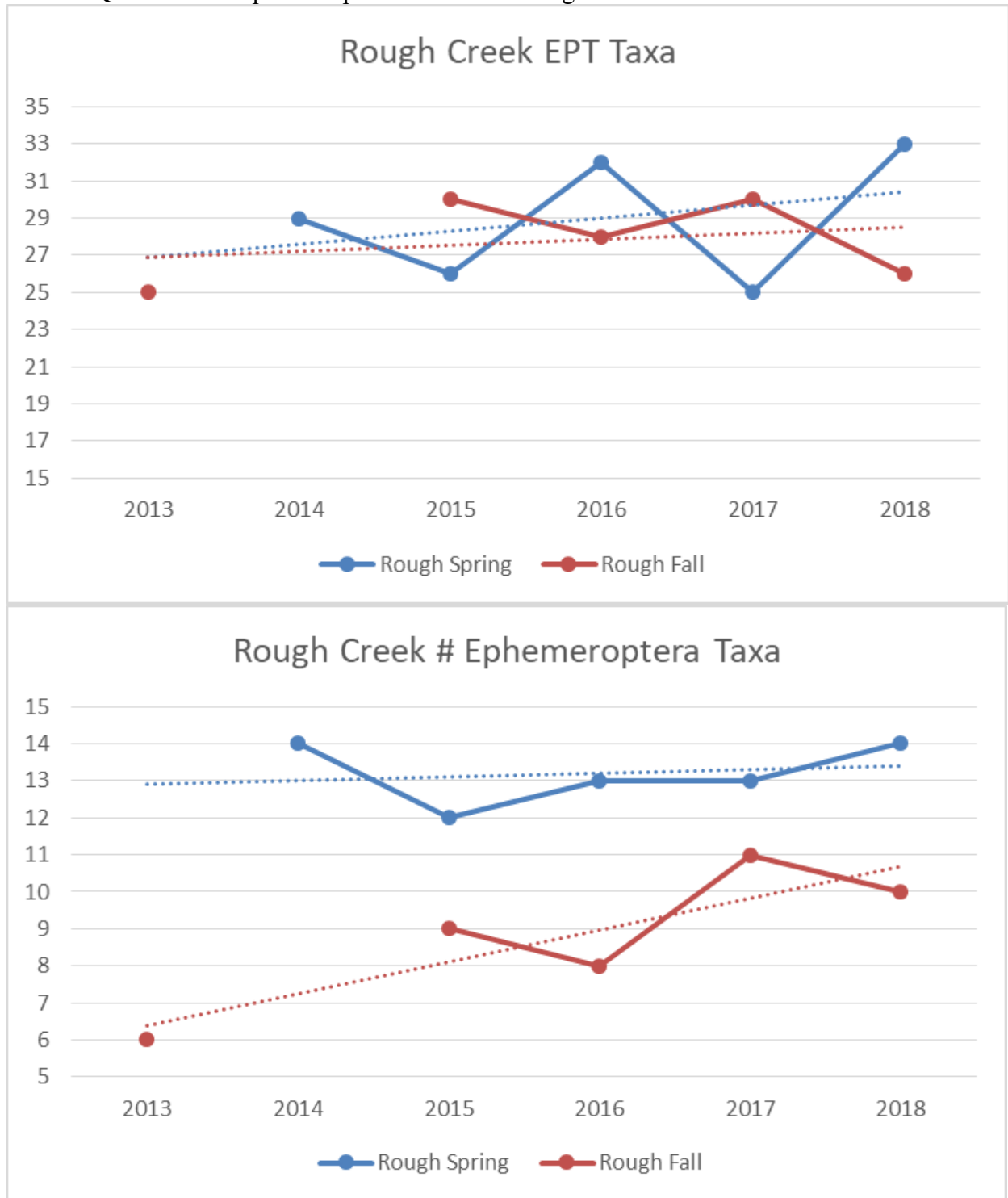
Chart AQ3. EPT and Ephemeroptera richness in Sheeds Creek.

Chart AQ4. EPT and Ephemeroptera richness in Rough Creek.



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 botanical monitoring elements are defined as follows:

MQ6 E3. What are the trends in forest composition and condition that have been associated with these insects and diseases?

MQ6 E4. Are planned measures to control destructive insects and disease being achieved?

MQ6 E5. Are there established populations of target weed species within proposed project areas, adjacent to T&E locations or within wildlife openings?

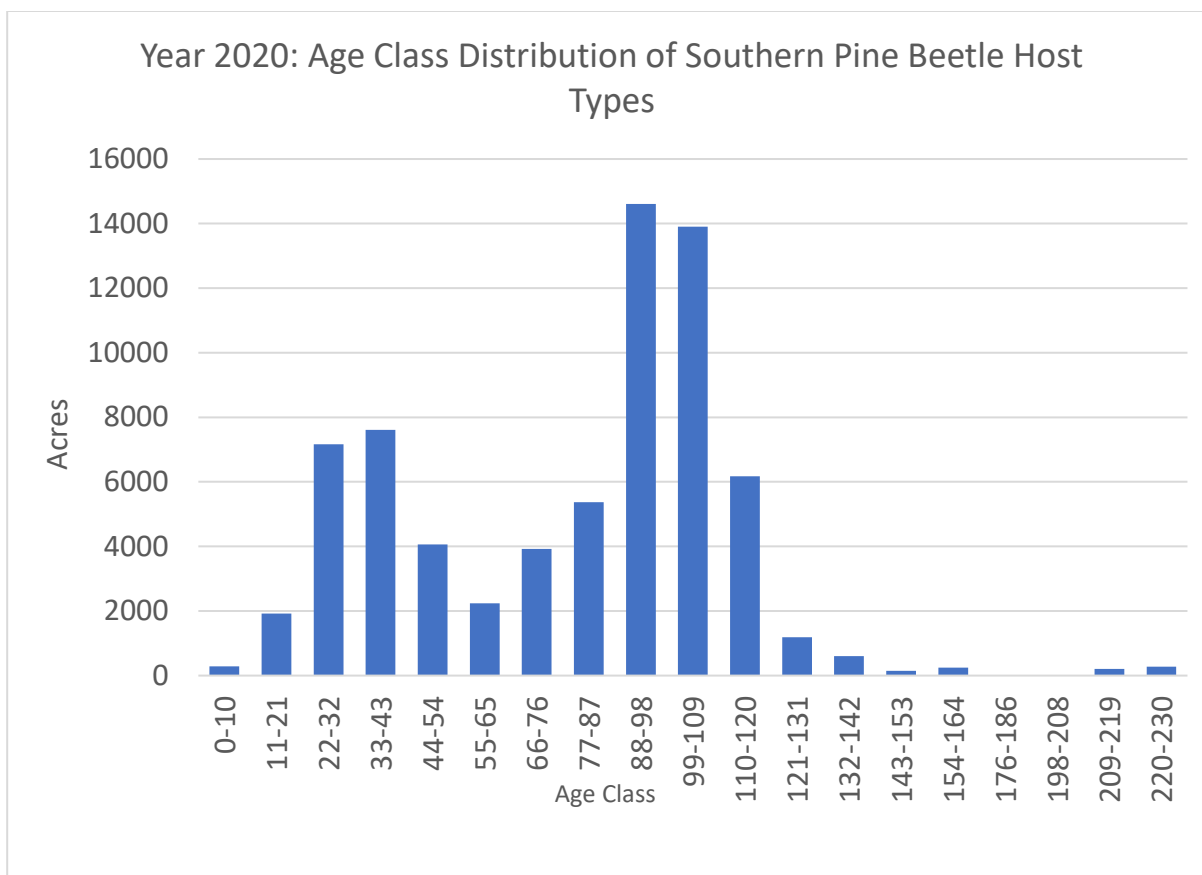
MQ6 E6. What are the trends in the number of occurrences and/or acreage of selected non-native species?

MQ6 E7. Are there established populations of target weed species within proposed project areas, adjacent to T&E locations or within wildlife openings?

Monitoring Discussion and Findings

MQ6 E3. Refer to MQ2 E12 for a discussion on the southern pine beetle. Southern pine beetle primary host trees include southern yellow pines, especially Shortleaf, loblolly, Virginia, Table Mountain, and pitch pines. Southern pine beetles usually attack trees that are at least 15 years old and if they are stressed from a lack of soil moisture, intense fire, or from some other disturbance. Ensuring stand health through management and improved growing conditions promotes vigorous tree growth which increases the probability that individual trees can expel beetles with pitch.

Below is the age class distribution for forest types on the Cherokee National Forest that contain primary host trees for southern pine beetle (loblolly pine, loblolly pine-hardwood, pitch pine, pitch pine-oak, shortleaf pine, shortleaf pine-oak, Table Mountain pine, Table Mountain pine-hardwood, Virginia pine, Virginia pine-oak).



MQ6 E4. Yes. Measure are being taken to monitor gypsy moth, southern pine beetle, and hemlock wooly adelgid (HWA) infestations. Planned measure are being implemented using an integrated pest management strategy which includes promoting healthy vigorously growing stands through active management (e.g. thinning), harvest of susceptible trees to mitigate spread, release of healthy trees resistant to pests, and in some cases chemical and biological control (e.g. soil injection of imidacloprid and predator beetles to control HWA, aerial spraying for gypsy moth). Refer to MQ2 E11 and E12 for additional details on the gypsy moth and southern pine beetle.

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 2016, treatments were made on 464 acres,

which are approximately 155 sites. In 2017, treatments were made on 345 acres, which are approximately 115 sites. In 2018 and 2019, 75 sites were treated (approximately 450 acres). Thousand canker disease (TCD) affects walnut, and emerald ash borer affects ash (EAB) were discovered in 2010 in the vicinity of the Cherokee NF. The Cherokee NF is entirely within the EAB quarantine area. A number of counties in TN have been quarantined for TCB, though none on the Cherokee NF. To date, no Asian Longhorn Beetles have been detected in Tennessee; however, it has been found in South Carolina. This invasive insect feed primarily on maple but has a broad host range that includes other hardwoods trees including elms and willows.

MQ6 E5. Refer to MQ6 E6 and E7.

MQ6 E6. 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 has routinely treated approximately 500-700 acres of invasive species infestations per year since completing forest-wide NEPA in 2008. In 2016 and 2019, the forest received additional, multi-year funding for weed treatments through the award of Joint Chiefs projects, which led to additional acres being treated. In 2018 and 2019 approximately 973 acres and 1,028 acres were treated respectively, including sites containing kudzu, autumn olive, tree-of-heaven, Oriental bittersweet, English ivy, privet, tall fescue, lespedeza, purple loosestrife, Japanese honeysuckle, and Japanese knotweed.



Before and after photos of large Kudzu patch at Butler Cemetery



Before and after photos of large Kudzu patch at Childers Creek

MQ6 E7. 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 150 acres of the acreages 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.

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? and

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)], and

Monitoring Question 12-3: What are trends in Air Quality Related Values (AQRV) in Class 1 Wilderness Areas?

Monitoring Discussion and Findings

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 0.070 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 2012-2019 at sites near the northern and southern ends of the Cherokee National Forest are compared to the ozone NAAQS (Table 1). Note the most recent 3-year averages near the Cherokee National Forest measured ozone concentrations are lower than the standard.

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

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 2-3 in *RLRMP*) are established to contribute to the recovery of threatened, endangered and candidate-species over the life of the *RLRMP*. The monitoring elements and respective responses 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?

Monitoring Discussion and Findings

MQ 7 E 1. 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.

This Forest, in agreement with the U.S. Fish and Wildlife Service, has recovery responsibilities for 39 species federally listed as Threatened or Endangered (Table 30).

Table 30. 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 31. 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	Microhexura montivaga	Spruce-fir moss spider	E	No Critical Habitat on Forest	Roan Mountain
Fish	Cyprinella caerulea	Blue shiner	T	No Critical Habitat on Forest	Conasauga River
Fish	Erimonax monachus	Spotfin chub	T	No Critical Habitat on Forest	Tellico River

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
Fish	Etheostoma sitikuense	Citico darter	E	No Critical Habitat on Forest	Citico Creek & Tellico River
Fish	Noturus baileyi	Smoky madtom	E	Citico Cr. below Barkcamp Br.	Citico Creek & Tellico River
Fish	Noturus flavipinnis	Yellowfin madtom	T	No Critical Habitat on Forest	Citico Creek & Tellico River
Fish	Percina antesella	Amber darter	E	No Critical Habitat on Forest	Nearest record is 5 miles downstream of Forest
Fish	Percina jenkinsi	Conasauga logperch	E	Conasauga River	Conasauga River from Halway Br downstream
Fish	Percina tanasi	Snail darter	T	No Critical Habitat on Forest	Hiwassee River & Citico Creek
Mammal	Corynorhinus townsendii virginianus	Virginia big-eared bat	E	No Critical Habitat on Forest	Portions of Carter and Johnson Counties
Mammal	Glaucomys sabrinus coloratus	Carolina northern flying squirrel	E	No Critical Habitat on Forest	>4000 feet in Monroe and Carter Counties
Mammal	Myotis grisescens	Gray bat	E	No Critical Habitat on Forest	Cocke and Greene Counties; Carter and Sullivan Counties on private lands
Mammal	Myotis septentrionalis	Northern long-eared bat	T	No Critical Habitat on Forest	All counties
Mammal	Myotis sodalis	Indiana bat	E	No Critical Habitat on Forest	Monroe County
Mussel	Alasmidonta raveneliana	Appalachian elktoe	E	No Critical Habitat on Forest	Nolichucky River
Mussel	Epioblasma capsaeformis	Oyster mussel	E	No Critical Habitat on Forest	Nearest record is 5 miles downstream of Forest
Mussel	Epioblasma florentina walkeri	Tan riffleshell	E	No Critical Habitat on Forest	Hiwassee River above Apalachia Powerhouse
Mussel	Epioblasma metastriata	Upland combshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	Epioblasma othcaloogensis	Southern acornshell	E	Conasauga River Reach 1 & 2	Nearest record is 8 miles downstream of Forest

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
Mussel	Hamiota altilis	Fine-lined pocketbook	T	Conasauga River Reach 1 & 2	Conasauga River
Mussel	Medionidus acutissimus	Alabama moccasinshell	T	Conasauga River Reach 1 & 2	Nearest record is 4 miles downstream of Forest
Mussel	Medionidus parvulus	Coosa moccasinshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	Pleurobema decisum	Southern clubshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	Pleurobema georgianum	Southern pigtoe mussel	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	Pleurobema hanleyianum	Georgia pigtoe	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	Pleurobema perovatum	Ovate clubshell	E	Conasauga River Reach 1 & 2	Nearest record is 5 miles downstream of Forest
Mussel	Pleronaia dolabelloides	Slabside pearlymussel	E	Hiwassee River	Hiwassee River above Apalachia Powerhouse
Mussel	Ptychobranhus foramanus	Rayed kidneyshell	E	Conasauga River Reach 1 & 2	Conasauga River
Mussel	Ptychobranhus subtentum	Fluted kidneyshell	E	Hiwassee River	Nearest record is 5 miles downstream of Forest
Mussel	Villosa trabalis	Cumberland bean pearly mussel	E	No Critical Habitat on Forest	Hiwassee River above Apalachia Powerhouse
Reptiles	Glyptemys muhlenbergii	Bog turtle	T	No Critical Habitat on Forest	Private land in Johnson and Carter Counties
Nonvasc. Plant	Gymnoderma lineare	Rock gnome lichen	E	No Critical Habitat on Forest	Roan Mountain
Vascular Plant	Geum radiatum	Spreading avens	E	No Critical Habitat on Forest	>4200 feet Carter County
Vascular Plant	Hedyotis purpurea montana	Roan Mountain bluet	E	No Critical Habitat on Forest	Carter County
Vascular Plant	Isotria medeoloides	Small whorled pogonia	T	No Critical Habitat on Forest	Nearest record is in Hamilton County

Cherokee National Forest Threatened and Endangered Species					
Group	Scientific Name	Common Name	FWS	Critical Habitat	Location on Forest
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
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

Table 32 lists the T and E species and the dates their protocols were implemented or the agency responsible for the monitoring.

Table 32. Monitoring Protocols for T&E Species

Group Common Name	Scientific Name	Status	First year Protocol Implemented
Arachnids			
spruce-fir moss spider	Microhexura montivaga	E	No protocol
Fish			
blue shiner	Cyprinella caerulea	T	2000
spotfin chub	Erimonax monachus	T	2004
Citico darter	Etheostoma sitikuense	E	1993
smoky madtom	Noturus baileyi	E	1986
yellowfin madtom	Noturus flavipinnis	T	1986
amber darter	Percina antesella	E	Not on Forest
Conasauga logperch	Percina jenkinsi	E	2000
snail darter	Percina tanasi	T	2002
Mammals			
Carolina northern flying squirrel	Glaucomys sabrinus coloratus	E	2008
gray bat	Myotis grisescens	E	1997
Indiana bat	Myotis sodalis	E	1997
Mussels			
Appalachian elktoe	Alasmidonta raveneliana	E	2003
tan riffleshell	Epioblasma florentina walkeri	E	1993
upland combshell	Epioblasma metastriata	E	Not on Forest
southern acornshell	Epioblasma othcaloogensis	E	Not on Forest
finelined pocketbook	Lampsilis altilis	T	2000
Alabama moccasinshell	Medionidus acutissimus	T	Not on Forest
Coosa moccasinshell	Medionidus parvulus	E	Not on Forest
southern clubshell	Pleurobema decisum	E	Not on Forest
southern pigtoe mussel	Pleurobema georgianum	E	2000
ovate clubshell	Pleurobema perovatum	E	Not on Forest
triangular kidneyshell	Ptychobranhus greenii	E	Not on Forest
Cumberland bean pearly mussel	Villosa trabalis	E	1993
Non-vascular Plants			
rock gnome lichen	Gymnoderma lineare	E	USFWS
Vascular Plants			
spreading avens	Geum radiatum	E	USFWS
Roan Mountain bluet	Hedyotis purpurea var. montana	E	USFWS
small whorled pogonia	Isotria medeoloides	T	Not on Forest

Ruth's golden aster	<i>Pityopsis ruthii</i>	E	1987
White Fringeless Orchid	<i>Platanthera integrilabia</i>	T	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 33).

Table 33. 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

Table 34. Monitoring Protocols for Botanical T&E Species

Common Name	Scientific Name	Status	Lead Agency
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	TVA (data since 1987)
White Fringeless Orchid	<i>Platanthera integrilabia</i>	T	USFS-CNF (data since 1996)
Blue Ridge goldenrod	<i>Solidago spithamea</i>	T	USFWS
Virginia spiraea	<i>Spiraea virginiana</i>	T	Not on Forest

MQ 7 E 2. Recovery Progress

Ruth's Golden Aster



The worldwide distribution of the federally endangered **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 was initially monitored through random

quadrants at several key sites, however in the past several years, more comprehensive counts (total census) have 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, and has been completed every year since that date to present (See Table 36 below).

Table 36 Results of Annual Census – Hiwassee River

Year	Total Count
2010	10,750
2011	10,016
2012	10,582
2013	12,005
2014	12,857
2015	10,986
2016	8,958
2017	8,181
2018	7,837
2019	8,122

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 increase in the census data from 2011-2015 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 large decline in 2016 and 2017 is thought to be a result of an extended outage at the Appalachia Powerhouse that resulted in elevated flows in the river for approximately five months. Continued monitoring will indicate whether this decline has a lasting effect on the population. (From TVA 2019 – “Now that we are a couple years out from the extended, elevated flows resulting from the planned outage at Appalachia powerhouse, it appears that event had a demonstrable negative impacts in a number of areas where plants were inundated for months. There have also been notable dry periods that may have contributed to those declines – 2016 and 2019 for instance. The good news is that habitat still exists at all of these places.”).

The Ocoee River population is much smaller (an average of 874 plants) and is monitored through a complete census each year. Figure 37 summarizes the population trend for the Ocoee River population. The upward trend for this population is statistically significant ($R^2 = 0.87$).

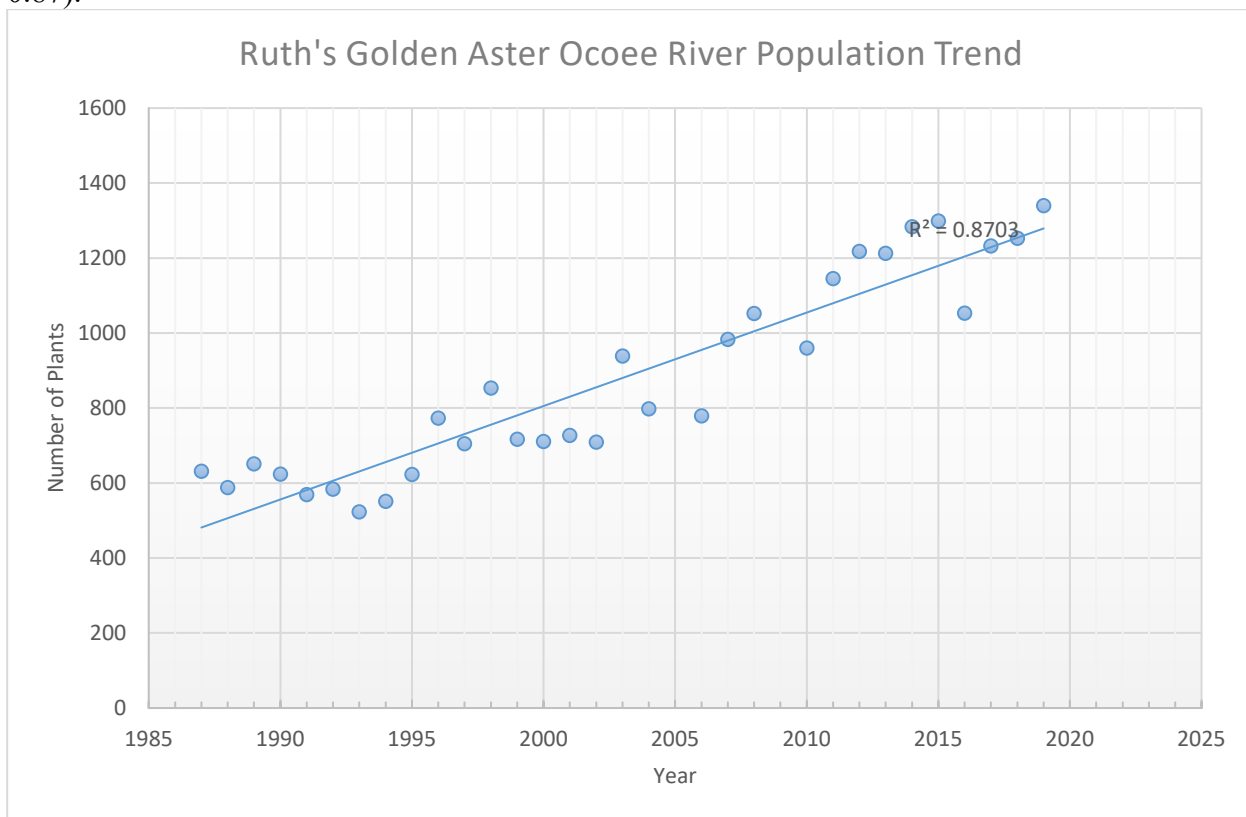


Figure 37 Trend for the Ocoee River population of Ruth's golden aster

White Fringeless orchid



One of the largest known populations in the world for this federally threatened species occurs on the Cherokee National Forest. In 1997 the core area containing the orchids was fenced to keep out feral hogs. 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, and have continued annually as part of the overall monitoring. Presence of the non-native

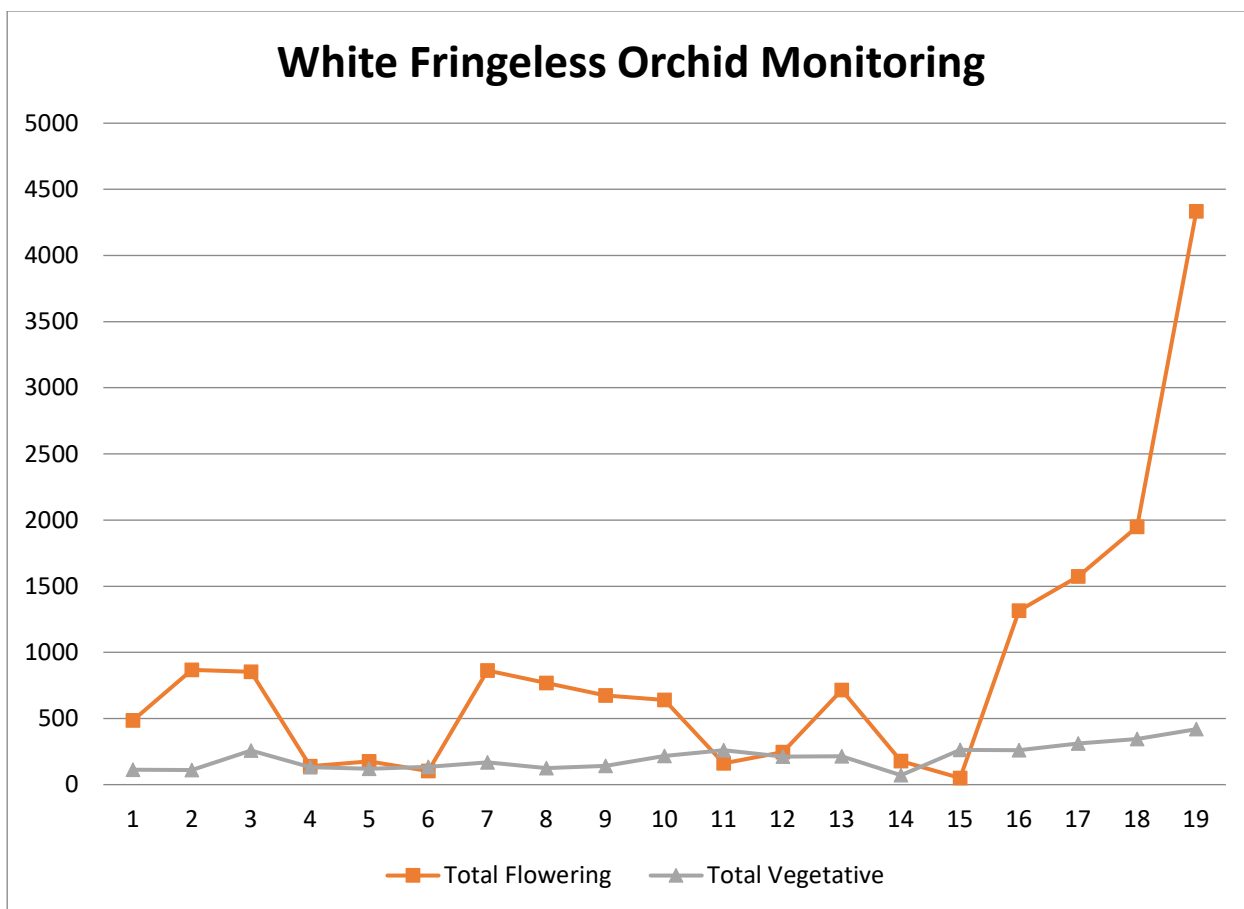
grass species *Microstegium vimineum* has been noted in almost all of the surrounding area, but not in the main part of the bog. It is thought that the dense native cover of sedges, grasses, and forbs are keeping this unwanted species out. During sampling in 2002, damage from feral hogs was apparent 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 up-rooted. Repair of the feral hog exclusion fence was completed later that year and maintenance and repair of this exclusion device has remained an annual 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 the all of the monitoring transects. The 2013 monitoring effort was aborted after encountering very high water levels in the bog (see photos 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.



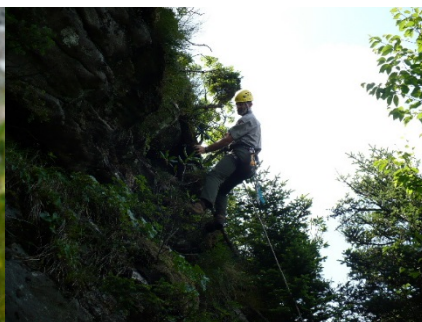
High water in the bog from a very wet summer made monitoring impossible in 2013

Any question of whether the extended period of high water in 2013 might negatively affect the plants, was answered immediately by the large display of flowering individuals seen upon arrival at the bog in 2014. The 2014, 2015, 2016, and 2019 counts have represented the highest number of flowering individuals (1,315, 1,575, 1,948, and 4,333 respectively) counted within the transects to date, with a higher than two-fold increase between 2016 and 2019, following another two extremely wet summers. Figure 38 below displays the total number of flowering and non-flowering individuals within the transects from 1996-2019. No monitoring was conducted in 2017 and 2018 due to extended periods of rain during the monitoring timeframe.



A much smaller site for the species occurs in the vicinity of the Conasauga River along an unnamed tributary to Sawmill Branch. The population size is estimated to be between 50 and 100 individuals. Flowering had not been observed at the site since 2004, however in conjunction with recommendations from the US Fish and Wildlife Service and Atlanta Botanical Gardens, a small canopy opening was made at the site in 2018 with the intent to stimulate flowering. Monitoring in 2019 did yield one flowering plant at the site, however it was located slightly upstream from the area immediately affected by the increased light, thus it is not clear if this was a response to the management, or simply a very good year for the species as evidenced by record numbers seen at many other sites across the species' range in 2019. Future monitoring will document the efficiency of the management.

Roan Mountain Plants: 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.



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 ten to fifteen 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, northeastern Tennessee, and southern Virginia. 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. *Houstonia montana* is known across three separate areas (Carvers Gap west, Grassy Ridge, and Houston Ridge) on the Pisgah NF at Roan Mountain. In addition, one small subpopulation occurs near Engine Gap on the Cherokee NF. The four separate areas on Roan Mountain are treated as three populations based on separation distance of at least two kilometers. The three populations vary significantly in the number of subpopulations and numbers of individuals. Subpopulation numbers and overall population size increase from Houston Ridge to Grassy Ridge to west of Carvers Gap. Monitoring has been variable across the 20 subpopulations. All sites have been visited at least once or searched for during the last 15 years.



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.



The Blue Ridge goldenrod (*Solidago spithamea*) is a federally threatened species that is endemic to three mountaintops 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 six 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. More 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. A fairly large decline in the census numbers along the Hiwassee River has been seen for 2016 thru 2019. This is thought to be a result of an extended outage at the Appalachia Powerhouse that resulted in elevated flows in the river for approximately five months. Continued monitoring will indicate whether this decline has a lasting effect on the population.

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. In years that flowering

numbers are low, the vegetative numbers increase, suggesting the plants are still persisting at the site, just not flowering in some years, and 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. It is recommended that population monitoring and maintenance of the enclosure fence continue. Continued monitoring at the Conasauga site indicate the presence of plants, but mostly in the vegetative stage. Results of the management to create a canopy gap at the site to stimulate flowering are preliminary. One individual was seen flowering in 2019 (for the first time since 2004), but thus far the management primarily appears to have stimulated herbaceous growth of associated plants species in the area. Additional data will be noted in upcoming years.

Roan Mountain Plants: All four federally listed Roan Mountain plant species were observed on Cherokee National Forest lands in 2018-2019, 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 2019. The populations appear to be stable with minor amounts of mortality and new recruitment as seen in previous years.

Roan Mountain bluet: No new information to report in 2019. In 2017, the small subpopulations at Grassy Ridge and Engine Gap were observed and were stable with small subpopulations may no longer be present, probably to woody plant encroachment. The large subpopulation at Roan High Bluff had the greatest number of flowers observed on that site during the last 15 years. The two subpopulations that have been consistently monitored ten times during the last 15 years continue a downward trend.

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 2019. In 2016 and 2017 Andrea Thompson, a North Carolina State University masters student, completed a preliminary population census of this goldenrod. The populations at Roan Mountain during the 2-year assessment were determined to be stable in size and number. The Roan Mt. and Grandfather Mountain subpopulations are the largest ones known across this species limited range.

Aquatic Species

Monitoring protocols have not been specifically developed for all TE aquatic species on the CNF. Aquatic Biologists are working to establish new monitoring protocols and sampling schedules for aquatic TE species. This will entail working with USFWS to establish species specific protocols, selecting and establishing long term monitoring sites, establishing a monitoring schedule, and generating data that can be used in future trend analysis. It is estimated for some species that this may take 3-5 years to collect enough data to display any trend in populations. 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 TE species on the Forest have been established and data is being shared. Current sampling for

Aquatic TE fish species is conducted by CFI and TVA using fish observed per sampling effort snorkeling protocols. The CNF has never held a USFWS Section 10 permit for monitoring T&E species and relies on partner agencies to lead or conduct monitoring for threatened and endangered aquatic species.

Nine TE fish have potential habitat or designated critical habitat on the CNF. Two of these species have not been documented on the forest and the remaining seven should be monitored. Four of the seven TE fish species on the forest are monitored annually by CFI using observed per sampling effort snorkeling surveys (semi-quantitative), one by TVA, and two species are monitored qualitatively during snorkeling programs. This last method however is not a statistically valid method and no specific protocol is in place at this time. The only TE species monitored during the reporting period using semi-quantitate protocols were Snail Darter (TVA), Citico Darter, Smoky Madtom, Yellowfin Madtom, and Spotfin Chub (CFI). Blue Shiner and Conasauga Logperch were monitored using qualitative presence/absence surveys during snorkeling education programs. TE mussels have not been monitored since 2016. TVA sampling data was not available for inclusion in this report.

MQ 7 E 2: What progress is being made toward recovery of aquatic T&E species and conservation of sensitive species?

Metric – track accomplishment of recovery objectives for T&E and conservation strategies for sensitive species.

Accomplishments towards recovery objectives for AQ-TESV species are described below. Many of these species occur in five major streams: Citico Creek, Conasauga River, Hiwassee River, Nolichucky River, and Tellico River. Recovery actions that take place for species in these systems are grouped together by stream. Recovery actions also occurred for Hellbender (sensitive) and Tennessee Dace (viability concern) that occur outside of the five major streams and will be described separately. The CNF captive breeding and release program augmented approximately 20 miles of stream habitat through reintroduction efforts during the reporting period.

Citico Creek

Threatened and Endangered Species: Citico (Duskytail) Darter, Smoky Madtom, Yellowfin Madtom

Sensitive and Viability Concern Species: Hellbender, Blotched Chub, Wounded Darter, Tennessee Clubshell

Recovery objective for all TES species is to provide high quality water:

Water quality in Citico Creek has been maintained at the same level as the last reporting period. However, a number of anthropogenic disturbances exist that contribute to degraded conditions at the local scale. These impacts include dispersed camping along the streambank and associated rock dam building. Impacts from dispersed camping include compacted soils, bank erosion and failure, loss of riparian vegetation, organic pollutants (human waste), and the construction of recreational rock dams. The only mitigation of these impacts is annual removal of rock dams. Rock dams impact TE habitat by moving large rocks that TE fish use for nest sites. The movement of these rocks may cause disturbance to nest sites and lead to males abandoning nests resulting in nest and clutch mortality. The rock dams also alter

habitat function turning riffle and glide habitat into slack water dam pool habitat. The annual breakdown of rock dams restores stream function throughout the winter months until the rock dams are recreated by campers to create swimming areas the next summer season. It is strongly recommended that the forest issue a closure order to prohibit rock dam construction in habitat occupied by threatened, endangered and sensitive aquatic species.

Captive Breeding Program:

- TE fish – Citico Darter, Smoky Madtom, and Yellowfin Madtom: All three species are monitored annually by CFI and a captive breeding program for all three has been established. Releases occur annually in Citico Creek to increase genetic diversity.
- Sensitive Fish - Blotchside Logperch: releases in 2018 and 2019
- Sensitive Amphibians – Hellbender: translocation in 2019. Twelve animals were relocated to Citico Creek from the Hiwassee River. Only four animals survived the initial translocation. It is hypothesized that the remaining animals were casualties of river otter predation.

Conasauga River

Threatened and Endangered Species: Blue Shiner, Conasauga Logperch, Fine-lined Pocketbook, Georgia Pigtoe, Rayed Kidneyshell, and Southern Pigtoe

Sensitive and Viability Concern Species: Bridled Darter, Bronze Darter, Holiday Darter, Redeye Bass, Edmund's Snaketail, Alabama Creekmussel, Alabama Rainbow, Coosa Creekshell, Delicate Spike

Recovery objective for all TES species is to provide high quality water:

Water quality in the Conasauga River has been maintained at the same level as the last reporting period. However, a number of anthropogenic disturbances exist that contribute to degraded conditions at the local scale. These impacts include dispersed camping along the streambank and associated rock dam building. Impacts from dispersed camping include compacted soils, bank erosion and failure, loss of riparian vegetation, organic pollutants (human waste), and the construction of recreational rock dams. The number of dispersed sites along the Conasauga River and Jack's Fork is increasing. As a result, riparian vegetation, bank erosion and sedimentation is continuing to increase in this area. It is recommended that the dispersed campsites within 50 feet of the Conasauga and Jacks River be closed and restored to reduce impacts to critical habitat.

No recovery objectives for AQ-TESV species occurred in the Conasauga River in the reporting Period.

Hiwassee River

Threatened and Endangered Species: Snail Darter, Cumberland Bean Pearlymussel, Slabside Pearlymussel and Tan Riffleshell

Sensitive and Viability Concern Species: Hellbender, Blotchside Logperch, Mountain Brook Lamprey, Olive Darter, Christy's Elimia, Smooth Mudalia, Tennessee Clubshell, Tennessee Heelsplitter, Tennessee Pigtoe

Recovery objective for all TES species is to provide high quality water:

Water quality in the Hiwassee River has been maintained at the same level as the last reporting period.

No recovery objectives for AQ-TESV species occurred in the Hiwassee River in the reporting Period.

Nolichucky River

Threatened and Endangered Species: Appalachian Elktoe

Sensitive and Viability Concern Species: Blotched Chub, Fatlips Minnow, Sharphead Darter, Spiny Riversnail, Green Faced Clubtail

Recovery objective for all TES species is to provide high quality water:

Water quality in the Nolichucky River has been maintained at the same level as the last reporting period.

No recovery objectives for AQ-TESV species occurred in the Nolichucky River in the reporting Period.

Tellico River

Threatened and Endangered Species (experimental population): Citico Darter, Smoky Madtom, Spotfin Chub, Yellowfin Madtom

Sensitive and Viability Concern Species: Hellbender, Blotchside logperch, Wounded Darter

Recovery objective for all TES species is to provide high quality water:

Water quality in the Tellico River has been maintained at the same level as the last reporting period.

Captive Breeding Program:

- TE fish - Duskytail Darter, Smoky Madtom, and Yellowfin Madtom: a captive breeding program has been established for all three species and annual releases occurred in 2018 and 2019.
- Sensitive Fish - Blotchside Logperch: a captive breeding program has been established and annual releases occurred in 2018 and 2019.

Rough Creek

Hellbender Translocation:

In 2018-2019, hellbenders from a robust population in Tumbling Creek were implanted with radio transmitters and their movements tracked. In spring 2019 five mature hellbenders were translocated from Tumbling to Rough Creek to supplement the population and increase genetic diversity. The population in Rough creek is aging in nature, isolated from immigration/emigration and has been in decline. The translocated hellbenders were continually radio tracked from 2019 to 2020 and survivorship of the translocated animals is 100%.

Cookson Branch

Aquatic Organism Passage – Tennessee Dace

Cookson branch holds a population of TN Dace whose habitat continuity has been disjointed by a culvert barrier that limited upstream movement for decades. In 2019 the culvert barrier was removed and replaced with an AOP structure. Monitoring conducted after the replacement with the AOP documented upstream movement through the new structure into habitat that was previously non-accessible. This demonstrated a successful reconnection of habitat and opened the upper 1.5 miles of stream to upstream migration.

MQ 7 E 3: What is the population trend for each of the 13 aquatic T&E and 28 sensitive species?

Metric – sample survey occupied habitats

CFI monitors four species of TE fish populations in Citico Creek and Tellico River annually. Historically, annual surveys were also conducted in the Conasauga River, however a lack of funding has eliminated these surveys since 2016. CFI specifically tracks the populations of three T&E fish in Citico Creek and four in Tellico River. The populations in Tellico River are considered experimental populations and have been established through a captive breeding and annual stocking program. Experimental populations in Tellico River aid in the recovery of these species and are identified in their respective recovery plans. Data collected by CFI in Citico Creek indicated that the populations of Smoky Madtom, Yellowfin, and Citico (Duskytail) Darters are stable. Citico Darter and Smoky Madtom have a increasing trend since the captive breeding program began in 1994 while Yellowfin Madtom appear to have no increasing or decreasing trend and remain stable (Chart AQ5). Recovery efforts began in Tellico River for four TE fish in 2002. Since the TE fish stocking program began all four species now have established populations in Tellico River. Data collected by CFI in Tellico River indicate that the populations of Spotfin Chub, Smoky Madtom, Yellowfin Madtom, and Citico (Duskytail) Darters are stable. Trend for Smoky Madtom, Citico Darter are increasing as has been seen in Citico Creek while Yellowfin Madtom trends are neither increasing or decreasing and appear to be stable (Chart AQ6). The population of Spotfin Chub is on an increasing trend since it was first released in 2002.

No other trend data for AQ-TESV is available at this time.

Chart AQ5. Trends of TE fish in Citico Creek from 1994 to 2019. Monitoring conducted by CFI.

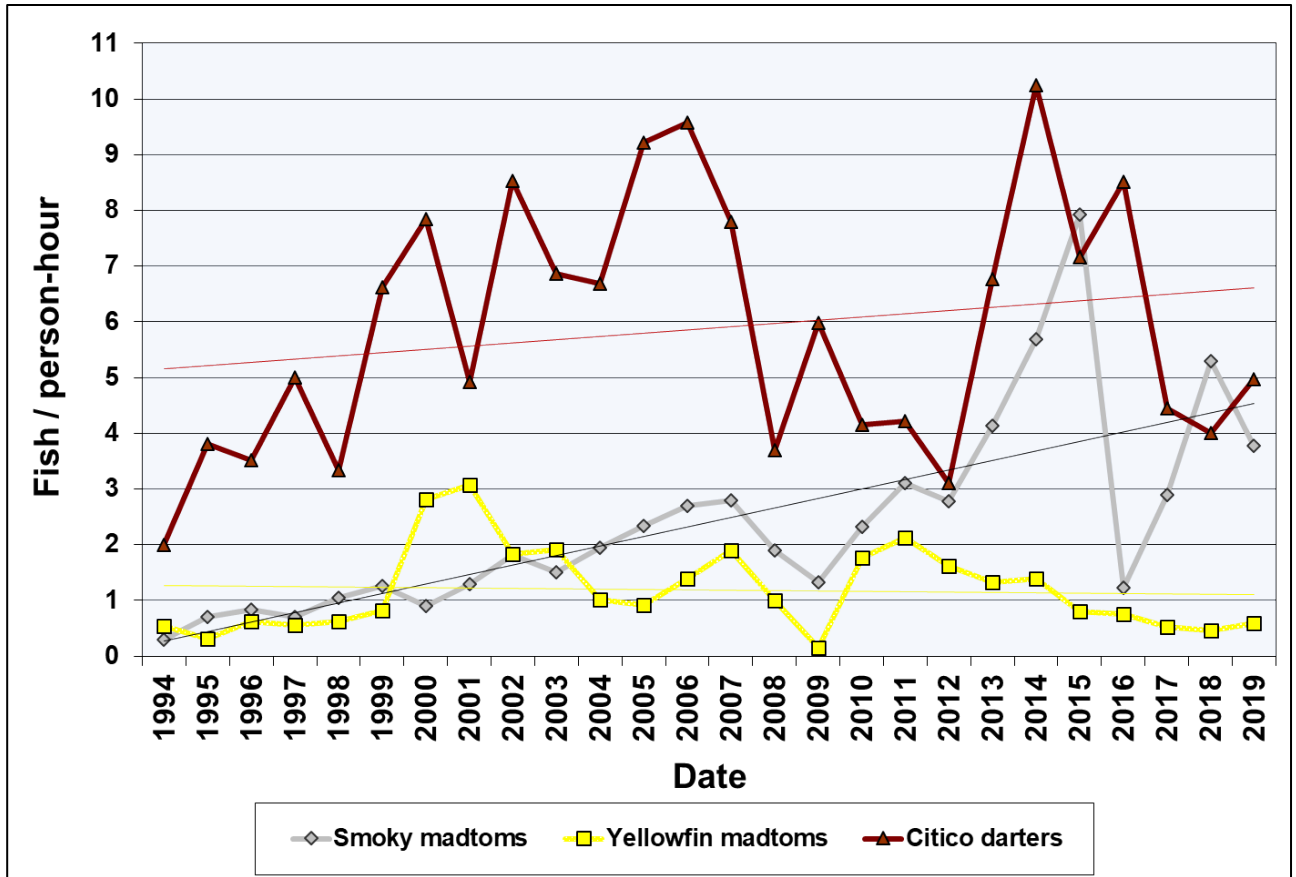
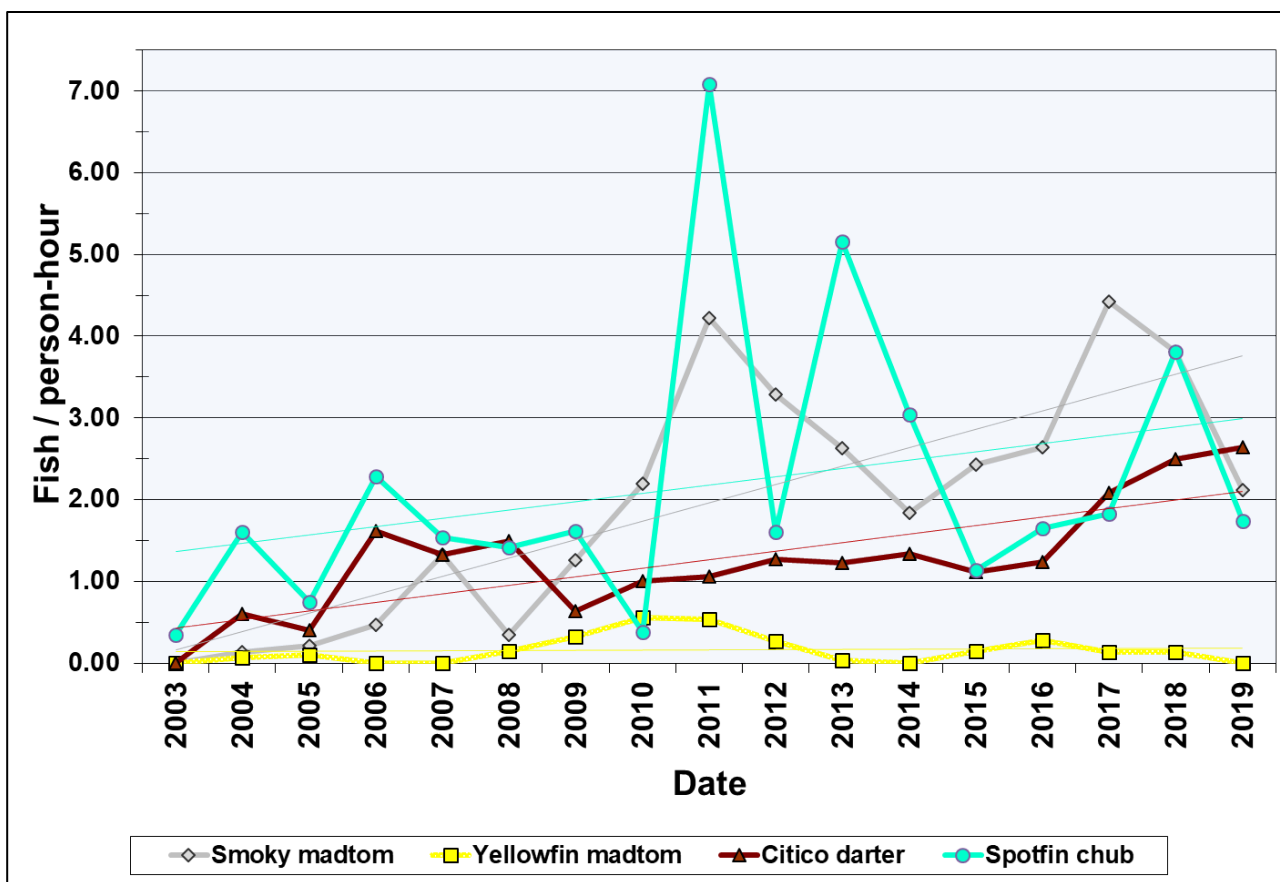


Chart AQ6. Trends of experimental populations of TE fish in Tellico River from 2003 to 2019. Monitoring conducted by CFI.



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

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. White fringeless orchid was listed as Threatened by the USFWS in 2015 and is now addressed under a separate monitoring question (MQ7) specific to trends for federally listed species. The monitoring elements and respective responses 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.

Monitoring Discussion and Findings

1. No cerulean warblers were located in 2018 or 2019. 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. One species, ovate catchfly (*Silene ovata*) was monitored in fiscal years 2018 and 2019.

Ovate Catchfly



Ovate catchfly (*Silene ovata*) is a Regional Forester's sensitive species with only 4 known sites on the Forest. Beginning in 2003, two sites for this species were identified for monitoring on the Watauga Ranger District. The Lemon Gap site is located on a road edge and is threatened by the non-native invasive plant species Japanese spiraea and other successional vegetation growth. The second site is along the Meadow Creek Mountain trail where a large population exists in a canopy gap extending over a 150 meter section of trail, up to 50 meters wide in some areas. Monitoring has only been conducted sporadically based upon funding and available personnel. The following is a summary of the data collected since 2003 (Table 36).

Table 36. Ovate Catchfly monitoring from 2003-2019.

Year	Monitoring Site (# stems)	
	Lemon Gap	MC Mtn.
2003	27	n/a
2005	30	n/a
2006	71	521
2012	0	107
2013	12	n/a
2014	23	n/a
2017	14	n/a

During the 2018 monitoring Japanese spiraea and sumac were hand-pulled from the site (see pictures below).



The site at Lemon Gap is a roadside population and it was noted in 2006 that it is subject to weedy invasion and over-growth by successional tree species. No plants were seen in 2012, however these plants were re-discovered in 2013 and some vegetation control measures (targeted treatment of Japanese spiraea) were implemented with hopes of seeing this population rebound. The counts in 2014 showed almost double the number counted in 2013 and additional vegetation control measures were implemented in 2015, 2017, and 2018 including opening the canopy and additional weed control. Continued monitoring is recommended.

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 37). 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, though no data was reported for 2019. The data for all years is presented below.

Table 37. Numbers of Marsh Marigold (<i>Caltha palustris</i>) 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				

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 was enhanced significantly in 2016, 2017, and 2018. Monitoring will continue on a two year schedule to evaluate these treatments on the population.

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. The transplanted population is to restore a more natural hydrologic regime within the bog is in the planning stages.

Avian Viability Concern Species Trends

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. Point counts were set up using a stratified random sampling design that allocated a minimum of 30 points either equally among habitat groups or in proportion to group composition. To be able to compare data in this report to previous Monitoring and Evaluation Reports, North America Breeding Bird Survey (BBS) trend estimates from 1966-2017 in the Appalachian Region (<https://www.mbr-pwrc.usgs.gov/> and used in previous reports) will be discussed as well as recent analysis of the R8 Bird database. See the "Management Indicator Species – Birds" section above for more information about analysis methods.

Matseur et al. (2020) estimated abundances and population trends for 102 species On CNF. Species with the highest average abundances included red-eyed vireo (1.44 birds/point), ovenbird (0.80 bird/point), and American crow (0.77 bird/point). Species with the lowest average abundances were great horned owl (0.01 bird/ point), green heron (0.01 bird/point), and northern mockingbird (0.01 bird/point). More species had positive than negative annual trends; 25 species had significant positive annual trends and 4 species had significant negative annual trends (Figs. 7, 8). Red-breasted nuthatch had the greatest annual trend (15.97 percent), followed by eastern phoebe (13.15 percent) and American robin (9.19 percent). Some woodland-breeding species with positive annual trends included downy woodpecker (7.78 percent), cedar waxwing (7.60 percent), blue-gray gnatcatcher (6.94 percent), eastern wood-pewee (6.79 percent), red-bellied woodpecker (5.86 percent), northern parula (4.95 percent), eastern tufted titmouse (4.77 percent), and white-breasted nuthatch (4.58 percent). Some early-successional, scrub-breeding species with positive annual trends were Carolina wren (3.43 percent), American goldfinch (3.26 percent), and northern cardinal (2.22 percent). Red-eyed vireo and ovenbird had some of the highest average abundances and had small positive annual trends, 0.45 percent and 0.50 percent, respectively. Of the species with significant negative annual trends, common grackle had the greatest negative trend (-29.27 percent), followed by rose-breasted grosbeak (-6.56 percent) and Canada warbler (-4.55 percent). Chestnut-sided warbler was the only early-successional, scrub-breeding species that had a negative annual trend (-4.18 percent). Linear trends were generally similar to annual trends, but smaller (Fig. 7).

Table 38 displays trends for avian Viability Concern Species. Estimates are based on point count surveys.

Table 38—Avian Viability Concern Species number of detections, annual trend, linear trend, 95-percent credible interval defined by LCI and UCI, and average abundance for Management Indicator Species on the Cherokee National Forest, 1992–2017 (Matseur et al. 2020)

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.

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.

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?

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 and respective responses are defined as follows:

1. What are the trends in the number of permits issued for selected special forest products?
2. What are the fish stocking levels by type and location?
3. What are the sport fish population levels in relationship to stream and lake habitat improvement activities?

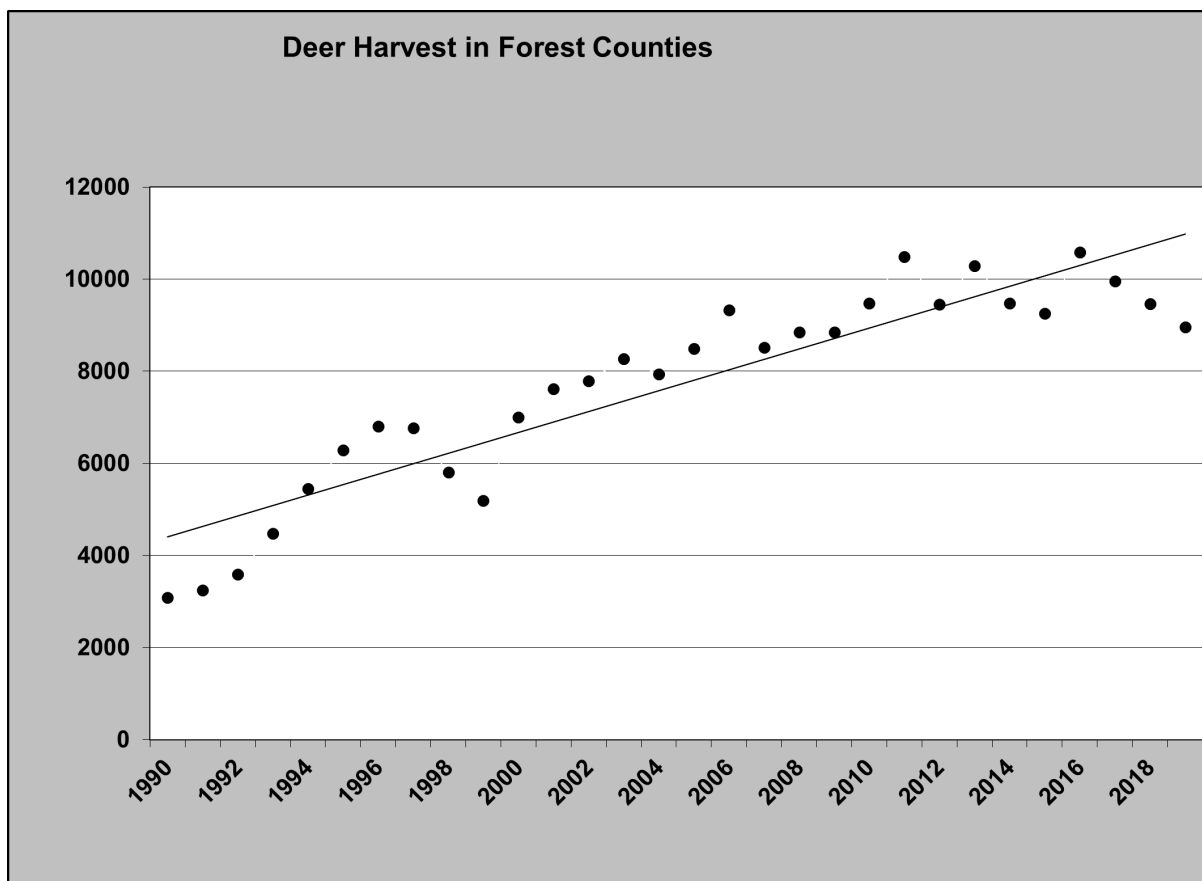
Monitoring Discussion and Findings

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 15 shows the very strong upward trends in deer harvest.

Figure 15. Deer harvested in counties containing Forest Service 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. 16). 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.

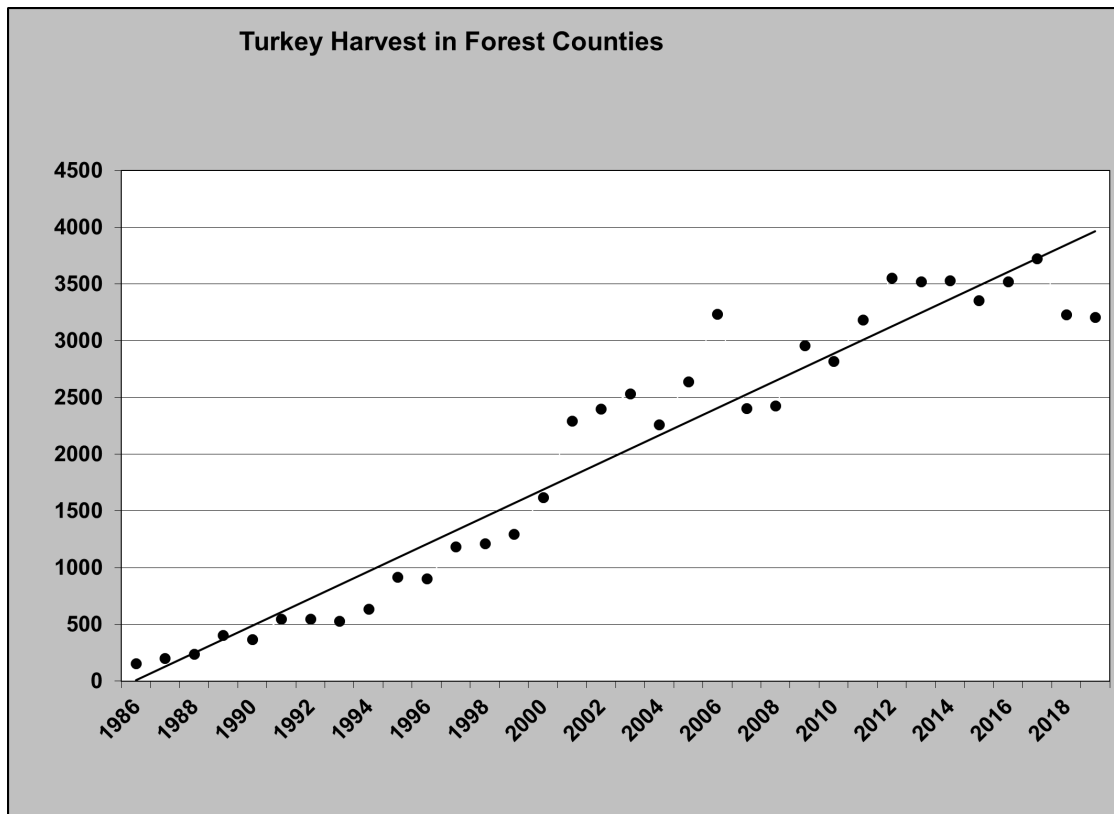


Figure 16. Turkey harvest numbers from Tennessee counties with Forest lands

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 E 1. 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. 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 are rotated each year to allow plants a five year recovery period necessary to help ensure populations remain sustainable.

Ramps

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 and that they actually collect the amount permitted. Permit data are shown below for the years 2002-2013 in Table 17:

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) for \$20. All permits now require that the harvest record be completed and returned to the forest. Compliance with this has been a major issue, but if followed, would provide a better look at actual harvest numbers. Table 18 shows the numbers of free use and commercial permits issued from 2015 through present, with the total pounds permitted under each.

Fiscal Year	Free Use Permits	Commercial Permits	Total Pounds Permitted	Price
2015	98	35	448	\$700
2016	102	35	452	\$700
2017	83	25	333	\$500
2018	42	20	242	\$400
2019	42	28	322	\$560

Other Botanical Products

Permit data (permits issued) for other botanical products, including medicinal plants, food plants, floral products and transplants, and native seed, is recorded in the TIM database, but like the information on ginseng and ramps, is only representative of the number of people who actually came into the offices to purchase a permit. Table 19 provides a brief summary of selected permits from the TIM database from 2016 to present.

Table 19: Number of Permits (Commercial and Free) of Selected Botanical Products by Fiscal Year								
Fiscal Year	Mushrooms	Rhododendron Root stock	Cut Foliage	Unicorn Root	Black Cohosh	Partridge berry	Misc. Med. Herbs	Seed
2016 Com.	0	45	20	2	0	0	3	0
2016 Free	14	0	0	0	0	0	0	0
2017 Com.	0	25	25	1	17	1	4	2
2017 Free	14	0	0	0	0	0	0	0
2018 Com.	0	78	30	2	3	1	3	2
2018 Free	5	0	0	0	0	0	1	0
2019 Com.	0	89	21	1	0	16	1	1

2019 Free	5	0	0	0	0	0	0	0
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Other products permitted during this time include bloodroot and miscellaneous transplants.

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. Even for those who do obtain permits, a lack of compliance in harvest reporting from the public and/or from the district offices is a major problem.

Based upon range-wide declines for this species, dramatic changes to the forest's permitting process were implemented in 2013. These changes were designed to set harvest levels at sustainable levels for the long-term. While interest in the lottery seems high based upon the number of phone calls we receive, actual participation has been less than full. Since the inception of the ginseng lottery, most years see less than a full complement of names submitted, and even those given the opportunity to purchase permits don't always come in and actually purchase one. Among those who do collect and report on their harvest, 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. Only three forests within the Region (the Cherokee National Forest, National Forests in North Carolina, and the Chattahoochee-Oconee National Forest) still issue permits for ginseng collection and discussions are now underway regarding a possible moratorium on harvest in the future to pave the way for restoration activities.

Ramps

The number of permits issued has remained fairly stable since implementing the new limits, however the volumes reported are based upon permitted levels and may not reflect actual pounds collected.

Other Botanical Products

Data from permits on other botanical products simply provide an indication of demand. If there is a large demand for a particular product, more data may be required to determine sustainability. Like other products, it is assumed that there is a large amount of non-permitted collection that occurs simply because it is a very difficult to monitor public behavior. The data obtained from permits only provides information from those members of the public that choose to follow regulations.

MQ 9 E 2: What are the fish stocking levels by type and location?

Metric – Track TWRA put & take stocking – miles of streams stocked, species stocked, and number of fish stocked.

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. TWRA stocking records can be accessed at the following website: <https://www.tn.gov/twra/fishing/trout-information-stockings.html>. It is recommended that this monitoring question be dropped or replaced in future reports. This activity is the sole responsibility of TWRA and a number of these populations are put and take fisheries. Meaning that these fish would not successfully reproduce or survive in the long term in many stocked streams. The CNF will continue to manage its stream habitat responsibly and provide quality habitat and clean water to be stocked by the state agency. Native Brook Trout stocking for restorative efforts is discussed in monitoring question 25.

MQ 9 E 3: What are the sport fish population levels in relationship to stream and lake habitat improvement activities?

Metric – Track TWRA electrofishing surveys for Beaverdam Creek, Laurel Fork and North River and estimate the standing crop in each stream. Plot against previous year.

Lake fish populations are not tracked by the CNF. However, lake improvement activities to add habitat structure, control aquatic vegetation, and improve fishing access are implanted annually. Table AQ2 below identifies lake improvement activities and number of acres improved by the CNF from 2018-2019.

Table AQ2. Lake improvement activities (acres improved) completed on the CNF 2018-2019.

Zone	2018	2019
North Zone	51	5.6
South Zone	102	229

Stream trout population surveys are conducted annually at a number of long term monitoring sites by TWRA with assistance from CNF Aquatic Biologists and technicians. Additionally, improvement activities to enhance instream habitat, limit sedimentation, and improve riparian condition are implanted annually. Table AQ3 below identifies physical stream habitat enhancement activities and number of miles improved by the CNF from 2018-2019.

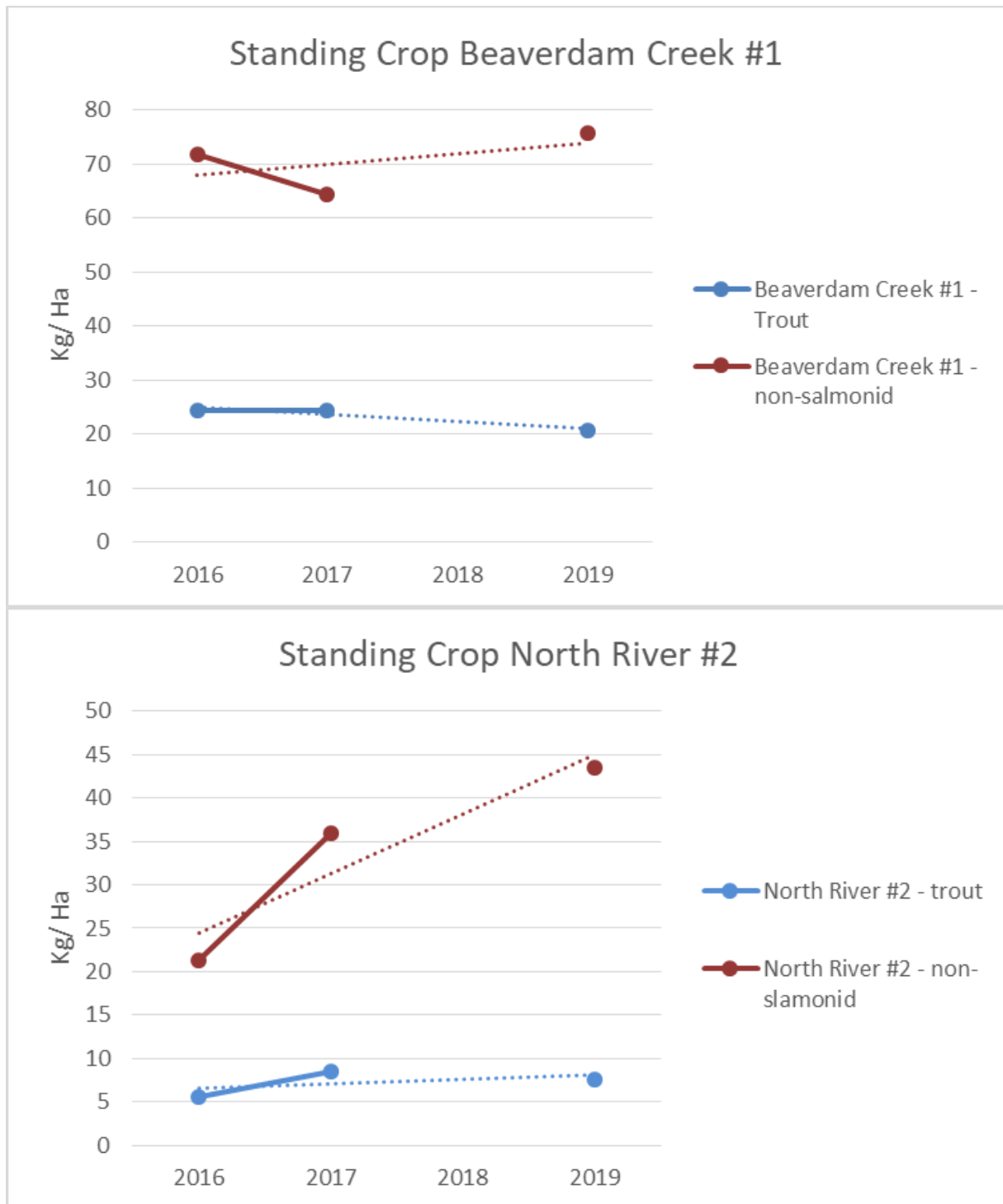
Table AQ3. Stream improvement activities (miles improved) completed on the CNF 2018-2019 that directly enhanced physical stream habitat. Excluded activities include river cleanups, fishing access improvements and species introductions.

Zone	2018	2019
North Zone	15.5	7
South Zone	11.5	5.5

However, these enhancement activities do not always overlap with “sport fish” populations and instead focus on at risk aquatic species habitat. One at risk species, the Brook Trout is considered a sport fish and activities do occur to improve habitat. Brook Trout habitat enhancement activities are described in depth in MQ 25. Below are standing crop estimates

from two long term monitoring stations, one from each zone (Chart AQ7). These streams hold naturally reproducing populations of trout and are also stocked with hatchery fish annually to supplement populations. No habitat enhancement activities occurred in these streams in 2018-2019. Standing stock estimates for both trout and non-game fishes are presented below. Overall biomass of native non game fishes greatly outweighs non-native trout or game fish species found in these streams. Diversity of native non game fish varies from 25 in Beaverdam Creek to 10 in North River.

Chart AQ7. Standing crop estimates (Kg/Ha) for native non-game fish and game fish (trout) in Beaverdam Creek and North River.



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.

Monitoring Discussion and Findings

MQ 10 E 1. National visitor use monitoring (NVUM) is conducted for each national forest once every five years based on a nationally established protocol. Survey data was collected in fiscal year (FY) 2018 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, e.g. 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.

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

The results of the 2017 NVUM allow the forest to see trends for the first time. Total estimated site visits to the Cherokee have increased 62% since 2007, from 1,773,000 to 2,875,000 visits. Total estimated visits to the Forest have increased by 53% since 2007, from 1,351,000 to 2,073,000.

Trends in specific activities are much harder to parse out due to varying response categories, but some things are clear. Day use is still the most popular category of use on the Forest, with Viewing Natural Features, Hiking/Walking, and Non-motorized Water the top three categories. Picnicking, Bicycling, Nature Study, Backpacking, and Primitive Camping all stayed fairly constant, while Fishing, Hunting, Nature Center Activities, and Horseback Riding fell in use levels. This is consistent with field observations.

Visitor satisfaction has increased every round of NVUM. In 2007, 94% of visitors were either Very Satisfied or Somewhat Satisfied overall, with 77.5% being very satisfied. In 2017, 97.6% of visitors were either Very Satisfied or Somewhat Satisfied overall, with 88.1% being very satisfied.

MQ 10 E 2. Semi-primitive recreation settings and backcountry recreation opportunities have been maintained. All changes to motorized access have been documented on the Motor Vehicle Use Map (MVUM).

MQ 10 E 3. The Cherokee National Forest has created a priority investment list of recreation sites to reduce its deferred maintenance by decommissioning underutilized, unneeded, and damaged structures and systems. In some instances, these facilities may be replaced by new facilities. In others, it will mean public access is still allowed, but with few or no site amenities. 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)

Guided by the RLRMP, the Forest will invest its increasingly limited resources into sustainable facilities and opportunities.

MQ 10 E 4-5. The Watauga and Unaka Ranger Districts have maintained volunteer agreements with Appalachian Trail maintaining clubs in fiscal years 2018 & 2019. 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.

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

This monitoring question is responsive 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 and respective responses 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?

Monitoring Discussion and Findings

MQ 11 E1. There were 38 reported bear incidences in 2018 and 18 in 2019. The majority of the incidences were due to improper food or trash storage. These numbers are fairly

unchanged over the last 16 years. Continued diligence and caution should be exercised in reporting and dealing with bears across the Forest.

MQ 11 E2. 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.

Johnson City and the surrounding area are developing a regional recreation plan, in which the Forest Service is playing a collaborative role. The outcomes of this planning effort will inform Forest decisions on recreation in the Buffalo Mountain area moving forward.

Findings:

The Forest Service conducted periodic inspections of the Buffalo Mountain ATV Trail in FY 2015 and 2017 to evaluate the effectiveness of improvements made in previous years. The US Forest Service and a local riding club had implemented a formalized agreement for cooperatively maintaining and sustaining the existing 12-mile trail. The Forest has continued to work with riding groups to maintain the ATV trail in FY18-19.

MQ 11 E3. Projects in the Citico Creek, Paint Creek and Conasauga River priority watersheds are being pursued which, when completed, would allow the Forest to close out the WRAPs in those watersheds.

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 and respective responses 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? (now integrated with MQ 6-1 and MQ 6-2)
4. What is the status and trend of visibility in Class 1 areas and relationship to landscape visibility across the Forest? (now integrated with MQ 6-1 and MQ 6-2)

Monitoring Discussion and Findings

MQ 12 E 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.

In FY19, Upper Bald River was added as a new Wilderness area, and the same performance elements were selected for it. Wilderness acreage was also added to Big Frog, Big Laurel Branch, Little Frog Mountain, and Sampson Mountain.

The following 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

Untrammeled Quality

- Agency Management Actions

Solitude Quality

- Opportunities for Primitive and Unconfined Recreation

Administration

- Workforce Capacity
- Education
- Wilderness Character Baseline

Wilderness Area	WSP Element	FY18	FY19	Change
Bald River Gorge	Managed to Standard Score = 60	44	50	+6
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	4	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	0	2	
	Workforce Capacity	6	10	
	Education	6	8	
	Wilderness Character Baseline	0	0	
	Additional Requirements	4	4	

Big Frog	Managed to Standard Score = 60	44	44	+0
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	4	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	0	2	
	Workforce Capacity	6	8	
	Education	6	6	
	Wilderness Character Baseline	0	0	
	Additional Requirements	4	2	
Big Laurel Branch	Managed to Standard Score = 60	52	52	+0
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	8	6	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	2	2	
	Workforce Capacity	6	8	
	Education	10	8	
	Wilderness Character Baseline	0	4	
	Additional Requirements	4	2	
Wilderness Area	WSP Element	FY18	FY19	Change
Citico Creek	Managed to Standard Score = 60	44	48	+4
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	4	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	0	2	
	Workforce Capacity	6	10	
	Education	6	6	
	Wilderness Character Baseline	0	0	
	Additional Requirements	4	4	

Gee Creek	Managed to Standard Score = 60	44	50	+6
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	6	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	0	2	
	Workforce Capacity	6	8	
	Education	6	8	
	Wilderness Character Baseline	0	0	
	Additional Requirements	4	4	
Little Frog Mountain	Managed to Standard Score = 60	44	44	+0
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	4	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	0	2	
	Workforce Capacity	6	8	
	Education	6	6	
	Wilderness Character Baseline	0	0	
	Additional Requirements	4	2	
Wilderness Area	WSP Element	FY18	FY19	Change
Pond Mountain	Managed to Standard Score = 60	50	50	+0
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	6	4	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	2	2	
	Workforce Capacity	6	8	
	Education	10	6	
	Wilderness Character Baseline	0	4	
	Additional Requirements	4	4	

Sampson Mountain	Managed to Standard Score = 60	52	48	-4
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	8	6	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	2	2	
	Workforce Capacity	6	6	
	Education	10	6	
	Wilderness Character Baseline	0	4	
	Additional Requirements	4	2	
Unaka Mountain	Managed to Standard Score = 60	52	50	-2
	Invasive Species	4	4	
	Air Quality Values	4	4	
	Natural Role of Fire	8	8	
	Recreation Sites	4	4	
	Trails	8	6	
	Agency Management Actions	2	2	
	Opportunities for Primitive and Unconfined Recreation	2	2	
	Workforce Capacity	6	6	
	Education	10	6	
	Wilderness Character Baseline	0	4	
	Additional Requirements	4	4	

Wilderness Area	WSP Element	FY18	FY19	Change
Upper Bald River	Managed to Standard Score = 60	N/A	16	N/A
	Invasive Species	N/A	0	
	Air Quality Values	N/A	0	
	Natural Role of Fire	N/A	0	
	Recreation Sites	N/A	0	
	Trails	N/A	2	
	Agency Management Actions	N/A	2	
	Opportunities for Primitive and Unconfined Recreation	N/A	0	
	Workforce Capacity	N/A	10	
	Education	N/A	0	
	Wilderness Character Baseline	0	4	
	Additional Requirements	N/A	2	

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Visitor use of Wildernesses in the Cherokee National Forest was surveyed as part of the National Visitor Use Monitoring in fiscal year 2018. The results from FY 2012 include an estimate of 64,000 annual visits to Wilderness areas. Results from FY 2018 include an estimate of 119,000 annual visits to Wilderness areas.

MQ 12 E 2. No prescribed burning took place in wilderness in 2018 or 2019. Fire regimes in wilderness remain unchanged.

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?

Monitoring Discussion and Findings

MQ 13 E 1. Six waterways are currently eligible for a Wild and Scenic River study: 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.

MQ 13 E 2. The Nolichucky suitability study was submitted to congress in 1991 but no action has been taken. Special interest groups have renewed their interest in pursuing this designation. 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 and response is defined as follows:

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

Monitoring Discussion and Findings

MQ 14 E 1. The scenic inventory is maintained and refined on a project specific basis.

Presently, invasive pests such as the Hemlock Woolly Adelgid continue 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. Emerald Ash Borer and southern pine beetle have also created more noticeable impacts in Fiscal Years 2018 and 2019.

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.

MQ 15: Are heritage sites protected?

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 and response 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?

Monitoring Discussion and Findings

Heritage resource surveys and/or historical record reviews are performed for all undertakings that have the potential to affect historic properties. If historic properties are identified, a determination of the effect of the undertaking on the historic property is made and the findings are sent to the Tennessee State Historic Preservation Office for review, comment and concurrence.

Historic properties on the Cherokee National Forest that are listed on National Register of Historic Place or are eligible for listing are protected pursuant to and in compliance with the National Historic Preservation Act and 36 CFR 800. Additionally, they are identified as Priority Heritage Assets (PHAs) of the Cherokee National Forest. Twenty percent of the Forest's PHAs are subjected to a condition survey each year; therefore, each PHA is monitored/assessed at least once every five years. Sites that have been recorded but have not been evaluated for National Register eligibility are monitored in connection with Section 106 work.

Memorandum of Agreements (MOAs) and accompanying Historic Preservation Plans (HPPs) have been formulated, and signed by the TN SHPO, for various historic administrative and recreation facilities/sites such as the Donley Cabin, Tellico Ranger Station, Rock Creek

Recreation Area, the Unicoi Turnpike Trail and the Copper Road Trail. An MOA and HPP for Civilian Conservation Corps (CCC) sites on the Forest should be completed in FY2021.

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?

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?

Monitoring Discussion and Findings

MQ 16 E 1-5. No new information

MQ 16 E 6-8. In 2015, the Forest Hydrologist worked with a Hydrologist Contractor to develop a 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). Since 2015, the CNF has annually implemented the aforementioned 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 in the past 12 months. 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

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

A summary report of data collected is written annually. The executive summaries of those reports are provided below. The full reports, monitoring protocols, and forms for 2018 and 2019 are provided in Appendices V and W, respectively. A five-year review of BMP implementation and effectiveness data is provided in Appendix X. The executive summary of the five-year review report is provided below.

2018 Best Management Practices Monitoring – Executive Summary

In 2018, Best Management Practices (BMPs) were monitored on the Cherokee National Forest. The monitoring was done to determine whether BMPs were being implemented and effective in controlling sediment and other pollutants during timber sale and road reconstruction and maintenance activities. Seventeen harvest units were selected for review. Of these, all were harvested with ground-based logging systems. Nine National Forest System and two temporary roads associated with these units were also inspected. Logging units and roads were associated with the Lost Josh, Blue Vines, Brickyard and Katy Branch timber sales on the North Zone and Dutch Fields and Greasy Creek timber sales on the South Zone. 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 318 BMPs were checked for implementation and effectiveness. Of these, 221 BMPs were related to sediment delivery to streams. By determining implementation rates, we are attempting to answer the question: *Were the practices properly applied?* By determining effectiveness, we are attempting to answer the question: *Were the practices effective in preventing a pollutant from impacting water quality?*

The overall implementation rate in 2018 was 94.7%. There was a minor departure from the Standards and Goals (S&Gs) 3.1% of the time and a major departure from the S&Gs 2.2% of the time. A gross departure from the S&Gs did not occur in 2018. The overall effectiveness rate was 95.0%. There was a minor or temporary impact 2.8% of the time; a major short-term impact 1.6% of the time. Twice (0.6%) there was a major long-term impact observed that requires corrective action. Visible sediment did not enter streams 99.1% of the time while non-critical visible sediment reached streams 0.5% of the time and critical visible sediment flow reached a stream channel 0.5% of the time in 2018. 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 (See Photo 15 in Appendix V).

Implementation and effectiveness rates for the BMP category *Harvest Area Including Skid Trails/Log Decks* were 99.4% and 98.8%, respectively (See Table 1). These implementation and effectiveness rates indicate the application of BMPs is working in this category and sediment or other pollutants are generally not reaching streams. A minor departure from the S&Gs was given 0.6% of the time because Practice 6, *Minimize the Number of Skid Trails; Use Existing Skid Trails if Properly Located* was not adequately applied in one instance.

The implementation and effectiveness rates for *Skid Trail Stream Crossings* were 100.0% because skid trail stream crossings were avoided. The low number of skid trail stream crossings generally indicates a proper unit layout. Stream crossings with skid trails are frequently avoided to protect water quality and aquatic habitat.

Implementation and effectiveness rates for the BMP category *Roads* was 94.9%. Non-critical visible sediment was observed only 1.3% of the time in the Roads category. A minor departure from the S&Gs was given 2.5% of the time because Practice 21, *Water Control Structures Applied*; Practice 22, *Revegetation and/or Mulch Applied*; Practice 23, *Roads Located to Minimize Sediment*, and Practice 24, *Temporary Road Treatment and Closure* were not adequately applied.

The last category monitored was *Road Stream Crossings*. Implementation and effectiveness rates were 75.5% and 79.6%, respectively. Problems identified were associated with Practices 29 and 31, *Perennial and Intermittent Crossings Acceptable*; Practice 34, *Grade Carried Across Crossing*; Practice 35, *Broad-Based Dips and Wing Ditches Used at Crossings*; and Practice 40, *Flow Not Obstructed; Aquatic Organism Passage* were inadequately applied. These problems were generally associated with legacy roads and can only be corrected as projects are prioritized and funding becomes available.

Table 1 displays the implementation, effectiveness and visible sediment rates for all BMP categories in 2018.

TABLE 1 – BEST MANAGEMENT PRACTICE SUMMARY in 2018

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	99.4%	0.6%	0.0%	0.0%	0.0%	98.8%	1.2%	0.0%	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	94.9%	2.5%	2.5%	0.0%	0.0%	94.9%	2.5%	2.5%	0.0%	98.7%	1.3%	0.0%
Road Stream Crossings	75.5%	14.3%	10.2%	0.0%	0.0%	79.6%	10.2%	6.1%	4.1%	96.0%	0.0%	4.0%
Total Percent	94.7%	3.1%	2.2%	0.0%	0.0%	95.0%	2.8%	1.6%	0.6%	99.1%	0.5%	0.5%

In conclusion, Best Management Practices are generally being applied and are working properly on the Cherokee National Forest. Overall BMP implementation and effectiveness in 2018 was 94.7 and 95.0%, respectively. The overall “no visible sediment to stream channels” rate in 2018 was 99.1%.

2019 Best Management Practices Monitoring – Executive Summary

In 2019, 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. Four harvest units were selected for review. Of these, all were harvested with ground-based logging systems. Three National Forest System and one temporary road associated with these units were also inspected. Logging units and roads were associated with the Peter Hall, Heaberlin, Walkabout, and Paint Creek 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 86 BMPs were checked for implementation and effectiveness in 2019. Of these, 62 BMPs were related to sediment delivery to streams. By determining implementation rates, we are attempting to answer the question: *Were the practices properly applied?* By determining effectiveness, we are attempting to answer the question: *Were the practices effective in preventing a pollutant from impacting water quality?*

The overall implementation rate was 95.3% (Table 2). There was a minor departure from the guidelines 4.7% of the time. A major or gross departure from the guidelines did not occur in 2019. The overall effectiveness rate was 96.5%. There was a minor or temporary impact 3.5% of the time. A major short-term impact or major long-term impact was not observed in 2019. Non-critical or critical visible sediment was not observed in streams in the 2019 monitoring. 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 89.5% and 92.1%, respectively (Table 2). These implementation and effectiveness rates indicate the application of BMPs is generally working in this category and sediment or other pollutants are not reaching streams. A minor departure from the guidelines was given 10.5% of the time because of poorly located and constructed skid roads on the Peter Hall and Heaberlin timber sales.

The implementation and effectiveness rates for *Skid Trail Stream Crossings* were 100.0% because skid trail and skid road stream crossings were avoided (Table 2). The low number of skid trail stream crossings generally indicates a proper unit layout. Stream crossings with skid trails are frequently avoided to protect water quality and aquatic habitat.

Implementation and effectiveness rates for the BMP category *Roads* in 2019 was 100% (Table 2). Non-critical or critical visible sediment was not observed being delivered to streams this year.

The last category monitored was *Road Stream Crossings*. Only two perennial stream crossings were observed this year; each providing adequate flow and aquatic organism passage. One crossing was an appropriately sized CMP and the other a hardened ford.

TABLE 2 – BEST MANAGEMENT PRACTICE SUMMARY in 2019

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	89.5%	10.5%	0.0%	0.0%	0.0%	92.1%	7.9%	0.0%	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	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Road 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%
Total Percent	95.3%	4.7%	0.0%	0.0%	0.0%	96.5%	3.5%	0.0%	0.0%	100.0%	0.0%	0.0%

In the 2019 Best Management Practices monitoring, only four units, three system roads and one temporary road were available for monitoring. This was due to a wet year where little logging occurred on the Cherokee National Forest. Still, all units and roads that were accepted or ongoing and were available to the contractor, were monitored. This small sample size resulted in a lower than expected score for harvest units and a higher than expected score for roads and road stream crossings.

In conclusion, Best Management Practices are generally being applied and are working properly on the Cherokee National Forest. Overall BMP implementation and effectiveness rates in 2019 were 95.3 and 96.5%, respectively. The overall “no visible sediment to stream channels” rate in 2019 was 100%.

Best Management Practices Five Year Review and Trend Analysis (2015-2019) – Executive Summary

Between 2015 and 2019, Best Management Practices (BMPs) were monitored on the Cherokee National Forest. The monitoring was done to determine whether or not BMPs were implemented and effective in controlling sediment and other pollutants during timber sale and road reconstruction and maintenance activities. 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?*”

Eighty-two harvest units and 56 roads from 27 different timber sales were selected for review. Specific BMPs were selected from the *Revised Land and Resource Management Plan*,

Cherokee National Forest, January 2004 and Guide to Forestry Best Management Practices in Tennessee. Tennessee Department of Agriculture, Division of Forestry, 2003.

A total of 1,538 individual BMPs were checked for implementation and effectiveness in the 2015-2019 monitoring. Of these, 1,081 were related to sediment delivery to streams. The overall implementation rate was 94.0 percent (Table 3). There was a minor departure from the rules 4.2 percent of the time; a major departure from the rules 1.9 percent of the time. The overall effectiveness rate was 93.8 percent. There was a minor or temporary impact to the aquatic resource 4.2 percent of the time; a major short-term impact 1.6 percent of the time and a major long-term impact 0.4 percent of the time. Major long-term impacts were always related to problems on legacy system roads that predated the timber sales. Non-critical visible sediment reached the streams 1.8 percent of the time and critical visible sediment flow reached stream channels 0.1 percent of the time. 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.

TABLE 3 – BEST MANAGEMENT PRACTICE SUMMARY (2015-2019)

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	97.5%	2.3%	0.1%	0.0%	0.6%	96.4%	2.7%	0.2%	0.0%	100.0%	0.0%	0.0%
Harvest Stream Crossings	99.1%	0.9%	0.0%	0.0%	3.8%	95.3%	0.9%	0.0%	0.0%	100.0%	0.0%	0.0%
Roads	97.2%	2.3%	0.5%	0.0%	0.0%	97.2%	2.3%	0.5%	0.0%	99.5%	0.5%	0.0%
Road Stream Crossings	72.0%	16.1%	11.9%	0.0%	0.0%	72.9%	15.1%	9.2%	2.8%	82.9%	16.2%	1.0%
Total Percent	94.0%	4.2%	1.9%	0.0%	0.6%	93.2%	4.2%	1.6%	0.4%	98.1%	1.8%	0.1%

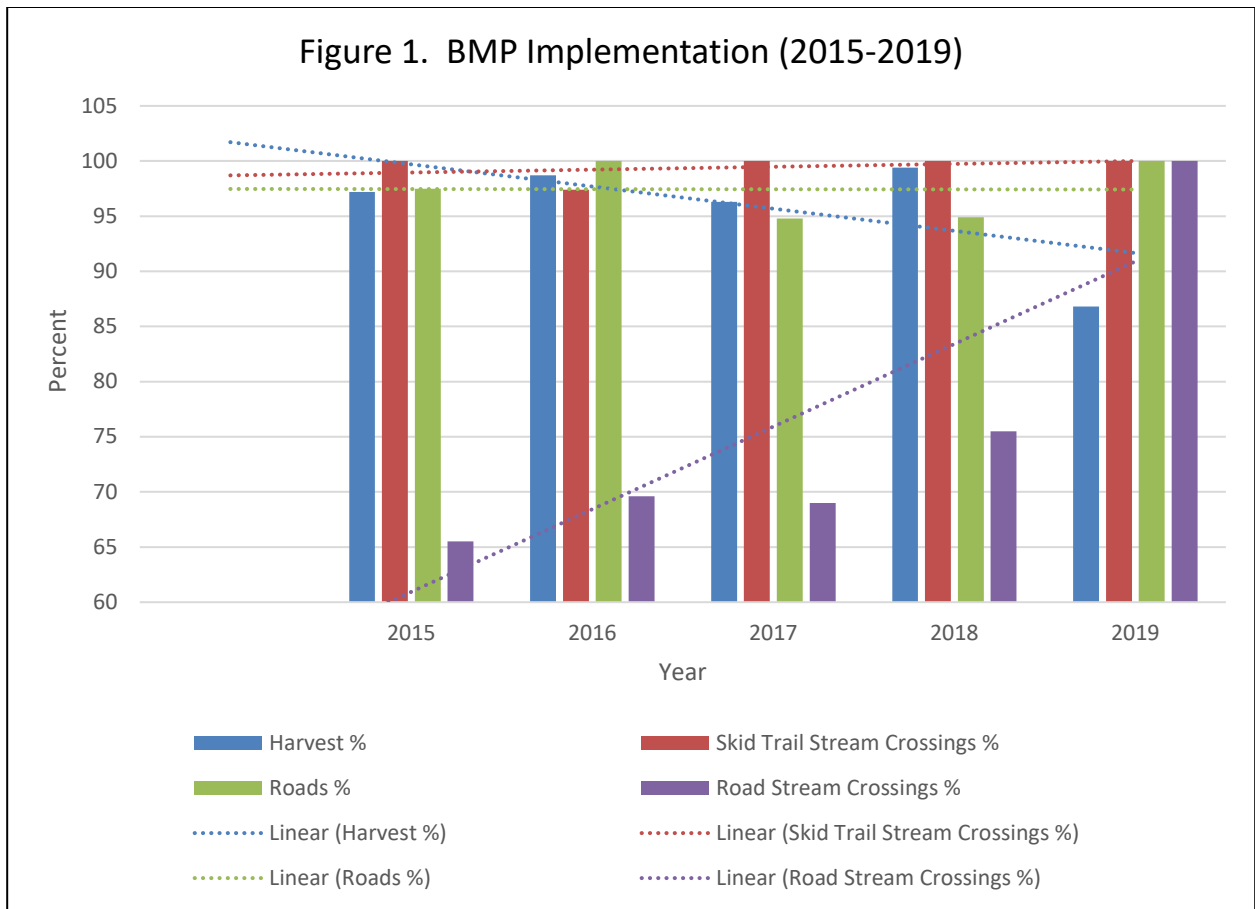
Implementation and effectiveness rates for the BMP category *Harvest Area Including Skid Trail/Log Deck* was 97.5 percent and 97.0 percent, respectively. Sediment has not been observed delivered to streams in the Harvest Area Including Skid Trail/Log Deck category. This is a very good implementation and effectiveness rate that indicates the application of BMPs is working in this category and sediment or other pollutants are generally not reaching streams.

Implementation and effectiveness of BMPs in the category *Harvest Stream Crossings* was 99.1 percent. Non-critical or critical visible sediment was never observed coming from skid trail stream crossings in the five years of inspections. Because it is difficult not to contribute some sediment to the stream with skid trail crossings, these practices are avoided to the extent possible during timber sale planning.

The implementation and effectiveness rate for the BMP category *Roads* was 97.2. Non-critical visible sediment was observed 0.5 percent of the time. The sediment was delivered from legacy system roads located adjacent to streams.

The last category monitored was *Road Stream Crossings*. Implementation and effectiveness rates were 72.0 percent and 72.9 percent, respectively. Non-critical visible sediment was delivered to streams 16.2 percent of the time. Critical visible sediment was delivered 1.0 percent of the time. The implementation and effectiveness BMP ratings could be improved into the 90 percent or higher range over time by correcting existing stream crossings where rusted CMPs need replacing, where the road grade declines over stream channels and where removing obstructions to aquatic organism could be accomplished.

A trend analysis for the past five years is presented in the following Figures. The five-year trend for *BMP* implementation and effectiveness is shown in Figures 1 and 2, respectively. The trend lines are inconclusive, primarily due to the short period of BMP monitoring (five years) and the small sample size in 2019 (four units and four roads). In 2019, there were only two stream crossings inspected, so this is skewing the data analysis. The category *Road Stream Crossings* continues to have the lowest BMP implementation and effectiveness due to the legacy issues that can only be improved when funding becomes available to correct BMP stream crossing issues. The declining implementation and effectiveness trend shown in the category *Harvest Area* BMPs is also probably not real due again to the small sample size (four units) in the 2019 monitoring. Between 2015 and 2018, an average of twenty units per year have been inspected.



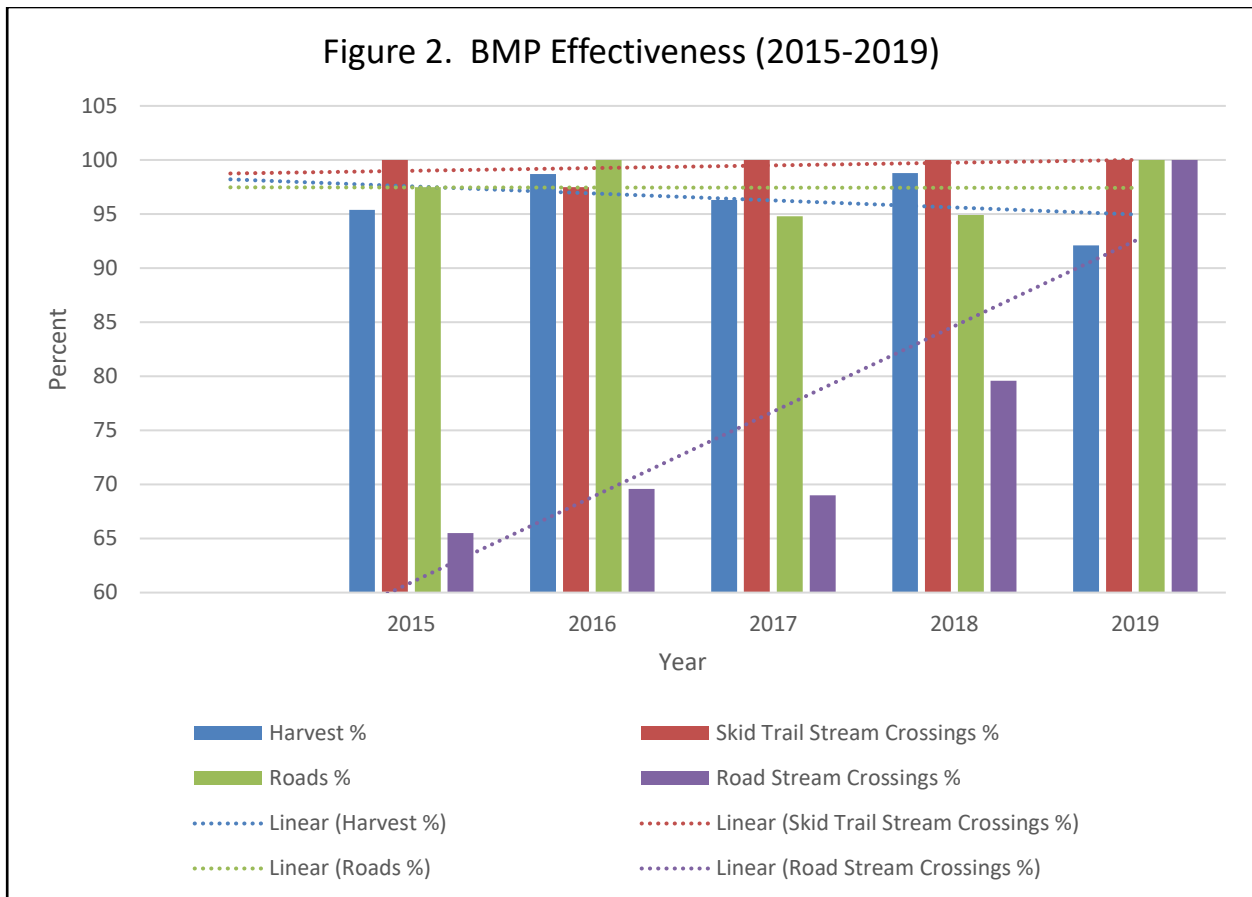
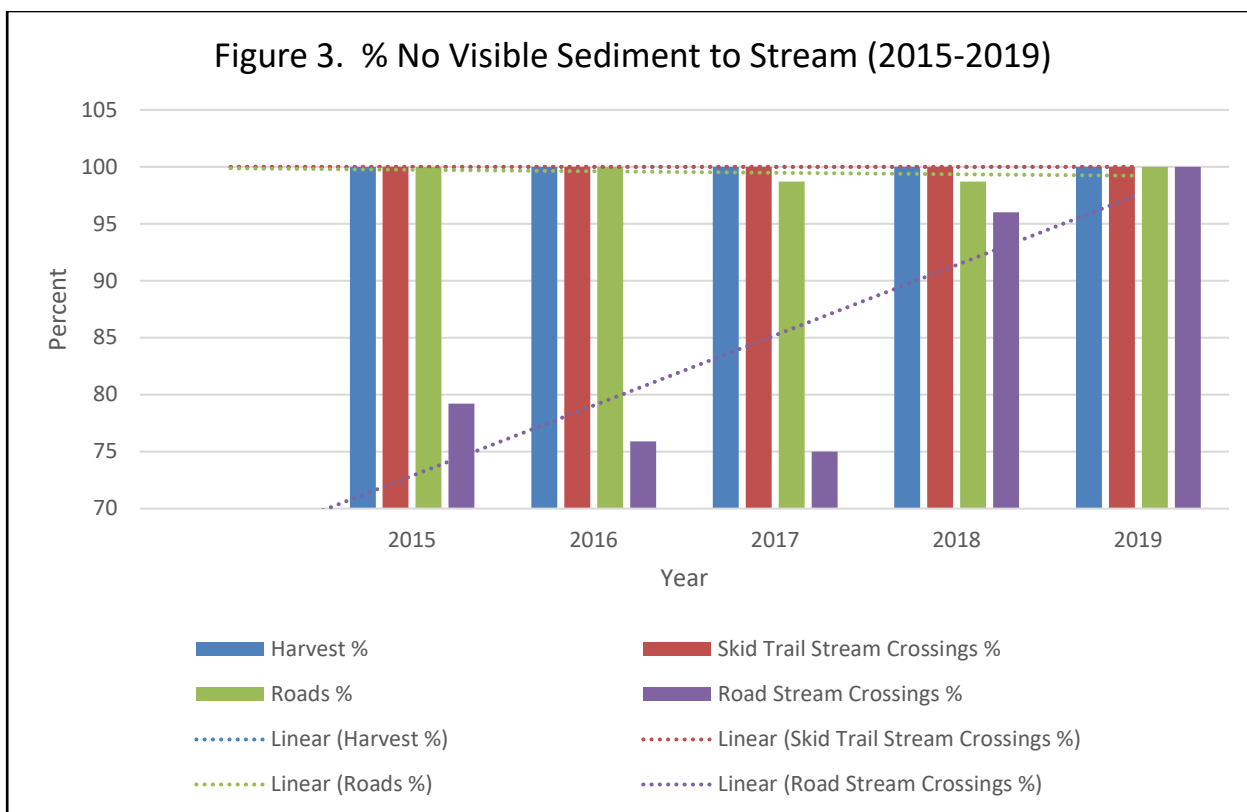


Figure 3 shows the five-year trend analysis for percent *No Visible Sediment to Stream Channel*. The data reveals a static trend for the categories *Harvest*, *Skid Trail Stream Crossings* and *Roads* and an improving trend for *Road Stream Crossings*. This could partially be a function of insufficient years of data collection and a small data set for 2019. It could also partially be true that some legacy road problems are being corrected with available road maintenance or other appropriations. Very little sediment has been delivered from the first three categories. Sediment delivery to streams in the *Road Stream Crossings* category has exclusively been attributed to legacy road problems that can only be corrected with sufficient funding.



It was previously stated that the purpose of BMP monitoring is to answer two questions: *Have the rules been properly applied?* (Implementation Monitoring); and *Were the rules effective in preventing a pollutant from impacting water quality?* (Effectiveness Monitoring)

From the information collected and analyzed over the last five years, it appears that the Cherokee National Forest is implementing Best Management Practices during timber sales and they are effective in protecting streams and water quality. There has generally been a static trend in the categories *Harvest Area*, *Harvest Stream Crossings* and *Roads*. However, the implementation and effectiveness rates and no visible sediment to stream channels are nearly 100 percent. Implementation and effectiveness and no visible sediment to stream channels for the category *Road Stream Crossings* lags behind because of legacy stream crossing issues that have yet to be funded.

The six “major long-term impact” ratings in the 2015-2019 BMP monitoring were related to failing stream crossings and barriers to aquatic organism passage. These identified problems all preceded and were not related to the timber sale activities. When system road problems are identified they are prioritized and corrective action is taken as funding becomes available. Eight times in the five years sediment was observed being delivered to a stream by the road grade sagging over the culvert. Five times sediment was delivered because the stream crossing was contributing to stream bank erosion. Again, these are legacy road issues.

MQ 16 E 9-10. No new information

MQ 16 E 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 2018 and 2019, the CNF conducted soil disturbance monitoring. Units were selected for inspection from the pool of all units where water quality BMP monitoring occurred. Units were selected on the North Zone and the South Zone. 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 (FSDMP), 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 RLRMP criteria for allowable soil disturbance. Goal 6 of the Cherokee National Forest Revised Land and Resource Management Plan (2004) states “Design and implement projects in ways that will maintain or improve the long-term productive capacity of the soil resource.” Goal 8 states “During mechanical disturbance on all soils dedicated to growing forest vegetation, the organic layers, topsoil and root mat will be left in place over 85 percent of a project area.”

There are multiple Forest Plan Standards related to soil productivity. In summary, the standards identify the use of best management practices during projects to avoid impacts to soils and minimize the extent of detrimental soil disturbance so that it is less than 15 percent of vegetation management treatment areas.

Monitoring activities implemented in 2018 and 2019 are summarized below. Data, screening results, and notes for 2018 and 2019 FSDMP are presented in Tables 4 and 5, respectively. Soil Disturbance Monitoring Reports for 2018 and 2019 are included as Appendices Y and Z, respectively. A five-year review of Soil Disturbance Monitoring data is provided below.

In 2018 and 2019 Soil Disturbance Monitoring revealed that a total of 2 out of 7 units monitored had greater than 15% detrimental soil disturbance. It should be noted that the units selected for soil disturbance monitoring 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.

2018 Soil Disturbance Monitoring Summary

Five individual harvest units were surveyed in May 2018 for post implementation soil monitoring on the Cherokee National Forest. Thirty sampling points were collected in each unit using twenty four parameters including amount of bare soil, coarse wood, compaction, live vegetation, and overall detrimental soil disturbance to name a few (See Methodology section for a complete list).

While all of the units saw localized effects in the form of soil displacement, fine and coarse wood removal, and compaction, with impacts to the forest floor ranging from 33 to 67 percent of the sample points, two of the units surveyed (Greasy Creek Unit 9 and Dutch Fields Unit 5) have greater than 15 percent detrimental soil disturbance levels due to roads and landings causing topsoil displacement, deep rutting, compaction and evidence of soil erosion on steeper slopes. The other three units (Greasy Creek Units 1, 5 and 8) have less than 15 percent detrimental soil disturbance.

TABLE 4 – Detrimental Soil Disturbance in Timber Harvest Units Monitored using SDMP in 2018

<u>South Zone</u>				
	Greasy Creek Unit 1	19	7%	Skid roads were well slashed.
	Greasy Creek Unit 5	8	10%	Minor localized disturbance to soil properties occurred within the unit typically on skid trails/roads. A lot of logging debris remained in the unit and in the undisturbed or slightly disturbed areas, the litter and duff layers were intact with some portions of the unit thick with shrubs.
	Greasy Creek Unit 8	30	7%	Slopes ranged from 5 to 45 percent and the main skid trails were located on the ridges with fairly minimal impacts to the steeper side slopes. Several streamside management zones were found within the unit with no harvesting occurring in those areas. In general soil disturbance in this unit was lighter and more dispersed rather than heavy and concentrated, resulting in a lower number of detrimental points.
	Greasy Creek Unit 9	27	17%	Detrimental disturbance was limited to skid trails/roads and landings which were prevalent throughout the. Detrimental determinations were due to either compaction or topsoil displacement.

	Dutch Fields Unit 5	25	17%	Forest floor impacts were documented at 67 percent of the data points sampled. Results indicated that 23 percent of the soil monitoring points had bare ground showing at the time of the survey. 30 percent of the sample points had ruts present that were less than 5 cm. The soils in Dutch Fields Unit 5 are finer textured with less coarse fragments and are more susceptible to compaction than some of the soils within the Greasy Creek Units (1, 5 and 8). There was minor evidence of overland surface flow where slopes were steeper. Detrimental disturbance was limited to skid trails/roads and landings which were prevalent throughout the unit. Detrimental determinations were due to either deep compaction or topsoil displacement.
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2019 Soil Disturbance Monitoring Summary

Two timber harvest units were surveyed in April 2019 for post-implementation soil monitoring. Thirty sampling points were collected in each unit using twenty four parameters including amount of bare soil, coarse wood, compaction, live vegetation, and overall detrimental soil disturbance, among others.

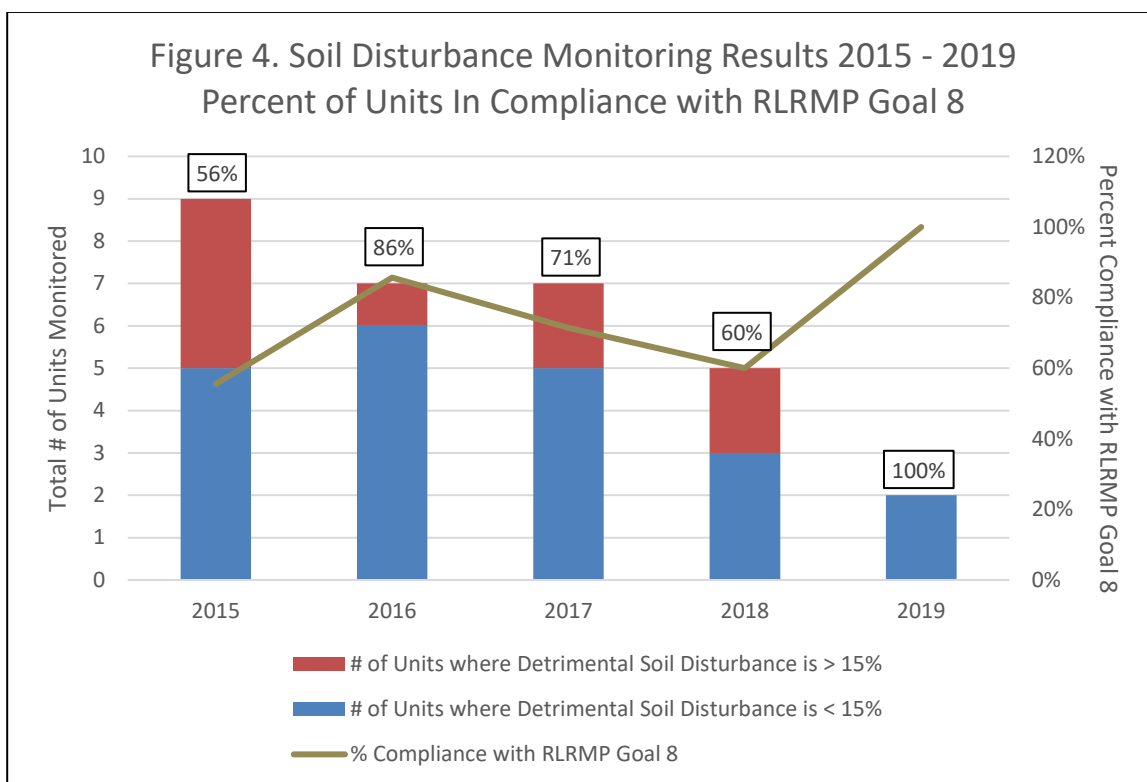
Both units demonstrated localized effects from soil displacement, fine and coarse wood removal, and compaction. However, neither the Heaberlin (10%) or Paint Creek #7 (13%) Timber Sale Unit demonstrated detrimental soil disturbance in excess of 15%. The Heaberlin and Paint Creek #7 units displayed considerable bare soil estimated at 43 and 37 percent, respectively.

TABLE 5 – Detrimental Soil Disturbance in Timber Harvest Units Monitored using SDMP in 2019

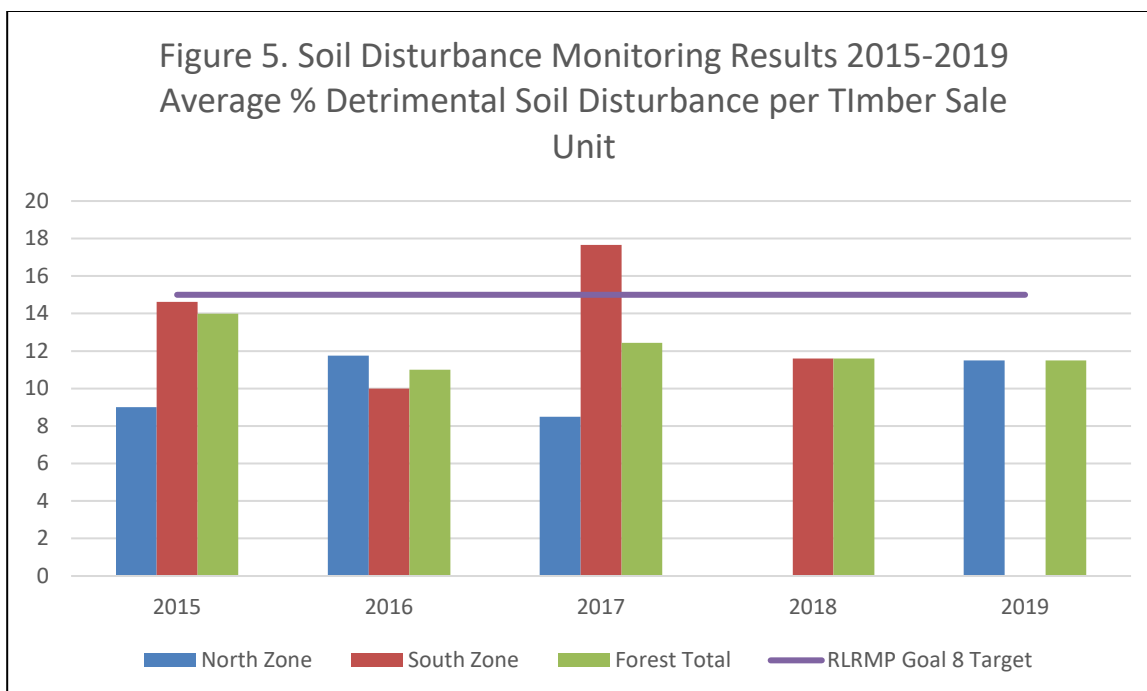
<u>North Zone</u>				
	Sale and Unit	Acres	% Detrimental Soil Disturbance	Notes
	Heaberlin	70	10%	In general soil disturbance in this unit was lighter and more dispersed rather than heavy and concentrated, resulting in a lower number of detrimental points. Good soil cover from leaf litter and fine wood on skid roads.
	Paint Creek Unit 7	14	13%	All detrimental disturbance was on bladed skid trails, roads or log landings.

Soil Disturbance Monitoring Five Year Review and Trend Analysis (2015-2019)

A five-year data summary and trend analysis for percent compliance with RLRMP Goal 8 is shown in Figure 4. The data indicates that there are generally several units per year which exceed the target of a maximum of 15% detrimental soil disturbance. The total compliance rate during the evaluation period is 70%. It should be noted that the units selected for soil disturbance monitoring are 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 and the overall forest compliance rate is likely higher. The trend lines are inconclusive, primarily due to the short period of monitoring (five years) and the small sample size in 2019 (two units). Between 2015 and 2018, an average of seven units have been monitored annually.



The five-year trend for average percent detrimental soil disturbance is shown in Figure 5. Although several units per year have been documented to exceed the RLRMP Goal of no more than 15% detrimental soil disturbance, it should be noted that the average forestwide percent detrimental soil disturbance per unit has, without exception, been below 15% during the analysis period. Since soil disturbance monitoring focuses on timber sale units with the highest number of risk factors, it is not anticipated that exceedance of allowable disturbance limits is a widespread problem on the units not monitored and the overall forest percent detrimental soil disturbance is likely much lower.



Over the past several years restoration actions were completed to restore soil productivity on two units identified in 2015 as out of compliance with RLRMP Goal 8. Restoration actions were completed on Island Creek Unit 1 in October 2015 and Island Creek Unit 7 in October 2018. Restoration actions brought the treated units back into compliance with the 15% threshold using de-compaction, recontouring, and revegetation techniques.

MQ 16 E 12-16. No new information.

MQ17: What are the conditions and trends of riparian area, wetland and floodplain functions and values?

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?

Monitoring Discussion and Findings

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.

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

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?

Monitoring Discussion and Findings

MQ 18 E 1. Objective 19.01 – Provide 33,726 MCF of sawtimber per decade.

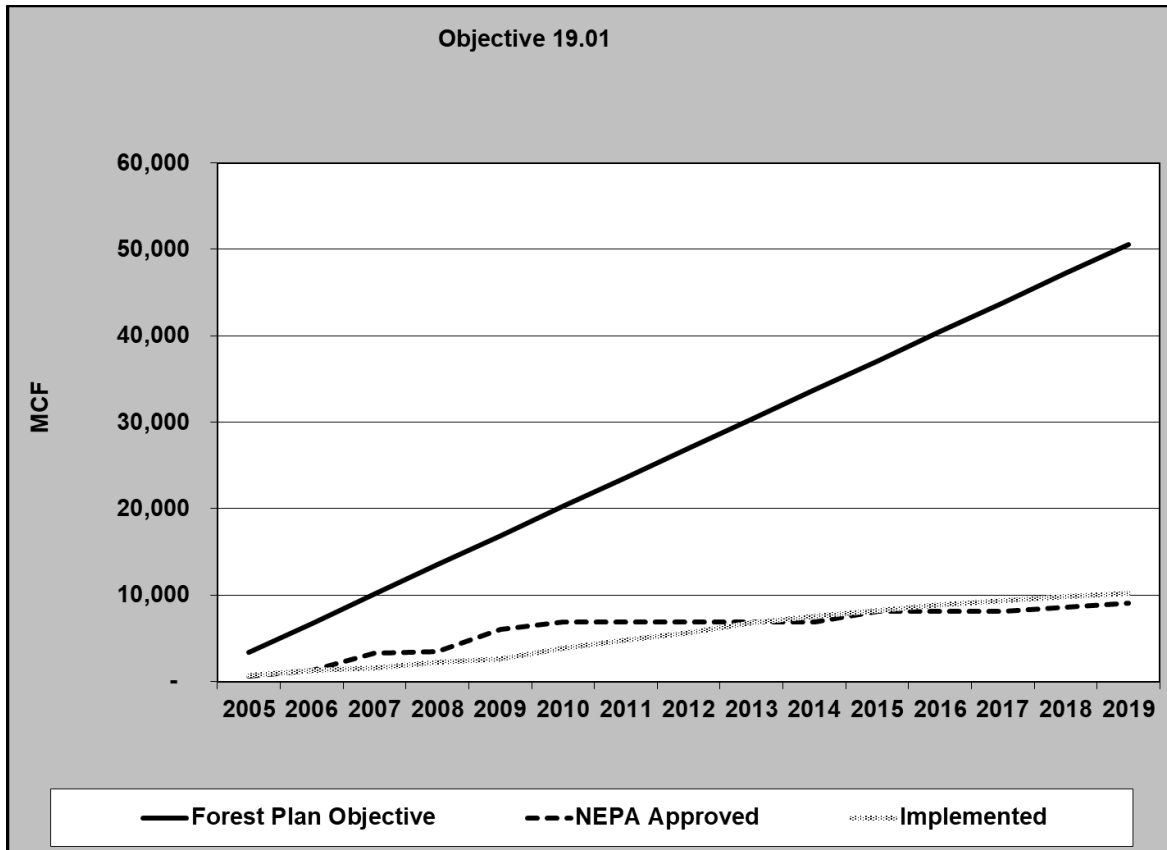


Figure 22. Objective 19.01

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

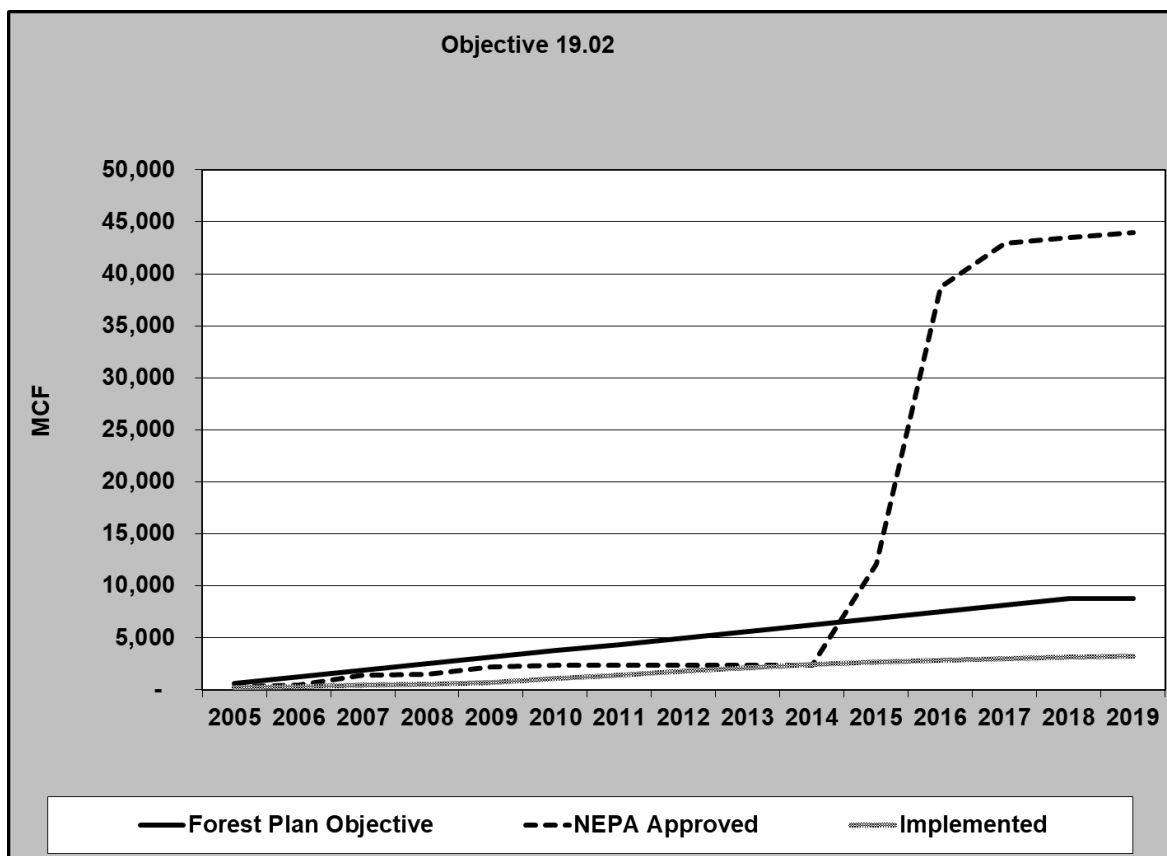


Figure 23. Objective 19.02

MQ 18 E 2. There is currently little demand for mineral resources on the Cherokee National Forest. In 2019, the Cherokee National Forest issued 3 mineral material permits for 9 tons of non-commercial, surface landscape rock. No other demands or requests were received.

MQ 18 E 3. The Cherokee National Forest continues to work on acquiring all dormant subsurface minerals rights. The desired future condition is 100% U.S. ownership of subsurface rights.

MQ 18 E 4. The Cherokee has received no 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.

MQ 18 E 5-7. 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

MQ 18 E 8. The estimates for road-related projects (maintenance, reconstruction, & construction) are within 10% of the actual costs. 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?

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?
5. Are appropriate harvest methods used on the Forest?
- 6.

Monitoring Discussion and Findings

MQ 19 E 1. Lands are being adequately restocked within 5 years of regeneration treatments with a mixture of planted and natural regeneration. In fiscal years 2018 and 2019, 459 acres of land were certified as restocked. The results of first year survival exams for areas planted in FY 2019- and third-year survival exams for areas planted in FY 2017 are displayed in the table below. One supplemental planting of northern red oak plantation failed due to root disease from the nursery, but otherwise planted seedling survival has been good across the Cherokee National Forest. The area with failed northern red oak seedlings is being restocked naturally and is being monitored.

Species	1 st Year Exam – planted in 2019	3 rd Year Exam – planted in 2017
Northern red oak	6%	64%
White oak	N/A	80%
Shortleaf pine	89%	69%

MQ 19 E 2. A timber land suitability analysis was completed during the development of the RLRMP. The geospatial database is monitored during the project development process to ensure that lands not suited for timber production are classified correctly.

MQ 19 E 3. No lands identified as not suitable for timber production have become suitable during FY 2018 or FY 2019.

MQ 19 E 4. All silvicultural practices implemented in FY 2018 and 2019 were in compliance with the RLRMP. The Plan allows a variety of harvest methods and sizes to accomplish silvicultural objectives.

MQ 19 E 5. All silvicultural practices implemented in FY 2018 and 2019 were in compliance with the RLRMP. The Plan allows a variety of regeneration, timber stand improvement and restoration treatments to accomplish silvicultural objectives.

MQ 19 E 6. Appropriate harvest methods are used on the Cherokee National Forest, they are consistent with the RLRMP, project level NEPA decisions, and all forest management related laws and regulations.

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

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 and respective responses 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?

Monitoring Discussion and Findings

MQ 20 E 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, fuels reduction, forest health, scenery, recreation, wildlife, soil and water, and roads.

National Environmental Policy Act (NEPA) documents produced since the RLRMP was implemented are shown in Figure 24.

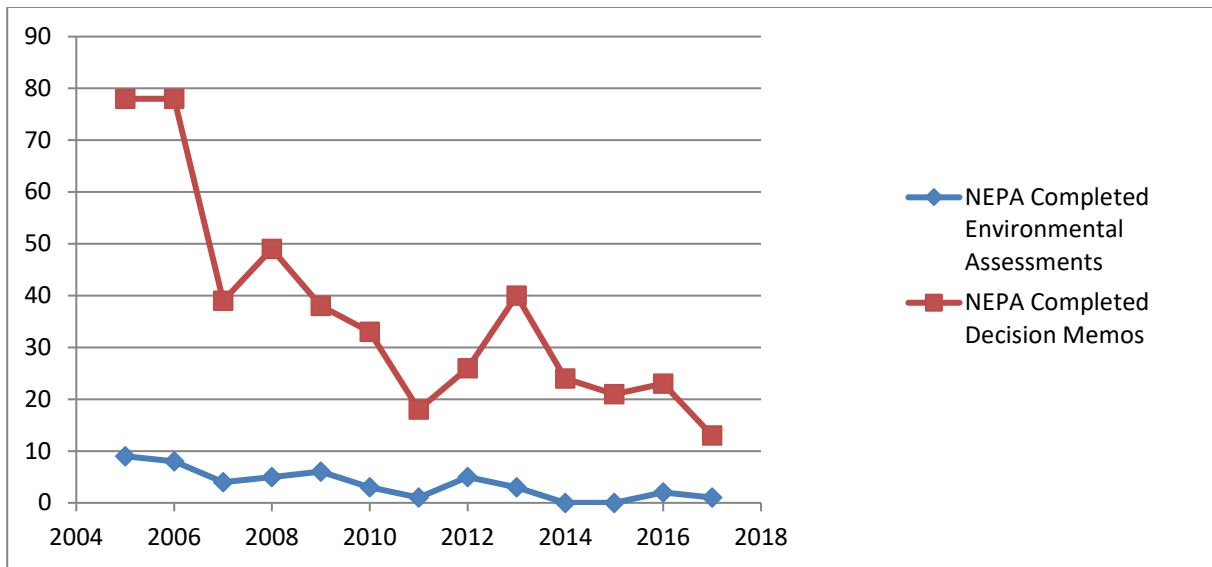


Figure 24. NEPA documents completed on the Forest

The types of projects on which NEPA was conducted are shown in Table 26. Many NEPA documents have more than one project purpose.

Table 26. 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	FY 2016	FY 2017
Facility Management	1	1	0	2	4	2	2	2	2	7	0	0	0
Forest Products	11	3	0	0	4	5	7	12	8	0	7	6	3
Fuels Management	11	20	21	18	20	19	9	16	30	18	8	16	7
Heritage Resource Mgmt	1	1	1	1	3	3	1	1	1	0	0	0	0
Recreation Management	25	24	21	19	21	17	22	21	15	2	2	4	6
Research	2	1	2	2	0	0	0	0	0	0	1	0	0
Road Management	8	9	6	4	9	5	6	8	8	5	5	6	5
Special Use Management	37	26	18	21	19	15	16	13	8	3	10	9	4
Vegetation Mgmt (not For. Prod.)	23	20	21	16	24	23	20	27	31	16	14	16	15
Watershed Management	2	2	2	1	2	3	6	6	5	1	2	4	2
Wildlife, Fish, Rare Plants	21	20	25	23	24	17	16	23	37	0	12	13	11
Grazing Management	0	1	2	2	1	1	1	1	0	0	0	0	0
Land Acquisition	0	0	1	1	0	0	0	0	0	1	3	0	0
Land Ownership Management	0	0	1	1	0	0	0	0	0	1	2	0	0
Special Area Management	0	0	1	0	0	0	0	0	0	0	0	0	0

MQ 20 E8. In 2019, approximately 43 new and renewed permits were issued and in 2018, approximately 27 new and renewed permits were issued. Depending on the project, NEPA demands for these permits were met within a reasonable time frame.

MQ 20 E9-10. No changes detected

MQ 20 E11-12. 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. Figure 66. Boundary Line Data indicates 2003 was the last year the minimal amount of boundary work was accomplished, and the accumulated deficit indicates many areas are over two cycles past due for maintenance. Continued reduced ability to maintain boundary marks and posting will result in increased potential for trespass, encroachments and other boundary conflicts. Forest lands may lose their national forest character as the land is encumbered with special uses, and as development occurs on private land next to the forest property line.

Multiple Land Acquisition projects are typically implemented each year. These projects are evaluated according to a set of criteria derived from USDA Departmental and Forest Service goals and objectives, as well as the enabling legislation for the Land and Water Conservation Fund, and the Endangered Species Act. Proposals are evaluated against National Criteria in a two-stage process which is competitive, and merit based. The project list is reviewed by Agency leadership and then forwarded to the Office of Management and Budget through the Department of Agriculture.

The criteria used to evaluate proposed land purchase projects funded by the Land and Water Conservation Fund appropriations are derived from the following laws and Departmental and Agency Goals:

- Section 7 of the Land and Water Conservation Fund Act of 1966, as amended;
- Section 5 of the Endangered Species Act of 1973, as amended;
- The Secretary of Agriculture's 7 Strategic Goals for OneUSDA;
- The Forest Service Chief's Five Priorities; and
- Forest Service Strategic Goals as stated in the Forest Service's Strategic Plan 2015 - 2020.

From FY06-FY19, forty-seven land purchases and conveyances (Table 14) totaling 16,926 acres were acquired for \$37,195,055 consolidating NFS lands, providing new and improved recreation access, protecting the Appalachian National Scenic Trail and Trail of Tears National Historic Trail corridors; and protecting and restoring watersheds, cultural resources, wilderness, and critical wildlife, fish and plant habitats. Other accomplishments include operation and maintenance efficiencies and enhancement of climate resilience. Exterior boundary lines for new acquisitions continue to be marked and posted to standard.

Table 14. Land Purchases and Conveyances, FY 06-19

<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	
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

<u>YEAR</u>	<u>NAME</u>	<u>TRACT NO.</u>	<u>ACRES</u>	<u>AMOUNT</u>
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
2015	Towee Falls Baptist Church LEX	K-1597	71.25	\$18,000
2015	Towee Falls Baptist Church LEX (Conveyance)	K-1596	-71.25	0
2015	The Conservation Fund - Rich Mountain	U-1166	100.00	\$540,000
2015	Elizabeth M. Beaver	U-1600	22.22	Donation
2015	The Nature Conservancy Tapoco T-4 Lands	K- 1559b,c,d,e	813.80	Donation
2015	Michael L. Sams Easement	Z-713	1.88	Donation
2016	The Conservation Fund- Shook Branch	U-1523b	19.439	\$685,000
2016	The Conservation Fund- Cut Laurel Gap Phase 1	U-1590	200.00	\$980,000
2017	The Conservation Fund-Cut Laurel Gap Phase 2	U-1590a	898.00	\$3,400,000
2017	SAHC-Rice Creek	U-1533	81.22	\$276,000

<u>YEAR</u>	<u>NAME</u>	<u>TRACT NO.</u>	<u>ACRES</u>	<u>AMOUNT</u>
2017	The Conservation Fund-Trail of Tears Britton	K-1607	3.55	\$175,000
2017	YMCA of Metropolitan Chattanooga	K-1576	157	\$100,000
2018	Buffalo Mountain (TCF & TNC)	U-1604	488	Donation
2018	Howell (TCF & TNC)	K-1603	616.01	\$862,414
2018	Hump Mountain (SAHC)	U-1091a	324	\$900,000
2019	Divided Mountain (TCF)	U-1601	186.53	\$200,000
2019	Dry Fork (TCF & TNC)	U-1591,a,b	549	\$740,000
Total			16,926.02	\$37,195,055

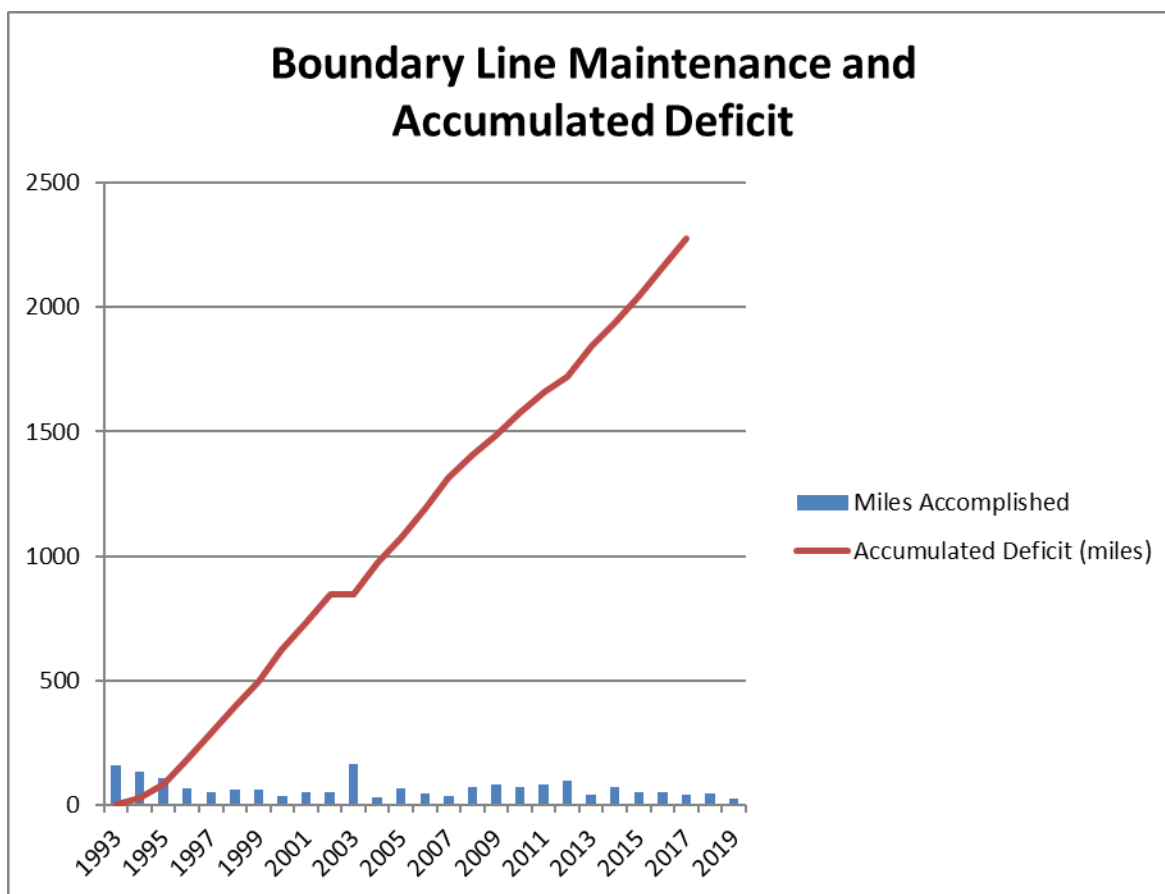


Figure 66. Boundary Line Data

MQ 20 E13. Law enforcement incidents vary by level of severity and type of activity.

CHEROKEE NATIONAL FOREST
Revised Land and Resource Management Plan
Administrative Change
2012 Planning Rule Monitoring Program Transition
April 2016

This Administrative Change – the 2012 Planning Rule Monitoring Program Transition – to the 2010 Revised Land and Resource Management Plan (LRMP) for the Cherokee National Forest, brings the plan monitoring program into conformance with the requirements of the 2012 Planning Rule. The 2012 Planning Rule allows for corrections or adjustments to the Forest Plan using a process called “Administrative Changes.” “Administrative changes” as defined by 36 CFR 219.13(c) in the 2012 Planning Rule is “... any change to a plan that is not a plan amendment or revision. Administrative changes include corrections of clerical errors to any part of the plan, conformance of the plan to new statutory or regulatory requirements, or other content in the plan (219.7(f)).”

Administrative Change

The administrative changes to the plan monitoring program are as follows:

Climate Change

In meeting the requirement to monitor “measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area” (36 CFR 219.12(a)(5)(vi)), the following monitoring questions and indicators will be added to the Forest’s Monitoring Program:

Monitoring Question #21 – How has climate variability changed and how is it projected to change across the region?

Monitoring Question #22 – How is climate variability and change influencing the ecological, social, and economic conditions and contributions provided by plan areas in the region?

Monitoring Question #23 – What effects do national forests in the region have on a changing climate?

Indicators and Procedures for these three Monitoring Questions:

These three monitoring questions will be addressed and evaluated through the Region 8 Broader-Scale Monitoring Strategy, which the Forest will incorporate into the Forest Evaluation Reports. To see the indicators and procedures that will be used at the broader-scale for these monitoring questions, see the Region 8’s Broader-Scale Monitoring Strategy at www.fs.usda.gov/main/r8/landmanagement/planning.

In addition to including Monitoring Questions 21, 22, and 23, the following Monitoring Questions from the Monitoring Program in the existing Forest Plan provide monitoring information to evaluate “other stressors that may be affecting the plan area.” These Monitoring Questions and their Indicators are:

Monitoring Question	Indicators
MQ1: Are rare communities being protected, maintained, and restored?	land exchange and purchase (acres), Prescribed fire, Table mountain pine

MQ2: Are landscape-level and stand-level composition and structure of major forest communities within desirable ranges of variability?	Forest density, hazardous fuels treatment, integrated pest management, land exchange and purchase (acres), late-successional habitats, Loblolly pine, mid-successional condition, native grasses (acres), oak-pine forests (acres), open woodland, savanna, or grassland structure, pitch pine (acres), Prescribed fire, Shortleaf pine, southern pine beetle (SPB), species reintroduction, Table mountain pine, Timber Harvest - Thinning, Virginia pine (acres)
MQ4: How well are key terrestrial habitat elements being provided?	Acadian flycatcher, black bear, chestnut-sided, fuelwood permit spot checks, hooded warbler, landscapes important for forest interior birds, leave tree spot checks, Management Indicator Species (MIS), native grasses (acres), ovenbird, pileated woodpecker, pine warbler, prairie warbler, scarlet tanager, snag density, Transportation infrastructure
MQ6: What are the status and trends of forest health threats on the Cherokee National Forest?	autumn olive, emerald ash borer, hemlock woolly adelgid, Japanese honeysuckle, Japanese knotweed, kudzu, lespedeza, Non-native invasive species (NNIS), purple loosestrife, southern pine beetle (SPB), tall fescue, target weed species locations, thousand canker disease

MQ7: What are the status and trends of federally listed species on the Forest?	Alabama moccasinshell, amber darter, Appalachian elktoe, Blue Ridge goldenrod, blue shiner, Bog turtle (<i>Clemmys muhlenbergii</i>), Carolina northern flying squirrel, Citico darter, Conasauga logperch, Coosa moccasinshell, Cumberland bean pearly mussel, finelined pocketbook, fluted kidneyshell, Georgia pigtoe mussel, gray bat, Indiana bat, northern long-eared bat, ovate clubshell, oyster mussel, rayed kidneyshell, Roan Mountain bluet, rock gnome lichen, Ruth's golden aster, slabside pearlymussel, Small-whorled pogonia (<i>Isotria medeolides</i>), smoky madtom, snail darter, southern acronshell, southern clubshell, southern pigtoe mussel, Species of Conservation Concern, spotfin chub, spreading avens, spruce-fir moss spider, tan riffleshell, upland combshell, Virginia spiraea, Virginian big-eared bat, yellowfin madtom
MQ8: What are the status and trends of species with viability concerns and/or their habitats?	Blackburnian warbler, Bobwhite quail, Cerulean Warbler, common raven, Ovate Catchfly, Red-breasted nuthatch, Species of Conservation Concern, Swainson's warbler, Whip-poor-will, White fringeless orchid (<i>Platanthera integrilabia</i>), Winter wren
MQ16: 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?	Acid Neutralizing Capacity (ANC), Best Management Practices (BMPs), non-point source pollution, soil and water protection standards, stream water temperatures, streambed material particle size distribution, Water Quality

Social, Cultural and Economic Sustainability

In meeting the requirement to monitor plan contributions to the social, cultural, and economic sustainability of communities, which is a part of monitoring the progress toward meeting the desired conditions and objectives, including providing multiple use opportunities (see 36 CFR 219.12(a)(5)(vii)), the following monitoring questions and indicators will be added in to the Forest's Monitoring Program:

Monitoring Question #24 – What changes are occurring in the social, cultural, and economic conditions in the areas influenced by national forests in the region?

Indicators and Procedures:

This monitoring question will be addressed and evaluated through the Region 8 Broader-Scale Monitoring Strategy, which the Forest will incorporate into the Forest Evaluation Reports. To see the indicators and procedures that will be used at the broader-scale for this monitoring question, see the Region 8's Broader-Scale Monitoring Strategy at www.fs.usda.gov/main/r8/landmanagement/planning.

In addition to including Monitoring Question 24, the following Monitoring Questions from the Monitoring Program in the existing Forest Plan provide information to evaluate social, cultural, and economic sustainability. The premise is that by producing or contributing to the ecosystem services that provide benefits to people and communities, social, cultural, and economic sustainability is enhanced. The following Monitoring Questions and Indicators from the exiting Monitoring Program in the Forest Plan provide information needed to evaluate ecosystem service benefits that are relevant to plan implementation:

Monitoring Question	Indicator
MQ9: What are the trends for demand species and their use?	brook trout, eastern wild turkey, ginseng, permits issued, ramps, ruffed grouse, white-tailed deer
MQ12: What is the status and trend of wilderness character?	Air quality - visibility, Prescribed fire, Recreation use and satisfaction
MQ12-3: What are the trends in air quality related values in Class 1 Wilderness areas?	Air Quality - Acid Deposition, Air Quality - Ozone, Air quality - visibility, Air Quality Related Values (AQRV)
MQ15: Are heritage sites protected?	heritage protection effectiveness, historic administrative and recreational facilities - preservation and maintenance plans
MQ18: How do actual outputs and services compare with projected?	access for mineral resource exploration, forest products production, Mineral Resource Development, surface rights, Transportation infrastructure

MQ 25: Are the number of populations and miles of occupied habitat of Southern Appalachian brook trout (SABT) increasing across the range in Tennessee?

Another requirement is that the plan monitoring program must include monitoring questions and indicators on the status of a select set of focal species to assess ecological conditions (see 36 CFR 219.12(a)(5)(iii)). A “focal species” is defined as a “species whose status permits inference to the integrity of the larger ecological system to which it belongs and provides meaningful information regarding the effectiveness of the plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the plan area” (36 CFR 219.19).

The following table shows the species that are being identified as “focal species” for this plan’s monitoring program, along with ecological system/ecological conditions that each focal species will serve as an indicator of:

Focal Species	Ecological System/Conditions
Brook Trout	Aquatic/drought, global warming, timber harvesting, roads

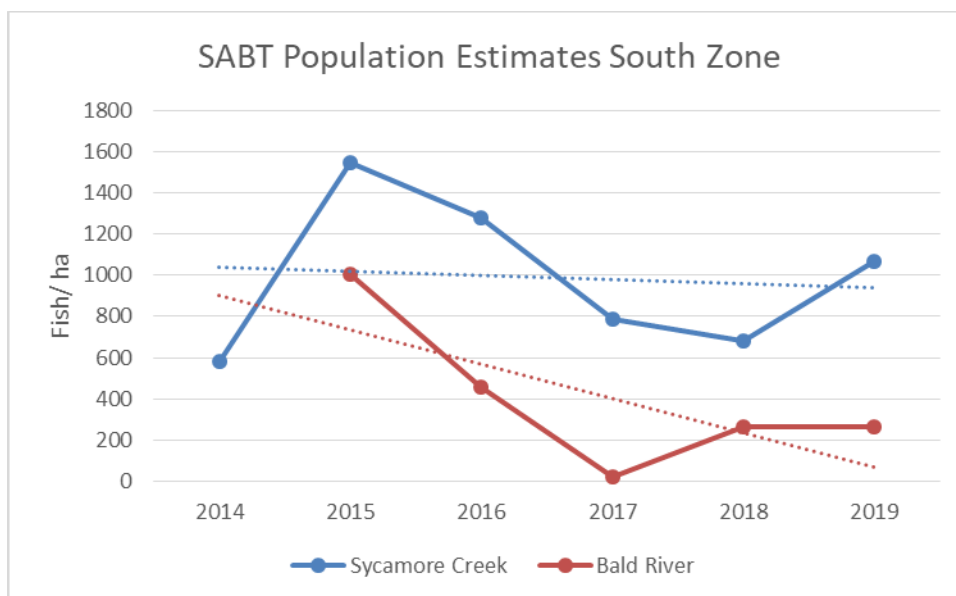
Brook Trout are a species of special concern to both local and national audiences. Brook Trout numbers are declining across the native range due to environmental and biological impacts. On the Forest, the native or southern strain of Brook Trout is limited to two known streams on the south zone of the Forest but occurs in approximately 55 stream reaches on the north zone.

A Southern Appalachian Brook Trout (SABT) hatchery was started at the Tellico hatchery in 2011. In 2015 fingerlings approximately 1500 were produced by the Tellico hatchery and released into Sycamore Creek. The hatchery failed in 2016 due to severe drought conditions and was consequentially shut down. Additional funding was secured in 2019 to make necessary changes to water cooling units and the hatchery is operational as of 2020.

South Zone Populations

No recovery actions occurred in 2018-2019. Miles of occupied habitat was not monitored during the reporting period. Therefore, it cannot be determined at this time if populations or miles of occupied habitat on the south zone of the forest are increasing or decreasing at this time. Long term monitoring sites were monitored on upper Bald River and Sycamore Creek. Data suggests that there is a slight decreasing trend in population estimates at these two sites (Chart AQ8). The severe drought conditions in 2016 is believed to have contributed to reductions in densities however, both populations have shown increasing trends since that event. Other than the 2015 stocking event at Sycamore Creek, no additional stocking has occurred in these reaches and all reproduction and population recovery is natural.

Chart AQ8. SABT population estimates at two reaches on Bald River and Sycamore Creek.



North Zone Populations

Miles of occupied habitat was not monitored during the reporting period. Recovery actions were implemented that added to SABT occupied habitat in six streams (Table AQ4), but it is unknown if there were declines in occupied habitat in the remaining streams that may have offset this increase. Therefore, it cannot be determined at this time if populations or miles of occupied habitat as a whole on the north zone of the forest are increasing or decreasing at this time. Recovery actions implemented during the reporting period included non-native trout removal and reintroduction of SABT to three streams. The north zone is the stronghold for SABT on the Forest and the state of TN containing hundreds of miles of cold, high elevation streams that are suitable for Brook Trout. No population trend data was available at the time of this report.

Table AQ4. Brook Trout enhancement activities on the north zone from 2018-2019.

Stream	Recovery Actions 2018	Recovery Actions 2019
<i>Little Stony Creek</i>	<i>Stock SABT</i>	<i>Stock SABT</i>
<i>Little Jacob Creek</i>	<i>Stock SABT</i>	
<i>Trail Fork Big Creek</i>	<i>Non-native trout removal</i>	<i>Non-native trout removal</i>
<i>Green Mountain Branch</i>	<i>Non-native trout removal</i>	<i>Non-native trout removal</i>
<i>Phillips Hollow</i>	<i>N/A</i>	<i>Stock SABT</i>
<i>Shell Creek</i>	<i>N/A</i>	<i>Non-native trout removal</i>

MQ 26: What are the trends in both populations and associated habitats for federally listed threatened and endangered species, proposed and candidate species, and selected species of viability concern on the Cherokee National Forest?

Direct monitoring of species populations is the most reliable method to determine population trend data. Accuracy should be high if using standard monitoring protocols designed for individual species in question. Using qualitative monitoring of selected habitat conditions, in combination with direct quantitative species monitoring, will yield very accurate results for

the question and indicators. Reliability includes but not limited to: recovery plans, published monitoring protocols, etc.

Threatened and Endangered species were already being monitored in the existing monitoring program under various monitoring questions, and will continue to be monitored according to the protocols already established. However, the evaluation of the information gathered from the monitoring of these species will now be used within the context of evaluating the integrity of the ecological system the species is a part of, along with the effectiveness of the plan in maintaining or restoring those ecological conditions.

The following is a list of 2004 Revised Land and Resource Management Plan Monitoring Questions, Elements, and respective Desired Condition/Goal/Objective/Standard that are now combined into Monitoring Question 26 as previously stated:

Monitoring Question #1. Are rare communities being protected, maintained, and restored?

Monitoring Question #4. How well are key terrestrial habitat elements being provided?

Monitoring Question #7. What are the status and trends of federally listed species on the Forest?

Elements 1, 2, & 3. Do all T&E species tracked by CNF currently have monitoring protocols in place and being implemented? What progress is being made toward recovery of aquatic T&E species and conservation of sensitive species? What is the population trend for each of 13 aquatic T&E and 28 sensitive species?

Desired Condition/Goal/Objective/Standard: FW Obj. 14.01, 14.03

Monitoring Question #8. What are the status and trends of species with viability concerns and/or their habitats?

Elements 1 & 2. Determine presence or absence of cerulean warbler. Track acres for canopy gaps. Trends in recovery of T&E species, and status 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.

Desired Condition/Goal/Objective/Standard: FW Obj. 11.02, 14.01

Forest Supervisor's Certification

The 2004 *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. I have reviewed the monitoring discussion and finding disclosed this report.

Based on the monitoring and evaluation results, the 2004 *Revised Land and Resource Management Plan* (RLRMP) is sufficient to guide management activities on the Cherokee National Forest, unless changed circumstances or new information identifies a need for change.

Stephanie Bland
Acting Forest Supervisor

Date

Appendix A

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