# Francis Marion National Forest

# Monitoring and Evaluation Annual Report

# Fiscal Year 2003

U. S. Department of Agriculture
Forest Service
Southern Region


# Francis Marion National Forest

## Fiscal Year 2003
## Monitoring and Evaluation Report

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**September 2004**

The photograph on the cover was taken at Harleston Dam Creek, one of the sites of fish population monitoring on the Francis Marion National Forest.Photograph was taken by Jeanne Riley, Fisheries Biologist.

# Acronyms

| | |
|---|---|
| ASQ | Allowable Sale quantity |
| BCD | Biological; conservation Database |
| BMP | Best Management Practices |
| BVET | Basin-wide Visual Estimation |
| DBH | Diameter at breast height |
| EPA | Environmental Protection Agency |
| FS | Forest Service |
| FW | Forest-wide |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| HMA | Habitat Management Area |
| IM | Inventory and Monitoring |
| MA | Management Area |
| MIS | Management Indicator Species |
| MMCF | Million cubic feet |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act |
| NVUM | National Visitor Use Monitoring |
| OHV | Off-highway vehicle |
| PETS | Proposed, endangered, threatened, and sensitive species |
| PPM | Parts per million |
| PSD | Prevention of Significant Deterioration |
| RPA | Resource Planning Act |
| SAMI | Southern Appalachian Mountains Initiative |
| SCD-HEC | South Carolina Department of Healh & Environmental Control |
| SCDNR | South Carolina Department of Natural Resources |
| SPB | Southern Pine Beetle |
| T&E | Threatened and endangered |
| USDA | United States Department of Agriculture |

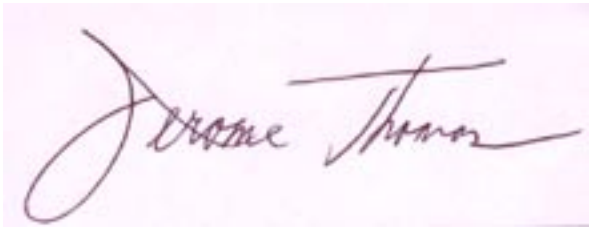
# Table of Contents

# 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* (Forest 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.



September 10 , 2004

JEROME THOMAS
Forest Supervisor

# Executive Summary of 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 is used to assess how well goals and objectives are being met, if standards and guidelines are being properly implemented and whether environmental effects are occurring as predicted. Evaluation of monitoring results is 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 Francis Marion has achieved 110 per cent of the Forest Plan objectives for longleaf pine forest type restoration through reforestation and prescribed burning activities. No acres were planted with longleaf pine in FY 2003.

Southern pine beetle (SPB) populations returned to low levels in FY 2003.

Of the total 49,322 acres in longleaf pine or mixtures of longleaf with loblolly pine about 62 per cent has been burned by prescription in the last 5 years, creating good conditions for the longleaf pine ecosystem. Approximately 36 per cent of Management Area 26, which has as a goal of restoring and maintaining the longleaf ecosystem, has been burned in the last 3 years. No early successional habitat was created through even-aged forest regeneration. No new stands were established in the 0-3 year age class since regeneration cuts have not been done for 14 years. Prescribed burning has been used in the past to keep some early successional habitat. However, as these stands grow and mature they can no longer be managed to provide this habitat.

The Second Revision of the Red-Cockaded Woodpecker (RCW) Recovery Plan was released in January 2003. Analysis to determine consistency with the Forest Plan is on going. The RCW population on the forest increased to 346 potential breeding pairs in 2003, based on a 25 per cent population sample, resulting in an increasing 5-year trend, and the second largest population since Hurricane Hugo. The forest completed 1,200 acres of mechanical mid-story control, installed 142 artificial cavities, and prescribed burned more than 40,000 acres for the red-cockaded woodpecker and other fire-adapted species. In the last 5 years 48 per cent of the RCW Habitat Management Area has been prescribed burned.

Several new locations for proposed, endangered, threatened or sensitive (PETS) species or their habitats were discovered as a result of project-level surveys. Populations for a subset of PETS were monitored, including red-cockaded woodpecker, Bachman's sparrow, flatwoods salamander, and bald eagle. Inventories for Rafinesque's big-eared bat and Southeastern myotis were conducted in partnership with Coastal Carolina University. Habitat management for PETS associated with fire-maintained ecosystems was also conducted. Experimental habitat management was conducted on the federally endangered pondberry at Honey Hill in conjunction with the South Carolina Native Plant Society.

A Forest Plan Amendment resulting in a change in the list of management indicator species (MIS) for the forest was completed in April 2003. Also in 2003, surveys, monitoring, and habitat management projects were completed for a number of management indicator species including red-cockaded woodpecker, yellow-throated vireo, awed meadow beauty, pine woods tree frog, and sweet pitcher plant. Refer to the MIS section and chapter 3 of this report for a summary of work completed.

Forest and aquatic communities were monitored including ephemeral wetlands, stream fish communities and habitat, aquatic macroinvertebrate community, anadromous and catadromous fishes, and pond game fish.

**Sustainable Multiple Forest and Range Benefits**

Timber harvest has been well under that allowed in the Forest Plan. In FY 2003, 2.3 million cubic feet (MMCF) were offered for sale. The allowable sale quantity is 33 MMCF/year during the 10-year period.

The main silvicultural practices employed in FY

2003 were commercial thinning harvest, release of seedlings and saplings using prescribed fire, and pre-commercial thinning.

Signing at developed recreation sites and trails was improved based on comments from visitors. Additionally, agency presence was increased and services enhanced during high use periods (weekends and holidays) by rearranging staff work schedules. Fee Demo funds were used to help fund the additional services.

The addition of new tent sites increased public capacity by a third at the popular Buck Hall Recreation Area on South Carolina's Intracoastal Waterway.

Using a combination of appropriated, fee demo, and grant funds, partnerships and volunteer efforts increased trail maintenance.

Planning and design for a major reconstruction of the Wambaw Cycle trail and Trail head was initiated in FY 2003. Implementation is expected in middle to late FY 2004.

Results from a scenery management review indicated that Forest Plan visual quality objectives are being met.

The Heritage Resource program of work included cultural resource inventory in support of 59 projects and land management activities. This inventory resulted in recording 115 new archeological sites, 29 of which were determined to be possibly eligible but unevaluated for listing in the National Register of Historic Places.

The revision of the *Francis Marion National Forest Cultural Resources Overview* is still in progress.

**Other**

The federal government acquired an additional 4,000 acres.

The Francis Marion and Sumter National Forests participated in the National Visitor Use Monitoring (NVUM) project from October 2001 through September 2002. This project estimated visitor use for all activities including recreational facilities and trails. The sampling strategy used did not allow separation of use by forest. Visitor use on both forests for fiscal year 2002 was 1.1 million National Forest visits. There were 1.5 million site visits (visit to one site) and an average of 1.3 site visits per National Forest visit. There were approximately 52,864 wilderness site visits.

Highest developed recreational use on the Francis Marion occurs at the Sewee Visitor and Environmental Education Center and Buck Hall Recreation Area. Highest used trails included Wambaw Cycle Trail, Swamp Fox Passage of the Palmetto Trail, and the Tuxbury Horse Trail, in that order.

# Chapter 1. Introduction

The Francis Marion National Forest is about 252,840 acres in the lower coastal plains of South Carolina. The *Revised Land and Resource Management Plan* (Forest Plan), approved on December 18, 1995, directs management activities. National Forest lands are managed to provide goods and services for timber, outdoor recreation, water, wildlife, fish, and wilderness following multiple-use goals and objectives.

Monitoring and evaluation are integral parts of the Forest Plan designed to ensure the goals and objectives are being achieved, standards and guidelines are being followed, and environmental effects occur as predicted. Forest Plan monitoring and evaluation determine if the forest is moving toward or achieving the desired conditions for resources as described in the Forest Plan.

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

# Chapter 2. Monitoring Results and Findings

**Issue 1. Ecosystem Condition, Health and Sustainability**

**Sub-Issue 1.1 - Biological Diversity**

**1. Vegetation Management**

**Determine if the regeneration of desired tree species is being achieved.**

No regeneration harvest treatments have been conducted on the Francis Marion for 14 years since Hurricane Hugo in 1989.

Substantially fewer acres are being planted annually than anticipated in the Forest Plan. No acres were planted in FY 2003. The Forest Plan estimated an annual average of 1,615 acres to be planted. Total acres regenerated from 1995 to 2003 are 31 per cent of the amount expected to this point. Acres regenerated since the Forest Plan was approved are shown in Table 2-1.

**Table 2-1. Acres Regenerated**

| Year | Acres Regenerated |
|---|---|
| 1995 | 1,912 |
| 1996 | 1,412 |
| 1997 | 417 |
| 1998 | 285 |
| 1999 | 333 |
| 2000 | 192 |
| 2001 | 0 |
| 2002 | 0 |
| 2003 | 0 |
| TOTAL | 4,551 |

**Determine if the vegetation is being managed according to the Forest Plan's requirements and making progress toward achieving the Desired Future Conditions (DFC) for vegetation.**

Currently, there are 37,283 acres in the mixed pine/hardwood type. The Forest Plan objective was to have 14,800 acres in the next 90-year period. The Francis Marion continues to emphasize hard mast

production in Management Area (MA) 27 by releasing hard and soft mast producers during pine thinnings.

The Francis Marion has achieved 110 per cent of its 10-year objective for longleaf pine forest types. This forest type includes loblolly/longleaf mixtures that can be thinned to favor longleaf.

The Forest Plan has an objective of establishing 5,000 to 10,000 acres in the 0-3 year age class. This includes permanent openings, wildlife openings, and road and utility rights-of-way. The forest presently has approximately 800 acres in permanent wildlife openings and 800 acres in rights-of-way. Prescribed burning to limit regeneration of loblolly seedlings in stands containing mixtures of loblolly and longleaf has been done periodically throughout the forest to make up for the shortage of early successional habitat since regeneration cuts have not taken place. These loblolly stands can no longer be managed to provide this habitat component. Also, the amount of shrub/seedling habitat is declining as the number of acres in the 3-10 year age class declines.

Thinning stands to low moderate basal areas followed by prescribed burning create openings in the forest canopy that somewhat mimics early successional habitat. The forest offered 2,228 acres thinning harvest in FY 2003. Francis Marion is preparing for a large increase in the commercial thinning program. Tens of thousands of acres are now coming of size for commercial thinning.

Table 2-2 shows prescribed burning accomplishments since 1998. During FY 2003, a total of 22,580 acres were burned during the growing season (i.e., after April 1) in the longleaf pine ecosystem with 16,502 acres being burned more than one time. The objective is to restore the role of growing season fires on 16,000 acres of longleaf pine forest type by having these acres burned on a 2 to 4 year cycle in the next 10 years and on 40,000 acres in the long term. Approximately 62 per cent of the longleaf type has been burned in the last 5 years.

**Table 2-2. Prescribed Burning Accomplishments (acres)**

| FY98 | FY99 | FY00 | FY01 | FY02 | FY03 |
|---|---|---|---|---|---|
| 34,281 | 29,327 | 30,064 | 35,367 | 23,236 | 41,527 |

Challenges to the prescribed burning program continue at urban interfaces, such as on National Forest lands in proximity to SC Highways 17 and 41. Prescribed burning required by the longleaf pine ecosystem, fire-adapted plant communities, and some PETS species, is hampered by smoke management challenges at urban interfaces. Only 36 per cent of Management Area 26, which has a goal to "restore, expand, and maintain the longleaf pine ecosystem and related fire-associated communities" has been prescribed burned in the last 3 years. This management area has a standard (MA26-2) to burn pine stands on a 2-3 year cycle, which is not likely being met. In the last 5 years 48 per cent of the RCW Habitat Management Area (HMA) has been prescribed burned, which is below requirements for a burning cycle of 2-5 years throughout the entire HMA, as recommended in the Record of Decision, *Final Environmental Impact Statement for the Management of the Red-cockaded Woodpecker in the Southern Region,* and by forest-wide standard FW-83. Much of the area surrounding two unique areas containing fire-dependent species on the forest, including the Awendaw savanna and habitat for the federally threatened flatwoods salamander, has received prescribed fire only once since Hurricane Hugo. To supplement the prescribed burning program, the Francis Marion treated 1,200 acres of the mid-story pine canopy by mechanical means. This treatment clears out dense undergrowth and improves habitat for the red-cockaded woodpecker and associated forest species. This work also reduces fuel hazards in areas where the mid-story has become too dense to be controlled using fire alone. More of this work is scheduled in the future.

Table 2-3 summarizes vegetation-monitoring results related to objectives from the Forest Plan.

| Table 2-3. FY 2003 Vegetation Management Results versus Forest Plan Objectives. | | | |
|---|---|---|---|
| | **Objective** | **FY 2003 Results** | **Change FY 2002 to FY 2003** |
| FMNF O-2 | Have 48,000 acres typed and managed as potential hard-mast producing hardwoods in next 10 years | Concentrating on increasing hardwood component in MA27 | Continuing efforts to release hard & soft mast producers during pine thinning operations |
| FMNF O-4 | Increase longleaf pine forest type to 44,700 acres within next 10 years | 49,322 Acres including Loblolly/Longleaf (34,273 acres, just longleaf) | Increase of 587 acres since last report |
| FMNF O-5 | Restore the role of growing season fires on 16,000 acres of longleaf forest type in the next 10 years | 22,500 acres | An increase of 18,012 acres |
| FMNF O-9 | Create conditions on 38,000 to 50,000 acres of pine stands that release overcrowded live crowns, increase residual stand growth potential, allow more sunlight to forest floor, and increase suitable habitat for RCW | 11,232 Acres thinned FY 1996 to FY 2003 (2,328 acres in FY 2003) | 2,228 acres thinning harvest offered in FY 2003. FMNF is preparing for a large increase in the commercial thinning program. Tens of thousands of acres are now coming of size for commercial thinning. |
| FMNF O-11 | Increase mixed pine/hardwood acres to 14,800 in the long term | 37,283 acres forestwide; 4,680 acres in MA27 | An increase of 1,465 acres |
| FMNF O-12 | Maintain 5,000 to 10,000 acres of early successional habitat in short & long term | 1,600* | Unchanged |
| * This includes wildlife openings and rights-of-way only. The forest has not created any additional 0-3 year age class since no regeneration harvesting has taken place. | | | |

**2. Management Indicator Species**

National Forests use Management Indicator Species (MIS) as a tool for identifying specialized habitats, formulating habitat objectives, and developing standards and guidelines to provide for a diversity of wildlife, fish, and plant habitats. MIS are used to address issues related to biological diversity as well as to manage wildlife and fish for commercial, recreational, or aesthetic values or uses (FSM 2621.1). Habitat and population trends are evaluated within the context of Forest Plan requirements, risks to the species and probability of species and habitat persistence. Recommendations by resource specialists are made to shift management emphasis or to amend management or monitoring in cases where the data are either inclusive or suggest that the species or habitat is declining to a point that species persistence cannot be assured. This ongoing analysis offers a larger context for evaluation of biodiversity at the landscape scale, which can be used to strengthen project development, effects analysis and Forest Plan revision efforts.

A Forest Plan amendment resulting in a change in the list of management indicator species (MIS) was completed in April 2003. The MIS list was reduced to 11 species, to increase the efficiency and effectiveness of the monitoring program and of project effects analysis. The revised list is comprised of two demand species, two viability concern species, and ecological indicators associated with early succession, pine forests and woodlands, upland hardwood forests, ephemeral wetlands, and bottomland hardwoods. The MIS document prepared for the Francis Marion and

Sumter National Forests in 2001, available on our web site at http://www.fs.fed.us/r8/fms/management/wl/MIS.pdf, contains population and habitat trend information for MIS included on the revised list, with the exception of yellow-throated vireo and sweet pitcher plant.

Chapter 3 of this report gives the status of action items related to MIS. Here is a summary of select MIS species (by habitat grouping) collected from ongoing surveys.

*Pine Forest and Woodlands*

**Red-cockaded Woodpecker**—The red-cockaded woodpecker population on the Francis Marion has been increasing since 1999, to 346 potential breeding pairs in 2003, based on a 25 per cent population sample. In the last 5 years 48 per cent of the RCW Habitat Management Area (HMA) has been prescribed burned, which is below requirements for a burning cycle of 2-5 years throughout the entire HMA, as recommended in the ROD, *Final Environmental Impact Statement for the Management of the Red-cockaded Woodpecker in the Southern Region*, and by forest-wide standard FW-83.

*Upland Hardwood Habitat*

**Yellow-throated vireo**—Species is common and well distributed. Pine dominated habitats are preferred in mid to late successional forest stages. Uplands are preferred locations with a wide majority of observations recorded in sapling/pole and mature stands. Reported statewide population trend for yellow-throated vireo is increasing however occurrence records on the Francis Marion suggest a decreasing trend. There were 75 observations of yellow-throated vireo at 69 points over a 7-year period. Mixed and hardwood stands combined, accounted for approximately half of the records.

*Ephemeral Wetlands*

**Awed Meadow Beauty**—Thousands of plants are known from several sites along Halfway Creek Road; 3 new sites were located in 2001 near the intersection with Steed Creek Road, though one of these sites was not relocated in 2002.

**Pine Woods Tree Frog**—As part of a participating agreement with the College of Charleston (initiated in 2001), Dr. John Fauth summarized population and habitat trends for the pine woods tree frog on the Francis Marion National Forest (preliminary report dated May 20, 2003). Amphibian data were compiled for 101 cypress/tupelo ponds on the Francis Marion from 1996 to 2001. Pine woods tree frogs (*Hyla femoralis*) were one of the most frequently detected amphibians (72 per cent occurrence). "The per centage of ponds used by pine woods tree frogs decreased from 1996 through 2003, but the decline was not statistically significant and is readily explained by the historic droughts of 1998-2002" (Fauth, 2003). Median numbers of pine woods tree frogs recorded in each pond increased to 200 in 2002-2003 compared to fewer than 25 during the years 1998-2001.

Dr. Fauth also used multiple regression to examine effects of aquatic and terrestrial habitat variables on its abundance, using data from 15 ponds, selected to represent five different burn histories: 0, 1, 3, 5, and >8 years post burn. On average, prescribed burning during the study increased by 60 per cent the minimum number of pine woods tree frogs recorded at each site, from 8.7 to 14 frogs per pond, and breeding activity was concentrated in fish-free, isolated wetlands. Dr. Fauth concluded that the pine woods tree frog remains widespread and abundant in the Francis Marion National Forest (2003).

**Sweet Pitcher Plant**—Sweet Pitcher Plant, *Sarracenia rubra*, was listed as a management indicator species through Forest Plan amendment in April 2003, as an ecological indicator of healthy ecotones between ephemeral wetland pocosins and fire-associated uplands. The species was considered sensitive in 1985, but is no longer considered sensitive (list last updated by the Regional Forester in 2001). On the Francis Marion, 36 occurrences for sweet pitcher plant are known from the forest (data obtained from SC DNR biological conservation database, and supplemented by the personal observations of Danny Carlson, district technician).

Known populations for sweet pitcher plant are increasing on the Francis Marion, but have likely declined in the Wando/Cainhoy area because of a lack of frequent prescribed fire. The following table shows the number of sweet pitcher plant sites documented by decade.

| Table 2-4. Sweet Pitcher Plant Sites Documented on the Francis Marion National Forest, by Decade | |
|---|---|
| **Decade** | **Sites Documented** |
| 1970-1979 | 7 |
| 1980-1989 | 11 |
| 1990-1999 | 14 |
| 2000-2003 | 36 |

**3. Forest and Aquatic Communities**

*Rare Communities*

**Pond Cypress Savannas** —A research project to inventory, classify, and map pond cypress savannas was completed on the Francis Marion National Forest. This information will be used to refine the Carolina Survey database at the University of North Carolina at Chapel Hill, and to increase our knowledge regarding their importance towards Regional biodiversity.

A study was initiated by the Southern Research Station to evaluate soils, hydrology, and fire relationships among a subset of ephemeral wetlands on the forest.

*Marl Communities*

A report on the extent, location, and composition of high calcium communities in the outer coastal plain of South Carolina, completed in 2001, identified several globally rare communities of this type on the forest, including locations at Awendaw savanna, Guilliard Lake, little Wambaw swamp, and Compartment 92 (dominated by nutmeg hickory).

*Longleaf Pine Woodlands*

Of the total 49,322 acres in longleaf pine or mixtures of longleaf with loblolly pine, about 62 per cent has been burned by prescription in the last 5 years, creating good conditions for longleaf woodlands. The Francis Marion has achieved 110 per cent of its 10-year objective for longleaf pine forest types, if loblolly/longleaf mixtures that can be thinned to favor longleaf are included. Thinning to 40-60 sq. ft. basal area, and prescribed burning on at least a 5-year rotation, is necessary to promote high quality longleaf woodlands.

**Stream Fish Communities and Habitat**

In 2003, 15 streams were surveyed. Six of these streams were inventoried in 2002. The other nine were dry due to drought conditions in 2002. These streams were last surveyed in 1993 following Hurricane Hugo. Swampy conditions from above average rainfall made additional streams scheduled to be inventoried in 2003 inaccessible. Redbreast sunfish were not sampled in any of the 15 streams. These streams are scheduled for monitoring in 2004, and additional streams are scheduled to be inventoried in 2004. A habitat inventory process for coastal streams was developed for 2003 surveys but not implemented due to swampy conditions.

*Aquatic Macroinvertebrate Community*

Crayfish were collected in 2003 for identification purposes from the 15 streams surveyed. Crayfish will be collected in additional streams that are inventoried in 2004.

*Anadromous and Catadromous Fish*

American eel were captured in seven survey streams and pit tagged in six of those streams to determine distribution and movement dynamics. These streams will be monitored for American eel in 2004 and additional streams will be inventoried.

*Pond Game Fish*

The Forest Fisheries Biologist and the Center for Aquatic Technology Transfer (SRS) crew monitored largemouth bass and bluegill in 15 ponds on the Francis Marion in coordination with the SCDNR. Water quality was also monitored in these ponds.

**4. Threatened and Endangered Species**

**Determine the progress toward recovery objectives for Threatened and Endangered (T&E) species and conservation objectives for sensitive species.**

The Forest Service relies on the expertise of numerous individuals across the state to assist in the

inventory of proposed, endangered, threatened, and sensitive species. These species are tracked using the biological conservation database (BCD), which is maintained by the South Carolina Department of Natural Resources, Heritage.

A Revised Recovery plan for the RCW was approved in January 2003, and analysis of consistency with the current Forest Plan is ongoing. The red-cockaded woodpecker population increased on the forest to 346 potential breeding pairs in 2003, based on a 25 per cent population sample, resulting in an increasing 5-year trend, and the second largest population since Hurricane Hugo. This number still falls short of the long-term population of 450 potential breeding pairs for RCW on the forest. Overall, the most limiting factor to RCW growth is availability of cavity trees depleted as a result of Hurricane Hugo. In 2003, the forest installed 143 artificial cavities and continues to ensure that at least four cavities are available in each active cluster.

Dr. Jullian Harrison has been monitoring for the flatwoods salamander since 2000. Four breeding ponds that harbor one of the only two known populations in the state are known from the forest. From these four breeding ponds, only 6 flatwoods salamanders have been captured in the last 20 years, including 3 larvae and 3 adults. Factors affecting the flatwoods salamander population could include drought, or lack of prescribed fire.

Several new locations for proposed, endangered, threatened or sensitive (PETS) species or their habitats were discovered as a result of project-level surveys. Populations for a subset of PETS were monitored, including red-cockaded woodpecker, Bachman's sparrow, flatwoods salamander, and bald eagle. Inventories for Rafinesque's big-eared bat and Southeastern myotis were conducted in partnership with Coastal Carolina University. Habitat management for PETS associated with fire-adapted communities was also conducted. Experimental habitat management was conducted on the federally endangered pondberry at Honey Hill in conjunction with the South Carolina Native Plant Society.

The Forest Plan tiers to existing recovery plan for Threatened and Endangered (T&E) species and Forest Service Manual direction for viability for sensitive species. Specific requirements for protection are included in standards and guidelines in the Forest Plan. Table 2-5 summarizes the status of T&E species on the Francis Marion and progress toward recovery.

Bald Eagle

| Table 2-5. Threatened and Endangered Species Status and Progress Toward Recovery | | |
|---|---|---|
| **Species** | **Progress Toward Recovery in 2003** | **Status** |
| American Alligator | Monitoring | Populations stable; some evidence of poaching |
| American Chaffseed | Inventory, monitoring, and habitat management including prescribed fire, mid-story control, and population enhancement. | Seven distinct populations including over 1200 plants; 4 populations exhibiting declines since 1994; numbers of plants generally stable compared to 1994. |
| Bachman's Warbler | Inventory | Last seen on the forest in 1963. |
| Bald Eagle | Inventory, monitor | Increasing in the state. Five nests on the forest w/ 7 chicks fledged in 2003. |
| Canby's Dropwort | Inventory, monitor | One small population known from the forest; stable to decreasing. Population not observed in 2002 (Pat McMillan, personal comment). |
| Flatwoods Salamander | Inventory, monitor, manage habitat | Seven breeding ponds of which only 4 have exhibited activity in the last 20 years; one flatwood salamander larvae detected in 2003; habitat prescribed burned in 2003. |
| Pondberry | Inventory, monitor, manage habitat | 12 populations with two populations exhibiting declines |
| Red-Cockaded Woodpecker | Inventory, monitor, manage habitat | 346 functional breeding groups; increasing since 1999. |
| Shortnose Sturgeon | Inventory | One fish caught and tagged in the Santee River adjacent to National Forest land in 2002. |
| West Indian Manatee | Inventory | 19 documented citings in the Intracoastal waterway near Mt. Pleasant in the last 6 years |
| Wood Stork | Inventory | Birds forage on the forest but are not known to nest here. |

## Sub-Issue 1.2– Forest and Range Health

### Air Quality

**What is the ambient monitoring data telling us about air quality?**

The South Carolina Department of Health and Environmental Control (SCDHEC) has been monitoring ground-level ozone near the Francis Marion. High or chronic exposures to ozone can harm people involved in vigorous outdoor activities or those with respiratory illnesses. It can also cause biomass reduction to vegetation.

High levels of ozone exposures are of concern because they may be reducing the growth and consequently the health of susceptible forest vegetation. It is uncertain how ozone is also affecting vegetation because numerous biotic and non-biotic environmental factors have an impact on the health of vegetation. Work performed for the Southern Appalachian Mountains Initiative (SAMI) presented numbers for ozone exposures that may result in a 10 per cent growth loss to several plant species. Table 2-6 compares results found at monitoring sites within or near the Francis Marion. Growth losses to vegetation are most likely to occur when there is both high seasonal ozone exposures (W126 values) and a frequent occurrence when ozone exposures are greater than or equal to 0.100 parts per million (ppm, also called N100). Taking the two parameters into consideration there is a possibility the extremely sensitive vegetation on the Francis Marion may be having a 10 per

cent growth loss (if other environmental factors were favorable for ozone uptake into the leaves). Furthermore, it is unlikely that ozone is causing 10 per cent or more growth loss for any of the southern pine species.

**Table 2-6. Seasonal Ozone Exposures at 2 Monitoring Sites Near the Francis Marion National Forest**

| County /Year | Site ID | Max. | W126 | N100* |
|---|---|---|---|---|
| Berkeley | | | | |
| 1997 | 450150002 | 0.094 | 18.905 | 0 |
| 1998 | 450150002 | 0.117 | 32.473 | 6 |
| 1999 | 450150002 | 0.107 | 22.833 | 3 |
| 2000 | 450150002 | 0.107 | 20.293 | 3 |
| 2001 | 450150002 | 0.086 | 15.504 | 0 |
| 2002 | 450150002 | 0.100 | 14.822 | 1 |
| 2003 | 450150002 | 0.086 | 11.504 | 0 |
| Charleston | | | | |
| 1997 | 450190046 | 0.116 | 24.592 | 4 |
| 1998 | 450190046 | 0.092 | 18.550 | 0 |
| 1999 | 450190046 | 0.104 | 22.030 | 4 |
| 2000 | 450190046 | 0.107 | 30.127 | 2 |
| 2001 | 450190046 | 0.080 | 11.485 | 0 |
| 2002 | 450190046 | 0.100 | 20.522 | 1 |
| 2003 | 450190046 | 0.088 | 16.496 | 0 |
| | | | | |
| Group | Test Species | | | |
| Extremely sensitive | Black cherry and yellow poplar | | >6.51 | >1 |
| Sensitive | Whorled-wood aster and black cherry | | >7.68 | >10 |
| Moderate | Yellow poplar | | >24.21 | >33 |
| Resistant | Red maple | | >85.35 | >245 |
| *Number of hours greater than or equal to 0.100 parts per million. | | | | |

Particulate matter is the second pollutant of concern on the Francis Marion because it can obscure visibility along highways during periods of high humidity, and the fine particles can impact human health if they penetrate deep into the lungs in sufficient quantity. There are two sizes of particulate matter of concern:

1) 10 microns or smaller in size ($PM_{10}$),
2) fine particulate matter that is 2.5 microns and smaller in size ($PM_{2.5}$).

Both types are monitored by the SCDHEC near the forest using Environmental Protection Agency (EPA) approved methods. Furthermore, particulate matter is also measured by the IMPROVE program at Cape Romain National Wildlife Refuge. In 2003, the maximum 24-hour $PM_{10}$ concentrations range between 32 and 56 micrograms per cubic meter (ug/m$^3$) (Table 2-7). The 1995 through 2002 average reconstructed $PM_{10}$ mass ranged in values between 11.9 to 18.7 ug/m3 at Cape Romain National Wildlife Refuge. The $PM_{10}$ values recorded near the Francis Marion are below levels of concern for human health for both the 24-hour average (150 ug/m$^3$) and annual average (50 ug/m$^3$). Table 2-8 presents the results for the fine particles. Maximum 24-hour fine particle concentrations are below the level of concern for human health (65 ug/m$^3$); however, the annual average fine particle concentrations are close to exceeding levels (15 ug/m$^3$) considered unhealthy for people in the counties of Charleston and Georgetown. The range in the 1995 through 2001 average reconstructed fine particle mass at Cape Romain National Wildlife Refuge was 8.07 to 10.3 ug/m$^3$. No particulate matter was available from the IMPROVE website for the year 2003 when this analysis was performed.

**Table 2-7. Monitoring Results for Particulate Matter 10 Microns ($PM_{10}$) and Smaller in Size for the Year 2003***

| County | Site ID | Maximum 24-hour (ug/m$^3$) | Annual Average (ug/m$^3$) |
|---|---|---|---|
| Charleston | 450190046 | 32 | 15 |
| Charleston | 450190047 | 33 | 19 |
| | | | |
| Georgetown | 450430009 | 48 | 21 |
| Georgetown | 450430010 | 56 | 25 |
| * The National Ambient Air Quality Standard is violated if the annual average is 50 ug/m$^3$ or greater, or the maximum 24-hour average for the 99th per centile during a 3-year period is 150 ug/m$^3$ or greater. | | | |

**Table 2-8. Monitoring Results for Particulate Matter 2.5 Microns ($PM_{10}$) and Smaller***

| | | 2001 | | 2002 | | 2003 | |
|---|---|---|---|---|---|---|---|
| **Location** | **Site ID** | **Maximum 24-hour ($ug/m^3$)** | **Annual Average ($ug/m^3$)** | **Maximum 24-hour ($ug/m^3$)** | **Annual Average ($ug/m^3$)** | **Maximum 24-hour ($ug/m^3$)** | **Annual Average ($ug/m^3$)** |
| | | | | | | | |
| Berkeley County – Monks Corner | 450150005 | -- | -- | 27 | 10.2 | 22 | 10.1 |
| | | | | | | | |
| Charleston County | 450190048 | 28 | 12.1 | 27 | 11.3 | 25 | 12.2 |
| Charleston County | 450190049 | 27 | 11.5 | 44 | 11.0 | 28 | 10.7 |
| | | | | | | | |
| Georgetown County | 450430009 | 27 | 12.3 | 28 | 12.5 | 29 | 12.2 |

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

**What is visibility like near the Francis Marion?**

The closest visibility-monitoring site is at Cape Romain National Wildlife Refuge. A uniform haze is the primary type of visibility impairment observed in the coastal area of South Carolina, and the average distance a person can see (based upon 1996 through 2002 fine particle data) is between 52.2 and 65.3 km. The haze is not as noticeable in the coastal areas as in the mountain and upper piedmont areas since there are not large/tall dark objects (i.e., mountains) in the distant view. In 2002, the average visibility estimated for Cape Romain varies by season with an average wintertime visibility of 64.6 km and summer being lower at 63.7 km. However, visibility on the worst days can be 34.4 km. The IMPROVE program routinely determines what types of compounds are found in the fine particles. As is found throughout the eastern United States, sulfates comprise most of the fine particle mass (on average is 67.8 per cent in 2003) at Cape Romain and consequently the Francis Marion. Most of the sulfates impairing visibility originated as sulfur dioxide emissions from coal-fired power plants and were transformed to fine particles of sulfate on warm sunny days.

**What are the levels of pollutant emissions from Forest Service activities?**

Prescribed fires are probably the most significant management activity emitting air pollution. Research results indicate there are approximately 22 pounds for fine particulate matter ($PM_{2.5}$) emitted for each ton of vegetation consumed. Typically, the prescribed fires on the Francis Marion consume 2.5 tons of fuel for each acre treated. Favorable weather conditions for fuel treatment and smoke dispersal allowed more acres to receive prescribed fire treatment in FY 2003 than in the previous 5 years (Table 9). The increase in prescribed fire emissions did not appear to significantly alter fine particle concentrations measured in Berkeley, Charleston, or Georgetown counties (Table 2-8).

**Table 2-9. Emissions of Fine Particulates (tons per year)**

| FY98 | FY99 | FY00 | FY01 | FY02 | FY03 |
|---|---|---|---|---|---|
| 943 | 806 | 827 | 972 | 639 | 1,142 |

No data have been compiled to estimate the amount of pollutant emission from other Forest Service activities on the Francis Marion National Forest. Emission estimates should also be estimated for the following Forest Service activities: heavy-duty equipment use and two-cycle engines.

**How has pollutant emissions changed near the forest?**

Our nation has had significant reductions in air pollution emissions through the Clean Air Act since the 1970s. The 2002 Forest Monitoring reported the 1990 and 2010 emission estimates given in the Southern Appalachian Mountain Initiatives (SAMI) database. Another emissions inventory for the year 1999 has been prepared by the southeastern Regional Haze organization called Visibility Improvement State and Tribal Association of the Southeast (VISTAS). Also, another future year inventory for the year 2010 was prepared by the Environmental Protection Agency to understand how emissions reductions at coal-fired power plants would change with the Bush Administration's Clear Skies proposal. In December 2003 the EPA proposed the Interstate Air Quality Rule that has similar reductions as the Clear Skies proposal. In 1999, the VISTAS emissions inventory listed 4-point sources of pollution that emitted 5,000 tons per year or more of nitrogen oxides and/or sulfur dioxide and are within 120 miles of the Francis Marion. Recent and future emission estimates for Berkeley and Charleston County (Table 2-10), as well as all other counties within 120 miles (Table 2-11) were also examined for the Francis Marion. Within the two counties the emissions of all five types of primary pollutants are expected to decrease by 2010 with implementation of the Interstate Air Quality Rule. The volatile organic compound listed in Tables 2-10 and 2-11 are from people's activities and do not include the larger component from vegetation (especially trees). Also, there are large uncertainties with the fine particle estimates. The emission estimates in Tables 2-10 do not adequately reflect the total emissions from forestry prescribed fires (and agricultural fires) in Berkeley and Charleston county (71 tons in the year 1999), when the results are compared to Table 2-9. Currently, VISTAS and the EPA are working to adequately estimate fine particulate matter emissions from prescribed fires and wildfires.

Emissions of air pollution from counties within 120 miles are likely to have an impact on the air quality of the Francis Marion. Table 2-11 shows the future emission estimates of all five types or primary pollutants are likely to decrease by the year 2010 with the implementation of the Interstate Air Quality Rule. Therefore, fine particle concentrations measured in the atmosphere are likely to decrease as well as visibility is likely to improve by 2010 since sulfur dioxide emissions will decrease; while ozone exposures will also be less with decreasing nitrogen oxide emissions.

Currently, all portions of the Francis Marion National Forest meet National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. Table 2-12 shows the fourth highest 8-hour average for the monitoring season (current NAAQS). Assuming the results are representative of certain portions of the forest then there may be periods of time when people visiting the forest are exposed to unhealthy amounts of ozone, especially if they are involved in vigorous exercise. However, the Environmental Protection Agency is the responsible agency to designate any area as non-attainment for ozone, and the April – October ozone data

**Table 2-10. Emission estimates (tons per year) for Berkeley and Charleston County, which includes the Francis Marion National Forest using the VISTAS estimates for 1999 and Blue Skies with control for 2010.**

| Estimates (Year) | Volatile Organic Compounds | Nitrogen Oxides | Sulfur Dioxide | Particulate Matter ($PM_{10}$) | Fine Particles ($PM_{2.5}$) |
|---|---|---|---|---|---|
| 1999 | 39,604 | 62,154 | 79,144 | 19,662 | 7,658 |
| 2010 | 33,819 | 30,874 | 62,684 | 14,011 | 6,325 |

**Table 2-11. Emission estimates (tons per year) for the counties within 120 miles of the Francis Marion National Forest using the VISTAS estimates for 1999 and Blue Skies with control for 2010.**

| Estimates (Year) | Volatile Organic Compounds | Nitrogen Oxides | Sulfur Dioxide | Particulate Matter ($PM_{10}$) | Fine Particles ($PM_{2.5}$) |
|---|---|---|---|---|---|
| 1999 | 459,263 | 475,701 | 388,101 | 371,383 | 126,237 |
| 2010 | 366,774 | 330,553 | 353,953 | 208,826 | 101,132 |

for the years 2001 – 2003 were used to determine if an area was attaining the ozone standard. An area is designated as non-attainment for ozone if a monitoring site had a 3-year average of the fourth highest 8-hour average of 0.085 ppm or greater. The EPA (on April 15, 2004) classified all counties occupying a portion of the forest as attainment

A NAAQS also exists for fine particulates and the results in Table 2-8 suggest no portion of the forest will be designated as non-attainment for fine particles. The EPA is expected to announce the areas designated as non-attainment for particulate matter in December 2004.

If any portions of the forest are ever designated as non-attainment for one or more criteria pollutants then this will invoke the General Conformity Rules. The General Conformity Rule states that permission must be received from the air pollution control agency before a project can be approved, unless the total emissions from the proposal are considered insignificant.

**Table 2-12. Summary of Ozone Monitoring Data in Relation to Proposed National Ambient Air Quality Standard ***

| Monitor County | Year | Fourth highest 8-hour average | 3 Year Average |
|---|---|---|---|
| Berkeley | 1997 | 0.073 | |
| | 1998 | 0.083 | |
| | 1999 | 0.083 | 0.080 |
| | 2000 | 0.080 | 0.082 |
| | 2001 | 0.071 | 0.078 |
| | 2002 | 0.074 | 0.075 |
| | 2003 | 0.070 | 0.072 |
| | | | |
| Charleston | 1997 | 0.082 | |
| | 1998 | 0.072 | |
| | 1999 | 0.080 | 0.078 |
| | 2000 | 0.076 | 0.076 |
| | 2001 | 0.068 | 0.075 |
| | 2002 | 0.075 | 0.073 |
| | 2003 | 0.074 | 0.072 |

* The proposed ozone standard would be violated at a site if the 3-year average of the fourth highest 8-hour average ozone concentration is 0.085 ppm or higher.

**How many applications for new sources of air pollution were reviewed in 2003?**

The Forest Service is required under the Clean Air Act Amendments of 1977 to advise the appropriate state or local air pollution control agency if any Class I areas under its management will be adversely impacted by a new source of pollution. The means by which this work is accomplished is by reviewing and commenting on Prevention of Significant Deterioration applications. There are no Class I areas managed by the Forest Service within or near the Francis Marion National Forest, so no PSD applications were reviewed in FY 2003.

**Forest Pests**

**Determine if insects, disease, and noxious weeds have increased to damaging levels.**

Southern pine beetle populations returned to low levels during 2003.

The spread of noxious and invasive exotic plants is becoming an increasing threat to native biodiversity and forest health. Invasive species are defined as alien species whose introduction does or is likely to harm human health or have adverse economic or ecological impacts. Forests in the Southern Region began implementing a regional noxious and invasive weed strategy in June 1999. The Regional Forester identified a list of invasive species in the Southern Region in May 2001. Species of particular concern on the Francis Marion National Forest include common reed (Phragmites australis), tallow tree (*Tradica sebifera*), Chinese privet (*Ligustrum sinense*), autumn olive (*Elaeagnus umbellata*), Chinese wisteria (*Wisteria sinensis*), cogongrass (*Imperata cylindrical*), tall fescue (*Lolium arundinaceum*), Japanese honeysuckle (*Lonicera japonica*) and Tropical soda apple (*Solanum viarum*). The inventory of invasive exotic plant populations on the Francis Marion is ongoing.

**Sub-Issue 1.3 Watershed Condition**

**Determine if soil and water resources are being conserved and ensure there is no permanent impairment of site productivity.**

The Francis Marion closed some problem sections of roads and trails in FY 2003 and relocated others. However, 2003 was a wet year and Off-Highway Vehicle (OHV) and horse uses on trails indicate that

they generally cannot hold up to the high moisture levels. Continuing illegal OHV misuses of the existing trail system occur when users do not stick to the trail as they try to avoid severely rutted sections, and end up developing new problems and concerns with illegal off-trail uses.

All timber harvest and thinning areas reviewed were consistent with South Carolina Best Management practices (BMP), Forest Plan Standards and Guidelines, and National and Regional Soil Quality Standards. However, interaction with SC Forestry Commission to obtain BMP checks has not been used to any extent. We hope to expand this external monitoring of our activities in the future. A Regional field assistance trip looked at mechanical mid-story control treatment stands to help evaluate impacts on soil productivity and wetlands. Some potential existed for soil compaction, rutting and puddling when operating within wet sites and wetlands. Generally wet sites and wetland areas are avoided, but 2003 made it more difficult due the higher than normal rainfall. Rutting and puddling impacts are easier to see. Compaction cannot be readily seen and activities need to review soil series and moisture levels to help determine if compaction problems are likely. In many instances, the depth of organic materials was sufficient to protect soils from compaction and other impacts from the heavy equipment.

Prescribed burning activities were consistent with the need to protect the soil organic component. Fire rarely exposes the soil surface since sufficient organic accumulations exist. Some concerns with constructed firelines exist as they may entrench and alter surface hydrologic patterns to some degree. Care is taken that firelines do not unnecessarily alter the surface hydrology or drain wetlands. Mitigation measures are used when needed to reshape these firelines following use. Landscape burning helps to limit the amount of firelines. Due to the extent of some of these areas, fire is sometimes hot and consumes much of the litter, duff and humus layers on small portions of the treatment areas (generally less than 5 per cent of the area). Mitigation measures beyond reshaping entrenched firelines are seldom needed in the relatively flat terrain.

Activities are under way at the Francis Marion Seed Orchard and other areas to produce native plants for erosion control for both the Francis Marion and Sumter National Forests. The native plant work is done cooperatively with the SCDNR, USDA Natural Resource Conservation Service (NRCS), South Carolina Native Plant Society, Clemson University, Tall Timbers Research Station, and others. The Francis Marion seed orchard has provided substantial nursery and operation support to this statewide program. We use Plateau or other herbicides, prescribed burning and other treatments to prevent invasive or other weeds from getting into the native seed production fields.

In the past, extensive monitoring by the SC Forestry Commission within the state of SC indicates forestry practices on the Francis Marion have fully implemented BMP on the areas sampled. However, monitoring of some recreational activities, such as OHV/ATV uses and horse trails, has been minimal and needs to be increased.

**Determine if the desired water quality and quantity objectives are being achieved.**

Water quality objectives relative to forest management are being achieved by implementing Best Management Practices and minimum management measures (coastal zone). They are designed, implemented and adjusted over time to address water quality, wetland, floodplain, riparian, stream and watershed conditions. Avoidance and minimization are often used to limit or prevent effects. Mitigation measures are designed and applied to reduce the magnitude and duration of effects. Most state agencies see the Forest Service as a lead example agency in how to manage activities and protect water quality. Where possible, the Forest Service cooperates with other state and federal water quality programs. Most watersheds in the coastal plain, however, contain some localized activities or areas needing repair of some soil and water concerns. We are actively working toward improving them.

Closing, decommissioning and restoring some roads have improved long-term water quality and quantity.

Communications with the re-licencing activities of Santee Cooper for Lake Moultrie stress the need to evaluate water quantity and quality changes in the Santee River including the effects downstream on the Francis Marion National Forest. We are hopeful that the re-license evaluation will determine ways to minimize or mitigate effects of the dams and diversions on the hydrology, water quality, and beneficial uses of the Santee River, streambanks and associated bottomlands.

**Ensure compliance with State water quality requirements and monitor the effects and adequacy of Best Management Practices (BMP).**

State BMP are implemented as part of project planning and contractual requirements. Monitoring effects and adequacy of BMP continue to rely heavily on internal field inspections and observations. Although not completely implemented in FY 2003, the agreement with the South Carolina Forestry Commission to conduct compliance checks will help us obtain an outside look at our implementation and effectiveness. Spot checks of BMP implementation are made and functional assistance trips used to address activities and issues.

**Determine the effects of management actions on soil quality and site productivity.**

Activities that impact or potentially impair site productivity and soil conditions were identified or evaluated in the Forest Plan or in environmental analysis. The Forest Service's Southern Regional Office provided guidance that suggested how much soil erosion could occur while maintaining productivity. The relatively flat terrain in coastal areas limits the potential for erosion. The sandy soils tend to be erosive, but with the limited gradient, erosion is generally low except where water is concentrated or flows in waterways. Ways to avoid and mitigate erosion and productivity effects are evaluated before decisions are made.

Efforts to establish and improve site conditions with native grasses are actively under way. Improvements expected include increased herbaceous and grass ground cover and increased root density and organic matter in the surface soils. The prescribed fire program has helped establish an increasing per centage of native grasses and other plants in the forest understory. Eight cooperators, led by the Forest Service, are involved in collecting, testing, growing, and establishing native plants for erosion control and soil improvement on the National Forest. Although many of the results are to address erosion problems on the Sumter National Forest, the attention to establishing and restoring native plants is assisting these efforts within the coastal community. These efforts have also increased partnerships and interactions with others also interested in native plant restoration. One cooperative effort is an effort by the Southern Research Station, Francis Marion National Forest, and the local community to address the decline of sweet grass *(Muhlenbergia capillaries var. filipes)* along coastal areas. Sweet grass is important habitat and a source of raw material used by the local African American community for basket weaving and other crafts.

We are working with the Southern Research Station to determine the long-term effects of fire on the landscape evidenced by the changes being documented on the historic prescribed burn plots begun by Dr. Bill McKee and others on the Santee Experimental Forest. We are looking at the effects of fire frequency and intensity over time.

**Determine the effects of management actions on riparian values, soil and water quality and stream bank stability.**

Management actions are analyzed under the National Environmental Policy Act (NEPA) and other requirements and directives. Areas of analysis include the potential effects of activities on riparian, soil, water, and stream resources. In most cases, implementing existing Forest Plan Standards and Guidelines and BMP will limit effects to the critical resource areas. We are continuing to evaluate road and trail maintenance, timber harvest, thinning, road building, wildlife openings, firelines and landscape burning activities.

Effects identified with specific practices or actions have become the focus of pointed assessment due to the potential for resource impacts. Measures are being implemented to improve conditions. In 1998, the Forest Service identified some roads, off-highway vehicle (OHV) trails and firelines were problem areas. Since then, the Francis Marion has aggressively inventoried and treated many problem areas using a combination of funding avenues to improve conditions. Some of the work involves partnerships and interagency cooperation. Training sessions for staff and cooperators were completed in a joint effort. Aggressive, quality law enforcement has helped highlight problems. Improved frequency and design of maintenance measures and training have decreased environmental damage. However, 2003 was a very wet year, and effects from OHV trail use on wet trails have added problems associated with illegal off-trail uses as well as impacts to the function of existing trails.

The off trail uses are special problems as they have not been fully assessed for impacts to T&E species, soil, water, cultural and other resources.

In 2003, a Regional Office field assistance trip included review of prescribed burning activities and their potential effects on a wide variety of soil types. We found a few, very small areas that were impacted by burning. Firelines present issues because of the relatively flat terrain and abundance of wet soils and wetlands. When installed on terrain with good drainage, firelines can blade the surface and be easily stabilized after use. When installed on areas with poor drainage, firelines are often rutted and tend to hold and retain water for extended periods of time each year. Smoothing firelines to the original surface can be difficult to accomplish. Without care, firelines can alter hydrological patterns to make areas wetter or dryer, depending on the circumstances. Even with these challenges, the forest is doing a good job avoiding impacts by using a landscape prescribed fire approach which minimizes ground disturbance in constructing firelines by using containing bladed firelines to uplands when possible, and using unbladed wetlands, streams and roads where possible. Increasing difficulty because of the higher density of homes and businesses within the urban interface creates added problems in locating and constructing firelines.

There is a need to continue to pay close attention to activities that have the potential to impact wetlands. In FY 2003 we continued to assess impacts relative to Steed Creek road widening, mechanical understory, debris removal, salvage and thinning over large areas. Site-specific evaluations from the forest soil scientist or hydrologist are provided when needed, but most of these activities are only extensively sampled due to the size of the activity treatments each year. Other agencies such as the Corps of Engineers and Natural Resources Conservation Service have also responded when asked to assist with wetland delineations. Concerned public such as the SC Native Plant Society and others have also added attention to specific problem areas that have improved our knowledge of the situation and follow-up to address effects.

As indicated, the activities of Santee Cooper for Lake Moultrie have impacted riparian values, soil and water quality and stream bank stability along the Santee River within the Francis Marion National Forest. We are hopeful that the re-license evaluation will help determine ways to minimize or mitigate effects.

**Determine if temporary roads are being re-vegetated within 10 years of contract or permit termination.**

Temporary roads are closed and re-vegetated within 10 years of contract or permit termination on the National Forest.

## Issue 2 Sustainable Multiple Forest and Range Benefits

### Sub Issue 2.1 Outdoor Recreational Opportunities

**Determine if the desired recreational uses, opportunities, and aesthetic values are being achieved.**

Recreation management activities in FY 2003 helped move the Francis Marion toward the desired conditions set forth in the Forest Plan. The following is a list of examples.

In an effort to address a primary concern of National Forest visitors, improved signing continued to be an emphasis at developed recreation sites and trails across the Forest. Additionally, Forest Service presence was increased and services enhanced during high use periods (weekends and holidays) by rearranging staff work schedules and augmenting with some Fee Demo funds. Increased services included more frequent cleaning, public contacts, and information dissemination.

The Sewee Visitor and Environmental Education Center continued outreach and information to 45,000 visitors and environmental education to 4000 local students through continued partnerships with the US Fish and Wildlife Service, the SEWEE Association, and other dedicated cooperators and volunteers. A butterfly interpretive garden was added to the site as well as a sweet grass demonstration area. The Visitor Center hosted activities for National Trails Day, National Fishing Day, Careers Come Naturally, and Wood Magic Forest Fair.

Visitor information was enhanced through a partnership between the Francis Marion National Forest and Sewee to Santee Community Development Corporation through the production of a brochure highlighting eco-tourism, rural services, the Francis Marion and the Sewee Visitor & Environmental Education Center.

The addition of new tent sites increased public capacity by a third at the popular Buck Hall Recreation Area on South Carolina's Intracoastal Waterway. This

project was a combination of Fee Demo and Regional Capital Improvement dollars and had been in the works since FY 2002.

The Francis Marion continued to emphasize resource sensitive trail maintenance to provide high customer satisfaction. For example, on the popular Wambaw Cycle Trail, annual maintenance activities were funded by motorized trail fees and appropriated dollars, and the Family Riders Trail Club contributed 210 volunteer hours.

Two members of the Family Riders Trail Club also completed the forest-sponsored SWECO trail tractor training (funded through a Recreational Trail Fund grant) and put their newly honed skills back into the trail. The increased use of the SWECO has improved customer satisfaction on the Wambaw Cycle Trail and helped to mitigate some of the resource concerns typically associated with these kinds of facilities. However, increased maintenance alone was not sufficient to meet the goals of high customer satisfaction and resource sensitivity: increased education and law enforcement were needed. With the abnormally wet year, wet weather closures were also warranted. This multi-pronged approach helped protect the trail investment, mitigate resource impacts, and provide high quality and safe opportunities for riders.

Planning and design for a major reconstruction of the Wambaw Cycle Trail and trail head began in FY 2003. Like trail maintenance, the dual purpose of this project is to mitigate resource impacts from the high use motorized activity, and at the same time provide outstanding customer satisfaction. To this end, a $100,000 RTP grant (leveraged with Fee Demo and Regional Capital Improvement funds) was awarded. Planned implementation is expected in middle to late FY 2004.

**Additional observations:**

- Scenery management reviews indicate that Forest Plan visual quality objectives are being met.

- Requests continue for more and better trail maps, information and signing.

**What is the current use of recreational facilities and trails?**

The Francis Marion and Sumter National Forests participated in the National Visitor Use Monitoring (NVUM) project from October 2001 through September 2002. This project estimated visitor use for all activities including recreation facilities and trails. Sampling strategy does not allow us to separate the two forests use. Visitor use on both forests for fiscal year 2002 was 1.1 million national forest visits. There were 1.5 million site visits (visits to one recreation site) and an average of 1.3 site visits per National Forest visit. There were approximately 52,864 wilderness site visits on both the Francis Marion and Sumter National Forests.

Of the non-wilderness visitors, about 79 per cent were male and 21 per cent were female. More than 80 per cent of our visitors were between 21 and 60 years old. Most visitors, more than 90 percent, were white, about 5 per cent were black and about 3 per cent were Asian. There were no international visitors. Visitors stay an average of 8.1 hours. Just under 11 per cent stayed overnight on the forests. The top activities were hunting, fishing, relaxing, other non-motorized activities, and viewing natural features. The top facilities or areas that were used were non-motorized trails (includes hiking, biking, horseback trails), other forest roads, picnic areas, boat launches, and designated wilderness.

Of the wilderness visitors, about 84 per cent were male and 16 per cent were female. More than 72 per cent of users were between the ages of 21 and 60. Most visitors to wilderness are white, more than 99 per cent. Visitors stay an average of 9.6 hours.

In addition to the NVUM data, visitor use information is derived from additional sources including fees collected at fee sites, empirical observation by staff, Sewee Visitor Center reporting, and the occasional use of traffic counters. Highest developed recreation use on the Francis Marion occurs at the Sewee Visitor Center, and Buck Hall Recreation Areas, while highest used trails include Wambaw Cycle Trail, Swamp Fox National Recreation Trail (part of the Palmetto Trail), and the Tuxbury Horse Trail in that order.

**Sub-Issue 2.2 Infrastructure**

**Ensure that any roads constructed are designed according to standards appropriate to the planned uses.**

Roads were constructed and reconstructed to carry the traffic volumes safely and efficiently. Using the Forest Service road construction, maintenance, and

reconstruction standards, current Best Management Practices, and technical assistance from other resource experts, road designs emphasized mitigating negative impacts to resources with the focus on watershed health. Emphasis was placed on road reconstruction, maintenance, and decommissioning. Road projects for timber activities were mainly resurfacing and culvert replacement. No new miles of road construction were completed in FY 2003 (Table 2-12).

In FY 2003, the Francis Marion continued the road condition survey program to determine the condition of the road system and the amount of deferred road maintenance. The updated survey identified $11,143,377 of maintenance needed on the 556.9 miles of road on the Francis Marion National Forest. The completion of all road condition surveys is now scheduled for the end of FY 2006 and will give a complete picture of the road maintenance backlog.

Road mileage will continue to be adjusted as a result of the road condition survey effort, land acquisition and road decommissioning. The resent and planned land acquisitions will slightly increase the mileage in future years as the existing roads acquired are added to the forest system.

**Table 2-12. Status of Roads on the Francis Marion National Forest in FY 2003**

| FY 03 Road Status | Miles |
|---|---|
| Roads Constructed | 0.0 |
| Roads Reconstructed | 0.2 |
| Timber Roads | 25.0 |
| Roads Decommissioned | 6.0 |
| Total Open Roads | 430.5 |
| Total Closed Roads | 126.4 |

**Sub Issue 2.3 Human Influences**

An additional 4,000 acres were acquired on the Francis Marion National Forest during this fiscal year.

**Sub Issue 2.4 Roadless Areas/Wilderness/Wild & Scenic River**

**Roadless Areas**

The Francis Marion National Forest has two inventoried roadless areas managed to retain their roadless character.

**Wilderness Areas**

The Francis Marion National Forest has four wilderness areas, mostly found in low-lying coastal areas. Of these, Wambaw Creek Wilderness, which has a canoe trail running through it, is the most visited. Forest Plan standards and guides for wilderness are being followed and management activities are maintaining wilderness values in all the Francis Marion wildernesses.

**Wild and Scenic Rivers**

There are no rivers eligible for wild and scenic status on the Francis Marion.

**Are probable activities, costs, and outputs occurring as estimated in the Forest Plan?**

Specific items have been tracked and summarized in Table 2-13. The Forest Plan established a range of acceptable results of within 20 per cent of estimated projections.

Despite considerable progress in achieving desired conditions, the Francis Marion is still short of achieving some of the probable activities anticipated in the Forest Plan (e.g., horse camp and additional horse trail miles, new campground, canoe access points, and new OHV trail miles. See Table 2-13. The Developed Recreation Site Assessment is in progress to determine which facilities best line up with forest niche, markets, and expected budgets.

**Table 2-13. Comparison of Probable Activities and Outputs**

| Activity | Unit of Measure | FY 2003 | 10 Year Plan Estimate |
|---|---|---|---|
| **Construct** | | | |
| Boat Ramps | # of Sites | 0 | 2 |
| Horse Camps | # of Sites | 0 | 1 |
| Campgrounds | # of Sites | 0 | 1 |
| Canoe Access | # of Sites | 0 | 5 |
| OHV Trails | Miles | 0 | 20 |
| Bicycle Trails | Miles | 0 | 10 |
| Canoe Trails | Miles | 0 | 10 |
| Hiking Trails | Miles | 0 | 10 |
| Horse Trails | Miles | 0 | 20 |
| **Recreation Capacity** | | | |
| Boat Ramps | PAOT* | 500 | 500 |
| Horse Camps | PAOT | 0 | 50 |
| Campgrounds | PAOT | 125 | 400 |
| Canoe Access | PAOT | 0 | 130 |
| Other | PAOT | 1,410 | 1,165 |
| **Trail Miles** | | | |
| OHV | Miles | 40 | 60 |
| Bicycle | Miles | 63 | 10 |
| Canoe | Miles | 35.8 | 22.5 |
| Hiking | Miles | 57.3 | 30 |
| Horse | Miles | 33 | 38 |
| Total | Miles | 166.1 | 160.5 |
| *people-at-one-time | | | |

**Sub-Issue 2.5 Timber**

**Determine if timber resource sale schedule is within the Forest Plan's Allowable Sale Quantity (ASQ).**

Timber harvest has been well under that allowed in the Forest Plan. In FY 2003, 2.3 million cubic feet (MMCF) were offered for sale. The allowable sale quantity is 33 MMCF/year during the 10-year period.

**Determine if silvicultural practices are in compliance with the Forest Plan.**

The main silvicultural practices used in FY 2003 were commercial thinning harvest, release of seedlings and saplings using prescribed fire, and pre-commercial thinning. These silvicultural practices comply with the Forest Plan.

**Determine if harvested lands are adequately restocked within 5 years.**

No regeneration harvest has been done since Hurricane Hugo in 1989.

**Determine if maximum harvest unit size limits are being met and should be continued.**

Size limits apply only to regeneration harvest units, none of which occurred on the Francis Marion in FY 2003.

**Ensure that no timber harvesting occurs on lands classified as not suited for timber production, except for salvage sales or sales necessary to protect other multiple-use values where the Forest Plan establishes that such actions are appropriate.**

Records revealed no timber harvest on lands classified as unsuitable for timber production.

**Determine if lands identified as not suitable for timber production have become suitable.**

No lands identified as unsuitable for timber production are known to have become suitable.

**Sub-Issue 2.6 Forage**

**Determine if the desired forage production objectives are being achieved.**

There are no grazing areas on the Francis Marion.

**Sub-Issue 2.7 Other Products**

**Identify other products typically requested and status in relation to Forest Plan expectations.**

The Forest Plan does not have expectations regarding other forest products. No pine straw was sold.

**Sub-Issue 2.8 Heritage Resources**

**Ensure the protection of significant cultural resources from degradation and destruction.**

The forest manages heritage resources in accordance with federal legislation and the various standards and guidelines contained in federal regulations and the Forest Service Manual.

Heritage resources are vulnerable, nonrenewable resources and our goal is to preserve, protect, and interpret them for the public. To this end, the forest conducts a heritage resource inventories to identify

heritage resources before undertaking any activities that might affect these resources. A preliminary evaluation of these resources is conducted to determine if they are eligible for listing in the *National Register of Historic Places.* However, because of limited funds, we are unable to conduct complete evaluations, and many of the sites are placed in the unevaluated category until a more thorough review can be made. Both eligible and unevaluated archaeological sites, buildings, and structures are protected in place during projects or activities that might adversely affect them.

Under a Memorandum of Understanding (MOU), direction is provided on how the forest will comply with Sections 106 and 110 of the National Historic Preservation Act. Parties to this agreement included the Forest Service, the Advisory Council on Historic Preservation, and the South Carolina State Historic Preservation Office.

The fiscal year program of work included cultural resource inventory in support of 59 projects and land management activities. This inventory included 3,496 acres and 13 miles of national forest lands and resulted in recording 115 new archeological sites, 29 of which were determined to be possibly eligible but unevaluated for listing in the *National Register of Historic Places.*

The Forest Service monitors archaeological sites and historic buildings to determine 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 Table 2-14.

| Table 2-14. Archaeological Sites and Historical Buildings | |
|---|---|
| Total number of sites monitored | 6 |
| Sites monitored within project area | 0 |
| Sites effected by project | 0 |
| Sites vandalized | 0 |
| Sites eroding by water | 2 |
| Sites damaged by forest users | 2 |
| Sites undisturbed | 2 |

Through monitoring natural threats to archaeological sites were identified. The most serious damage occurred on two sites that are being eroded by maintenance and use of Atlantic Intracoastal Waterway. In addition to natural threats two sites were damaged by unauthorized activities such as the use of off road vehicles other than on designated trail.

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 dig for artifacts on historic sites is a growing concern.

Heritage resources include buildings and structures as well as archaeological sites. There are four historic buildings and two fire lookout towers that need repair, restoration, or documentation.

**Forest response to sites at risk**

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 activities that damage historic properties. Forest Service projects may be redesigned to avoid impacts to heritage resources. Partnerships are developed with local interest groups to assist in meeting obligations to protect heritage resources.

The forest needs to monitor and determine the effects of unauthorized activities and uses on archaeological sites including use of off road vehicles, horse trails, and woods roads. The forest is systemically surveying all wildlife openings and firelines to determine impacts on heritage sites.

**Public participation**

The forest promotes heritage values including a sense of public stewardship and greater understanding of the nature and benefits of heritage resources through public education, outreach, and interpretation. In addition to the hands-on participation heritage staff made presentations to community groups, conducted on site interpretive programs, participated in the South Carolina Archaeology Week, and sponsored guest speakers at the Sewee Visitors Center.

**Partnerships**

The Forest Service works cooperatively with the South Carolina Institute of Archaeology and Anthropology (SCIAA) and the South Carolina State Historic Preservation Office (SHPO) to document and record heritage resources. The Forest Service has an agreement with the Office of the State Archaeologist to store and maintain all artifact collections made on National Forest lands.

**Summary of research findings and needs**

The Forest Service is working to refine and test the predictive models used for understanding and predicting archaeological site locations. Ongoing inventory of the forest will help to refine the current site location model. The Forest Service is using site inventory data to develop a more complete picture of prehistoric and historic settlement within the Francis Marion National Forest.

The revision of the *Francis Marion National Forest Cultural Resources Overview* is still in progress.

The forest needs to continue monitoring and determine the effects of unauthorized activities and uses on archaeological sites. The evaluation of the effects of management activities such as tilling wildlife fields and constructing firelines should also be continued.

In past years the forest has had a very successful research program through challenge cost share in cooperation with a number of universities and state agencies. However, given the decreasing heritage resources funding, partnership opportunities have decreased significantly. The forest should seek other funding opportunities to increase this important program.

## Issue 3. Organizational Effectiveness

### Sub-Issue 3.1 - Economics

**1. Economics**

There is a need to document cost associated with carrying out the planned management prescriptions, as compared with the costs estimated in the Forest Plan. Evaluate radical deviations between planned and budged costs.

The budget allocation and expenditure tracking on the Francis Marion and Sumter National Forests do not allow the expenditures to be tracked separately for each Forest, so they must be considered together.

**Table 2-15. Actual and Inflated Expenditures[1] for the Francis Marion and Sumter National Forests from 1997 to 2003 (adjusted for inflation)**

| Year | Actual Expenditures | Inflation Factor | 2003 Value |
|---|---|---|---|
| 1997 | $11,879,379 | 1.15 | $13,661,286 |
| 1998 | $12,065,070 | 1.13 | $13,633,529 |
| 1999 | $12,411,344 | 1.10 | $13,652,478 |
| 2000 | $12,365,747 | 1.07 | $13,231,349 |
| 2001 | $11,720,065 | 1.04 | $12,188,868 |
| 2002 | $11,399,929 | 1.02 | $11,627,928 |
| 2003 | $11,451,882 | 1.00 | $11,451,882 |

[1]Expenditures do not include any dollars allocated for grants or for specific programs (such as recreation fee demo, rural development, or Senior Community Service Employment Program).

### Sub-Issue 3.2 – Evaluating New Information

**Identify emerging issues, concerns and opportunities that need to be addressed**

The timber program over the next several years will emphasize commercial thinning with some regeneration harvest to keep the ecosystem healthy. This is in response to the large acreage in young pine stands. Pre-commercial thinning will also occur in select areas.

Prescribed burning required by the longleaf pine ecosystem, fire-adapted plant communities, and some PETS species, is hampered by smoke management challenges associated with prescribed burning at urban interfaces.

Efforts are under way to develop a strategy to implement the Healthy Forests Restoration Act passed by Congress on January 7, 2003.

- Determine how to convert thousands of acres of loblolly pine stands to longleaf pine.
- Develop a strategy for managing hardwoods.
- Control invasive plants.

Address OHV and equestrian management issues both existing and future.

Central Electric Power Cooperative has proposed constructing a 16-mile power line with about one mile crossing the forest. The Rural Utility Service is the lead agency on the environmental analysis with the Forest Service acting as a cooperating agency.

**Determine when changes in RPA, policies, or other direction would have significant effects on Forest Plan.**

None known at this time.

**Determine if conditions or demands in the area covered by the Forest Plan have changed significantly.**

There have been no significant changes to resources during this time period based on yearly monitoring results.

**Evaluate the effects of National Forest management on land, resources, and communities adjacent to or near the National Forest; and the effects upon National Forest Management of activities on nearby lands managed by other Federal, State, or local government agencies.**

The Secure Rural Schools and Community Self-determination Act of 2000 (PL 106-393) provided counties with the option of continuing to receive payments under the 25 per cent fund or electing to receive their share of the average of the three highest 25 per cent payments during the period of 1986 through 1999, called the full payment option. Twenty-five per cent payments were based on timber receipts.

In recent years, the number of timber sales on National Forest land has declined, reducing the amount of revenues received by the Forest Service and raising concerns by local communities regarding the effect this may have on their businesses and communities.

In 2000, Congress passed legislation to make up for the reduction in timber sales. The Secure Rural Schools and Community Self-Determination Act gave local communities a choice. Both Charleston and Berkeley counties chose to receive the full payment option as shown inTable 2-16.

**Table 2-16. Returns to Counties**

| County | FY 2003 Full Payment |
|---|---|
| Berkeley | $678,605.68 |
| Charleston | $218,038.36 |

*Butterfly Weed*

# Chapter 3. FY 2004 and FY 2005 Action Plan and Status

**Actions Not Requiring Forest Plan Amendment or Revision**

**a) Action**: Identify opportunities to maintain and restore pine and pond cypress savanna communities through project planning.

**Responsibility**: District staff and forest botanist or biologist

**Date**: Ongoing

**Status**: 1,200-Acre Restoration Project initiated in 2004

**b) Action:** Improve baseline data on existing acreage in maritime communities occurring on the National Forest. Try to obtain maritime communities during land acquisitions.

**Responsibility**: District staff and forest botanist or biologist

**Date**: Ongoing

**Status**: Work will be completed in 2004.

**c) Action:** Ensure land bird monitoring points in National Forest ownership adequately cover maritime communities.

**Responsibility**: District staff

**Date**: FY 2004

**Status**: No points were added in 2003.

**d) Action** Add yellow-throated vireo and sweet pitcher plant to the MIS document prepared for the Francis Marion and Sumter National Forests in 2001.

**Responsibility**: Supervisor's Office staff

**Date**: FY 2004

**Status**: These two species were added to the Forest MIS list in May 2003 through a Forest Plan Amendment.

**e) Action**: Plan an integrated resource review for the Francis Marion National Forest in FY 2004

**Responsibility**: District and Supervisor's Office

**Date**: Summer of 2004

**f) Action**: Inventory and then develop a monitoring program for aquatic macroinvertebrate communities across the Francis Marion National Forest, including aquatic insects, crayfish and mollusk.

**Responsibility**: Districts and Supervisor's Office

**Date**: FY 2004 and FY 2005

**Status**: Crayfish have been collected for identification purposes from a limited number of streams on the Francis Marion National Forest.

**g) Action:** Compile and analyze bird point or harvest data for MIS species including Northern Bobwhite, Eastern Wild Turkey, Painted bunting, and American swallow-tailed kite, Prairie Warbler, Northern Parula.

**Responsibility**: Supervisor's Office staff

**Date**: FY 2004 and FY 2005

**Status**: In the process of compiling and analyzing this information.

**Actions That Require Forest Plan Amendment or Revision**

**a) Action:** Prepare a forest plan amendment to simplify the process for determining how to allocate lands acquired through exchange or purchase into management areas.

**Responsibility**: SO planning and resource staffs

**Date:** FY 2004/2005

**b) Action:** Prepare a Forest Plan amendment, as necessary, to modify the boundary of MA-26 or eliminate standard MA-26-2 regarding the frequency of prescribed burning, which is constrained at urban interfaces within this management area.

**Responsibility**: SO planning and resource staffs

**Date**: FY 2005

**c) Action:** Prepare a Forest Plan amendment, as necessary, to modify FW-83 or Appendix a regarding items which are inconsistent with the new Recovery Plan for RCW.

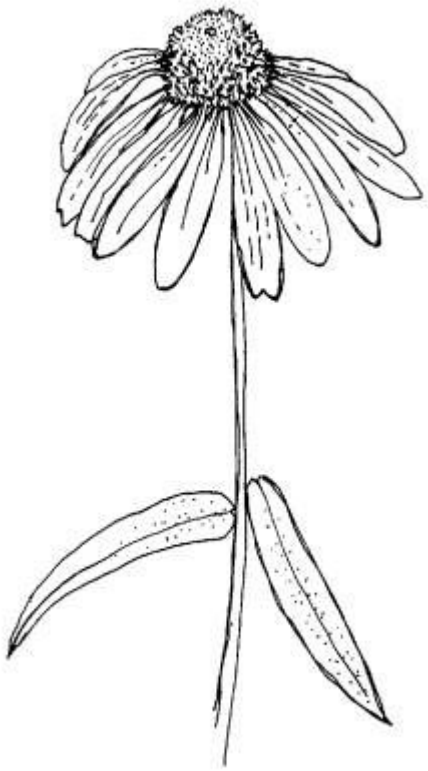
**Responsibility**: SO planning and resource staffs

**Date**: FY 2004/FY 2005

**d) Action:** Prepare a Forest Plan amendment, as necessary, to modify FW-84 regarding the ground-application of herbicide within 60 feet of any threatened, endangered, proposed, or sensitive plant.

**Responsibility**: SO planning and resource staffs

**Date**: FY 2005



*Coneflower*

# Appendixes

## A. List of Preparers

| The following individuals contributed to this report: | |
|---|---|
| Jim Bates | Forest Archaeologist |
| John Cleeves | Forest Planner |
| Robbin Cooper | Landscape Architect |
| Bill Hansen | Hydrologist |
| Ed Hedgecock | Forest Engineer |
| Bill Jackson | Air Specialist |
| Charlie Kerr | Fire/Aviation Management Officer |
| Dennis Law | Soil Scientist |
| Robert Morgan | Archaeologist |
| Gary Peters | Wildlife Program Manager |
| Jay Purnell | Forest Silviculturist |
| Jeanne Riley | Fisheries Program Manager |
| Joe Robles | Recreation Specialist |
| Robin Roecker | Ecologist/Botanist |
| Eric Schmeckpeper | Geographic Information System Specialist |
| Oscar Stewart | Resource Staff Officer |
| Gail White | Public Affairs Specialist |
| Tony White | Planning, Engineering, Recreation, and Heritage Resources Staff Officer |

## B. Amendments to Forest Plan

**Amendment 1, October 2002**

This amendment provides direction for the preparation of site-specific Biological Evaluations (BE) including inventory requirements for Proposed, Endangered, Threatened, and Sensitive (PETS) species. The amendment makes the process of conducting BE more efficient and consistent throughout the Southern Region of the Forest Service.

**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 of project effects analysis.

## C. Summary of Research Needs

The following research needs have been identified for aquatic species.

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

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

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

- What ecological factors are affecting the health of the federally-endangered pondberry at Honey Hill? How can this population best be managed?

- What ecological factors are affecting the health of the federally threatened flatwoods salamander on the forest? How can this population best be managed?

# Francis Marion National Forest
# Fiscal Year 2003
# Monitoring and Evaluation Report

## Comment Form

If you have any comments on this report, please fill out this form and mail it to

USDA Forest Service
4931 Broad River Road
Columbia, South Carolina 29212

Please include your name and address at the bottom of this form.

I have the following comments on the fiscal year 2003 Monitoring and Evaluation Report:

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Name: _____
Address: _____
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