

Fiscal Year 2011
Monitoring and Evaluation Annual Report

Francis Marion National Forest

Revised Land and Resource Management Plan

August 8, 2012

United States Department of Agriculture
Forest Service
Southern Region

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Forest Supervisor's Certification

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

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

Any amendments or revisions to the Forest Plan will be made using the appropriate National Environmental Policy Act procedures.

/s/ Paul L. Bradley

Paul L. Bradley
Forest Supervisor
Francis Marion and Sumter National Forests

08/01/12

Date

Executive Summary

Monitoring and Evaluation Results and Report Findings

The *Revised Land and Resource Management Plan* (Forest Plan) provides guidance on how the Francis Marion National Forest (FMNF) will be managed. Monitoring determines how well goals and objectives are being met, if standards and guidelines are being properly implemented and whether environmental effects are occurring as predicted. Monitoring results are used to determine if programs should be adjusted or if changes in Forest Plan direction are needed.

Summary of Key Findings

Ecosystem Condition, Health and Sustainability

The GIS database shows 48,773 acres of longleaf pine forest types on the Francis Marion NF. This is 109% of the objective. The GIS database shows 38,154 acres of longleaf pine forest types in management area 26. The acreage of longleaf pine forest types is within 5% of the objective.

The Forest burned over 32,000 acres (i.e., 17,685 acres dormant season and 14,711 growing season) for hazardous fuels reduction during the FY 2011. This is slightly less than FY 2010. These acres were achieved during a year in which several factors inhibited hazardous fuels reduction: budgets were not released and implemented until late in the fiscal year, drought conditions were supported by historic high KDBI and ERC values, and both regional and national preparedness levels exceeded 3 and 4 for the majority of the prescribed fire season. The trend for prescribed burning longleaf pine forest types remains above 60 %, at 68%. This trend has continued to rise since FY07 (60%). Fire is critical to restoring and maintaining this fire-dependent community, and thus the percent burned needs to increase in the future. However, the current levels of treating 30,000-40,000 acres per year falls short of the 53,000 acres needed to maintain this burn cycle. Fire is critical to restoring and maintaining RCW habitat and fire-dependent communities. The Francis Marion is using different strategies to increase the number of acres burned annually.

The GIS database shows 34,813 acres of mixed pine/hardwood forest types, 511 acres more than reported for FY 2010. It is over 2.3 times the objective. The GIS database shows 4,315 acres of mixed pine-hardwood types in management area 27. This is 62 acres more than reported for FY 2010.

The FMNF red-cockaded woodpecker (RCW) population is the third largest population in the United States and continues to grow. Since only ½ of the habitat management area is being prescribed burned on a 5 year rotation, we have found that the core burn area is able to support a much larger population of red-cockaded woodpeckers than originally modeled and anticipated in conjunction with the 1996 Revised Forest Plan. No RCW monitoring was conducted on the Francis Marion during 2011. As such, no additional information is available concerning changes in the number of potential breeding groups, single bird groups or vacant clusters. As of January 2011 there were approximately 423 active RCW clusters on the FM. Of these, 411 were

suspected to be potential breeding groups and 12 were single bird groups. The recovery plan objective is 350 potential breeding groups. A contract was awarded to monitor 25% of the population/annually over the next four years. Stewardship dollars will be used to paint and mark trees and install artificial cavities. Mastication treatments were used to reduce hazardous fuels and improve habitat for the red-cockaded woodpecker on approximately 900 acres during 2010.

Two adult Rafinesque's big-eared bats, a sensitive species, were located under a small concrete bridge crossing Turkey Creek in 2010.

A contract was awarded in 2011 to monitor 115 rare plant populations on the Francis Marion.

Monitoring for American chaffseed in 2010 confirmed 405 plants from 4 populations, down from 1244 plants from 6 populations in 2001. Several occurrences were prescribed burned in 2010.

Monitoring for Pondberry in 2010 confirmed 13 populations, including 9 with over 500 stems, but only one producing fruit. An agreement was initiated with Dr. Danny Gustafson at The Citadel to identify barriers to fruit production in pondberry.

Monitoring of all pondspice records on the Forest (56 known total), was conducted in 2010 by Dr. Joel Gramling at the Citadel to determine the possible impact of laurel wilt on pondspice in the future. From the 56 total wetlands where pondspice was observed in the Francis Marion National Forest, he determined that there are nearly 70,000 stems of 1.4 meters or greater in height. Across all sites, laurel wilt was only observed twice.

No early successional habitat is being created through even-aged forest regeneration, though some is now planned in the Honey Hill and Hellhole projects with signed decisions. The Macedonia project (in planning stages) will also have even-aged regeneration harvest. Thinning stands to moderate basal areas followed by prescribed burning create openings in the forest canopy that somewhat mimics early successional habitat. GIS records show 1,181 acres in permanent openings and wildlife openings, and 50 acres in the 0-3 year age class.

Likely reasons for the decline in pileated woodpeckers are tied to lack of old growth trees as a result of Hurricane Hugo in 1989, a decreasing supply of snags, and undesirable stand conditions (e.g., pine stands regenerated after Hurricane Hugo).

The vast amount of forest stands that were damaged and/or regenerated by Hurricane Hugo provided ample habitat for species such as the prairie warbler and Bachman's sparrow. However, now that these stands are approximately 20-21 years old, most do not provide ideal habitat at the scale that they once did. Areas on the FMNF that have been maintained on a 2-3 year fire return interval are providing ideal habitat for these two species. Some of the largest concentrations of Bachman's sparrow can be found in frequently burned areas in the Waterhorn and Guillard Lake portions of the FMNF, while some of the largest concentrations of prairie warbler can be found in the central portion of the FMNF.

Northern bobwhite population declines on the FMNF are likely associated with inadequate nesting and brood rearing habitat, combined with increased predation and unfavorable weather conditions. It has been well documented in the literature that inadequate nesting and brood rearing habitat appears to be one of the most limiting factors throughout the northern bobwhite's range. A sustained level of silvicultural thinnings and regeneration harvests will provide a continuous cycle of desirable habitat for species such as the northern bobwhite, Bachman's sparrow and prairie warbler. Thinning and regeneration harvests planned in the Honey Hill Habitat Restoration Project and Hellhole Analysis Area Environmental Assessment should provide ideal habitat within their respective analysis areas. Thinning and mastication operations improved habitat conditions for species such as the northern bobwhite during 2010.

South Carolina Department of Natural Resources turkey brood surveys indicate that turkey recruitment remained good during 2011. Prior to 2010, reproduction in wild turkeys had been poor six of the last seven years, so the numbers documented in 2010 and 2011 are positive signs statewide. Similar to reproduction, total turkey harvest in South Carolina has seen steady declines since 2002. Declines in total harvest are likely attributable to one primary factor (i.e., poor reproduction). It is unclear why reproductive success significantly improved during 2010 and remained fairly constant in 2011. Two main reasons for the declines reported during past years include habitat loss and less than ideal weather patterns. Significant precipitation, combined with cooler temperatures during the spring nesting and brood rearing season can negatively impact reproductive success. Continuing an aggressive prescribed burning program, restoring mast producing hardwood stands, restoring the longleaf pine ecosystem, and increasing the FMNF's timber thinning and regeneration harvests programs are needed to maintain and restore turkey habitat on the FMNF.

The Riverbanks Zoo is caring for 2 of 3 frosted flatwoods salamanders (*Ambystoma cingulatum*) that were collected on the FMNF on March 16, 2010. This species is extremely rare on the Francis Marion National Forest. During 2010, the Frosted Flatwoods Salamander was documented on the forest for the first time since 2003. Breeding ponds for the frosted flatwoods salamander on the Francis Marion were dry during the breeding season in 2011, and thus no surveys were conducted. The Francis Marion supports one of only three known breeding populations in South Carolina. Only 8 adults and a few larvae have been captured on the Francis Marion in the past 20 years.

Breeding of the sensitive Carolina Gopher frog (*Lithobates capito*) was confirmed on the FMNF for the second year in a row during 2010. The Carolina gopher frog has been documented to travel significant distances to and from breeding wetlands. As such, good quality upland habitat adjacent to the breeding wetlands is essential.

Beginning in 2007, FM personnel installed 3 North American Amphibian Monitoring Program (NAAMP) frog routes on the FMNF. These NAAMP routes are run three times per year and are designed to monitor anuran populations. The primary goal of these frog routes is to assess frog and toad population trends using a calling survey technique. Overall, frog and toad trends on the FMNF appear to be stable, but long-term monitoring is needed to account for temporal variation and the complex life histories of our native amphibians. Species such as the Carolina Gopher Frog and Frosted Flatwoods Salamander are in a critical state, and are highly susceptible to local

extirpation without proper protection and habitat management. The FMNF and other protected lands in SC provide critical refuges for isolated wetlands. These palustrine wetlands are critical for ensuring the continued viability of pond breeding amphibians. Most of the isolated wetlands that have been digitized thus far occur along the Cainhoy Ridge and are primarily depressional-type wetlands.

Approximately 1,040 acres in compartments 115 and 116 were burned during 2008 and 2010, which significantly improved reptile and amphibian habitat in these compartments. Compartments 115 and 116 contain known breeding wetlands for the Carolina Gopher Frog and Frosted Flatwoods Salamander. The Cainhoy Ridge stretches from the southwest corner of the FMNF to the Santee River and supports some of the most diverse herpetofaunal communities on the forest.

During recent surveys, it has been observed that large wood is lacking in the coastal stream systems. Large wood is an important component of a stream system and a major influence on aquatic populations. Hansbarger and Dean (1994) stated that fish inventory was difficult due to the abundance of downed trees and wood in the streams. In 2010, 25 species were captured in 28 streams. All species captured since 1993 are native to the Santee Cooper Drainage. The population status of the sampled species is considered to be currently stable throughout all or a significant portion of their range, except for the ironcolor shiner. The ironcolor shiner, a species considered Vulnerable by AFS, was not captured during the sampling period. This species was captured in several streams in 1993 surveys.

There are 15 recreational fishing ponds on the Francis Marion consisting of a total of 41 acres. Largemouth bass and bream are the primary sport fish in the ponds. A few of the ponds have been stocked with catfish and grass carp for aquatic plant control. Twelve of the ponds had low alkalinity and need to be limed for aquatic species productivity. Due to extreme low water levels, pond liming has been postponed until 2012.

Southern pine beetle populations were at endemic levels during FY 2011. Laurel wilt is not one of the diseases mentioned in the monitoring item, but it spread across the Francis Marion National Forest in FY 2011.

The two main activities that cause air pollution within the Francis Marion National Forest are motor vehicle use and prescribed fires. Both of these activities emit pollutants that can increase ozone and fine particulate matter concentrations. Both fine particulate matter and ozone concentrations near the Francis Marion National Forest are meeting their respective air quality standards, and no negative impacts to either visitors to the Forest or vegetation within the Forest are expected. Bio-monitoring conducted in August 2010 indicated minimal foliar damage due to ozone exposure. Air quality within the Forest is being maintained and in many cases appears to be improving.

Sustainable Multiple Forest and Range Benefits

The Forest continued to follow its Land Ownership Adjustment Strategy. The Forest continues to pursue L&WCF funding for acquisitions, and was selected to submit a collaborative 2013 L&WCF funding request as a pilot project between the Forest Service, the Fish and Wildlife Service, and the National Park Service. One exchange is on the Francis Marion District. The Wambaw office and work center on the Francis Marion is also being processed, and is scheduled for competitive sale in early FY12. The Francis Marion accepted a donation of 63 acres in Charleston County. Two large land exchanges are expected to close in FY 2012. One exchange is on the Francis Marion District. The Wambaw office and workcenter on the Francis Marion is also being processed, and is scheduled for competitive sale in FY 2012.

The forest continues to identify and monitor archaeological sites and historic buildings at risk. Heritage resource specialists are working with law enforcement, other Forest Service employees, and the public to document and deter unauthorized forest activities that damage historic properties. The forest needs to increase monitoring to determine the effects of unauthorized activities and uses on archaeological sites including use of off road vehicles, horse trails, and woods roads. The effects of management activities such as tilling wildlife fields and construction of firelines need to be evaluated as well. Finally, the forest needs to develop historic preservation plans (HPP) for at risk priority assets and implement a regularly scheduled monitoring program.

Organizational Effectiveness

Factors such as uncertain weather, budget and staffing constraints, increasing urbanization, and smoke sensitivities will have an effect on the ability to sustain or significantly increase the acres burned. Stewardship and other types of partnerships are being used and need to continue to be used to maintain critical ecosystem components and control hazardous fuels.

The Francis Marion road system used by the public and commercial users has remained heavy, even during a weakened economy. Emphasis has continued on maintaining and reconstructing roads to meet the objective maintenance level, meet current design standards and best management practices, and reduce negative impacts to resources with the focus on watershed health. Road projects to support timber activities continue to focus on road surfacing and drainage repair and replacement. No new miles of road were constructed in FY 2011.

The Forest's new construction road miles continue to be near zero and is considerably lower than the target projected in the plan. This is being driven by the completeness of the road system; as it relates to the timber program's specified road needs. Miles of road reconstruction continue to fall behind the ten year plan target due to a stagnant budget. This will affect the road system in future years by requiring more expensive road work and reduction in serviceability of the

system. The forest has not been able to close significant mileage of roads to reach the percentage of closed roads in the plan.

The Francis Marion continues to conduct road condition surveys to determine the condition of the road system and the amounts of annual and deferred maintenance. Road decommissioning was not done in FY 2011; which allowed program dollars to be spent on high priority open roads. The forest is maintaining an increasing number of maintenance level 2 roads. The decreased level of maintenance will also reduce the quality of access or restrict access to some areas of the forest for the traveling public.

Chapter 1. Introduction

The Francis Marion National Forest is approximately 252,840 acres in size and is located on the lower coastal plain of South Carolina. The *Revised Land and Resource Management Plan* (Forest Plan) was approved on December 18, 1995 and guides all natural resource management activities and sets management standards for the Forest. Part of the mission of the Forest Service is to protect and manage the resources of the national forest so that they best demonstrate the sustainable multiple-use management concept. The Forest provides a number of goods and services for the public including timber, outdoor recreation, water, wildlife, fish and wilderness.

Forest Plan monitoring and evaluation is conducted to determine if the Forest is moving toward or achieving the desired conditions for resources. Forest Service resource specialists, universities, state resource agencies and contract specialists conduct surveys and inventories on a variety of natural resources annually.

Chapter 2. Monitoring Results and Findings

Chapter 2 of this report includes the monitoring questions and tasks defined in Chapter 5 and Appendix B of the Forest Plan. Appendix B of the Forest Plan contains the detailed monitoring task sheets. In this report, the monitoring questions are numbered consecutively with the corresponding task sheet in parentheses based on the page number in Appendix B.

Issue 1. Ecosystem Condition, Health and Sustainability

Sub-Issue 1.1 - Biological Diversity

1. Are the acres of longleaf forest type increasing at a rate to achieve objective (B-4)?

Information

This monitoring question is responsive to goals 1, 6, 7 and 8 and objective 4. **Objective 4** is to increase the longleaf pine forest type to 44,700 acres within 10 years. The longleaf pine ecosystem is maintained, restored, and enhanced.

- Acres of longleaf pine forest type.

Results

The GIS database shows 48,773 acres of longleaf pine forest types on the Francis Marion NF. This is 109% of the objective.

Findings

No additional action is needed.

2. Are the acres of longleaf forest type in Management Area (MA) 26 increasing at a rate to achieve objective (B-5)?

Information

This monitoring question is responsive to goals 1, 6, 7 and 8 and objective MA26-Objective-1. **MA26-Objective-1** is to have 40,000 acres of longleaf pine forest type within the next 10 years in MA 26. The longleaf pine ecosystem is maintained, restored, and enhanced.

- Acres of longleaf pine forest type in management area 26.

Results

The GIS database shows 38,154 acres of longleaf pine forest types in management area 26.

Findings

The acreage of longleaf pine forest types is within 5% of the objective.

3. Are sufficient longleaf pine management type acres being burned on a 2 to 4 year growing season burn cycle to achieve objectives (B-6)?

Information

This monitoring question is responsive to goals 1, 6, 7 and 8 and objectives 1 and 5.

Objective 1 is to maintain a red-cockaded woodpecker population of 450 clusters.

Objective 5 is to restore the role of growing-season fires on 16,000 acres of longleaf forest types in the next 10 years and on 40,000 acres in the long term by prescribed burning on a 2 – 4 year cycle. The red-cockaded woodpecker population is maintained, and the longleaf pine ecosystem is maintained, restored, and enhanced.

- Annual acres and location of longleaf pine management type stands burned on a 2 to 4 cycle during the growing season (April – September).
- Percent of the 160,000 RCW Habitat Management Area (HMA) acres which has been prescribed burned in the last 5 years.
- Percent of the longleaf pine forest types which has been prescribed burned in the last 5 years.
- Percent of MA- 26 that has been burned in the last 3 years.

Results

Shortages of firefighting resources are also common when wildfires and prescribed fire operations occur on the same day. Recommendations have been to continue requesting wildland fire preparedness funding and pursue alternative funding sources and increase partnerships with cooperators to offset funding shortfalls and leverage appropriated funds.

The Forest Service received ARRA funding in FY 2010 that allowed an agreement to be formed between The Nature Conservancy (TNC) and the Forest Service. This agreement continued in FY 2011. The result was a TNC prescribed fire burn module, consisting of leadership, firefighters, and equipment to assist Forest Service burn crews in planning and implementing prescribed fire treatments on federal lands.

Table 2-1, below, summarizes monitoring items.

Table 2-1. Monitoring Item and Results for FY 2007-2011

Monitoring Item	FY07-Results (acres)	FY08-Results (acres)	FY09-Results (acres)	FY10-Results (acres)	FY11-Results (acres)	Desired Condition
*Annual acres burned on 2 to 4 year cycle during the growing season	10,501	13,510	5,298	8,030	2,028	See Objective 5
**Percent of RCW HMA burned last 5 years	50%	50%	50%	50%	50%	See Objective 1 Prescribed burning cycle of 2 – 5 years throughout the entire HMA (ROD – RCW FEIS and standard FW-83)
Percent of longleaf pine forest types burned during the last 5 years	60%	60%	67%	67%	68%	See Objective 1
Percent MA-26 burned during the last 3 years	25 %	44%	48%	29%	25%	MA-26-G-1 states “Restore expand and maintain the longleaf pine ecosystem and related fire-dependent communities.” Standard MA-26-2 states burn pine stands on a 2 – 3 year cycle.
*The process to calculate annual acres burned on a 2 to 4 year cycle during the growing season has changed in order to better match the monitoring question. For this year’s analysis, fire frequency burn data from FY07 through FY11 was overlaid with areas of longleaf management type (including mixed) stands from the forest FSVeg spatial stand layer to obtain acres burned. The table above portrays a dramatic decline in production however, in reality the refined analysis process should now better display accurate accomplishments.						
**This is an estimate from district personnel. The RCW HMA is not available in a GIS layer and is not currently an accurate measure of habitat that is being managed for the benefit of RCW.						

Findings

Preparedness and hazardous fuels personnel achieved over 32,000 acres (i.e., 17,685 acres dormant season and 14,711 growing season) for hazardous fuels reduction during the 2011 fiscal year. These acres were achieved during a year in which several factors inhibited hazardous fuels reduction: budgets were not released and implemented until late in the fiscal year, drought conditions were supported by historic high KDBI and ERC values, and both regional and national preparedness levels exceeded 3 and 4 for the majority of the prescribed fire season.

Prescribed burning in the last 5 years within the RCW HMA remained near 50%. The area managed for RCW has changed since the LRMP was signed in 1996, and the RCW HMA is no longer an accurate tool for identifying RCW habitat.

Total acres burned on a two to four year rotation only totaled 2,028 acres, a major drop in recent years. While the drop off is significantly lower, analysis shows that 68% percent of Longleaf Pine habitat has been prescribed burned over the past 5 years. The trend for prescribed burning longleaf pine forest types remains above 60 %, at 68%. This trend has continued to rise since FY07 (60%). Fire is critical to restoring and maintaining this fire-dependent community, and thus the percent burned needs to increase in the future.

The forest has burned approximately 25 % of MA-26 in the last 3 years. This reflects a slight decrease from FY 10 to FY 11. The intent is to remain on a 2 to 3 year cycle in MA-26 with 50 percent of the area being burned over a three year period. This percentage needs to continually increase in order for the forest to meet monitoring goals and objectives.

However, the current levels of treating 30,000-40,000 acres per year falls short of the 53,000 acres needed to maintain this burn cycle. Fire is critical to restoring and maintaining RCW habitat and fire-dependent communities. The Francis Marion is using different strategies to increase the number of acres burned annually.

4. Are the acres of mixed pine/hardwood stands increasing at a rate to achieve the objective (B-8)?

Information

This monitoring question is responsive to goals 1, 6, 7 and 8 and objective 11. **Objective 11** is to increase the acres managed as mixed pine/hardwood forest types to 14,800 in the long-term. The amount of mixed pine and hardwood stands has increased, and mast-producing hardwoods are common.

- The acres managed as mixed pine/hardwood forest types.

Results

The GIS database shows 34,813 acres of mixed pine/hardwood forest types, 511 acres more than reported for FY 2010. It is over 2.3 times the objective.

Findings

No additional action is needed.

5. In management area 27, are the acres managed as mixed pine/hardwoods increasing at a rate to achieve the objective (B-9)?

Information

This monitoring question is responsive to goals MA-27-G-1 and MA-27-G-3 and objective MA 27-O-1. **Objective MA 27-O-1** is to have 6,700 acres managed as mixed pine/hardwood forest types to 14,800 in the next 90 years. Mixed pine/hardwood stands are found throughout this area on a variety of sites. Mast-producing hardwoods are common in hardwood stands, mixed stands and scattered throughout pine stands.

- The acres managed as mixed pine/hardwood forest types in management area 27.

Results

The GIS database shows 4,315 acres of mixed pine-hardwood types in management area 27. This is 62 acres more than reported for FY 2010. The context of the current mixed pine-hardwood acreage under objective 11 (forest-wide) above should be remembered when looking at the figures for management area 27.

Findings

No additional action is needed.

- 6. In management area 27, do loblolly pine stands by age 40 have 30 percent of the dominant/codominant canopy classes in mast-producing hardwoods (B-10)?**

Information

This monitoring question is responsive to goals MA-27-G-3 and MA 27-O-2. **Objective MA 27-O-2** is to have loblolly pine stands by age 40 with 30 percent of the dominant and/or codominant canopy classes in mast-producing hardwoods. Mast-producing hardwoods are common in hardwood stands, mixed stands and scattered throughout pine stands.

- 40 year old plus loblolly pine canopy class composition in MA 27.

Results

The results for FY 2011 are the same as those discussed in the FY 2004 monitoring report.

Findings

Baseline information will be used in the Forest Plan revision and to establish what conditions are needed to achieve desired results.

7. In management area 27, what conditions are needed in stand regeneration and development to achieve the objective (B-11)?

Information

This monitoring question is responsive to goals MA-27-G-3 and MA 27-O-2. **Objective MA 27-O-2** is to have loblolly pine stands by age 40 with 30 percent of the dominant and/or codominant canopy classes in mast-producing hardwoods. Mixed pine/hardwood stands are found throughout this area on a variety of sites. Mast-producing hardwoods are common in hardwood stands, mixed stands and scattered throughout pine stands.

- We expect specific items to be established during study in management area 27. This may need to be addressed when the plan is revised.

Results

Specific items have not been established.

Findings

This item would require a significant number of permanent plots to monitor. The Forest has not established such plots.

8. Are pine stands being thinned as planned (B-17)?

Information

This monitoring question is responsive to goals 4, 6, 7 and 8 and objective 9. **Objective 9** states create conditions on 38,000 to 50,000 acres of pine stands which release over crowded live crowns. The Forest continues to contribute to the long term economic stability, manage a sustainable forest, provide for wildlife habitat needs and sustain biological diversity.

- Acres of pine stands thinned.

Results

2,077 acres of thinning harvest were sold in FY 2011.

Findings

No additional action is needed.

9. Are red-cockaded woodpecker (RCW) clusters maintaining 350 or greater potential breeding groups (B-24)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 1, 4, 5 and 9. Provide a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. The Forest provides adequate habitat for various animals whose populations were previously threatened by dwindling populations.

- # of active RCW clusters
- # of groups nesting

Results

No RCW monitoring was conducted on the Francis Marion during 2011. As such, no additional information is available concerning changes in the number of potential breeding groups, single bird groups or vacant clusters. As of 1 January 2011 there were approximately 423 active RCW clusters on the FM. Of these, 411 were suspected to be potential breeding groups and 12 were single bird groups. The recovery plan objective is 350 potential breeding groups.

A contract was awarded to monitor 25% of the population/annually over the next four years. Stewardship dollars will be used to paint and mark trees and install artificial cavities.

The Forest monitored 128 RCW clusters on the FMNF internally in 2010.

We also facilitated implementation of a red-cockaded woodpecker translocation and monitoring project on the Francis Marion during 2010. This is the third year that the FMNF has donated sub-adult RCW's to at risk populations. This project was conducted in cooperation with the University of Georgia, Southeast Regional Partnership for Planning and Sustainability (SERPPAS), USFS, and the Southern Range Translocation Cooperative (SRTC). In association with this project, approximately 101 RCW clusters were monitored during 2010, and nestlings were banded in approximately 94 clusters. Based on allocations determined at the 2010 SRTC meeting, six pairs of sub-adults were translocated to Fort Jackson, two pairs went to Poinsett Combat Range and two pairs were translocated to Savannah River Site. This translocation project has not only saved the government money in terms of RCW monitoring, but has also identified 20-30 new budded and pioneered clusters. These budded clusters would not have been found during our typical annual monitoring activities.

As of 2010, the forest supports approximately 410 potential breeding groups, 12 single bird groups and 61 vacant clusters. The recovery goal is 350 potential breeding groups.

Findings

The FMNF RCW population is the third largest population in the United States and continues to grow. Since only ½ of the habitat management area is being prescribed burned on a 5 year rotation, we have found that the core burn area is able to support a much larger population of red-cockaded woodpeckers than originally modeled and anticipated in conjunction with the 1996 Revised Forest Plan.

10. Are populations of all existing PETS animal species being maintained or increased (B-25)?

Information

This monitoring question is responsive to goals 1, 5, 6, 7 and 8 and objectives 1, 2, 4, 5, 9, 11, 12, 13, 14, and 15. The Forest provides adequate habitat for various animals whose populations were previously threatened by dwindling populations.

- Numbers of PETS animals and related habitats.

Results/Findings

The Riverbanks Zoo is caring for 2 of 3 frosted flatwoods salamanders that were collected on the FMNF on March 16, 2010, and 2 Carolina Gopher Frogs collected as tadpoles during the spring of 2009. Both species are extremely rare on the Francis Marion National Forest.

Breeding ponds for the frosted flatwoods salamander on the Francis Marion were dry during the breeding season in 2011.

Frosted Flatwoods Salamander - The Forest completed another survey for the federally threatened Frosted Flatwoods Salamander (*Ambystoma cingulatum*) in 2010. Service contracts were used to fund surveys completed by John Palis and Joyce Marie Klaus. Nineteen wetlands were surveyed, and *Ambystoma cingulatum* was documented on the forest for the first time since 2003. Six larvae were collected from a previously undocumented breeding wetland. The Francis Marion supports one of only three known breeding populations in South Carolina. Only 8 adults and a few larvae have been captured on the Francis Marion in the past 20 years. Steve Bennett (SC state herpetologist) took three larvae to the Riverbanks Zoo in Columbia, SC, where Scott Pfaff (Curator of Herpetology) successfully raised them to metamorphosis. At the time of collection, the larvae were too small to collect tail tissue, so the zoo reared them until they were big enough to collect tissue. DNA analysis was performed. DNA analysis indicates that individuals from the Francis Marion do not represent a distinct species, and are closely related to other populations of the Frosted Flatwoods Salamander. This was the first genetic material available from SC. The three individuals collected from the FMNF will continue to be housed at the Riverbanks Zoo in order to study their natural history. This is one of the first times that the species has been successfully reared in

captivity. The last report that we received from the Riverbanks Zoo stated: "the salamanders are doing great, eating blackworms like crazy ... and they are the most "active" of any of the ambystoma larvae he's raised ... and he's raised several species to metamorphosis."



Carolina Gopher Frog - Three North American Amphibian Monitoring Program (NAAMP) routes were installed on the FMNF in 2007. Breeding of the sensitive Carolina Gopher frog (*Lithobates capito*) was confirmed on the FMNF for the second year in a row during 2010. These NAAMP routes are run three times per year and are designed to monitor anuran populations. The Carolina gopher frog has been documented to travel significant distances to and from breeding wetlands. As such, good quality upland habitat adjacent to the breeding wetlands is essential. Future surveys conducted for the frosted flatwoods salamander and information obtained from the NAAMP routes should allow the FMNF to better document and monitor these two species in the future. Scott Pfaff, Curator of Herpetology at the Riverbanks Zoo in Columbia, SC successfully raised several *L. capito* from the Francis Marion to metamorphosis. Because so little is known about this species' natural history, the zoo plans to raise these individuals, and hopefully get them to breed in captivity.



Rafinesque's Big-Eared Bat -Two adult Rafinesque's big-eared bats, asensitive species, were located under a small concrete bridge crossing Turkey Creek in 2010.

11. Is the number of populations of existing PETS plants being maintained or increased (B-26)?

Information

This monitoring question is responsive to goals 1, 2, 5, 6, 7 and 8 and objectives 13. Plant species with viability concerns are found to be more common than previously thought. The number of PETS plant populations is being maintained or increased.

- Location and number of existing PETS plant populations.

Results/Findings

No new information to report. A contract was awarded in 2011 to monitor 115 rare plant populations on the Francis Marion.

American chaffseed - Monitoring in 2010 confirmed 405 plants from 4 populations, down from 1244 plants from 6 populations in 2001. Several occurrences were prescribed burned in 2010. American chaffseed declines rapidly without a 2-3 year prescribed fire regime. The two extirpated populations, and another nearing extirpation, are each located at the WUI (wildland-urban interface) and went without fire for several years after Hugo.



*Federally Endangered
American chaffseed*



Federally Endangered Pondberry

Pondberry - Monitoring in 2010 confirmed 13 populations, including 9 with over 500 stems, but only one producing fruit. An agreement was initiated with Dr. Danny Gustafson at The Citadel, to identify barriers to fruit production in pondberry. He has collected fruits from pondberry occurring on adjacent private lands, and is looking at genetic structure of Francis Marion populations to see if they would benefit from enhancement of existing populations with plants grown from adjacent populations. Anne

Cubetta is working with Dr. Joel Gramling at the Citadel to develop a habitat characterization and suitability model for pondberry throughout the range of the species.

Pondspice - More intensive monitoring of all pondspice records on the Forest (56 known total), was conducted in 2010 by Dr. Joel Gramling at the Citadel to determine the possible impact of laurel wilt on pondspice in the future. From the 56 total wetlands where pondspice was observed in the Francis Marion National Forest, he determined that there are nearly 70,000 stems of 1.4 meters or greater in height. Three sites account for 94% of these stems with a single site (EO50) accounting for over half of this estimate. The other 53 sites account for only 4,117 adult stems. Roughly half of all adult stems were 1-2 cm in diameter at breast height (DBH) while only 2% were greater than 5 cm in DBH. Only 16% of the adult stems were in fruit or flower. While 71% of all adult stems where > 1 cm in DBH, 94% of reproducing stems were greater than > 1 cm in DBH. Across all sites, laurel wilt was only observed twice.

12. Are we maintaining viable populations of early successional native species and the habitat to support them (B-27)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 12 and 13. **Objective 12** is to maintain 5,000 to 10,000 acres of early successional habitat in the short and long term. Provide a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. Provide opportunities to enjoy a variety of recreational uses of wildlife.

- Acres in grass-forb habitat (acres in 0-3 year class, permanent openings, wildlife openings, road rights-of-way, utility rights-of-way) in the short and long term.

Results

No early successional habitat is being created through even-aged forest regeneration, though some is now planned in the Honey Hill and Hellhole projects with signed decisions. The Macedonia project (in planning stages) will also have even-aged regeneration harvest. Thinning stands to moderate basal areas followed by prescribed burning create openings in the forest canopy that somewhat mimics early successional habitat. GIS records show 1,181 acres in permanent openings and wildlife openings, and 50 acres in the 0-3 year age class.

Findings

The Forest needs to begin doing even-aged regeneration harvesting in order to meet Objective 12 and begin providing additional habitat for maintaining viable populations of early successional native species. The Honey Hill, Hellhole and Macedonia projects will begin to address this need.

13. Are we maintaining viable populations of older forest native species and the habitat to support them (B-28)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 1, 2, 9, 11, 14, and 16. Provide a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. Provide opportunities to enjoy a variety of recreational uses of wildlife.

- Acres in late successional habitat (pine > 80 years, hardwood > 100 years, and mixed >100 years).

Results

GIS records show:

- 13,516 acres of pine types over age 80
- 16,738 acres of hardwood types over age 100
- 1,580 acres of mixed pine-hardwood types over age 100

Findings

No additional action is needed.

14. Are we maintaining viable populations of native bird species and the habitat to support them (B-29)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 1, 2, 3, 4, 5, 8, 9, 11, 12, 13, 14, 15, and 16. Provide a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. Provide opportunities to enjoy non-consumptive uses of wildlife such as bird watching.

- Population trend of management indicator species (MIS) birds.

Results

Breeding Bird Survey: 110 points on FMNF
Bald Eagle Surveys: 1 annual survey on Santee River
Swallow-tailed kite surveys: Two annual surveys
Quail Call Counts: Two annual surveys

Technical report, *Population Trends and Habitat Occurrence of Forest Birds on Southern National Forests, 1992-2004* (General Technical Report NRS-9) indicates that mean observations per count for pileated woodpeckers have slightly declined since the early 1990s on the Francis Marion National Forest (FMNF). However, declines in the South Atlantic Coastal Plain have been negligible. Prairie warblers have increased in the South Atlantic Coastal Plain, but mean observations on the Francis Marion National Forest show sharp declines. The Bachman's sparrow is dependent upon fire maintained woodlands or other open habitats that support a dense ground layer of grasses and forbs. It is a bird of conservation concern in the South Atlantic Coastal Plain and forest sensitive species on the FMNF. Breeding bird survey data from the Francis Marion and Sumter indicate a 6.3 percent decline from 1992-2004. The Swainson's warbler prefers habitat that consists of understory thickets and canebrakes found in swamps and bottomland forests. Breeding bird surveys have shown an annual increase of 8.2 percent for Swainson's warblers on the Francis Marion and Sumter from 1992-2004.



American Bald Eagle

Findings

Refinements have been made to the Region 8 Bird Database, which now allows the Francis Marion and Sumter National Forests to analyze avian trends at the district level. Previously, analysis could only be conducted for the entire forest.

Likely reasons for the decline in pileated woodpeckers are tied to lack of old growth trees as a result of Hurricane Hugo in 1989, a decreasing supply of snags, and undesirable stand conditions (e.g., pine stands regenerated after Hurricane Hugo). The vast amount of forest stands that were damaged and/or regenerated by Hurricane Hugo provided ample habitat for species such as the prairie warbler and Bachman's sparrow. However, now that these stands are approximately 20-21 years old, most do not provide ideal habitat at the scale that they once did. Areas on the FMNF that have been maintained on a 2-3 year fire return interval are providing ideal habitat for these two species. Some of the largest concentrations of Bachman's sparrow can be found in frequently burned areas in the Waterhorn and Guillard Lake portions of the FMNF, while some of the largest concentrations of prairie warbler can be found in the central portion of the FMNF.

The decision notice for the Honey Hill Habitat Restoration Project has been signed, and it is anticipated that timber harvesting will begin during 2011. The Hellhole Analysis Area Environmental Assessment was completed during 2010, and the decision was signed in 2011. Both of the aforementioned projects are expected to benefit species such as the prairie warbler and Bachman's sparrow, especially the longleaf restoration treatments. The Honey Hill Habitat Restoration Project will consist of regeneration harvests on up to 840 acres, biomass thinnings on approximately 498 acres, first thinnings on 159 acres, and intermediate thinnings on over 1,200 acres. The longleaf restoration treatments proposed in the Honey Hill Habitat Restoration Project represent the first regeneration harvests that the FMNF has conducted on a landscape scale since the early 1990's.

Treatments planned in the Hellhole Analysis Area Environmental Assessment consist of the following:

- 1) Thinning approximately 2,400 acres of densely stocked pine stands down to a residual basal area of 40-60 square feet per acre.
- 2) Thinning approximately 1,100 acres of large pulpwood/small sawtimber pine stands down to 40-50 and 45-55 square feet per acre.
- 3) Regeneration harvests/longleaf pine restoration on approximately 580 acres.



Bachman's sparrow on FMNF

Traditionally, our pine thinnings have sought to reduce stand density to a residual basal area of 55-65 or 60-70 sq ft/ac. From a wildlife and ecological standpoint, heavy thinnings can prove to be highly beneficial, especially for species such as the red-cockaded woodpecker and Bachman's sparrow. When Hurricane Hugo struck the coast in 1989, there were upwards of 40,000 acres of pine and mixed pine stands that were completely regenerated. At approximately 20-21 years of age, these pine stands offer some of the poorest ecological and biological conditions on the FMNF. This is especially true if they aren't being managed on an appropriate burning regime. The thinning of densely stocked pine stands is crucial for enhancing wildlife habitat on the FMNF, especially when these stands are managed under an appropriate prescribed burning regime. It has been well documented in the literature that inadequate nesting and brood rearing habitat appears to be one of the most limiting factors throughout the northern bobwhite's range. A sustained level of silvicultural thinnings and regeneration harvests will provide a continuous cycle of desirable habitat for species such as the northern bobwhite, Bachman's sparrow and prairie warbler.

The FMNF began working on an environmental assessment for the Macedonia Analysis Area during 2011. This project should greatly improve floral and faunal habitat on thousands of acres, which are currently in relatively poor condition due to fire exclusion

and closed-canopy conditions. Treatments being considered include thinning, longleaf restoration, seedtree harvests, and mixed hardwood/pine restoration.

15. Are we maintaining viable populations of turkey and the habitat to support them (B-30)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 2, 3, 11, 13, and 16. Provide a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. Provide opportunities to enjoy consumptive uses of wildlife such as hunting and fishing.

- Population index trend of Eastern wild turkey.

Results

Turkey Brood Survey: Collection of casual observations on all Districts
Technical report, *Population Trends and Habitat Occurrence of Forest Birds on Southern National Forests, 1992-2004* (General Technical Report NRS-9) indicates that mean observations per count have slightly declined for turkey since the early 1990s on the Francis Marion National Forest. However, the declines in the South Atlantic Coastal Plain have been sharper.

South Carolina Department of Natural Resources turkey brood surveys indicate that turkey recruitment remained good during 2011. The average brood size of 4.2 poults and total recruitment ratio of 2.3 was only slightly down from 2010 survey results. For the Southern Coastal Plain Zone, where the FMNF resides, total recruitment ratio remained 1.6. Prior to 2010, reproduction in wild turkeys had been poor six of the last seven years, so the numbers documented in 2010 and 2011 are positive signs statewide. Similar to reproduction, total turkey harvest in South Carolina has seen steady declines since 2002. Declines in total harvest are likely attributable to one primary factor (i.e., poor reproduction). An estimated total of 14,183 adult gobblers and 2,902 jakes were harvested during 2011, which totaled 17,085 turkeys (16,924 were harvested during 2010). Total turkey harvests during 2010 and 2011 represent a substantial increase in harvest from 2009 (i.e., 16,234 harvested during 2009). The increase in harvest during 2010 was the first increase since 2005, so the 2011 harvest is another positive sign statewide. Harvest rates per square mile slightly decreased for Berkeley County (1.0/square mile during 2010 and 0.8/square mile during 2011) and remained constant in Charleston County (0.8/square mile during 2010 and 0.8/square mile during 2011).



Wild Turkey hens with poults

Findings

It is unclear why reproductive success appreciably improved during 2010 and remained fairly constant in 2011. Two main reasons for the declines reported during past years include habitat loss and less than ideal weather patterns. Considerable precipitation, combined with cooler temperatures during the spring nesting and brood rearing season, can negatively impact reproductive success. On the FMNF, previous declines in turkey reproductive success are likely attributable to poor nesting and brood rearing habitat (e.g., closed canopy pine stands that were regenerated after Hurricane Hugo), predation, and suboptimal weather conditions during nesting and brood rearing.

Tree thinning operations, especially those followed by adequate fire return intervals, have improved nesting and brood rearing habitat across the FMNF. It is anticipated that we will see an increase in brood recruitment with appropriate forest management and desirable weather conditions. However, wildlife biologists are becoming increasingly concerned about the impacts that predators such as the coyote might be having on species such as the Eastern Wild Turkey. Although coyotes were historically only found in the western half of the United States, this non-native species is now found in all counties of the state.

Continuing an aggressive prescribed burning program, restoring mast producing hardwood stands, restoring the longleaf pine ecosystem, and increasing the FMNF's timber thinning program are needed to maintain and restore turkey habitat on the FMNF. A sustained level of silvicultural thinnings and regeneration harvests on the FMNF will provide a continuous supply of desirable habitat for species such as the Eastern wild turkey. This is especially true when such activities are followed with an adequate fire return interval. Thinning and regeneration harvests planned in the Honey Hill Habitat Restoration Project and Hellhole Analysis Area Environmental Assessment should provide ideal habitat within each analysis area.

16. Are we maintaining viable populations of quail and the habitat to support them (B-35)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 4, 5, 9, 13, and 16. Provide a diversity of wildlife species. Provide quality habitat 24 which supports viable populations of native wildlife species. Provide opportunities to enjoy consumptive uses of wildlife such as hunting and fishing.

- Population index trend of northern bobwhite quail.

Results

Quail Call Counts: 4 routes

Technical report, *Population Trends and Habitat Occurrence of Forest Birds on Southern National Forests, 1992-2004* (General Technical Report NRS-9) indicates that mean observations per count have sharply declined for the northern bobwhite on the FMNF. However, the declines in the South Atlantic Coastal Plain have not been as steep. Annually since 1988, the South Carolina Department of Natural Resources (SCDNR) has conducted The Bobwhite Quail Hunter Survey. The purpose of the survey is to collect quantitative information on hunter success which aids biologists in tracking quail population trends. Statewide, the 2009-2010 survey shows that hunters flushed an average of 0.36 coveys per hour, a 38 percent decline when compared to the 2008-2009 survey. From 1988 to present, there has been a steady decline in coveys found per hour across the state. The Northern Coastal Plain and Midlands have produced the highest harvest rates when compared to the Southern Coastal Plain and Piedmont. However, certain areas of the FMNF have shown upward trends in covey numbers, especially those areas that have been adequately maintained with prescribed fire and/or specifically managed to improve habitat for the northern bobwhite.

Thinning and mastication operations improved habitat conditions for species such as the northern bobwhite during 2010. Mastication treatments were used to reduce hazardous fuels and improve habitat for the red-cockaded woodpecker on approximately 900 acres during 2010.

The FMNF and Lowcountry Chapter of Quail Unlimited (QU) have been working cooperatively to benefit the northern bobwhite quail on the FMNF since the mid 1990's. Initiated in 2003, the two organizations developed a habitat improvement plan known as Restoring and Enhancing Native Ecosystems for Wildlife (RENEW) project. This project is designed to increase habitat suitability for the northern bobwhite and other upland species in six focus areas on the FMNF. Management activities within these six focus areas include prescribed burning on more frequent intervals, creating forest openings along existing woods roads, promoting native ground cover, and planting native perennials and non-invasive annuals in existing woods roads. These activities will benefit a wide range of species which depend upon similar habitat as the northern bobwhite.

Findings

Northern bobwhite quail population declines on the FMNF are likely associated with inadequate nesting and brood rearing habitat, combined with increased predation and unfavorable weather conditions. As previously mentioned, approximately 40,000 acres of pine stands were completely regenerated after Hurricane Hugo struck the FMNF in 1989. Although thinnings can prove to be beneficial for numerous flora and fauna, the FMNF has only been able to thin 2,000-4,000 acres of densely stocked pine stands annually. Additionally, the FMNF has completed few, if any, regeneration harvests since 1990. As such, there is a need to increase the amount of thinnings conducted on the FMNF and implement a sustained level of regeneration harvests. First thinnings that reduce densely stocked pine stands to a residual basal area of 50-60 square feet per acre could prove beneficial for species such as the northern bobwhite quail. Heavier thinnings allow for delayed canopy closure, which in turn produces desirable wildlife habitat conditions. This is especially true when these stands are managed under an appropriate prescribed burning regime. It is critical that mechanically treated areas be maintained with an adequate fire return interval. If they aren't adequately burned, habitat benefits will rapidly disappear due to hardwood regeneration. Thinning and regeneration harvests planned in the Honey Hill Habitat Restoration Project and Hellhole Analysis Area Environmental Assessment should provide ideal habitat within their respective analysis areas.

17. Are we maintaining viable populations of native amphibians and the habitat to support them (B-37)?

Information

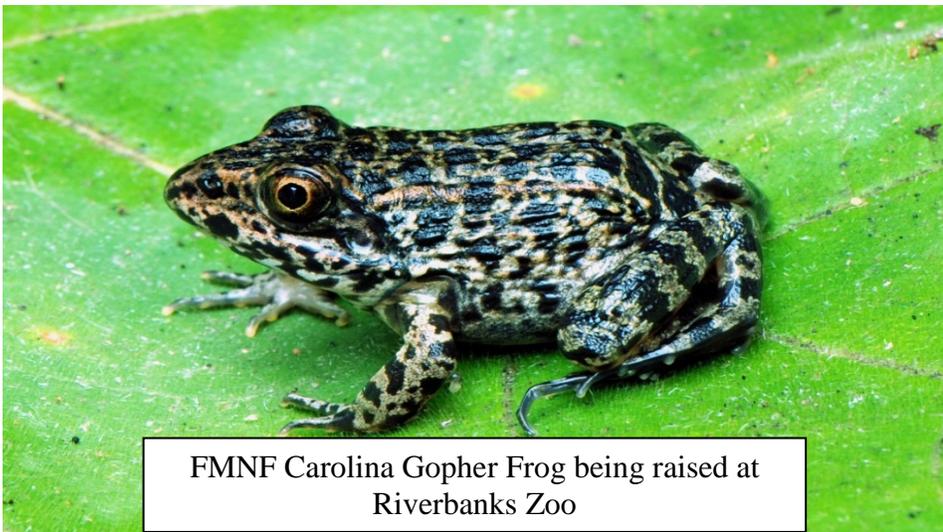
This monitoring question is responsive to goals 1, 3, 4, 7 and 8 and objectives 2, 11, 13, and 14. Provide for a diversity of wildlife species. Provide quality habitat which supports viable populations of native wildlife species. Provide opportunities to enjoy non-consumptive uses of wildlife such as photography and viewing.

- Number of individuals sighted.

Results

Beginning in 2007, FM personnel installed 3 North American Amphibian Monitoring Program (NAAMP) frog routes on the FMNF. These three routes are known as Cherry Hill, Huger, and Ten Mile. Each route consists of 10 stops and is run three times per year. Species richness for all NAAMP routes in the US can be quickly found by going to www.pwrc.usgs.gov/naamp/index.cfm?fuseaction=app.speciesRichnessMap.

Ten Mile Route, which runs from the intersection of Hoover Rd and Hwy 41 to the intersection of Halfway Creek Rd and Steed Creek Rd, continues to be one of the most diverse routes in the entire state of South Carolina. The primary goal of these frog routes is to assess frog and toad population trends using a calling survey technique. From 2003 to the fall of 2008, the coastal plain really had not had any significant rain events to recharge amphibian breeding wetlands. As such, amphibian breeding was fairly low in the coastal plain up until the fall of 2008. After an extended period without adequate rainfall and wetland inundation, the rains finally came in 2009, and some of the largest choruses of frogs and toads were heard on the FMNF. One of the largest Carolina Gopher Frog (*Lithobates capito*) breeding events in the past 10 years was documented in April 2009. Unfortunately, anuran breeding activity was minimal during 2011 due to droughty conditions on the FMNF, and Carolina Gopher Frogs were not documented on the FMNF. The drought conditions that persisted throughout the state during 2011 caused most isolated wetlands to remain dry all year. Other than the Frosted Flatwoods Salamander (*Ambystoma cingulatum*), the Carolina Gopher Frog is one of the rarest and most sensitive amphibians on the FMNF.



Approximately 1,040 acres in compartments 115 and 116 were burned during 2008 and 2010 (see before and after pictures below), which greatly improved reptile and amphibian habitat in these compartments. Up until 2008, these compartments hadn't been burned

since 2003. Compartments 115 and 116 contain known breeding wetlands for the Carolina Gopher Frog and Frosted Flatwoods Salamander. The Cainhoy Ridge stretches from the southwest corner of the FMNF to the Santee River and supports some of the most diverse herpetofaunal communities on the forest. These compartments should be burned during 2012 or 2013.

No surveys were conducted for the Frosted Flatwoods Salamander during 2011 due to the drought conditions that persisted all year long.

During 2010, *Ambystoma cingulatum* was documented on the forest for the first time since 2003. Six larvae were collected from a previously undocumented breeding wetland by John Palis, Danny Carlson and Steve Bennett. The Francis Marion supports one of only three known *A. cingulatum* breeding populations in South Carolina. Only 8 adults and a few larvae have been captured on the Francis Marion in the past 20 years. Steve Bennett (SC state herpetologist) took three larvae to Riverbanks Zoo in Columbia, SC, where Scott Pfaff (Curator of Herpetology) successfully raised them to metamorphosis. At the time of collection, the larvae were too small to collect tail tissue, so the zoo reared them until they were big enough to collect tissue. DNA analysis was performed. DNA analysis indicates that individuals from the Francis Marion do not represent a distinct species and are closely related to other populations of the Frosted Flatwoods Salamander. This was the first genetic material available from SC! The three individuals collected from the FMNF will continue to be housed at the Riverbanks Zoo in order to study their natural history. This is one of the first times that the species has been successfully reared in captivity. The last report that we received from the Riverbanks Zoo stated: "the salamanders are doing great, eating blackworms like crazy ... and they are the most "active" of any of the ambystoma larvae he's raised ... and he's raised several species to metamorphosis." The zoo plans to continue raising the *A. cingulatum* in captivity in order to learn more about the species' natural history. We do not know important natural history aspects such as when the species reaches sexual maturity, how long the species can live or if the species will breed in captivity. The Riverbanks Zoo is also raising Carolina Gopher Frogs that were collected on the Francis Marion during 2009. Like *A. cingulatum*, the zoo hopes to raise these individuals in captivity in order to ascertain natural history information about the species.

Findings

Overall, frog and toad trends on the FMNF appear to be stable, but long-term monitoring is needed to account for temporal variation and the complex life histories of our native amphibians. Species such as the Carolina Gopher Frog and Frosted Flatwoods Salamander are in a critical state, and are highly susceptible to local extirpation without proper protection and habitat management. As such, continued monitoring and proper management is crucial for maintaining viable populations of these two species, as well as other herpetofauna. Recent evidence from researchers in the Southeast suggest that month of burning can have a negative impact on migrating amphibians such as the Carolina Gopher Frogs and Frosted Flatwoods Salamander. Based on breeding dates of

the aforementioned species on the FMNF, it is highly recommended that prescribed burning take place from mid-April to September.

There are approximately 280 miles of perennial streams and 150,000 acres of palustrine, riverine, lacustrine, and estuarine wetlands on the FMNF. Isolated palustrine wetlands, which are common wetland habitats on the FMNF, are among the most important and imperiled herpetofaunal habitats in the Southeast. Contribution of isolated wetlands to regional biodiversity has been severely overlooked and there are major gaps constraining the development of management regimes that protect these important habitats. Alarming population declines for species such as the Flatwoods Salamander, Carolina Gopher Frog and Striped Newt (*Notophthalmus perstriatus*) have been directly attributed to loss and/or degradation of seasonal isolated wetlands and their adjacent uplands. At present, there are no federal measures in place to protect the filling of isolated wetlands. As a result of the Supreme Court's decision in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (SWANCC)*, 531 U.S. 159, (2001), the Army Corps of Engineers no longer has authority under the Clean Water Act to require permits for the dredging or filling of isolated wetlands on private lands. It is now up to the individual states to implement regulatory measures protecting isolated wetlands. Many states have implemented internal measures to supplement the Supreme Court's decision, but South Carolina still has not. South Carolina has introduced the Isolated Wetlands Protection Act of 2007 (Bill 116), but the bill still currently resides in the Senate Committee on Agriculture and Natural Resources. The FMNF and other protected lands in SC provide critical refuges for isolated wetlands. The FMNF needs to take these important habitats into consideration whenever land disturbing activities are conducted. These palustrine wetlands are critical for ensuring the continued viability of pond breeding amphibians. Most isolated wetlands are of such a small size that they have not been digitized in the FMNF's GIS layers. Mark Danaher created an isolated wetlands GIS layer which spatially represents 2,300 acres of isolated wetlands on the FMNF. This GIS layer needs to continue to be maintained and updated in order to ensure that these important habitats receive appropriate protection measures. Most of the isolated wetlands that have been digitized thus far occur along the Cainhoy Ridge and primarily consist of depression type wetlands. Isolated wetlands across the entire forest need to be incorporated into the GIS layer.



Isolated wetland/Documented *A. cingulatum* breeding wetland

Fire exclusion in some areas of the FMNF (e.g., Cainhoy Area) has resulted in undesirable hardwood encroachment within isolated wetlands and the adjacent uplands. Such vegetative conditions severely limit an isolated wetland's suitability for species such as the Carolina Gopher Frog and Frosted Flatwoods Salamander. The Cainhoy area supports a high density of seasonally flooded isolated wetlands, which coupled with the surrounding uplands, creates ideal habitat for unique flora and fauna. Several of these isolated wetlands are known to harbor the forest sensitive pondspice, Carolina Gopher Frog, the federally endangered pondberry, and the federally threatened Frosted Flatwoods Salamander. These wetlands occur in one of the most rapidly urbanizing areas of the forest. Unfortunately, due to smoke/safety issues associated with this wildland urban interface, an adequate fire return interval has been difficult to maintain. If an adequate prescribed burning regime continues to be difficult in areas such as Cainhoy, it may be prudent for the USFS to partner with organizations such as Riverbanks Zoo and examine possibilities for captive breeding and/or translocation of rare amphibians on the FMNF.



Before and after pictures of restored isolated wetland (notice “wall” of hardwood vegetation in top picture due to fire exclusion). Picture on right was taken during 2010 after mechanical mastication and 2 prescribed burns.

18. Are we maintaining viable populations of native species and the habitat to support them (B-38)?

Information

This monitoring question is responsive to goals 1, 2 and 8 and objectives 13 and 14. Throughout the Forest landscape, there is an ecologically sound distribution of plant communities and PETS plant habitats.

- Acreage of under-represented plant communities/PETS habitats

Results/Findings

No new information to report. Contracts were awarded in 2011 to:

- 1). Monitor 59 botanical areas on The Francis Marion on 2,056 acres;
- 2). Survey for high quality wet savannas on 4210 acres, and determine their condition; and
- 3). Conduct plant surveys on 6400 acres within the Macedonia project area.

Natureserve completed metrics for a rapid assessment of the ecological integrity of longleaf pine-dominated communities on southeastern National Forests including the Francis Marion.

19. What is the status and trends in stream fish communities in relationship to management activities and habitat conditions? What are current habitat conditions and trends (B-39 Amendment # 2)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8. Throughout the Forest landscape, there is an ecologically sound distribution of aquatic communities.

- Repeated quantitative sampling of fish communities, including diadromous species, in streams representative of 10 small watersheds across the Forest. Measure habitat parameters using BVET protocol where fish sampling is conducted.

Results

Fish inventory sampling in Francis Marion streams was conducted in 1993 by Hansbarger and Dean (1994). A total of 53 stream sites were sampled across the Forest post Hurricane Hugo. Stream population monitoring efforts in some of these same streams began in 2002 and continued through 2004 (Table 1). Repetitive sampling in streams varied from year to year due to drought conditions (2002), above average rainfall (2003) and below average rainfall (2004). Dry stream channels were encountered with drought and below average rainfall. Stream channels were indiscernible with the swampy conditions produced by above average rainfall. Stream sampling in 2006 occurred during the late winter-early spring months when water levels were more stable. Twenty-two of the original 53 stream sites were resurveyed in 2002, 2003 and 2006. The discussion in this report does not include 1993 stream sites that were not resurveyed. Two additional streams (Fogarty Creek and Old House Creek) were surveyed in 2003, 2004 and 2006 that were not surveyed in 1993. Thirty-five of the original stream sites were resurveyed in 2010 in early spring, along with the two additional streams from 2003, 2004 and 2006. As seen in Table 2-2, some of the 2010 stream sites had not been sampled since 1993. There were no streams sampled for fish in 2011.

Table 2-2. List of fish survey sites in the Francis Marion National Forest. Site numbers correspond to sites in Hansbarger and Dean (1994). UT = unnamed tributary.

Stream	Site #	Watershed	Quadrangle	# Species Captured					
				1993	2002	2003	2004	2006	2010
Cooter Creek	12	Awendaw Creek	Ocean Bay	3	10			8	4
Steed Creek	30	Awendaw Creek	Ocean Bay	9	11				
UT Bell Creek	29	Awendaw Creek	Ocean Bay	11					2
UT Bell Creek	52	Awendaw Creek	Ocean Bay	2					1
Fogarty Creek	54	Wando River	Cainhoy			3	3	5	1
Old House Creek	55	Wando River	Cainhoy			3	5	5	0
Pepper Gully	23	Wando River	Cainhoy	7				9	6
Harleston Dam Creek	50	Quinby Creek	Ocean Bay	3		7			
Harleston Dam Creek	13	Quinby Creek	Ocean Bay	10					6

Northampton Creek	14	Quinby Creek	Ocean Bay	10	4	6		9	1
Muddy Creek	24	Huger Creek	Huger	7	1			5	1
UT Fox Gully	4	Huger Creek	Bethera	10		4		3	1
Gough Creek	3	Huger Creek	Bethera	5					5
Nicholson Creek	27	Huger Creek	Bethera	3					5
Turkey Creek	31	Huger Creek	Shulerville	4					5
Alligator Creek	49	Huger Creek	Bethera	4					0
Bullhead Run	2	Wadboo Creek	Cordesville	14		2		7	1
UT Cane Gully	48	Wadboo Creek	Bonneau	2				1	0
UT Wadboo Creek	22	Wadboo Creek	Bonneau	5		4		5	3
Cane Gully Branch	1	Wadboo Creek	Cordesville	7					12
Cane Gully Branch	17	Wadboo Creek	Bethera	8					1
Persimmons Branch	15	Wadboo Creek	Jamestown	15					1
Beauford Branch	21	Wedboo Creek	Alvin	8	8	8		10	4
UT Meeting House	8	Wedboo Creek	Bonneau	9				7	6
Wedboo Swamp	9	Wedboo Creek	Alvin	6	9				
Dutart Creek	32	Dutart Creek	Jamestown	3		2		8	0
Gal Branch	34	Echaw Creek	Cedar Creek	9		6			2
Gravel Run	46	Echaw Creek	Jamestown	8		3			0
Gravel Run	33	Echaw Creek	Cedar Creek	3					0
UT Echaw Creek	36	Echaw Creek	Honey Hill	11	4	13		11	2
UT Echaw Creek	37	Echaw Creek	Honey Hill	5					9
Echaw Creek	43	Echaw Creek	Shulerville	8					2
Red Bluff Creek	7	Red Bluff Creek	Honey Hill	7		9		8	7
UT Big Morgan Creek	6	Wambaw Creek	Honey Hill	6				9	2
UT Cane Branch	38	Wambaw Creek	Honey Hill	7				11	3
UT Mill Branch	40	Wambaw Creek	Honey Hill	8	9	5			2
UT Mill Branch	53	Wambaw Creek	Honey Hill	7					6
UT Wambaw Creek	44	Wambaw Creek	Santee	7	3	6		14	0
UT Wambaw Creek	45	Wambaw Creek	Santee	7					0
Cane Branch	5	Wambaw Creek	Honey Hill	4					4

Hansbarger and Dean (1994) collected 35 fish species at 53 stream sites across the Forest in 1993. Repeated sampling at 22 of those stream sites in 2002, 2003 and 2006 produced

34 species (Table 2-3). The same 22 stream sites in 1993 contained 29 species. Five species captured in 1993 were not present in those 22 streams in 2002, 2003 and 2006. These included the brook silverside, common shiner, ironcolor shiner, dusky shiner and lined topminnow. However, the common shiner may have been misidentified in 1993 since its range does not extend into South Carolina. An additional four species captured in 1993 were not present in those sampled streams in 2010. These included the lake chubsucker, spotted sucker, gizzard shad and blackbanded sunfish. The only remaining fish species that has not been sampled since 1993 is the redear sunfish. Nine species captured in 2002, 2003, 2006 and 2010 were not present in the 1993 sampled streams. These include the swampfish, pumpkinseed sunfish, Eastern silvery minnow, Everglades pygmy sunfish, golden topminnow, mummichog, sawcheek darter, least killifish and hogchoker. In 2010, 25 species were captured from 37 stream sites. The number of species captured by watershed in 1993, 2002-2004, 2006 and 2010 is displayed in Table 2-4.

Table 2-3. Fish species captured by backpack electrofishing. Only the streams resampled after 1993 are listed in the 1993 column. The number of streams differ from the number of stream sites. A few streams had more than one sample site and the unnamed tributaries were counted with the stream name.

Species		1993	2002	2003	2004	2006	2010
	# Watersheds	10	6	9	1	10	10
	# Streams	28	9	15	2	18	28
Amblyopsidae							
<i>Chologaster cornuta</i>	swampfish		x			x	x
Amiidae							
<i>Amia calva</i>	bowfin	x		x			x
Anguillidae							
<i>Anguilla rostrata</i>	American eel	x	x	x	x	x	x
Aphredoderidae							
<i>Aphredoderus sayanus</i>	pirate perch	x	x	x		x	x
Atherinidae							
<i>Labidesthes sicculus</i>	brook silverside	x					
Catostomidae							
<i>Erimyzon oblongus</i>	creek chubsucker	x	x	x		x	x
<i>Erimyzon sucetta</i>	lake chubsucker	x					
<i>Minytrema melanops</i>	spotted sucker	x					
Centrarchidae							
<i>Acantharchus pomotis</i>	mud sunfish	x	x	x	x	x	x
<i>Centrarchus macropterus</i>	flier	x	x	x		x	x
<i>Enneacanthus chaetodon</i>	blackbanded sunfish	x					
<i>Enneacanthus gloriosus</i>	bluespotted sunfish	x	x	x			
<i>Enneacanthus</i>	banded sunfish	x		x		x	x

Species		1993	2002	2003	2004	2006	2010
<i>obesus</i>							
<i>Lepomis auritus</i>	redbreast sunfish	x				x	x
<i>Lepomis gibbosus</i>	pumpkinseed			x		x	
<i>Lepomis gulosus</i>	warmouth	x	x	x		x	x
<i>Lepomis macrochirus</i>	bluegill	x	x	x			
<i>Lepomis marginatus</i>	dollar sunfish	x	x	x			x
<i>Lepomis punctatus</i>	spotted sunfish	x		x		x	x
<i>Micropterus salmoides</i>	largemouth bass	x				x	x
<u>Clupeidae</u>							
<i>Dorosoma cepedianum</i>	gizzard shad	x					
<u>Cyprinidae</u>							
<i>Hybognathus regius</i>	Eastern silvery minnow					x	
<i>Luxilus cornutus</i>	common shiner	x					
<i>Notemigonus crysoleucas</i>	golden shiner	x	x	x	x	x	x
<i>Notropis chalybaeus</i>	ironcolor shiner	x					
<i>Notropis cummingsae</i>	dusky shiner	x					
<i>Notropis petersoni</i>	coastal shiner	x	x			x	x
<u>Esocidae</u>							
<i>Esox americanus</i>	redfin pickerel	x	x	x	x	x	x
<i>Esox niger</i>	chain pickerel	x				x	x
<u>Elassomatidae</u>							
<i>Elassoma evergladei</i>	Everglades pygmy sunfish					x	x
<i>Elassoma zonatum</i>	banded pygmy sunfish	x	x	x		x	x
<u>Fundulidae</u>							
<i>Fundulus chrysotus</i>	golden topminnow			x	x		
<i>Fundulus heteroclitus</i>	mummichog					x	x
<i>Fundulus lineolatus</i>	lined topminnow	x					
<u>Ictaluridae</u>							
<i>Ameiurus natalis</i>	yellow bullhead	x	x	x		x	x
<i>Ameiurus nebulosus</i>	brown bullhead	x		x			
<i>Noturus gyrinus</i>	tadpole madtom	x		x		x	
<u>Percidae</u>							
<i>Etheostoma fusiforme</i>	swamp darter	x	x				
<i>Etheostoma serrifer</i>	sawcheek darter					x	x
<u>Poeciliidae</u>							
<i>Gambusia holbrooki</i>	Eastern mosquitofish	x	x	x	x	x	x
<i>Heterandria formosa</i>	least killifish		x				x
<u>Soleidae</u>							
<i>Trinectes maculatus</i>	hogchoker		x				
<u>Umbridae</u>							
<i>Umbrina pygmaea</i>	Eastern mudminnow	x	x	x	x		x

Table 2-4. Number of species captured per forest watershed. NS: Not Sampled

Watershed	# Species Captured					
	1993	2002	2003	2004	2006	2010
Awendaw Creek	12	14	NS	NS	8	5
Wando River	4	NS	4	6	12	7
Quinby Creek	11	4	10	NS	9	6
Huger Creek	12	1	4	NS	8	10
Wadboo Creek	17	NS	4	NS	7	12
Wedboo Creek	13	14	8	NS	14	8
Dutart Creek	3	NS	2	NS	8	0
Echaw Creek	19	4	13	NS	11	12
Red Bluff Creek	7	NS	9	NS	8	7
Wambaw Creek	14	10	8	NS	19	12

All fish species sampled were ranked secure (G5) or apparently secure (G4) by NatureServe (2012). All species captured in 2002-2004, 2006 and 2010 are native to the Santee Cooper Drainage (Warren et al 2000). In addition, the population status of these species is considered to be currently stable throughout all or a significant portion of their range, except for the ironcolor shiner. The ironcolor shiner, captured in 1993 (in 10 of 35 sampled streams) but not during 2002-2004, 2006 and 2010, is listed as Vulnerable by the American Fisheries Society (Jelks et. al 2008). The Vulnerable population status indicates that the species is in imminent danger of becoming threatened throughout all or a significant portion of its range. All fish species captured are native to the Santee-Cooper watershed, except for the common shiner captured in 1993.

The SC Comprehensive Wildlife Conservation Strategy (Kohlsaet et. al 2005) includes the South Carolina Priority Species List. These species warrant conservation concern to maintain diversity in South Carolina waters. The species are ranked in priority as moderate, high and highest. The American eel is ranked with a highest priority; the blackbanded sunfish with a high priority; and the mud sunfish with a moderate priority.

Habitat inventory protocol was developed in 2002 using BVET methods (Dollof et. al 1993). Habitat inventory was attempted in 2003 and 2004. Dry conditions in 2003 and swampy conditions in 2004 restricted inventory to short segments of streams.

During recent surveys, it has been observed that large wood is lacking in the coastal stream systems. Large wood is an important component of a stream system and a major influence on aquatic populations. Hansbarger and Dean (1994) stated that fish inventory was difficult due to the abundance of downed trees and wood in the streams.

Findings

In 2010, 25 species were captured in 28 streams. All species captured since 1993 are native to the Santee Cooper Drainage.

The population status of the sampled species is considered to be currently stable throughout all or a significant portion of their range, except for the ironcolor shiner. The ironcolor shiner, a species considered Vulnerable by AFS, was not captured during the sampling period. This species was captured in several streams in 1993 surveys.

Large wood, an important component for habitat structure, is lacking in the sampled streams.

20. What is the status and trends in aquatic invertebrate (aquatic insects, mollusks, crayfish) populations in relationship to management activities and habitat conditions (B-40 Amendment #2)?

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8. Throughout the Forest landscape, there is an ecologically sound distribution of aquatic communities.

- Population trends will be measured by methods appropriate to the aquatic group using defined protocols.

Results

Existing population conditions are unknown. Crayfish and mollusk surveys were conducted across the forest in 2011. A total of 84 streams were sampled for crayfish. Crayfish were collected in 72 of these streams. Crayfish collected during 2011 surveys are listed in Table 2-5 (Jones and Eversole 2011). A total of 38 streams were sampled for mollusk species. Mollusk species were found in 26 streams. Thirteen mussel species, three clam species and eight snail species were collected in 2011. Mollusk species collected are listed in Table 2-6 (The Catena Group, Inc. 2011).

Table 2-5. Crayfish species collected in 2011.

Species		NatureServe Rank	AFS Conservation Status
<i>Procambarus acutus</i>	White River crawfish	G5	CS
<i>Procambarus ancylus</i>	Coastal Plain crayfish	G4G5	CS
<i>Procambarus enoplosternum</i>	black mottled crayfish	G4G5	CS
<i>Procambarus troglodytes</i>	Eastern red swamp crayfish	G5	CS
<i>Fallicambarus fodiens</i>	digger crayfish	G5	CS

All of these species are ranked as Currently Stable (CS) by the American Fisheries Society (Taylor et. al 2007). The SC Comprehensive Wildlife Conservation Strategy identified the Coastal Plain crayfish and black mottled crayfish as species of conservation concern ranked with a moderate priority.

Crayfish habitats were deemed to be of good quality across the forest with a variety and abundance of submerged habitat consisting of allocanthus material, hydrophytes, tree roots, root mats, undercut banks and stones.

Table 2-6. Mollusk species collected in 2011.

Species		NatureServe Rank	AFS Conservation Status
Mussels			
<i>Elliptio angustata</i>	Carolina lance	G4	SC
<i>Elliptio complanata</i>	Eastern elliptio	G5	CS
<i>Elliptio congaraea</i>	Carolina slabshell	G3	SC
<i>Elliptio fisheriana</i>	Northern lance	G4	SC
<i>Elliptio icterina</i>	variable spike	G5	CS
<i>Elliptio cistellaeformis</i>	box spike	G4	U
<i>Elliptio roanokensis</i>	Roanoke slabshell	G3	SC
<i>Lampsilis splendida</i>	rayed pink fatmucket	G3	SC
<i>Ligumia nasuta</i>	Eastern pondmussel	G4	SC
<i>Pyganadon cataracta</i>	Eastern floater	G5	CS
<i>Unio merus carolinianus</i>	Florida pondhorn	G4	CS
<i>Utterbackia imbecillis</i>	paper pondshell	G5	CS
<i>Villosa modioliformis</i>	Eastern rainbow	G5	CS
Snails and Clams			
<i>Amnicola</i> sp.	an Amnicola		
<i>Corbicula fluminea</i>	Asian clam		
<i>Campeloma limum</i>	file campeloma	G5	
<i>Physa pomilia</i>	glossy physa	G5	
<i>Physa</i> sp.	a Physid		
<i>Planorbella trivolvis</i>	marsh ram's horn	G5	
<i>Pseudosuccinea</i> sp.	a Lymnaea		
<i>Rangia cuneata</i>	Atlantic rangia		
<i>Sphaeriidae</i>	a Sphaeriid clam		
<i>Viviparus georgianus</i>	banded mystery snail	G5	
<i>Viviparus intertextus</i>	round mystery snail	G4	

The Carolina slabshell, Roanoke slabshell and rayed pink fatmucket are rated as G3 by NatureServe (2012). This indicates that a species is vulnerable, at moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines or other factors. The Carolina lance, Carolina slabshell, Northern

lance, Roanoke slabshell, rayed pink fatmucket and Eastern pondmussel are ranked as Special Concern (SC) by the American Fisheries Society (Williams et al. 1992). SC denotes a species that may become endangered or threatened by relatively minor disturbances to its habitat and deserves careful monitoring of its abundance and distribution. The box spike is ranked as U, denoting a species whose historic and current distribution and abundance has not been evaluated in recent surveys. Snail and clam species have no AFS ranking. The SC Comprehensive Wildlife Conservation Strategy identified the Roanoke slabshell, rayed pink fatmucket, Northern lance and Eastern pondmussel as species of conservation concern ranked with a high priority. The Carolina lance, Eastern elliptio, Carolina slabshell, and variable spike were ranked with a moderate priority.

The Asian clam is an introduced species that is widely distributed across the forest. The Atlantic rangia is another non-native clam species, introduced from the Gulf of Mexico, that now ranges the entire Atlantic coast.

The Catena Group report concluded that mussel diversity was low within stream reaches on the forest, which is considered typical of tannic, swamp water streams along the Atlantic Slope. However, a few streams characterized as having wide, natural riparian buffers contained very high densities of mussels. These streams were recommended for long term population and in-stream habitat monitoring. The report also indicated a negative correlation of large accumulations of woody debris and detritus with mussel abundance. This was attributed to debris influences on flow conditions and substrate composition.

Findings

Five species of crayfish were identified from a survey of 84 streams across the forest.

Crayfish habitats were deemed to be of good quality across the forest with a variety and abundance of submerged habitat consisting of allocanthus material, hydrophytes, tree roots, root mats, undercut banks and stones.

Thirteen mussel species, three clam species and eight snail species were collected from a survey of 38 streams across the forest.

Mussel diversity was low within stream reaches on the forest, which is considered typical of tannic, swamp water streams along the Atlantic Slope. However, a few streams characterized as having wide, natural riparian buffers contained very high densities of mussels.

21. What is the status and trend for pond game fish in relationship to management activities and habitat conditions (B-42 Amendment #2).

Information

This monitoring question is responsive to goals 1, 3, 4, 7 and 8. Throughout the Forest landscape, there is an ecologically sound distribution of aquatic communities.

- Sampling of game fish and water quality in established freshwater fish ponds annually across the Forest.

Results

There are 15 recreational fishing ponds on the Francis Marion consisting of a total of 41 acres. Largemouth bass and bream are the primary sport fish in the ponds. A few of the ponds have been stocked with grass carp for aquatic plant control and catfish.

Findings

Water quality and fish populations were monitored in November 2009. Aquatic plants were identified as well as the percent coverage of plants on the pond. The populations in the majority of ponds were out of balance, crowded with underweight bass. Bluegill have since been stocked at recommended rates. Twelve of the ponds had low alkalinity and need to be limed for aquatic species productivity. Due to extreme low water levels, pond liming has been postponed until 2012.

Sub-Issue 1.2 - Forest and Range Health

22. How are insect and disease populations affecting goal/objectives attainment (B-3)?

Information

This monitoring question is responsive to goals 1, 2, 3, 4, 6, 7 and 8. Decrease the susceptibility of forest stands to insects and disease by changing or avoiding ecosystem conditions that favor future insects and disease epidemics.

- Location and population trends of southern pine beetle, fusiform rust and annosum root rot.

Results

Southern pine beetle populations were at endemic levels during FY 2011. Laurel wilt is not one of the diseases mentioned in the monitoring item, but it spread across the Francis Marion National Forest in FY 2011.

Findings

No additional action is needed.

23. Are National Ambient Air Quality standards for suspended particulate matter and ozone being met on the Francis Marion National Forest (B-18)?

Information

This monitoring question is responsive to goal 8 which is to maintain air quality.

- Compliance with NAAQS air particulate and ozone concentrations in the atmosphere [36 CFR 219.27(a)(12)].

Results

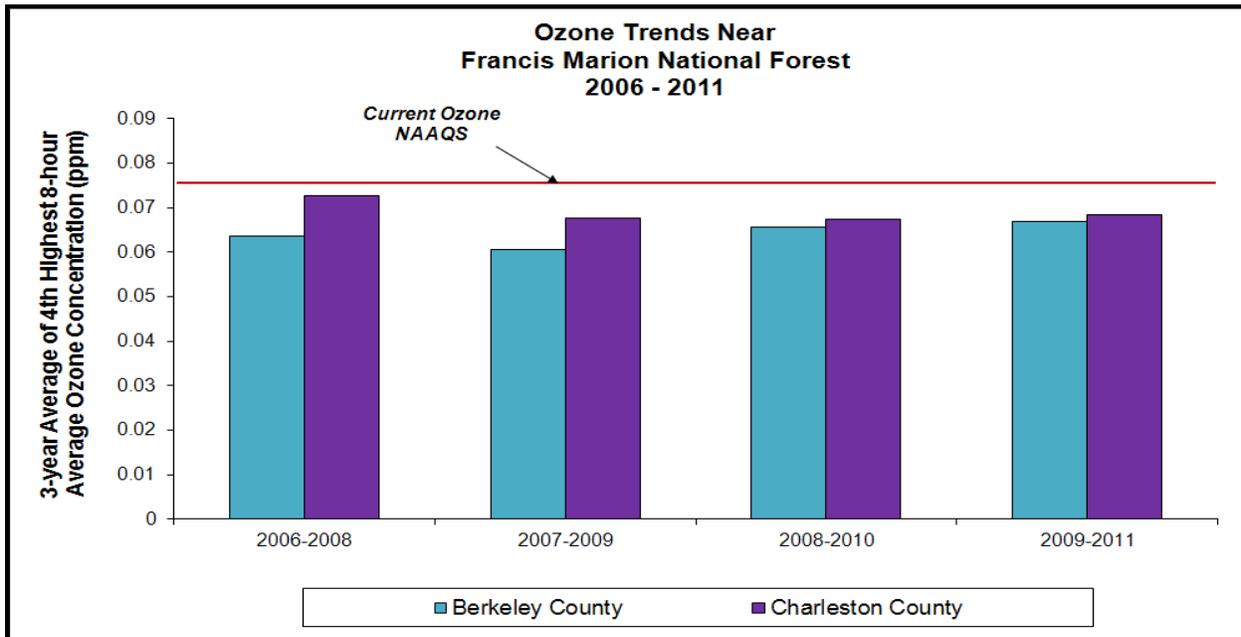
Through the Clean Air Act and its Amendments, Congress has directed the U.S. Environmental Protection Agency (EPA) to set national ambient air quality standards (NAAQS) for common air pollutants, called criteria pollutants, that are found throughout the United States. There are six such pollutants: carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), particulate matter (PM), lead (Pb) and ozone (O₃). Standards are set based on the most recent scientific literature, with reviews and possible updates to the standards required every five years. The air pollutants of most concern on the Francis Marion National Forest are particulate matter and ozone. Levels of these two pollutants are measured at air monitoring sites within or near the 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 current national ambient air quality standard (NAAQS) for ozone is 0.075 parts per million (ppm), set to protect both human health and the environment. At this time, all areas of the Francis Marion National Forest are meeting the NAAQS for ozone. As mentioned above, EPA reviews the standards every five years, and as a result the standard may become more stringent in the future.

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

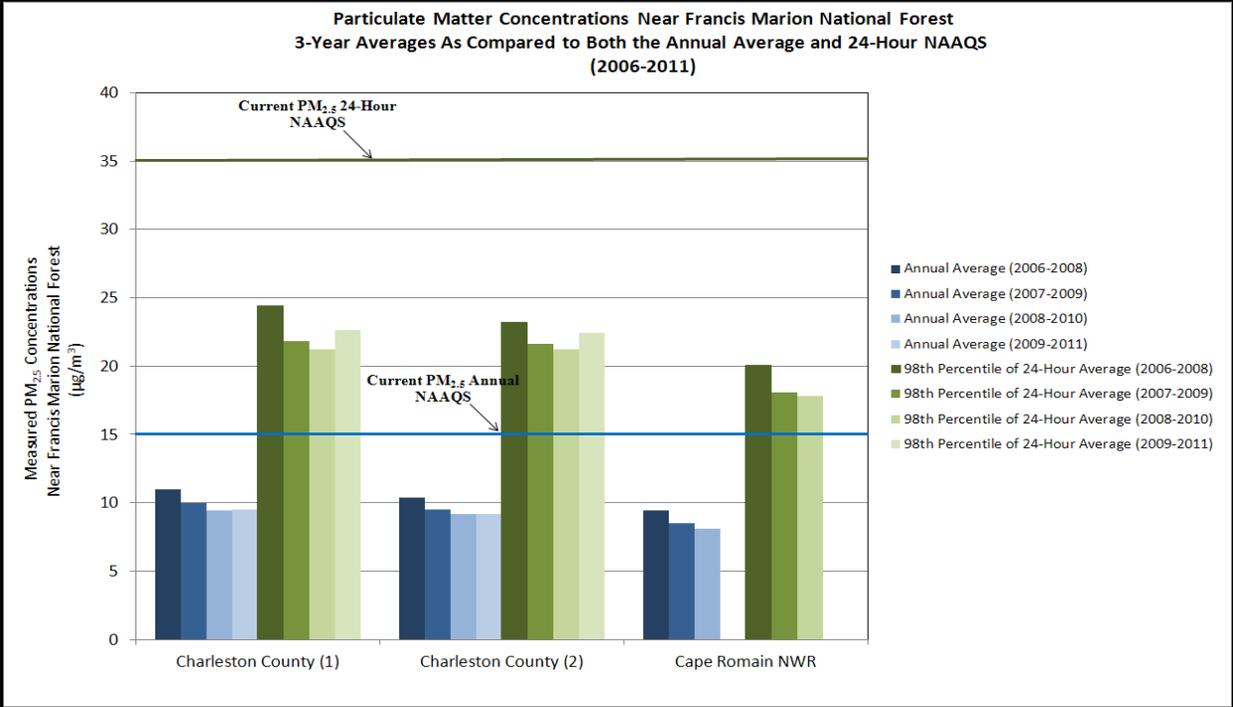
while the annual PM_{2.5} NAAQS is 15 µg/m³ to protect both human health and the environment. At this time, all areas of the Francis Marion National Forest are meeting the NAAQS for fine particulate matter.

There are two air quality monitors that measure ambient ozone concentrations near the Francis Marion National Forest – one located in Charleston County and the other in Berkeley County. The following graph shows the ozone concentrations at these two sites for the years 2006-2011, calculated in the same form as the NAAQS (3 year average of the 4th highest 8-hour ozone concentration). The NAAQS is shown as the red line; as seen, neither monitor is measuring concentrations in exceedance of the standard. (Data Source: http://www.epa.gov/airdata/ad_rep_mon.html)

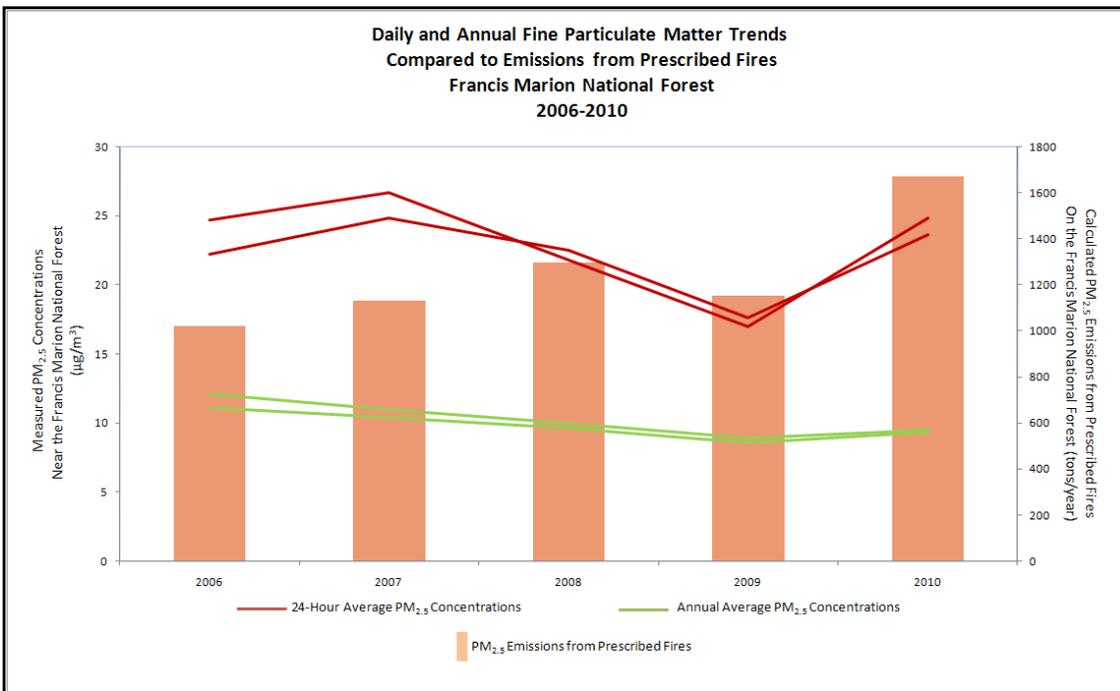
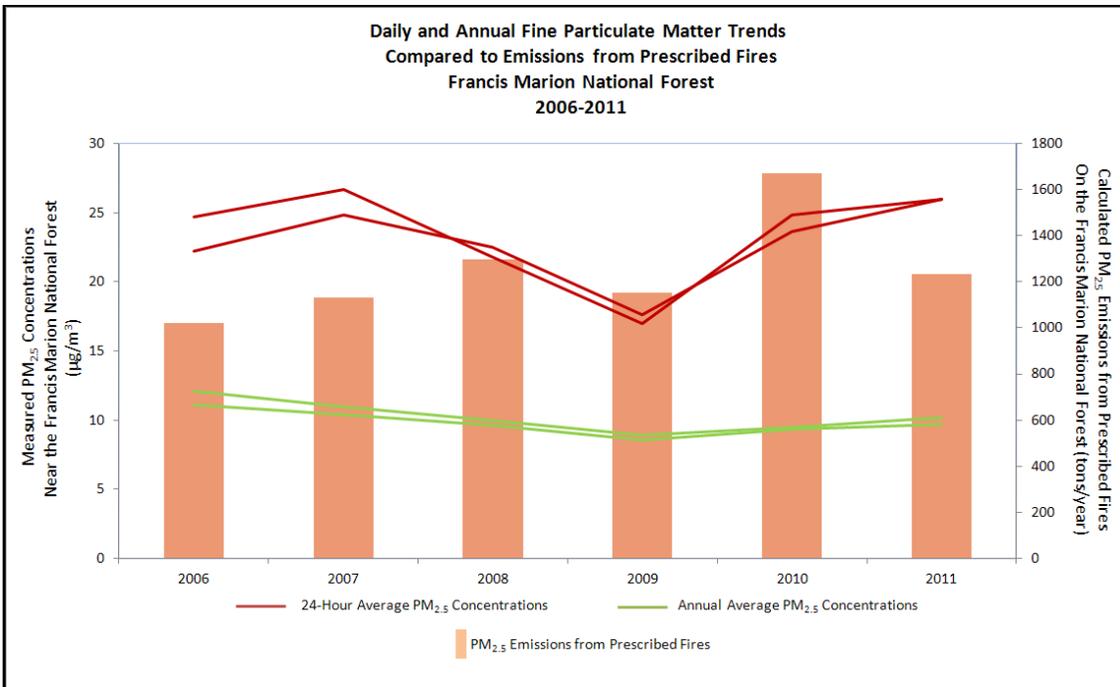


In order to measure fine particulate matter concentrations as well as visibility near the Francis Marion National Forest, there are several nearby PM_{2.5} monitoring stations operated by the South Carolina Department of Health and Environmental Control (DHEC) as well as a monitoring site at Cape Romain NWR operated by EPA under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program.

The graph below shows the measured fine particulate matter concentrations near the Francis Marion National Forest in comparison to the NAAQS. The blue columns are measured annual averages, and the green columns are measured daily values; the annual and daily NAAQS are shown by blue and green lines, respectively. Note that none of the fine particulate matter monitors near the National Forest are exceeding the current fine particulate matter NAAQS. (Data Source: http://www.epa.gov/airdata/ad_rep_mon.html)



In addition to monitoring the potential impacts that regional air pollution has on the natural resources within the Francis Marion National Forest, the Forest also conducts activities, particularly prescribed fire, that contribute to air pollution. With the increasing prescribed fire program, it is important to assess whether there is any indication that local and regional PM_{2.5} levels are mirroring that trend. The graph on the next page shows the daily and annual fine particulate matter concentrations near the Forest from 2006 through 2011 as compared to emissions from prescribed fire conducted on the Forest during that same time period. As shown, local and regional PM_{2.5} concentrations do not appear to be correlated with PM_{2.5} emissions from prescribed fires.



Findings

Both fine particulate matter and ozone concentrations near the Francis Marion National Forest are meeting their respective air quality standards, and no negative impacts to either visitors to the Forest or to vegetation within the Forest are expected. Biomonitoring conducted in August 2010 indicated minimal foliar damage due to ozone exposure. Air quality within the Forest is being maintained and in many cases appears to be improving.

Sub-Issue 1.3 - Watershed Condition

24. Are Forest streams in compliance with state water quality standards (B-21)?

Information

This monitoring question is responsive to goals 1, 3, and 8. The Forest's streams, lakes, wetlands, and riparian areas are healthy, functioning ecosystems that produce sustained flows of high quality water.

- Average annual water quality measured at monitoring stations on Turkey, Wambaw and Awendaw Creeks.

Results

In 2003, a monitoring report by Plewa and Hansen summarized the existing information on the Francis Marion National Forest concerning water quality. The resources to replicate or improve upon this 2003 effort have not been or likely to be available.

The 2003 monitoring report summarized that the streams in the coastal plain have eroded into deep marine deposits of past geologic epochs. The low stream gradients and extensive floodplains and wetlands adjacent to channels help detain surface waters for extended periods. The flat terrain might suggest that erosion or sediment is not a major issue. However on slopes 2% or greater, marine sediments can be very erosive when exposed to severe rainfall or concentrated flow. Erosion and sediment can be major issues on steeper terrain if soils are heavily disturbed resulting in loss of organics and root support. Bottomland hardwood roots and woody debris are primary structural elements that contribute to stream stability and aquatic habitat. Best Management Practices (BMPs) are implemented to limit ground disturbing activities and their connections to surface waters, including streams, wetlands and riparian areas.

The 2003 monitoring effort identified existing conditions of concern from excessive methyl mercury accumulations in certain fish species and fecal coliform in waters used for shellfish harvesting. Sources of airborne mercury include deposition of coal burning pollutants. Locally brackish waters may occur in the tidal influence zone and can be an issue relative to climate change and man-induced hydrological changes. More information is now available on these issues to suggest most black water streams

dominated by wetlands are going to have methyl mercury issues. A few other streams and lakes in the piedmont and mountains are also showing mercury issues.

Elemental mercury is converted to the toxic methyl mercury form due to sulfate reduction from the high sulfur, low pH, anoxic conditions in wetlands. Certain organisms accumulate methyl mercury in the food chain, and high levels have been identified in intermediate organisms like mosquito fish. Methyl mercury becomes a major public concern in game fish such as the carnivorous bowfin and largemouth bass. Essentially all the coastal black water streams with heavy contributions from wetlands are impacted, and the major rivers have fish consumption advisories based on monitoring to verify this. It should be assumed that other wetland dominated coastal waters have the same issues with methyl mercury conversion and bioaccumulation in certain species that do not have mechanisms for systemic mercury removal. Children and pregnant women are especially susceptible and should avoid fish from these sources while others should probably limit their intake. Methyl mercury is known to be especially damaging to babies and the young. Adults are typically able to eliminate small quantities.

Fecal coliform comes from a variety of sources of warm blooded animal and human waste. Specific sources are sometimes difficult to ascertain within the forest and for most practical purposes would be difficult to control except for human inputs. Outside sources can be numerous and may include cattle, pigs, raccoons, pets, faulty septic systems, and recreational uses. The water quality standards associated with shellfish gathering waters along the coast indicate sensitivity to very low levels of fecal increase. Activities that could increase inputs of fecal materials to coastal waters would be carefully evaluated, especially where drainage areas contribute to shellfish gathering waters, such as Awendaw Creek, for example.

Indicators of brackish water from the 2003 report in Wambaw Creek were not sampled or discussed in detail. In 2008 and 2009, monitoring of tidal water concentrations were found to be intermittently present of up to 8.1 PSU (Practical Salinity Units) or 0.81% salt) at the Wambaw Creek Wilderness boundary on September 20, 2009. Ocean salt water is about 3.5% salt or 35 PSU. Data is still being collected, but it has not been evaluated for 2010. There is nothing to suggest that results for other nearby stream channels with low elevations and tidal influence will be much different than those found in Wambaw Creek. Elevated salt concentrations are the result of the combination of high tides, water storage and low flow releases into the Santee River associated with upstream dams. The highest salinity effects to low elevation channels along the Santee River coincide with high tides connected with new and full moon periods, low flows in Santee River and tributary areas and possibly some wind effects. The reduction in historic Santee River flows from the dam effects allows increased tidal entry of salt water from the Atlantic Ocean into the Santee River. This effect periodically extends upstream to at least Jamestown, SC and into tributary areas such as Wambaw Creek and the Wilderness Area. Other sections of lower Santee River and tributaries such as Echaw Creek are also affected under conditions when the flows in the Santee River are low and tides are high. A past report by The Nature Conservancy has mapped the changes in coastal vegetation

below Highway 17 due to the frequency and extent of tidal salt water influence. It is obvious that the tidal influence has affected plant and aquatic communities.

However, the Wambaw Creek water quality data taken at the wilderness boundary has complexities to consider in their evaluation. The water quality sonde (data logger) is installed at a fixed stage low enough that it is unlikely to be exposed. Salt water is denser than fresh water, so there may be periods of incomplete mixing of the water between denser salt water near the bottom and fresh water near the top that could result in some inaccuracies in the collected data. Although tidal action often produces velocities of moving water that can be seen on the surface, there is no way to tell the extent of subsurface mixing that is occurring.

A substantial amount of new study is continuing and expanding to address many coastal water quality and hydrology issues for Turkey Creek within the Santee Experimental Forest. We are cooperating with these data collections, experiments and studies that are being developed or continuing to be implemented by the USFS Center for Forested Wetlands. Many partners are involved in the hydrological research. The Santee Experimental Forest is included as part of the USFS National Experimental Forest and Range (EFR) network to collect hydrologic and other data representative of coastal issues. Dr. Devendra Amatya, Research Hydrologist with the USFS Southern Research Station, leads this effort in the Turkey Creek collaboration with numerous agencies, scientists and professionals, studying coastal hydrological and water quality issues. Mercury, fecal coliform, nutrient, water and carbon cycling are among the issues being addressed in a variety of basic to intense project studies and research. Cooperation with other educational institutions and research efforts have provided useful opportunities to collect information, try new techniques and model outputs in efforts to achieve better understanding and management. Some of the studies highlight various aspects of coastal vegetation management and prescribed burning activities useful in technology transfer.

In 2010, with collaboration with the Southern Research Station, the Francis Marion National Forest tested groundwater dependent ecosystem (GDE) sampling protocols to represent coastal ecosystems for the national pilot effort with several other forests representing other regional ecosystems. The primary GDE areas sampled included spring, seep and fen examples, with secondary sites on Carolina bay and various types of isolated wetlands. Information collected suggested that water quality indicators and size of area with respect to contributing surface drainage could help evaluate the level of groundwater influence and dependency.

Additional collaboration of the Francis Marion NF specialists with the Santee Experimental Forest, and specifically the hydrological and soils efforts from scientists Drs. Devendra Amatya and Carl Trettin, have helped to characterize the response of water table changes with respect to various soil types and rainfall. This information is helpful in evaluating the frequency of soil saturation and flooding of specific soil types common to coastal ecosystems and the potential applications for silvicultural operations and a better understanding of surface – groundwater interactions within the soils. Some types of flora and fauna have dependency on these hydric and riparian ecosystems that

will be better understood as continuing information is being collected. Soil and hydrological interactions associated with timber management and prescribed fire are also part of the studies and research undertaken by the Santee Experiment Station in collaboration with the Francis Marion NF. More recent efforts to expand water table monitoring on various soil series in cooperation with the Natural Resources Conservation Service has been planned but not implemented sufficiently to produce findings.

Significant efforts to remove feral hogs are underway, and this work helps improve native habitats, water quality and other resources. Hogs can impact soils through disturbance and water quality from increased erosion and waste discharge.

Findings

Funds have been limited the last few years resulting in constraining some work being conducted by the Santee Experiment Station, SC Department of Health and Environmental Control and other agencies to sample and report on water issues in coastal ecosystems. These outside efforts are replacing the need for forest plan level monitoring for water quality concerns. The forest did not fund water quality data collection as initially planned for the five-year monitoring. Our partnerships and combined efforts with those developed by the Southern Research Station on the Santee Experimental Forest and others are producing more focus and more detail than was planned with the forest plan monitoring. Numerous publications concerning hydrology and water quality in Turkey Creek and other nearby small streams have been developed on the Santee Experimental Forest. Continuing research and collaborative efforts are ongoing. Public contacts and/or informational materials may still be needed to increase public awareness of methyl mercury and fecal coliform issues common within the coastal plain. Work on sampling GDE and defining and characterizing soil responses to rainfall and forest management activities associated with timber harvest, thinning and prescribed fire are providing new information on how these ecosystems function. This information will be important as we enter a new era of forest planning and effects evaluation.

It is unlikely to expect, with the mercury and fecal issues, past land management activities within the coastal plain, potential for severe storm events and the need to manage for a variety of resource outputs, that FMNF streams will always be within water quality standards. Careful attention is paid in forest management activities to implement BMPs and look for opportunities such as hog removal and user created trail closures to improve watershed conditions including water quality.

25. Is the Forest in compliance with State Best Management Practices (BMPs) (B-45 new)?

Information

This monitoring question is responsive to goals 1, 3, and 8. The Forest's streams, lakes, wetlands, and riparian areas are healthy, functioning ecosystems that produce sustained flows of high quality water.

- Compliance with State BMPs.

Results

In the field assessments of several timber sales and units with streams or wetlands on the Francis Marion NF during 2011, BMPs were fully implemented and effective at protecting water quality, soil productivity and associated resources. Recent procedures to categorize soil types into degrees of wetness and operability during activity planning and analysis seem to help address the areas that need to be managed under dry conditions. The last several years have had significant periods of dry conditions which tend to limit effects of logging equipment on the land. We did not detect any water quality or soil productivity problems in implementing the forest plan standards within the timber sale areas evaluated, which include BMPs. Measures in Forest Wide Standards such as FW-97, FW-99, FW-105, FW-106, FW-109, and FW-115 may augment BMPs sufficiently to limit water quality effects to acceptable levels on the National Forest. The forest standards decrease the intensity of impacts allowed and increase stream protection widths or protection measures. In addition, proposals at the landscape level may include many types of treatments to address fuel reduction and habitat improvements. Past projects have typically dealt with dispersed treatments across the landscape.

The SC Forestry Commission has shown from past monitoring of BMP implementation in forestry operations within the coastal plain that BMPs are effective when properly implemented at maintaining water quality and soil productivity. The timber harvesting BMPs were implemented 100% of the time on the sampled timber sales on public lands. BMPs were properly checked by the sale forester, administrator and/or inspector as to being implemented. Inspections and documentation were part of each sale record. Soil and Water Specialists also evaluated some areas for consistency. No reports associated with timber implementation were received suggesting any problems with implementation or effectiveness of BMPs or forest standards. However, updating some activities may be needed to better address issues that have emerged within the riparian corridor in the forest plan revision. A substantial amount of effort has gone into planning of prescribed burning, biomass, thinning, harvesting and other treatments to recognize soil limitations relative to compaction, displacement and rutting. Field conditions are being validated to insure that the sensitive soil types with high rutting potential or damaging to wetland hydrology are identified prior to treatments, with added measures to limit when activities can occur. BMPs are also being integrated into other ground disturbing resource activities.

Prescribed burning was evaluated on several sites. BMPs were implemented and there was some concern about localized areas within landscape treatments that burned too intensely and the frequency of burning and its potential effects on site productivity. The Santee Experimental Forest (SEF) is maintaining monitoring activities on two long-term fire studies. Work on the Santee Fire Plots is addressing the effects of long-term prescribed fire regime (46 years) on stand productivity and nutrient cycling in a regenerated stand, and the Fuel Management Study on Watershed 77 is addressing the cumulative effects of fuel management on hydrology, soils, and forest conditions. The SEF includes various hydrologic, soil, air and other resource monitoring instrumentation and studies. These efforts are being updated to address any new pertinent issues relative to prescribed burning within the National Forest and along the coastal urban interface expansion boundaries of Mount Pleasant, Charleston and other smaller communities. Concerns that we are looking into are associated with prescribed burning during extended dry periods. Riparian areas, wetlands or pocosins may burn hotter and more frequently than desired during these conditions, so we need to make sure we take a close look and adjust activities if necessary. We are not prepared at this time to share findings or make recommendations.

All terrain vehicle (ATV) trails were evaluated, and we found localized rutting and some unauthorized off trail uses in 2008 and 2009, especially associated with the power and gas transmission line. The district has put more resources and partnering efforts with users to better manage the trails in 2010, and this added attention continued in 2011. Wet weather closures are used to reduce the rutting that occurs when the trail is too wet and to provide timing for maintenance and trail stabilization after maintenance, before use begins. Added maintenance frequency has been used, and localized areas have been hardened with geomats. Some sensitive habitats have been fenced. Due to the amount of use, regular maintenance is part of the activity, and this would include returning and reshaping the dispersed sand accumulations back onto the trail tread. The district has increased communications with ATV users in efforts to notify them of closures, keep users on the trail and prevent off trail uses. Off trail uses have the potential to and in some instances are impacting sensitive soils, wetlands, archeological sites, T&E habitats and species. Some damage is continuing, but the district recreation trail manager is directing more attention to trail management and quality. Law Enforcement Officers and those certified to ticket offenses are helping to reduce unauthorized activities. We continue to have issues with the localized off trail damage. Collaboration with user groups is helping.

Issues with unauthorized trails continue. Even on designated trails, ATV and equestrian uses can cause resource damage that warrant regular attention. User created trails are creating resource issues because they are not properly evaluated and authorized, and some of these issues are expanding as use continues. However, the rate of this expansion is probably reduced since we have published the MVUM (motor vehicle use maps), which restrict users to only open roads and trails located on these maps. Issues with unclassified roads are not fully known, but we are actively making attempts to identify problem areas and working to address their closure needs. User created trails are not located, designed or managed to agency or forest standards and have had no formal

cultural, biological or other resources analysis, limited opportunity for funding, and they are really outliers and a challenge to address in our forest system of conducting quality work. Users in some instances are avoiding trail issues such as rutting by going outside of the designated trail tread or using non-system, unauthorized access routes. In the process, damage to soils, PETS plants, wetlands and other resources are occurring. This activity can damage gas transmission pipe facilities by causing wear or impact to scar the pipe. Damage to the pipe can produce rust and eventual failure can occur to these weakened areas, resulting in an explosion with many other effects.

The Forest is addressing many of the issues with the designated ATV trails, and this requires regular attention. They have improved monitoring and maintenance, worked with trail riders associations, provided wet weather trail closures and other structural and design trail improvements that are responsive to the needs of both resources and users. However, some users are disrespectful of measures to provide a designed trail that intends to control use. Some go as far as cutting fences or locks, removing signs and wearing deep trenches. It will take an integrated effort with managers, users and law enforcement to address the issues.

Findings

The Forest and Districts are actively involved with addressing the issues and complying with BMPs and Forest Standards. The increasing trend of utilizing the SC Forestry Commission for BMP Compliance Checks has been an excellent way to achieve mutual goals and maintain some outside review and interaction for quality control of forestry management activities. Timber activities are typically in acceptable to excellent compliance with BMPs. Due to the critical importance of maintaining prescribed fire as a management tool, and the complexity of the prescribed burning issues, continued quality control, study and monitoring are needed.

There are still some designated ATV trail sections with recurring issues that may require some action (improvement, section relocation, etc.). Findings of the forest specialist team and USFS trail specialists helped to identify, map and propose ways to address the ATV issues. Increased signing, maintenance, wet weather closures, relocation of problem sections, education, cooperation with user groups and enforcement all are all needed and are being implemented to varying degrees. We have made some progress but are still in the process of trying to turn this program around into the quality we expect. A more formalized strategy may be needed on how to address and limit specific types of unauthorized public use issues such as user created trails. Cooperative efforts with local law enforcement, utility companies, environmental interests and others are helping to address specific issues.

The forest is ready to consider potential opportunities to respond to the emerging availability of Light Detecting and Ranging (LiDAR) mapping. As LiDAR derived digital information becomes available in the near future, much improved analysis tools will be available with LiDAR based digital elevation models. Contours, shaded relief, surficial depressions, flow networks and improved georeferencing of channel network and past modifications will be much easier to locate and verify. We are just beginning to explore how it might be used in our efforts to identify and restore watershed and ecosystem conditions. We believe that there may be opportunities to benefit national

forest resources and other public interests by considering compensatory mitigation activities on selected areas in order to restore stream and wetland hydrology and other ecosystem functions that were altered with legacy drainage and channel modification activities and actions.

Issue 2. Sustainable Multiple Forest and Range Benefits

Sub-Issue 2.1 - Recreational Opportunities

26. Are the acres of land greater than ½ mile from an open road increasing at a rate to achieve the objective (B-2)?

Information

This monitoring question is responsive to goals 1, 3, 7 and 8 and objective 3. **Objective 3** is to increase the acres of land ½ mile from an open road or greater to 24,000 acres in this 10-year planning cycle. Road closure is emphasized in some areas of the Forest to enhance roadless area characteristics and to provide more semi-primitive recreational experiences. In addition, the Forest provides shelter and forage for a variety of neotropical migratory birds which can be enhanced by reducing open road density.

- Acres ½ mile from an open road and number of 250-acre blocks ½ mile from an open road.

Results

The total acreage that is at least ½ mile from an open road was 27,973 in FY2008. There are over 30 individual areas that are greater than 250 acres.

Findings

The objective of having 24,000 acres of land that is greater than ½ mile from an open road had been accomplished. There are several areas that are greater than 250 acres but additional road closures could increase either the acreage of these areas or the number of them.

27. Are the activities creating or maintaining the desired Recreation opportunity Spectrum ROS classes (B-12)?

Information

This monitoring question is responsive to goals 3, 4, 6 and 8 and objective 6. **Objective 6** is to manage the following acreage to achieve the Recreation Opportunity Spectrum class

conditions: rural (81,826 acres), roaded natural (126,219 acres), semi-primitive motorized (21,147 acres), and semi-primitive non-motorized (13,549 acres). Visitors enjoy a diversity of recreational opportunities.

- The condition of each ROS class.

Results

No targeted information was collected in FY 2011. However, ongoing ROS classification review is done throughout the year in conjunction with regular recreation site visits. No inconsistencies were found in FY 2011.

Findings

Recreation opportunities in the most primitive category continue to be in wilderness and roadless areas.

28. What is the current use of recreational facilities and trails (B-13)?

Information

This monitoring question is responsive to goals 3, 4, and 8. The Forest is a popular place with a wide range of recreational visitors.

- Recreational visitor use of facilities/sites and trails.

Results

The National Visitor Use Monitoring (NVUM) was conducted on the Forests in FY 2002 and FY2008. The results of both surveys show the following trends in recreation use. Overall national forest visits were down 3%. The annual visits in 2002 were 1,328,000 and that fell to 1,284,000 in 2008.

Findings

Overall use was down slightly in the six-year period between 2002 and 2008.

29. Are the distribution, design, location, capacity and condition of the recreation facilities and trails meeting the needs of the users (B-14)?

Information

This monitoring question is responsive to goals 3, 4, and 8 and objective 8. The Forest Plan objective (**Objective 7**) to increase the developed recreational facilities capacity to 2,200 people-at-one time (PAOT) within the next 10 years was dropped. Another

objective (**Objective 8**) is to increase the trail system to 160 miles within the next 10 years.

- User satisfaction with facilities and trails

Results

The second round of National Visitor Use Monitoring (NVUM) was conducted on the Forests in FY2008. (The NVUM survey combined both the Sumter and Francis Marion National Forests. Therefore the following information is not specific to the Francis Marion.)

- The following items were items that the forest did well or very well:
 - At day- use sites, bathroom cleanliness, parking, feeling of safety ranked the highest in term of satisfaction.
 - At overnight sites, parking, feeling of safety, and value for fee paid ranked the highest in terms of satisfaction.
 - At general forest sites (which include trails of all types, hunting, fishing, etc.) employees helpfulness, condition of environment, roads and parking, feeling of safety, and value for fee paid ranked the highest.
- The following were items that people were the most dissatisfied with:
 - The restroom cleanliness in general forest areas (trailheads and dispersed sites) was not rated well. Over 44% of users in these areas were very dissatisfied with the conditions of the restrooms.
 - Users would like to have improved recreation information and signage at campgrounds and wilderness.

There continues to be infrastructure changes/improvements to the Wambaw Cycle Trail system in an attempt to mitigate impacts to the natural resources around the trail (as well as improve trail experience so riders want to stay on the trail).

Findings

FY 2008 NVUM monitoring shows that in certain areas there are still improvements that can be improved in terms of user satisfaction.

30. Are miles of trails increasing at a rate to achieve objective (B-15)?

Information

This monitoring question is responsive to goals 3, 4, 6 and 8 and objective 8. The Forest Plan has an objective to increase the trail system to 160 miles within the next 10 years (**Objective 8**).

- Number of miles of trails

Results

The total miles of trail is over 166 miles and meets the plan objective.

Findings

No additional action is needed.

31. Are activities creating or maintaining the desired Visual Quality Objectives (VQOs) (B-16)?

Information

This monitoring question is responsive to goals 2, 3, 4, 6 and 8 and objective 10 of the Forest Plan which is to manage the following acreage to achieve the VQOs classes: modification (186,788 acres); partial retention (38,648 acres); retention (4,179 acres); and, preservation (13,812 acres). The landscape around most travel routes continues to be managed to reduce the visual impacts of activities that might be seen by passers-by. Generally, visual quality is improved.

- The condition of each VQO class.

Results

No specific visual monitoring information was collected in FY 2011. However, ongoing visual review is done throughout the year in conjunction with regular field visits. No inconsistencies were found in FY 2011.

In FY 2000 specific visual monitoring showed that management activities have created or are maintaining the desired VQOs. Several projects were monitored.

Findings

No additional actions are required.

Sub-Issue 2.2 - Land Adjustments

32. Are lands being acquired which consolidate ownership, contain unique areas, enhance recreational opportunities, maintain public access and increase management efficiency (B-20)?

Information

This monitoring question is responsive to goal 5. The Forest is more consolidated, and land acquisitions include an array of unique plant and animal habitats, riparian areas, geological features, cultural resources and unique recreational opportunities.

- Annual land adjustments.

Results

The Forest continued to follow its Land Ownership Adjustment Strategy. The Forest continues to pursue L&WCF funding for acquisitions, and was selected to submit a collaborative 2013 L&WCF funding request as a pilot project between the Forest Service, the Fish and Wildlife Service, and the National Park Service. One exchange on the Francis Marion District is expected to close in FY2012. The Wambaw office and work center on the Francis Marion is being processed, and is scheduled for competitive sale in early FY12. The Francis Marion accepted a donation of 63 acres in Charleston County.

Findings

New purchases are planned in the future.

Sub-Issue 2.3 - Heritage Resources

33. Are heritage sites protected (B-44 new)?

Information

This monitoring question is responsive to goal 2. Manage, protect and perpetuate natural and cultural values associated with these irreplaceable resources.

- Sample field condition assessment of sites eligible or listed on National Register.

The forest objective is to document and compare existing heritage resource conditions to the desired objectives through monitoring. Heritage resources include places such as archaeological and historical sites and traditional cultural properties. Heritage resources also include things such as artifact collections, historic maps and records, and special or

sacred objects. Heritage resources are vulnerable, nonrenewable resources, and our goal is to preserve, protect, and interpret them for the public.

Results

Given the large number of heritage resources on the forest the Forest Service uses a sampling strategy to select priority heritage assets (PHAs) for monitoring. Monitoring archaeological sites and historic buildings determines if current administrative and field procedures are sufficient to protect significant cultural resources from damage or destruction by either human or natural forces. The results of this effort are presented in the table below.

Total number of assets monitored	4
ARPA investigations	0
Assets eroding by water	1
Assets damaged by forest users	0
Assets damaged by forest management	0
Assets undisturbed	3

Monitoring identified threats to two historic buildings because of deferred maintenance. Both buildings continue to deteriorate and are in critical need of work to preserve these Priority Heritage Assets.

The full scope of archaeological site looting, vandalism, and other threats is not known due to the small sample of sites monitored. The use of metal detectors to locate and dig for artifacts on historic sites is a growing concern. Impacts to sites from user created OHV trails is another concern.

Findings

The forest continues to identify and monitor archaeological sites and historic buildings at risk. Heritage resource specialists are working with law enforcement, other Forest Service employees, and the public to document and deter unauthorized forest activities that damage historic properties.

The forest needs to increase monitoring to determine the effects of unauthorized activities and uses on archaeological sites including use of off road vehicles, horse trails, and woods roads. The effects of management activities such as tilling wildlife fields and construction of firelines need to be evaluated as well.

Finally, the forest needs to develop historic preservation plans (HPP) for at risk priority assets and implement a regularly scheduled monitoring program. The forest needs to assess its collections, including artifacts, photographs, and historical records, and develop a curatorial plan.

Issue 3. Organizational Effectiveness

34. Are probable activities, costs and outputs occurring as estimated in the Plan (B-22)?

Information

Specific items have been tracked and are summarized in the following table. The Forest Plan established a range of acceptable results of within 20 percent of estimated projections.

Results

Tables 2-9 and 2-10, below, show the trend in various activities across the Forest.

Findings

Factors such as uncertain weather, budget and staffing constraints, increasing urbanization, and smoke sensitivities will have an effect on the ability to sustain or significantly increase the acres burned. Stewardship and other types of partnerships are being used and need to continue to be used to maintain critical ecosystem components and control hazardous fuels.

Road projects supported timber harvest activities with emphasis was on:

1. Maintaining and reconstructing roads, to meet objective maintenance levels;
2. Meeting design standards and best management practices; and
3. Reducing negative impacts to resources, while focusing watershed health.

No new miles of road were constructed in FY 2011.

Miles of road reconstruction continue to fall behind the ten year plan target due to a stagnant budget. This will affect the road system in future years by requiring more expensive road work and reduction in serviceability of the system.

The forest has not been able to close enough road mileage to reach the percentage of closed roads in the plan.

The Francis Marion continues to conduct road condition surveys to determine the condition of the road system and the amounts of annual and deferred maintenance.

Road decommissioning was not done in FY 2011; which allowed program dollars to be spent on high priority open roads. The forest is maintaining an increasing number of maintenance level 2 roads. The decreased level of maintenance will also reduce the quality of access or restrict access to some areas of the forest for the traveling public.

Forest road mileage remained relatively steady, as corporate data continued to be reviewed and updated.

Table 2-9. Activities and Expenditures/Outputs

Activity	Unit of Measure	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	10 year Plan Estimate
<i>Road Construction</i>	<i>Miles</i>	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	15
<i>Road Reconstruction</i>	<i>Miles</i>	6.3	1.7	36.7	2.0	2.8	0.0	0.0	0.0	63
<i>Timber Roads*</i>	<i>Miles</i>	27.0	8.6	38.2	25.4	26.1	14.8	42.9	33.1	N/A
<i>Roads Decommissioned</i>	<i>Miles</i>	6.0	0.0	1.0	0.6	0.6	0.0	0.0	0.0	N/A
<i>Open Roads</i>	<i>Miles</i>	432.7	433.4	433.2	433.1	432.5	434.0	415.3	438.5	446
<i>Closed Roads</i>	<i>Miles</i>	127.2	131.0	131.0	131.0	142.2	140.8	142.6	143.4	172
<i>Maintained Permanent Wildlife Openings**</i>	<i>Acres</i>	720	720	720	819	706	706	706	706	810
<i>Convert Loblolly to Longleaf</i>	<i>Acres</i>	0	0	0	0	0	0	0	0	7,700
<i>Establish Regeneration</i>	<i>Acres</i>	0	0	0	0	0	0	0	0	16,150
<i>Fertilization</i>	<i>Acres</i>	0	0	0	0	0	0	0	0	600
<i>Intermediate Stand Treatments</i>	<i>Acres</i>	0	2,000	4,223	947	657	1,228	54	402	22,500
<i>Regeneration Harvest</i>	<i>Acres</i>	0	0	0	0	0	0	0	0	3,600
<i>Thinning Harvest</i>	<i>Acres</i>	983	2,280	3,736	1696	2127	2,228	2,132	2,077	44,000
<i>Volume offered for Sale</i>	<i>MMCF</i>	0.8	2.6	6.2	3.2	3.1	3.0	3.7	3.2	33
<i>Winter Season Prescribed Burning</i>	<i>Acres/Year</i>	24,426	23,381	19,521	23,824	25,561	29,581	25,765	17,685	26,000
<i>Growing Season Prescribed Burning</i>	<i>Acres/Year</i>	7,110	11,862	11,409	10,501	13,710	5,298	8,030	14,711	4,000
<i>Annual Payments to Counties</i>	<i>M\$</i>	908	929	938	937	844	760	685	571	N/A
<i>Annual Budget***</i>	<i>MM\$</i>	13.6	10.8	10.2	9.4	8.3	9.1	8.8	9.2	N/A

* Timber roads are those roads under timber sale contract.

** Permanent wildlife openings also include waterfowl impoundments and greentree reservoirs but do not include maintained linear wildlife strips. In FY2008, the acres for permanent wildlife openings came from GIS. Changes in the acres are due to changes in the GIS layer and no changes were made in the number of acres maintained.

*** The budget allocation includes both the Sumter and Francis Marion National Forests and cannot be tracked separately. Annual Budget expenditures are adjusted for inflation and do not include any dollars allocated for grants and other specific programs.

Table 2-10. Status of Recreational Facilities, Trails and PAOTs

Activity	Unit of Measure	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	10 year Plan Estimate
<i>Construct Boat Ramps</i>	<i># of Sites</i>	0	0	0	0	0	0	0	0	0	2
<i>Construct Horse Camps</i>	<i># of Sites</i>	0	0	0	0	0	0	0	0	0	1
<i>Construct Campgrounds</i>	<i># of Sites</i>	0	0	0	0	0	0	0	0	0	1
<i>Construct Canoe Access</i>	<i># of Sites</i>	0	0	0	0	0	0	0	0	0	5
<i>Construct OHV Trails</i>	<i>Miles</i>	0	0	0	0	0	0	0	0	0	20
<i>Construct Bicycle Trails</i>	<i>Miles</i>	7	0	0	0	0	0	0	0	0	10
<i>Designate Canoe Trails</i>	<i>Miles</i>	0	0	0	0	0	0	0	0	0	10
<i>Construct Hiking Trails</i>	<i>Miles</i>	7	0	0	0	0	0	0	0	0	10
<i>Construct Horse Trails</i>	<i>Miles</i>	0	0	0	0	0	0	0	0	0	20
<i>Recreation Capacity – Boat Ramps</i>	<i>PAOTs</i>	230	230	230	230	230	230	230	230	230	500
<i>Recreation Capacity – Horse Camps</i>	<i>PAOTs</i>	0	0	0	0	0	0	0	0	0	50
<i>Recreation Capacity – Campgrounds</i>	<i>PAOTs</i>	280	280	250	250	250	250	250	250	250	400
<i>Recreation Capacity – Canoe Access</i>	<i>PAOTs</i>	0	0	0	0	0	0	0	0	0	130
<i>Recreation Capacity – Other</i>	<i>PAOTs</i>	790	790	790	790	790	790	790	790	790	1,165
<i>-Trails, total</i>	<i>Miles</i>	166.1	166.1	166.1	166.1	116.1	166.1	166.1	166.1	166.1	160.5
<i>-OHV</i>	<i>Miles</i>	40	40	40	40	40	40	40	40	40	60
<i>-Bicycle</i>	<i>Miles</i>	63	63	63	63	63	63	63	63	63	10
<i>-Canoe</i>	<i>Miles</i>	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	22.5
<i>-Hiking</i>	<i>Miles</i>	57.3	57.3	57.3	57.3	57.3	57.3	57.3	57.3	57.3	30
<i>-Horse</i>	<i>Miles</i>	33	33	33	33	33	33	33	33	33	38

39. Are projects being managed according to requirements and making progress toward achievement of desired future condition (DFC) for vegetation (B-46 new)?

Information

This monitoring question is responsive to goals 1, 2, 3, 6, 7 and 8.

- Do an Integrated Resource Review (IRR).

Results

An Integrated Resource Review (IRR) was completed in FY 2010.

Findings

Based on findings in the IRR, no forest plan amendments are needed. The Francis Marion Forest Plan is scheduled to be revised within the next 3 years under the new planning rule.

Chapter 3. FY12 Action Plan and Status

Actions Not Requiring Forest Plan Amendment or Revision

a) Action: Develop a monitoring program for aquatic macroinvertebrate communities across the Francis Marion National Forest, including aquatic insects, crayfish and mollusks.

Responsibility: Districts and SO staffs.

Date: FY2014

Status: Existing population conditions are unknown. Crayfish and mollusk inventory surveys were conducted across the forest in 2011. (refer to the 2011 Monitoring Report).

b) Action: Emphasis needs to be placed on efforts to bring the Regional database into operational use for estimating forest-wide trends related to compiling and analyzing bird point or harvest data for MIS, including northern bobwhite quail, eastern wild turkey, painted bunting, American swallow-tailed kite, prairie warbler and northern parula warbler. The region is working on the R8 Bird Database, which should have this functionality soon. Fish and mussel surveys are planned to occur in 2010 or 2011.

Responsibility: SO staff.

Date: on-going

Status: Data has been entered and analysis can be done at the Regional and Forest level, but information is currently not available at the District level. No further action will be taken. Emphasis will be placed on getting access to the information by Districts to use in project planning.

c) Action: Baseline data is needed to determine the acreage and extent of low basal area savannas which contribute towards early successional habitat on the Forest in order to meet Objective 12.

Responsibility: District staff.

Date: 2012

Status: Natureserve and others are working both ecological potential and existing conditions for wet pine savanna and flatwoods ecological systems on the forest, due to be completed in early 2013. The first longleaf pine restoration project (Honey Hill Environmental Assessment (EA)) was completed in 2009. The decision for the Honey Hill habitat restoration project has been signed and it is anticipated that the planting of longleaf pine will begin in 2013 to 2015. The Hellhole EA has also been completed, which restore additional areas of longleaf pine on the Francis Marion National Forest.

f) Action: Digital databases for invasive plants, PETS plants, and underrepresented or high quality plant and animal communities are being developed and maintained on the district and forest. Develop ecological systems maps for use in restoration planning.

Responsibility: District and Forest Program Managers

Date: 2013

Status: Ongoing. A longleaf assessment, which included an assessment of canopy, mid-story, and understory conditions for existing and potential longleaf, was completed for the forest in 2010. An ecological systems map is being developed in 2013.

g) Action: Appropriate fire and biological staff should ensure that endangered and sensitive species, botanical areas, and underrepresented plant communities are prescribed burned on a regular basis as needed to maintain and enhance them. Meetings should occur annually to determine prescribed burning needs for these species and communities.

Responsibility: District and Forest Program Managers

Date: 2013

Status: Ongoing

Actions That Require Forest Plan Amendment or Revision

Francis Marion is scheduled for a forest plan revision pending the new planning rule.

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Appendix A - List of Preparers

The following individuals contributed to this report:

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Appendix B - Amendments to Forest Plan

Amendment 1, On February 22, 2008, a Court Order invalidated forest plan amendments that were created using the 2002 Supplements to the Vegetation Management Final Environmental Impact Statement. Due to this court ruling Amendment 1 is not longer valid.

Amendment 2, May 2003 - This amendment revises the Management Indicator Species (MIS) List to increase efficiency and effectiveness of the Forest's monitoring program and project effects analyses.

Amendment 3, December 2004 - This amendment adds a standard to the Forest Plan that is needed to incorporate newly acquired lands into the Forest Plan and begin managing these lands through site specific projects.

Appendix C - Summary of Research Needs

The following research needs have been identified for rare species.

- **What is the distribution of American eel across the Forest? What habitat does the eel utilize? What is the population status?**

Stream fish inventory surveys were conducted in 1993 by Hansbarger and Dean (1994). Monitoring surveys were conducted in 2002, 2003, 2004, 2006 and 2010 (refer to the 2011 Monitoring Report). American eel has been captured during every sample year. Habitat inventory protocol was developed in 2002 using BVET methods (Dollof et al 1993). Habitat inventory was attempted in 2003 and 2004. Dry conditions in 2003 and swampy conditions in 2004 restricted inventory to short segments of streams. During fish surveys, it was observed that large woody debris is lacking in the coastal stream systems. Hansbarger and Dean (1994) stated that fish inventory was difficult due to the abundance of downed trees and wood in the streams. Large woody debris, an important component for habitat structure, is lacking in the sampled streams.

- **What species of crayfish occur on the Forest and what is the distribution of crayfish across the Forest? What is the population status?**

Existing population conditions are unknown. Crayfish surveys were conducted across the forest in 2011. A total of 84 streams were sampled for crayfish. Crayfish were collected in 72 of these streams. Five species of crayfish were collected during 2011 surveys (refer to the 2011 Monitoring Report).

- **What species of mollusks occur on the Forest and what is the distribution of mollusks across the Forest? What is the population status?**

Existing population conditions are unknown. Mollusk surveys were conducted across the forest in 2011. A total of 38 streams were sampled for mollusk species. Mollusk species were found in 26 streams. Thirteen mussel species, three clam species and eight snail species were collected in 2011 (refer to the 2011 Monitoring Report).

- **What ecological factors are affecting the health of the federally-endangered pondberry at Honey Hill? How can our population at Honey Hill, as well as other sites on the forest be managed? How can American chaffseed best be managed?**

In 2010, two research projects on pondberry were initiated by graduate student and/or associated professors at the Citadel. Results are now available and efforts in 2013 will include working with USFWS to decide on to best move forward with pondberry restoration efforts on the forest. A new NEPA decision will be completed in 2013 to address needs for threatened and endangered species not included in existing decisions.

- **What ecological factors are affecting the distribution of the federally threatened Frosted Flatwoods Salamander on the forest?**

The Forest completed another survey for the federally threatened Frosted Flatwoods Salamander (*Ambystoma cingulatum*) in 2010. Six larvae were collected from a previously undocumented breeding wetland. The Francis Marion supports one of only

three known breeding populations in South Carolina. Steve Bennett (SC state herpetologist) took three larvae to the Riverbanks Zoo in Columbia, SC, where Scott Pfaff (Curator of Herpetology) successfully raised them to metamorphosis. DNA analysis indicates that individuals from the Francis Marion do not represent a distinct species, and are closely related to other populations of the Frosted Flatwoods Salamander. The three individuals collected from the FMNF will continue to be housed at the Riverbanks Zoo in order to study their natural history.

- **What ecological and biological factors affect habitat selection and nesting success of swallow-tailed kites on the FMNF? How do forest management practices on the FMNF affect suitability and productivity of swallow-tailed kite habitat?**

Two annual surveys have been completed.

What ecological and biological factors affect habitat selection, breeding success and tadpole/metamorph survival of the Carolina Gopher Frogs on the FMNF? What forest management practices are needed to maintain and enhance Carolina Gopher Frog habitat on the FMNF?

Three North American Amphibian Monitoring Program (NAAMP) routes were installed on the FMNF in 2007. The Carolina gopher frog has been documented to travel significant distances to and from breeding wetlands. As such, good quality upland habitat adjacent to the breeding wetlands is essential. Scott Pfaff, Curator of Herpetology at the Riverbanks Zoo in Columbia, SC successfully raised several *L. capito* from the Francis Marion to metamorphosis. Because so little is known about this species' natural history, the zoo plans to raise these individuals, and hopefully get them to breed in captivity.

- **What was the historic range and distribution of seasonally wet savannas on the Francis Marion? How can they best be managed/restored?** Naturereserve and others are working both ecological potential and existing conditions for wet pine savanna and flatwoods ecological systems on the forest. Within the collaborative framework of forest plan revision we will determine where, how, and to what extent they can best be managed and restored.

**FRANCIS MARION NATIONAL FOREST
FISCAL YEAR 2011 MONITORING AND EVALUATION
ANNUAL REPORT**

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