2008

Five-Year Review and Recommendations

Revised Land and Resource Management Plan

Francis Marion National Forest

October 2008

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I. Introduction

On December 18 1995, the *Revised Land and Resource Management Plan* for the Francis Marion National Forest (forest plan) was signed. The forest plan was put into effect following the destruction caused by Hurricane Hugo which came ashore near Bull Island, South Carolina, on September 21 1989. Estimated maximum sustained wind at landfall was 138 miles per hour. The center of the eye passed within five miles of the forest. Vast areas of the forest were blown down or damaged (pictured above) with a storm surge of up to 20 feet.

As stated in 36 CFR 219.10(g) [1982 Planning Regulations], the forest supervisor shall review the conditions on the land covered by the plan at least every five years to determine whether conditions or demands of the public have changed significantly. The time period covered by this document is 2003-2007.

II. Area of Analysis

The Francis Marion National Forest is located within Berkeley and Charleston counties and near Dorchester County in southeastern South Carolina and contains 258,942 acres. The land the forest occupies is a triangle formed by the Santee River to the north, the Intracoastal Waterway to the east and Lake Moultrie and the Cooper River to the west.

The forest comprises about 12 percent of the public lands in the state. Major highways into the forest include US highways 17, 17A, 52 and state highways 41 and 45.

The forest is within a 30-minute drive of the Charleston metropolitan area. The population of Charleston, Berkeley and Dorchester counties was estimated to be 603,178 in 2006. This ranks Charleston-North Charleston as the second largest metropolitan statistical area in the state behind the capital of Columbia. Nearly 80 percent of the Charleston metro population lives inside the city and its surrounding urbanized area (2000 pop.: 423,410).

According to US Census data (2000), Berkeley and Charleston counties are approximately 1,097.72 and 918.51 square miles, respectively. Persons per square mile in Berkeley and Charleston counties are 129.9 and 337.3, respectively. As a comparison, the state has 133.2 persons per square mile.

III. Management Review of Comprehensive Evaluation

A. Summary of Findings

1. Area of Analysis

The 258,942 –acre Francis Marion National Forest is located within Berkeley and Charleston counties and close to Dorchester County in southeastern South Carolina. It occupies a triangle formed by the Santee River to the north, the Intracoastal Waterway to the east and Lake Moultrie and the Cooper River to the west. The district office is located in McClellanville, South Carolina and the Forest Supervisor's Office is located in Columbia, South Carolina.

The forest is within a 30-minute drive of the Charleston metropolitan area. The population of Charleston, Berkeley and Dorchester counties was estimated to be 603,178 in 2006. Nearly 80 percent of the Charleston metro population lives inside the city and its surrounding urbanized area (2000 pop.: 423,410).

The *Revised Land and Resource Management Plan* for the forest (forest plan), signed by the regional forester on December 18, 1995, went into effect following the destruction caused by Hurricane Hugo in 1989. Vast areas of the forest were blown down; the maximum sustained wind at landfall was 138 miles per hour with up to a 20-foot storm surge.

2. Roles and Contributions

The forest topography is relatively flat to low sloping terrain, with localized surface depressions of Carolina bays, connected and isolated wetlands, floodplains and stream channels. Extensive loblolly and longleaf pine stands are found on drier sites; hardwoods are found on moister sites usually along streams and adjacent floodplains. The climate of the area is humid and subtropical.

Nine incorporated towns that have experienced substantial population growth lie within or next to the forest. Social and economic forces are altering the pattern of living in the small communities because many people are commuting to work in and around Charleston. Communities on the periphery of the forest are experiencing an influx of new residents from the Charleston area who are part of an urban culture. Consequently, a more urban population is now using the forest.

3. Ecological

The forest is within the Atlantic coastal plain and flatwoods physiographic areas and lies entirely within the range of the historic longleaf pine ecosystem. It is home to the third largest population of the federally endangered Red-cockaded Woodpecker (RCW). Fire-maintained longleaf pine savanna and woodland communities and ecosystems are not only of primary importance to RCW (USFWS, 2003), but also are known to support more than 120 plant species and 56 animal species from regional lists of proposed, endangered, threatened and sensitive species (RCW Management ROD, 1995; USFWS, 2003).

Management Areas

The forest plan grouped ecological areas into Management Areas defined as MA 2, MA 8, MA 26, MA 27, MA 28, and MA 29. In addition, MA 1 represents the seed orchard and progeny test areas and MA 4 is the Santee Experimental Forest and the Guilliard Lake Research Natural Area.

MA 2 areas are designated wildernesses on the forest. The goal in these areas is to preserve large hardwood swamp ecosystems. Swamps, water tupelo and bald cypress trees are common, and the areas are periodically flooded. Slight variations in elevation and soil conditions, when combined with varying moisture levels, add to the vegetation diversity and complexity in these areas. This management area seems to be staying in the desired condition described by the forest plan.

MA 8 areas contain unique geologic, botanical, historical and scenic qualities. Unique botanical areas are scattered across the forest; the more prominent ones are Honey Hill Limesink, I'on Swamp and Tibwin Plantation.

A further refinement and recognition of special areas has occurred during the planning period. A report on the extent, location and composition of high calcium communities in the outer coastal plain of South Carolina was completed in 2001. It 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). The forest acquired the International Paper (IP) Wando tract in 2004, and an ecological characterization of this tract identified a significant acreage of inland maritime forest. Approximately 2,223 acres of maritime communities have been mapped.

The Francis Marion National Forest contains numerous small isolated forested wetland depressions dominated by pond cypress (*Taxodium ascendens*), swamp gum (*Nyssa biflora*), pond pine (*Pinus serotina*), Virginia chain fern (*Woodwardia virginica*) and often a variety of herbaceous and graminoid species including pitcher plants (*Sarracenia*). These areas are embedded in other management areas and are usually very small. Some of them can contain open water habitat for at least a portion of the year. Fifty pond cypress wetland depressions were surveyed on the forest, of those, only nine had an area in excess of 2.5 acres.

MA 26 is defined as having the greatest potential for restoration of longleaf pine ecosystems. This area has mostly been defined by soil types; however, it is also intertwined with swamps and bays. The forest stands database identified 49,351 acres of longleaf pine and mixed loblolly pine/longleaf pine forest types. Of this acreage, 39,854 acres occur in MA 26. This ecosystem is becoming aligned with a "core burning area"[1]. The forest plan objective is to have 44,700 acres in the longleaf pine forest type within ten years and 53,500 acres in the long-term. Therefore, the forest has met the short-term objective for longleaf pine forest types.

The most critical factor in maintaining both longleaf pine and fire dependent communities is the presence of relatively frequent fire (two-four year cycle). Wildland-urban interface (WUI) areas and smoke management concerns have limited periodic prescribed burning in certain areas of the forest. These areas generally follow the US Highway 17 and 41 corridors and a substantial area in the northern part of the forest north and south of US Highway 17A around Macedonia. Regular use of prescribed fire has led to the development of vastly different, highly desirable understory conditions in all MAs. In contrast, lack of periodic prescribed burning in some areas has increased hazardous fuel loadings in the understory. This has adversely impacted a number of fire-dependent species and ecosystems, including habitat for threatened, endangered and sensitive species.

MA 27 contains loamy ridges, flats, rivers, creek bottoms and transitional areas with good potential for developing mixed pine/hardwood stands, high quality mast and timber producing hardwoods. These transition areas often have moist soils for the better part of most years. In addition, the forest had a pressing need to thin post-Hugo pine stands to improve RCW habitat and to reduce susceptibility to insects and disease, particularly southern pine beetle. For these reasons, timber management has avoided these areas.

MA 28 contains flatwoods and loamy ridges where loblolly pine is dominant on the upland sites and hardwoods are intermixed. A variety of age classes of pine are found throughout the area. This management area was designed to provide more flexibility in resource management which has left forest managers with considerable uncertainty regarding what conditions are desired in the management area. As the largest management area of uplands outside MA 26, MA 28 seems more defined as those upland areas where prescribed fire is unlikely to be applied with regular frequency.

MA 29 contains swamps and swampy flats and represents late successional stages. It provides connectivity to existing wilderness areas and contains the two roadless areas, Hellhole Bay and the Little Wambaw Swamp extension areas. The potential for developing old-growth characteristics has the greatest potential in this area. More than 25 percent of this management area is typed as pine stands. Timber management activities are suitable on about 75 percent of the area, and thinning provides some timber management opportunities appropriate for the designation.

[1] The "core burn area" represents about 50 percent of the Francis Marion National Forest where prescribed burning takes place on a more regular basis.

Early Successional Habitat/Age Class Distribution

Young forest stands less than five years old provide an important type of early successional habitat different from stands that are just periodically prescribe burned. The “Fiscal Year 2006 Monitoring and Evaluation Annual Report” listed 76 acres in the zero-three age class and 821 acres of wildlife openings. Such areas are important not only for wildlife habitat, but also for a flow of habitat through time. Forests that are heavy to older age classes are more subject to the effects of catastrophic events such as hurricanes, southern pine beetle outbreaks or age associated declines. This issue is most important not only in MA 26 and 28, but also to a lesser degree in MA 27 and 29.

The variety of age classes desired has not been achieved in this or any other management area. Impacts from Hurricane Hugo have made thinning the highest priority for timber management activities in this area. The first regeneration harvest is planned in the Honey Hill area of the forest in 2009.

Old Growth

The forest plan contains desired conditions and standards related to old growth. RCW clusters and recruitment stands, wilderness areas, roadless areas, special areas (MA 8) and suitable forested lands with age classes greater than 100 years old provide opportunities for potential old growth management.

Even-aged management of pine types for the RCW requires establishment of minimum rotation lengths ranging from 70 to 120 years depending on the species of pine being managed (RCW Management ROD, p.2). In addition, a prescribed fire frequency ranging from two to four years is very compatible with old growth conditions, particularly for the upland longleaf old growth community type. Potential old growth areas are present on the forest since no regeneration harvest has occurred during the planning period.

Non-Native Invasive Species (NNIS)

Region 8 began implementing a noxious and invasive weed strategy in June, 1999 following the signing of Executive Order 13112. The regional forester identified a list of NNIS in 2001 that should be treated. A decision was signed in 2001 on the forest that allowed using herbicide and mechanical methods to treat up to 3,000 acres. Site-specific vegetation management project planning has included identification of NNIS during plant surveys. The forest is actively finding, mapping and treating NNIS.

Management Indicator Species

A non-significant forest plan amendment in 2003 changed the number of management indicator species (MIS) on the forest to 11 (one amphibian, two plants and eight birds).

Plants

All known records for awned meadow beauty and sweet pitcher plant occur in MA 26 where the goal is to restore, expand and maintain the longleaf pine ecosystem

using frequent prescribed fires. Awned meadow beauty is stable, occurring primarily in Carolina bays, depression meadows, cypress ponds and limesinks. Sweet pitcher plant is a carnivorous plant inhabiting pocossin ecotones and savannas, particularly within areas of continuous seepage containing Sphagnum sp. (peatland pocossin and canebrakes; wet longleaf; streamhead seepages). Several populations are contained within unique natural areas (MA 8).

Habitat maintenance for species associated with ephemeral wetlands includes protecting pond hydrology by emphasizing management operations during drier periods to avoid rutting soils. Ephemeral wetlands are beginning to be mapped on the forest.

Wildlife

Pinewoods tree frog populations are stable except during drought conditions when populations decline. The species is an indicator of ephemeral ponds including cypress tupelo ponds, savannas and pocossin.

Populations of prairie warblers have increased in the South Atlantic Coastal Plain while mean observations on the forest show sharp declines. The species is an indicator of early successional habitat; there has been no regeneration harvest since Hurricane Hugo.

Painted buntings are a good indicator of edge habitats in maritime forests. Some maritime forest has been purchased, and a recent vegetation project has emphasized restoration of habitat where possible. However, federal acquisition of maritime forest is spotty, and the recent land purchase had extensive hydrologic modification in the past to grow loblolly pine trees. Not enough information has been collected on the forest to establish trends in painted bunting populations, but it has been steadily declining in South Carolina. Opportunities to develop early successional habitat combined with periodic prescribed burning are needed.

For the past 35 years, Northern Bobwhite quail has been on a steady decline range-wide. During that time, the preponderance of small fields has dwindled, farming practices on remaining farmlands have changed and other factors have hastened the decline. In South Carolina alone, Northern Bobwhite populations are currently 1/5 of their 1966 population. Management activities that have been implemented on the forest to enhance habitat for the species include planting wildlife openings with native seed, disking selected roads to encourage development of native vegetation cover production, mowing some woods roads and skid trails, and planting portions of roads to native seed. In addition, project planning is underway on the forest's five bobwhite quail focus areas to enhance the growth of native grasses, legumes and forbs to increase the quality of nesting and brood-rearing habitat.

The yellow-throated vireo is most often associated with forests that contain a healthy component of deciduous trees. These habitats on the forest are most often associated with bottomlands, riparian areas and upland oaks. Forestwide populations of this species appear to be relatively stable. The land area in oak dominated stands, bottomland and riparian forest types has remained static and is

getting older. Biomass and pulpwood thinnings typically favor retaining desirable hard mast in harvest units.

Eastern wild turkey, an important game bird in South Carolina, does well in a variety of habitats that include forestland. After Hugo, wild turkey populations rapidly declined and remained low for several years. Only recently, primarily in response to a sustained prescribed burning program and an aggressive thinning strategy, turkey numbers have been showing a steady increase. The forest provides a variety of habitat conditions for the species, and Berkeley County continues to be one of the most productive turkey hunting counties in the state.

The northern parula is a bird of a variety of structural forest conditions in riparian areas and bottomland forests. Although Hurricane Hugo severely damaged these habitats, they continued to exhibit characteristics that are suitable for this species. Consequently, forest-wide populations of this species appear to be relatively stable.

American swallow-tailed kites are birds of high canopy pines in the swamps and wet bottomland forests of the coastal plain. The forest provides the current northernmost nesting range and harbors the largest kite concentration in South Carolina. Populations along the coastal plain appear to be on an upward trend throughout the Atlantic flyway.

Aquatic Communities

Stream monitoring indicates a diverse stream fish community across the forest with the number of individuals and species varying by season and rainfall conditions. However, multi-year sampling indicates the fish community is stable.

Fifteen recreational fishing ponds totaling 44 acres exist on the forest. They are managed primarily for largemouth bass and bream; population balance is monitored periodically. Catfish are stocked in three ponds. Grass carp were stocked in ponds in 2007 for aquatic plant control. Water quality is monitored on an annual basis to determine the need for lime or fertilizer applications.

Information regarding crayfish and mussels were collected in conjunction with the fish community monitoring in 2003, but no population trend information is available.

<u>Proposed, Endangered, Threatened and Sensitive (PETS)</u>

The RCW population is expanding in areas but contracting in others due to lack of prescribed fire in the WUI and lack of foraging and nesting habitat in the wake of Hugo. The Forest Plan originally identified a 160,000 acre habitat management area for the RCW. This area is dominated by mixed pine/hardwood, longleaf pine, loblolly pine, and pond pine. This area is suitable for management within which standards and guidelines included in Appendix A of the RCW Management ROD (1995) would be followed. Current prescribed burn levels are below those needed to optimally meet the desired conditions for red-cockaded woodpecker and the fire-dependent longleaf pine ecosystem.

The RCW population experienced modest declines in 2004 from 363 active clusters to 351 in 2005. There were again 363 active clusters and 331 breeding groups in 2007. Populations at 350 potential breeding groups are considered recovered by the RCW Recovery Plan (2003). Approximately 62 vacant clusters exist on the forest, excluding recruitment sites. Inactive clusters tend to be concentrated in the WUI and areas where vegetation in the midstory have become extremely dense. Adequate foraging habitat continues to be a recurring problem.

American chaffseed has declined on the forest since 2003, and the species is very dependent on frequent prescribed burns (every two-three years). Sites within the WUI have not been prescribed burned at the frequency needed to maintain or expand the population.

Two new pondberry sites have been discovered on the forest since 2003. The pondberry populations at Honey Hill, once the largest on the forest, are slowing recovering in response to hand control of vegetation completed by the Forest Service and the South Carolina Native Plant Society. A larger scale project has been proposed to thin and prescribed burn adjacent uplands at the Honey Hill site beginning in 2009.

One Canby's dropwort population occurs in a pond cypress savanna near US Highway 17 in McClellanville in an area that is difficult to prescribed burn. The population was comprised of ten plants in 1999 and one plant in 2006. No additional populations have been located on the forest despite searches conducted by Forest Service personnel, partners and contractors.

No flatwoods salamanders have been detected on the forest since 2003. Monitoring of previously occupied flatwoods salamander ponds was conducted prior to 2006. A comprehensive survey plan and contract were awarded in 2006; however, exceptionally dry conditions for the past five years have prevented surveys from taking place.

American alligator (*Alligator mississippiensis*), bald eagle (*Haliaeetus leucocephalus*, recently delisted), Bachman's sparrow (*Aimophila aestivalis*), West Indian Manatee (*Trichechus manatus*) and wood stork (*Mycteria americana*) are all stable on the forest. Migrant loggerhead shrike (*Lanius ludovicianus migrans*) is not known to occur here though potential habitat is stable. The status of Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southeastern myotis (*Myotis austroriparius*), shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrhinchus*) are unknown since these species are difficult to monitor.

Soil and Water

Soil impacts associated with past land uses include severe rutting, removal of nutrients (e.g., regular harvest of pine needles through illegal pine straw raking) and natural infertility.

Modifications to hydrologic functioning have occurred locally from roads, drainage ditches, historic railroad trams, historic plantation rice fields and severe soil rutting from past logging activities. Impacts to water are associated with excessive levels of fecal coliform, methylation of mercury due to sulphate reduction in wetlands, seasonally low

oxygen with high stream temperatures and elevated salinity impacts that may be affecting vegetation and wilderness areas.

Biomass and first thinnings, wildfire suppression and prescribed burning operations have been monitored using procedures developed for assessing implementation of forest plan standards and guidelines for protection of water quality. Reviews were primarily conducted by the soil and water staff, district timber staff or sale administrators. South Carolina Best Management Practices for Forestry (BMP) checks were conducted by the South Carolina Forestry Commission in cooperation with the Forest Service and included both planned and unplanned visits. Overall, district personnel did an excellent job of implementing forest plan standards and guidelines, and soil and water resources were being protected.

Riparian Habitats

The forest contains extensive riparian areas and wetlands that are contained with the palustrine, lacustrine, riverine and estruarian systems. Palustrine wetlands are inland, non-tidal areas that lack flowing water. Lacustrine areas are connected to lakes and riverine wetlands are connected to rivers and streams. Estruarian wetlands have tidal influence to varying degrees that result in elevated salinity, water quality and habitat changes. Isolated ephemeral wetlands like Carolina bays, limestone sinks and pocosins have no flow outlets, accumulate organics or peat. Isolated ephemeral wetlands are critical habitat for some PETS species, including the flatwoods salamander and pondberry. Delineation of specific wetland types are needed to help in determining management and protection needs.

Few management activities such as timber harvesting occur within wet soil areas except during dry periods when the soils can support the equipment and rutting and other impacts can be limited. In most instances, persistent wetlands and streams are buffered from activity and avoided.

Forested wetlands and riparian areas typically contain bottomland hardwood species and/or other species that are adapted to saturated or flooded conditions, such as cypress, tupelo, cottonwood, willow, green ash, overcup oak, water hickory, sugarberry, sycamore, cherrybark oak, swamp chestnut oak, pond pine and other species. The hydrologic sources of moisture for these areas vary, but may include rainfall, streamflow, flooding, tides, lakes, ponds and groundwater sources. Impermeable or restricted soils types may sometimes lead to perched water tables.

Wetlands include both jurisdictional areas as defined and regulated by the Army Corps of Engineers (Corps) and non-jurisdictional wetland areas that meet some or all of the Corps' criteria (i.e., soils, plants and hydrology) and are isolated. In some instances, wetlands within the coastal zone may be also regulated by the state coastal zone agencies.

Impacts to ephemeral ponds and wetlands from illegal off-trail use in the vicinity of the Wambaw Cycle Trail have been reduced with improved management of the site. The construction of 6,000 feet of barrier fencing was completed in 2007 and 2008. Impacts to the trail have also been reduced with seasonal and wet period closures further

protecting adjacent wetland areas. User fees, grants from the South Carolina Department of Parks, Recreation, and Tourism, and South Carolina Department of Transportation are helping to offset the high maintenance costs.

Insects and Disease

Fusiform rust is generally at low levels, and southern pine beetle populations have generally been low through most of the plan period. The dense conditions of tens of thousands of acres of young pine stands as a result of Hurricane Hugo make them very susceptible to southern pine beetle attack.

Integrated pest management is evident with emphasis on both biomass and first thinnings to reduce susceptibility to southern pine beetle and on managing mixed species stands and hardwoods on wetter sites.

One disease not mentioned in the forest plan is laurel wilt, a new disease of redbay (*Persea borbonia*) and other plant species in the family Lauraceae. It is causing widespread mortality in the coastal regions of South Carolina, Georgia, and Florida. The disease has also been discovered in individual plants of the federally endangered pondberry (*Lindera melissifolia*), the threatened pondspice (*Litsea aestivalis*), sassafras (*Sassafras albidum*) and avocado (*Persea americana*). This disease could possibly eliminate redbay from the forest as well as throughout the rest of its range.

Wildland Fire

The resources at hand (equipment, personnel and leadership) to control wildfire at this time are less than the “most efficient level” indicated by the National Fire Management Analysis System outputs. From 1998-2002, 623 fires burned a total of 11,796 acres as compared to 2003-2007 when 172 fires burned 5,367 acres.

Prescribed Fire/Fuels

Prescribed fire treatment targets varied by year from 31,598 to 44,280 acres; accomplishments were between 79-108 percent of the targets. These targets included treatments for hazard fuels reduction, wildlife and PETS habitat improvement and timber stand improvement. Because of favorable weather conditions, 22,580 acres were burned during the growing season (April-September).

From 2003 - 2007, 176,117 acres were treated with prescribed fire, which is 94 percent of the total target of 187,822 acres. The growing season target is 16,000 acres annually. Growing season prescribed burning averaged 13,243 acres per year with a range between 9,184 to 22,580 acres. The growing season burning in the longleaf type forests continues to improve as more acres are conditioned to receive treatment.

Many variables influence the forest’s ability to meet the current prescribed fire goals. The fluctuation in year-to-year accomplishments is mainly attributed to weather constraints along with smoke management restrictions. The expanding WUI also limits burning opportunities, as well as budget constraints that limit the availability of personnel and equipment.

The desired condition for the Francis Marion is to maintain fire-adapted ecosystems using a fire return interval of once every three years. The total area that would benefit from fire is approximately 160,000 acres. The current levels of treating 30,000-40,000 acres per year falls short of the 53,000 acres needed**.** Fire is critical to restoring and maintaining RCW habitat and fire-dependent communities; thus, strategies to increase the number of acres burned annually are needed. Rising operational costs coupled with flat budgets will put even more stress on an organization that is already extremely efficient.

Prescribed burning in the last five years within the RCW Habitat Management Area[2] (HMA) remained constant at about 50 percent. This trend needs to continue since the forest is still below requirements for a prescribed burning cycle of two-five years. The forest has burned approximately 30 percent of MA-26 in the last three years. This reflects minor short term changes based on fuels and weather conditions. The intent is to remain on a two-three year cycle in MA-26 with 50 percent of the area being burned over a three year period.

Air Quality

Recently, the ozone National Ambient Air Quality Standard (NAAQS) was lowered to 0.075 parts per million. The data from two ambient ozone monitors (Charleston and Berkeley Counties) show the ozone NAAQS has not been exceeded; therefore, negative impacts to the health of vegetation sensitive to ground-level ozone are unlikely to be occurring. Furthermore, the trend in ozone concentrations at the Berkeley County monitoring site appears to be decreasing, while ozone concentrations at the Charleston County site have increased to just below the NAAQS.

The primary air pollutants (besides ground-level ozone) of concern that are deposited from the atmosphere are mercury, sulfur and nitrogen compounds.

Mercury deposition monitoring data have been collected at Cape Romain National Wildlife Refuge (NWR) which is adjacent to the forest. Mercury deposition is decreasing although not enough data has been collected to indicate a trend. The yearly average mercury deposition was between 155 and 189 (sample range was zero to 1,061) nanograms per cubic meter.

The estimated total sulfur deposition was above a level considered acceptable and below a deposition value considered unacceptable. The average total sulfur deposition estimates indicate more resource information needs to be collected before determining if resources are being adversely affected. However, the South Carolina Department of Health and Environmental Control (SC DHEC) fish consumption advisories indicates sulfur deposition has been sufficient to maintain bacteria populations that produce methylmercury which accumulate in some fish species.

[2] HMA are no longer used in the Revised RCW Recovery Plan.

Excessive nitrogen deposition from the atmosphere can contribute to eutrophication of lakes, streams and estuaries. Most of the nitrogen deposition originates from ammonia fertilization to agricultural fields, ammonia released from raising livestock and/or the conversion of atmospheric nitrogen gas into nitrogen oxides during combustion at high temperatures (such as in vehicles and coal-fired boilers). Eutrophication of an aquatic system can result in excessive plant growth and decay, an increase in the abundance of certain “weedy” species and severe reductions in water quality. The average nitrogen deposition has decreased between 2001 and 2005, and the total nitrogen deposition from the atmosphere was above a level considered acceptable for all years and below a deposition value that is considered unacceptable for four out of five years.

Between 2003 and 2007, prescribed fires were used to treat between 30,930 and 40,694 acres; the associated fine particulate matter (PM2.5) emissions were between 1,089 and 1,432 tons annually. At these emissions levels both the ambient 24-hour average and annual average have not exceeded the PM2.5 NAAQS at two urban monitoring sites near the forest. Furthermore, there does not appear to be a relationship between emissions of particulate matter from prescribed fires and the amount of fine particulates measured at the urban monitoring sites.

The Cape Romain NWR is a federally mandated Class I area, and it is a national goal to attain natural background visibility by the year 2064. The federal Regional Haze Rule has determined that monitoring results need to have a calculated visibility haze index (called “Deciview”, or dv) of 12.21 dv by the year 2064 so that visibility on the best days will not degrade. On days classified as having the best visibility, the haze index average (2000 – 2004) was 14.29 dv; days classified as having the worst visibility had a value of 26.48 dv.

Fine particles (PM2.5) are the primary contributor to visibility impairment and organic carbon compounds are secondary. An analysis conducted by the Visibility Improvement – State and Tribal Association of the Southeast (VISTAS) noted that wildland fires are a significant contributor to the organic carbon mass on a few days during the 2000-2004 monitoring period.

The VISTAS has conducted additional studies at Cape Romain NWR to understand which sources of air pollution may be contributing to the organic carbon fine particles. Preliminary results indicate that during fall and winter, the emissions from vegetation burning are a significant contributor to organic carbons. Using the VISTAS analysis, the SC DHEC concluded in their Regional Haze State Implementation Plan that: 1) large uncertainties exist in the prescribed fire emissions estimates (due to lack of field observations of fuel loading); and 2) despite the uncertainties in prescribed fire emission estimates, it appears that prescribed fire is not a significant contributor to visibility impairment at Cape Romain NWR. Therefore, at this time, the prescribed fire emissions from the forest are not inhibiting the Cape Romain NWR from making reasonable progress in improving visibility.

4. Social and Economic

Dispersed Recreation

The forest has a large variety of dispersed recreation including hunting, fishing, primitive camping, hiking and biking. The Wambaw Cycle Trail provides opportunities on a motorized trail; the forest also provides opportunities for horseback riding. Wildlife viewing and photography are also popular. The forest continues to try to accommodate increased demand for dispersed recreation activities a trend that has not changed since the forest plan was signed.

Trails

Several types of trails on the forest include equestrian (31 miles), off highway vehicle (OHV) (39 miles), hiking/mountain bike (64 miles) and water (26 miles). The forest has reached its objective of 160 miles of trails. The Awendaw Passage (42 miles) of the Palmetto Trail was developed for mountain biking and hiking on an interstate trail system that traverses the state from the ocean to the mountains. In addition, the forest's Wambaw Cycle Trail is the largest public OHV facility in South Carolina; elsewhere, the forest is closed to motorized riding. As OHV use has increased over the last five years, the forest continued efforts to improve facilities and to prevent and reduce resource impacts.

Equestrian use on the forest occurs primarily on the Tuxbury and Jericho Horse Trails. A Price Waterhouse Coopers' study indicates that equestrian use occurs mostly in the spring and fall. Based on the 2002 National Visitor Use Monitoring (NVUM) report, all visitors were less satisfied with the cleanliness of the restrooms, the availability of information on recreation, and the interpretive displays, signs and exhibits. The forest has addressed some of these concerns by improving signage at trailheads. Recreation trend information should be available in the future following the completion of the 2008 NVUM surveys.

Hunting and Fishing

Regional demands for big and small game hunting remain constant; however, demands have increased on the forest as alternate areas on private lands continue to decline. This trend has not changed since the plan period began. Buckhall Recreation Area is a popular launch site for shrimping.

Wilderness and Roadless Areas

The four wilderness areas on the forest remain unchanged. Human-caused fire is allowed in portions of the wilderness to help perpetuate more natural conditions. Monitoring of non-native invasive species and water quality in these areas is ongoing.

Visitor use is low due to wet, swampy conditions and the absence of land trails. Overnight use is virtually non-existent. Some boating occurs primarily on Wambaw Creek in the Wambaw Creek Wilderness.

Although the roadless policy has changed several times since the last plan, the actual management of the two roadless areas on the forest has not. They are located in low swampy management areas, adjacent to existing wilderness and are often flooded which leads to little human interaction

Developed Recreation

The forest has a number of developed recreation opportunities including the Sewee Visitor and Environmental Education Center and the Buckhall Recreation Area on the Intracoastal Waterway. Improvements at Buckhall include a new fishing pier and tent pad section. Water and electricity will be added in the future.

The Awendaw Creek Canoe/Kayak launch is a new facility which serves the multiple purposes of a trailhead for the Awendaw Passage of the Palmetto Trail and the Awendaw Creek Water Trail. The latter function has been particularly important due to the significant increase in water trail activities on the forest.

Hurricanes on the coast continue to take their toll on recreation facilities. Several have been reconstructed, including the total redesign of the Sewee Shell Ring where the boardwalk system was totally destroyed by a series of hurricanes in 2004.

Recreation Opportunity Spectrum Class

Field monitoring of several developed recreation and general forest areas has revealed they generally meet the Recreation Opportunity Spectrum (ROS) class they are in. Shifts in ROS class eligibility have not occurred because only minor road construction or decommissioning has been done since the forest plan was signed. ROS class eligibility changes are heavily dependent on changes in road density.

People-At-One-Time

Using people-at-one-time (PAOTs) as a measure of public satisfaction was dropped as a monitoring item (see monitoring report FY 2004). PAOTs measure facility capacity and do not serve as a proxy for determining how well people enjoyed their recreational experience.

Scenery

The forest has Visual Quality Objectives (VQOs) but will implement the new Scenery Management System (SMS) as a component of the forest plan revision. Scenery conditions and trends are continuing to move favorably toward expected desired conditions. Resource reviews throughout the planning period show mostly success implementing the forest plan's VQOs. Occasional conflicts occurred with timber resources and fire programs regarding inadequate mitigation for recreation areas or activities, but these were mostly short term impacts. In-field monitoring of several developed recreation and general forest areas found that the areas generally meet the VQOs.

Forest Products

From 1997-2007, average annual harvest was 16,751 ccf/year. With this adjustment, harvest levels were approximately 41 percent of the level of the past decade. The forest plan anticipated harvest levels approximately 50 percent of the levels of the past decade. In the last five years, biomass and pulpwood thinnings have increased. The first regeneration harvest since Hurricane Hugo to promote conversion to longleaf pine ecosystems is proposed beginning in 2009.

The desired condition in the forest plan envisioned that "The quantity and quality of hardwood products have increased, and the amount sold has also increased." This has not happened. Only minor amounts of hardwood products have been sold. The emphasis has been on thinning to improve forest health and reduce impacts from southern pine beetle. In addition, thinning has been done to reduce hazardous fuel loadings and to increase foraging habitat for the RCW. Biomass thinning has been done to address smaller and younger overstocked pine stands.

Minerals

No activity has occurred on the forest over the past five years. The forest received an inquiry for marl and limestone, but since the agency could only give a five year minerals material contract, the inquirers have not pursued it further.

Groundwater and land subsidence impacts from mineral activity may be occurring on adjacent private lands affecting the forest.

Landownership and Special Uses

From FY03-FY07, ten land purchases totaling 7,308 acres were bought for $16,164,584.

Urbanization on private land adjacent to the forest is occurring at a faster rate than other forests in the Southern Region. Acquisition funds have been very limited the past several years as the timber industry has divested large acreages within the forest. Land acquisition is becoming more difficult. It is becoming harder to acquire public access through road easements as private landowners are less willing to allow public access across their land.

The infrastructure needed to support development adjacent to the forest is in increasing demand, including the need for special-use authorizations such as road and utility (power, telephone and gas) expansion. Development on adjacent properties has led to increased issues with trespass, illegal trails, title claims, encroachments and law enforcement problems such as poaching, illegal posting of national forest land and user conflicts.

In 2005, the forest finalized the Land Ownership Adjustment Strategy, including developing criteria to guide the future direction of land adjustments. Goals in the plan include consolidating fragmented lands, disposing isolated lands that have lost national forest character and have become difficult to manage, and encouraging conservation

organizations and state and local governments to acquire conservation easements on nonfederal lands to limit development adjacent to the forest. The forest has documented the issues (threats), limitations and opportunities posed by urbanization and loss of open space. In addition, other factors outlined in the strategy, such as prescribed burning and timber harvest, will become increasingly difficult to implement because many of the new neighbors are not informed or aware of the important dynamics of living so close to the natural environment. All of these factors will have a significant negative impact on the forest's ability to process and administer lands special use cases and meet forest plan objectives.

Access/Travel Management

Prior to the plan revision, road reconstruction and construction was accomplished primarily through the timber sale program. Development of the forest's transportation system was substantially completed prior to 2000. As a result of Hugo, biomass and first thinnings have been the primary silvicultural need since the mid 1990s. However, these are low-value sales that generate little money for the necessary work needed to keep roads up to standards. Presently, road work in timber sales is mostly system road maintenance and use of temporary roads accomplished using road purchaser provisions in the timber sale contract.

With the continued reduced funding levels for road maintenance, serviceability of the road system will continue to decline which could result in a future need for road reconstruction. Currently, 433 miles of open system road and 131 miles of closed system road exist on the forest. System road mileage has slightly increased during from 2003-2007 as the forest has acquired additional roads through recent land acquisitions. This acquisition has increased the deferred maintenance backlog.

Lack of funding has resulted in choices on the level and degree of maintenance needed, such as whether to close roads, conduct spot surfacing, provide maintenance to surface drainage, culverts, bridges and aggregate surfacing. Roadside mowing, trimming large vegetation and other measures are still necessary for safety, but limited funding is not meeting the need. The forest has used stewardship contracts and agreements to reconstruct and maintain some system roads.

Collaboration

The forest has continued participation in the Non-point Source Memorandum of Understanding with the South Carolina Forestry Commission and SC DHEC. The forest has been involved with the state of South Carolina in BMP compliance checks with the South Carolina Forestry Commission relative to timber harvesting (Clean Water Act Section 319). The Forest Service Southern Research Station and the College of Charleston are collaborating on a variety of issues relative to the effects of prescribed fire, biomass treatments, thinning and other land management on erosion, water quality, groundwater levels, rutting, soil disturbance, soil productivity, nutrient losses and vegetation change. Research studies are often connected to ongoing forest management activities.

The soil and water professionals have continued to be instrumental in developing and expanding the program to collect native plant seed, provide testing, viability checks, plant, harvest and utilize native seed, mulch and planted plugs for ground disturbing activities. Efforts to expand study of sweetgrass, a culturally important species, have also been supported with various activities on the forest. These combined efforts with native plants have helped contribute to the viability of the Francis Marion Seed Orchard program, adding diversity to funding opportunities during a time when the superior tree and some of the other silvicultural program elements have declined. The forest has a six-year agreement with the University of South Carolina to provide GIS graduate level students to support program work on both the forest and the Districts.

5. New Information

Section IV of the five-year monitoring report provides detailed information on the original 14 forest plan issues. In addition, emerging issues were identified as well as changes needed to desired conditions, forest goals, objectives, and standards and guidelines.

6. Evaluation of Need to Change Existing Direction

The 1995 revised plan allocated land and assigned management direction to eight MAs on the forest. The forest-wide goals, objectives and desired conditions are still appropriate and have not changed during implementation of the forest plan.

Three forest plan amendments were completed to help keep the plan current. A general management review completed in 2007 recommended that the forest consider moving ahead with a forest plan amendment to incorporate the new RCW Recovery Plan.

7. Science Consistency

In the preparation of this Five-Year Review of the Forest Plan, best available science was used to update some of the information. Chapter IV, section F of this report lists some ways the best available science was used to provide information for preparing this document.

8. Risk and Uncertainty

The management direction (goals, objectives, desired conditions, standards and guidelines) in the forest plan makes the basic assumption that our desired outcomes will remain so for at least a decade. In addition, any unplanned natural or human caused events will be at a scale small enough to not be a significant threat to achieving the planned objectives. The forest relies predominately on its annual monitoring reporting to assess changing conditions and new risks as they develop, and adapt management direction as necessary to reach the forest plan’s desired outcomes.

B. Need for Change Determination

1. Introduction

The Francis Marion National Forest has completed the Five-Year Review of the Revised Land and Resource Management Plan. This document provides some key relevant information on current activities associated with the forest, and addresses key topics or considerations related to potential amendments or a revision of the forest plan. Finally, this document provides the forest supervisor's overall determination relative to the Five-Year Review of the Forest Plan.

2. Approach Used to Conduct Five-Year Review

The revised forest plan was prepared according to the 1982 planning regulations and signed in 1995. According to 36 CFR 219.10(g) of the 1982 planning regulations, the Forest Supervisor should "review the conditions on the land covered by the plan at least every 5 years to determine whether conditions or demands of the public have changed significantly." While the 1982 planning regulations are no longer in effect, the 2008 planning rule continues the expectation that forest plans will be reviewed every five years (see 36 CFR 219.6(a)(1)).

This Five-Year Review addresses concerns that have emerged regarding the forest plan and its interpretations and applications. It summarizes the monitoring work done on the forest during fiscal years (FY) 03 through FY07. A number of potential issues related to the forest plan were also identified by assessing information provided by Forest Service employees, as part of past and ongoing forest plan and project-related public involvement efforts (see Section IV in the Five-Year Review). Many of the potential concerns were related to policy and procedures for implementing the forest plan.

3. Potential Change Agents

This section briefly describes current activities or programs that potentially affect conditions on the land.

Prescribed Burning

Prescribed burning on the forest is critical for developing and maintaining desired habitat conditions for RCWs as well as other threatened, endangered and sensitive species. Periodic prescribed burning is also needed to reduce hazardous fuel loadings, especially in the WUI. Three areas on the forest are not being burned on a regular basis due to concerns with smoke hazards on roads and current forest stand conditions. Desired conditions, especially for MA 26, are closely tied to frequent burning to maintain the longleaf pine ecosystem. It is important in other MAs as well to develop and maintain vegetation conditions. Future plan revision efforts will need to address this issue in modifying or changing desired conditions based on frequency, location and timing of prescribed fire.

Timber Harvest

In the almost 20 years since Hurricane Hugo, the forest has worked diligently to address the immediate health and safety needs after the storm. In the years that followed, work shifted to thinning the vast number of stands in the major path of the storm that grew up all at once. Thinning was done to address RCW needs and to reduce the potential impact of southern pine beetle on forest health. Prescribed burning was used to restore and maintain habitat, focusing mainly on longleaf pine ecosystems, and to address hazardous fuel loadings. Future plan revision efforts will now have to also focus on the amount and distribution of early, middle, late and old successional classes as well.

PETS Species

Many of the PETS species described in this report are dependent on frequent fire to maintain habitat conditions. Many of them are located in areas difficult to burn because they are adjacent to WUI areas including major roadways such as US highways 17 and 41. Some of the habitats defined by some species are very small, sometimes less than an acre. Forest plan revision efforts will need to address habitat restoration and maintenance requirements.

4. Summary of Forest Plan Amendments

Amendment 1 (October 2002): This amendment provided direction for the preparation of site-specific Biological Evaluations (BEs) including inventory requirements for PETS species. A court order dated February 22, 2008 set aside the implementation of this plan amendment.

Amendment 2 (May 2003): This amendment revises the 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 that plan and begin managing these lands through site-specific projects.

5. Forest Plan Implementation

At this time, no factors would prevent continued implementation of the forest plan.

6. Subject Potentially Related to Forest Plan Amendment or Revision

The general management review recommended that the forest consider moving ahead with a forest plan amendment to incorporate the "Recovery Plan for the Red-cockaded Woodpecker" 2003 direction.

7. Determination

Based on the Five-Year Review and implementation of the forest plan to date and, as summarized above, I have determined that use demands of the public and conditions on the forest (lack of major natural disturbances) have not affected plan implementation significantly since 1995. Accordingly, the forest plan does not need to be revised at this time. However, the Five-Year Review identified potential items that could lead to minor adjustments or amendments. Yearly monitoring and evaluation of these and other items will identify the need for change. Any amendments or revisions to the forest plan will be made using appropriate National Environmental Policy Act procedures.

Jerome Thomas

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JEROME THOMAS
Forest Supervisor

10-6-08

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Date

IV. Comprehensive Evaluation

A. Roles and Contribution

1. Ecological

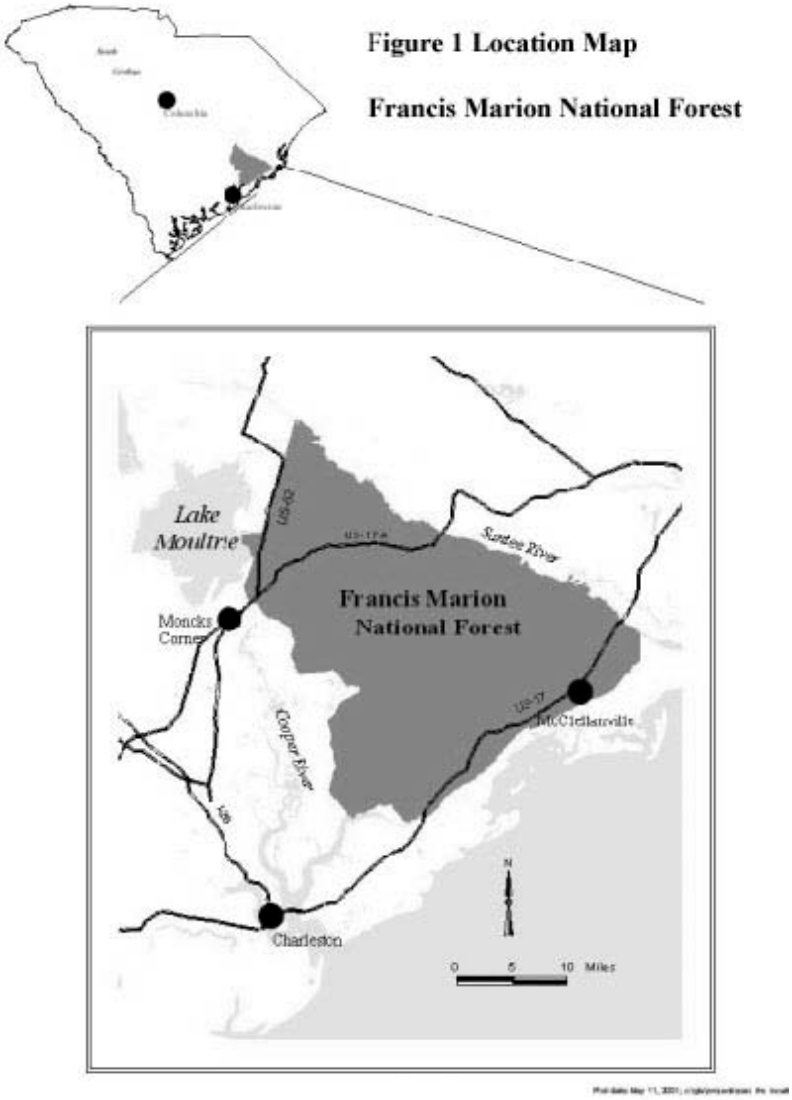


Figure 1 Location Map

Francis Marion National Forest

The Francis Marion National Forest is within the Atlantic coastal plain and flatwoods physiographic areas. The forest's topography is relatively flat to low sloping terrain, with localized surface depressions such as connected and isolated wetlands, Carolina Bays, and stream channels. Stream terraces and floodplains are most noticeable along the larger streams and rivers and tidal waters, while small tributaries range from well to poorly defined drainage patterns. Elevations range from sea level to about 60 feet. The general slope of the area is southeastward to the Atlantic Ocean. Most soils in the forest area are highly weathered, acidic, and sands may have low nutrient status. Site productivity, however, is generally high because soils are generally deep with ample plant-available moisture due to regular rainfall.

The climate of the area is humid and subtropical. Weather is highly variable. Annual rainfall averages 50 inches. Summer temperatures range from 85˚ to 95˚ Fahrenheit in the afternoons and 65˚ to 75˚ in the early morning hours. Winter temperatures range from 55˚ to 65˚ in the afternoons and 40˚ to 50˚ in the early morning hours. The average annual temperature is 68˚ and the average humidity is 74 percent. Average annual runoff is about ten inches per year meaning 40 inches is lost to evapotranspiration and seepage loss. Most of the area is underlain at some depth by limestone, and when it is shallow, the presence of sinkholes exist (such as Chicken Creek and Dutart Creek Area). When limestone is within the rooting zone, productivity may be improved due to the increased available nutrients. Most upland soils are highly productive except spodisols. The productivity in wetlands for some tree species is affected due to the anaerobic soil conditions.

2. Social and Economic

The following tables compare demographic statistics for the forest's economic area (lowlands) and for the state as a whole.

Table 1. Demographic Information for Berkeley and Charleston Counties[3]

	Berkeley	Charleston	South Carolina
Population, 2006 estimate	152,282	331,917	4,321,249
Population, percent change, April 1, 2000 to July 1, 2006	6.7%	7.1%	7.7%
Population, 2000	142,651	309,969	4,012,012
Persons under 5 years old, percent, 2006	7.2%	7.1%	6.6%
Persons under 18 years old, percent, 2006	26.5%	23.6%	24.1%
Persons 65 years old and over, percent, 2006	9.4%	12.3%	12.8%
Female persons, percent, 2006	50.5%	51.6%	51.3%
White persons, percent, 2006	68.0%	64.8%	68.5%
Black persons, percent, 2006	27.9%	32.3%	29.0%
American Indian and Alaska Native persons, percent, 2006	0.5%	0.3%	0.4%
Asian persons, percent, 2006	2.1%	1.4%	1.1%
Native Hawaiian and Other Pacific Islander, percent, 2006	0.1%	0.1%	0.1%
Persons reporting two or more races, percent, 2006	1.5%	1.1%	0.9%
Persons of Hispanic or Latino origin, percent, 2006	2.9%	3.3%	3.5%
White persons not Hispanic, percent, 2006	65.6%	62.1%	65.4%
Living in same house in 1995 and 2000, pct 5 yrs old & over	52.9%	49.6%	55.9%
Foreign born persons, percent, 2000	3.1%	3.6%	2.9%
Language other than English spoken at home, pct age 5+, 2000	5.9%	6.4%	5.2%
High school graduates, percent of persons age 25+, 2000	80.2%	81.5%	76.3%
Bachelor's degree or higher, pct of persons age 25+, 2000	14.4%	30.7%	20.4%
Persons with a disability, age 5+, 2000	28,611	59,609	810,857
Mean travel time to work (minutes), workers age 16+, 2000	26.5	22.6	24.3
Housing units, 2006	63,412	165,148	1,975,638
Homeownership rate, 2000	74.2%	61.0%	72.2%
Housing units in multi-unit structures, percent, 2000	12.0%	27.9%	15.8%
Median value of owner-occupied housing units, 2000	$91,300	$130,200	$94,900
Households, 2000	49,922	123,326	1,533,854
Persons per household, 2000	2.75	2.42	2.53
Median household income, 2004	$43,545	$39,962	$39,454
Per capita money income, 1999	$16,879	$21,393	$18,795
Persons below poverty, percent, 2004	12.7%	15.0%	15.0%

[3] Information comes from the United States Census Bureau, *QuickFacts*

Table 2. Business Information Summary

	Berkeley	Charleston	South Carolina
Private non-farm establishments, 2005	2,341	11,706	103,416
Private non-farm employment, 2005	35,040	176,165	1,584,914
Private non-farm employment, percent change 2000-2005	31.8%	3.8%	-1.0%
Non-employer establishments, 2005	8,447	26,058	259,604
Total number of firms, 2002	8,246	30,232	292,984
Black-owned firms, percent, 2002	15.3%	7.7%	9.8%
American Indian and Alaska Native owned firms, percent, 2002	1.3%	0.6%	0.5%
Asian-owned firms, percent, 2002	3.1%	1.8%	1.5%
Native Hawaiian and Other Pacific Islander owned firms, percent, 2002	<100 firms	<100 firms	0.0%
Hispanic-owned firms, percent, 2002	2.5%	1.0%	1.0%
Women-owned firms, percent, 2002	30.3%	28.1%	26.2%
Manufacturers shipments, 2002 ($1000)	2,935,102	3,113,448	81,132,781
Wholesale trade sales, 2002 ($1000)	1,106,443	2,446,472	32,988,974
Retail sales, 2002 ($1000)	882,440	4,638,504	40,629,089
Retail sales per capita, 2002	$6,059	$14,639	$9,895
Accommodation and foodservices sales, 2002 ($1000)	96,635	1,024,476	6,104,316
Building permits, 2006	2,012	5,347	50,776
Federal spending, 2004 ($1000)	619,324	4,020,289	30,051,171

The following figures depict urban growth in the Charleston area since 1990 and project it to 2030.

Figure 2. Urban Areas near Charleston - 1990

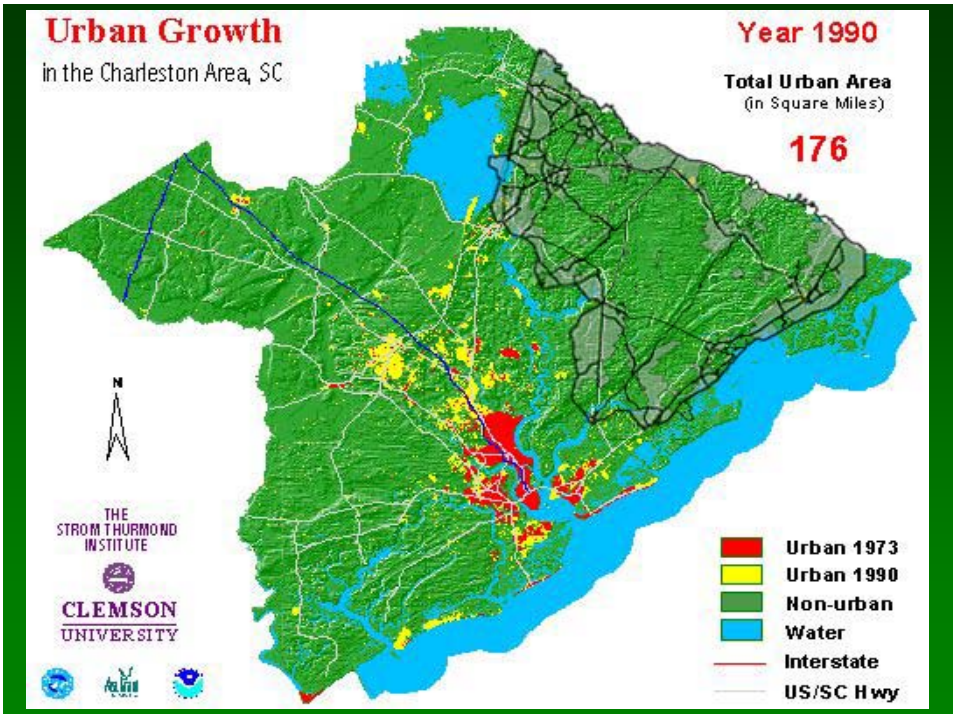


Figure 3. Urban Areas near Charleston - 2008

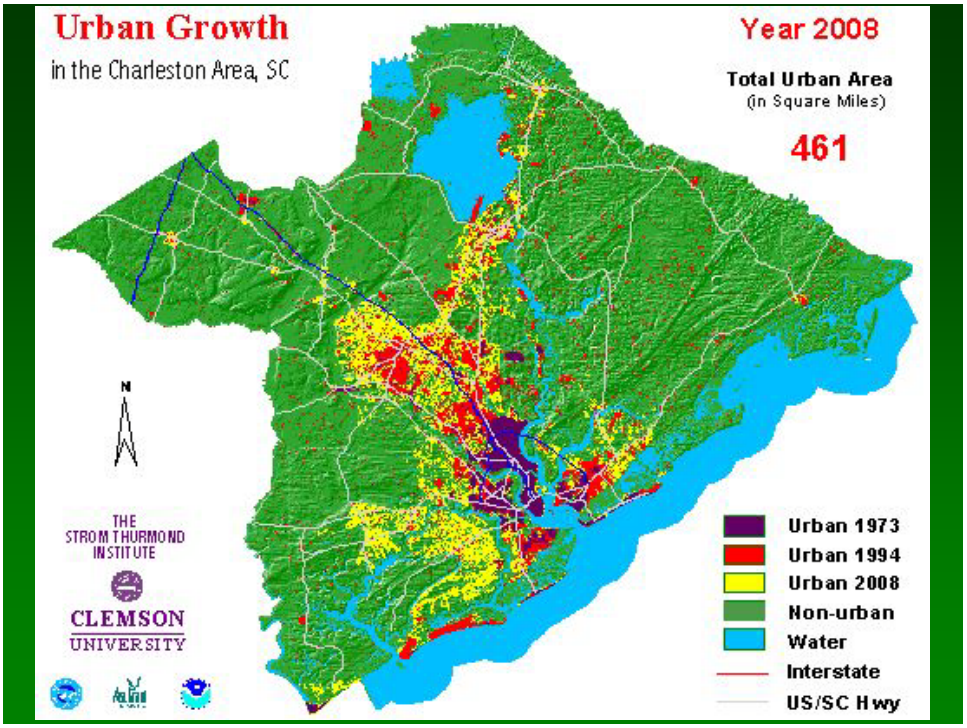


Figure 4. Urban Areas near Charleston - 2030

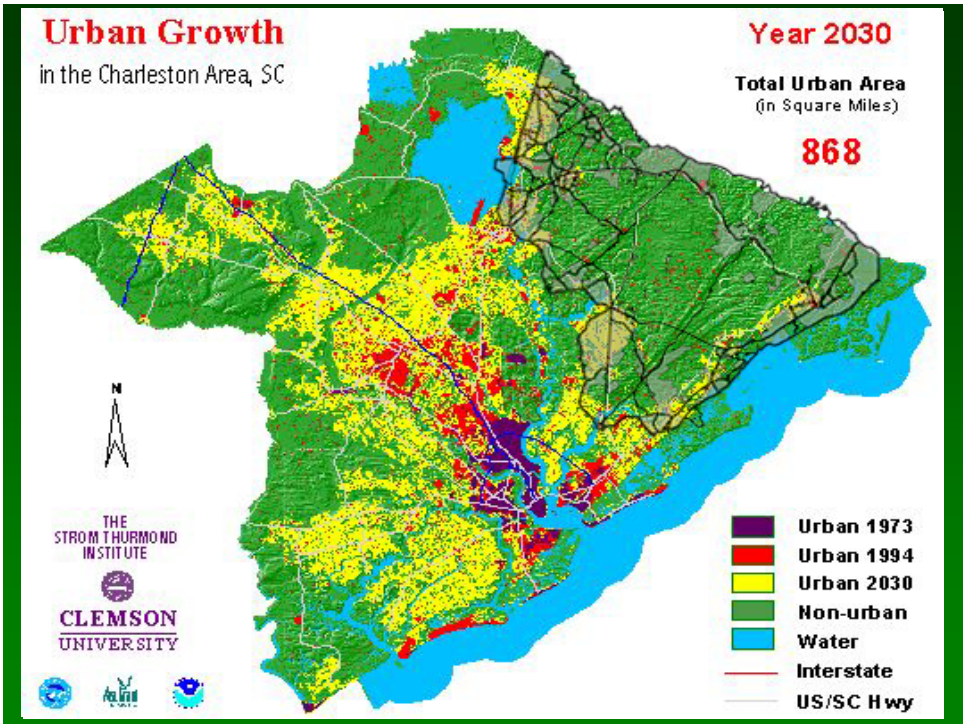


Table 3. Employment and Industry Characteristics in Berkeley and Charleston Counties as Compared to South Carolina

OCCUPATION	Charleston	Berkeley	South Carolina
Employed persons 16 years and over	132,506	52,228	1,603,425
Executive, administrative, and managerial occupations	15,583	4,890	163,295
Professional specialty occupations	19,933	5,182	190,365
Technicians and related support occupations	5,583	2,026	54,406
Sales occupations	17,079	6,365	182,118
Administrative support occupations, including clerical	18,242	7,712	219,725
Private household occupations	1,146	106	8,648
Protective service occupations	2,663	1,119	26,343
Service occupations, except protective and household	16,612	4,934	165,899
Farming, forestry, and fishing occupations	2,056	587	33,595
Precision production, craft, and repair occupations	17,874	9,743	221,207
Machine operators, assemblers, and inspectors	5,468	4,152	197,949
Transportation and material moving occupations	5,217	2,730	66,344
Handlers, equipment cleaners, helpers, and laborers	5,050		73,531
Employed persons 16 years and over	132,506	52,228	1,603,425
Agriculture, forestry, and fisheries	2,253	716	35,140
Mining	63	38	2,353
Construction	12,831	5,460	127,294
Manufacturing, nondurable goods	4,820	3,486	244,489
Manufacturing, durable goods	9,602	7,370	167,072
Transportation	6,016	2,633	51,336
Communications and other public utilities	3,301	1,877	46,063
Wholesale trade	4,445	1,498	58,455
Retail trade	24,770	9,957	265,919
Finance, insurance, and real estate	7,751	2,104	81,912
Business and repair services	6,040	1,985	60,492
Personal services	6,168	1,420	54,219
Entertainment and recreation services	1,623	423	17,517
Health services	13,409	2,990	110,222
Educational services	11,942	3,577	130,177
Other professional and related services	8,193	2,411	79,331
Public administration	9,279	4,283	71,434
CLASS OF WORKER			
Employed persons 16 years and over	132,506	52,228	1,603,425
Private wage and salary workers	90,258	36,020	1,238,950
Government workers	33,528	13,081	266,299
Local government workers	8,148	2,776	79,532
State government workers	12,650	3,690	130,088
Federal government workers	12,730	6,615	56,679
Self-employed workers	8,336	2,825	91,848
Unpaid family workers	384	302	6,328

B. Ecological

1. Vegetative Communities

a) Comparison of Existing Conditions/Trends to Desired Conditions

(1) Landscape Ecosystems

The Francis Marion National Forest lies entirely within the range of the historic longleaf pine ecosystem, home to the third largest population of the federally endangered red-cockaded woodpecker (RCW). Fire-maintained longleaf pine savanna and woodland communities and ecosystems are not only of primary importance to RCW (USFWS, 2003), but are also known to support over 120 species of plants and 56 species of animals from regional lists of proposed, endangered, threatened, and sensitive species (RCW Management ROD, 1995; USFWS, 2003). As described in Goal 1 of the Revised Land and Resource Management Plan (1996; p.1-2), the forest provides diversity, "[O]f particular importance are red-cockaded woodpecker habitat and longleaf pine communities".

The forest plan dealt with landscape ecosystems at a broad level primarily through management areas. The major management areas (MAs) in the plan are:

- MA 2 – Wilderness
- MA 26 – Sandy ridges/side slopes (longleaf pine ecosystems)
- MA 27 – Loamy ridges, flats and river/creek bottoms
- MA 28 – Flatwoods and loamy ridges/flats
- MA 29 – Swamps and swampy flats

<u>MA 2 (13,812 acres)</u>

This management area is all designated wilderness. The goal for MA 2 is "Preserve examples of large, relatively undisturbed hardwood swamp ecosystems and provide opportunities for a wilderness experience." The ecosystem portion of the desired condition is as follows: "The function of the landform as collecting basins from the surrounding pine uplands and as headwaters for several creeks is maintained. Varied soil conditions coupled with periodic flooding provide an excellent example of the generalized forest types locally known as "creek swamp" consisting primarily of swamp and water tupelo, and bald cypress trees."

This management area seems to be staying in the desired condition described by the plan.

<u>MA 26 (115,874 acres)</u>

As described in the forest plan: "This management area is mostly within the sandy ridges/side slopes and contains most of the potential area for restoration of the longleaf pine ecosystem." The goal for MA 26 is "Restore, expand and maintain the longleaf pine ecosystem and related fire-dependent communities." The first

three sentences of the desired condition state: "The uplands are mostly in longleaf pine communities where the older stands are characterized by open park-like stands of pine trees with herbaceous understories. The understories contain a diversity of plant and animal communities. Fire is a common occurrence in these areas with burning occurring throughout the year."

The forest plan defined these areas principally by soil type. However, the most critical factor in maintaining both longleaf pine and fire dependent communities is the presence of relatively frequent fire. These soil types do not always align with locations where prescribed fire can readily be used, especially near highways or urban interface areas. The most significant of these areas on the forest are:

- The Highway 17 corridor
- The Highway 41 corridor
- The Macedonia Area (northern portion of the forest)

Smoke on highways (pictured right) poses risks to the public and has limited prescribed burning in some areas. The very real importance of public safety quickly outweighs vegetation management desires, and must not be overlooked or underestimated.

While longleaf pine is a very important and highly desired component of these communities, these ecosystems have much the same dynamic with loblolly pine if the fire adapted/dependent understories remain the same. The endangered RCW uses loblolly pine for cavity trees and foraging just as it does longleaf pine.

Restoration and maintenance of longleaf pine habitat is becoming aligned with the areas that are prescribed burned on a regular basis Limitations on the use of prescribed fire in other parts of the forest are a significant issue for this management area. Related to this issue are:

- The need to realign MAs 26 and 28 and perhaps re-define them
- The effects of smoke management both in terms of state regulations and highway smoke concerns
- Increasing urban interface

Current conditions depend on which part of the management area one examines. Near Highway 17 or urban interface areas, current conditions do not reflect herbaceous understories or a composition of fire adapted/dependent species because prescribed fire has rarely been applied in such areas. In the core burning area, current conditions match well with plan desired conditions.

MA 27 (31,626 acres)

This management area emphasizes “mixed stands and high quality mast and timber producing hardwoods” and is generally in locations where the water table is seasonally close to the ground surface. Portions of the desired condition state: “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…A variety of age classes and conditions are found in the hardwood, pine and mixed forest types.”

Goals for MA 27 are:

- Expand, maintain and enhance mixed pine/hardwood stands.
- Maintain and enhance the transition areas between uplands and lowlands.
- Increase mast production.
- Increase the quantity and quality of the hardwood timber resource.

These transition areas often have moist soils for the better part of most years. For this reason harvest tends to be avoided in these areas. Also, management emphasis has been on reducing densities of pine stands on more upland areas to improve RCW habitat and to reduce susceptibility to insects and disease particularly southern pine beetle. This has led to less management emphasis in this management prescription.

The variety of age classes desired has not been achieved in this or any other management area. Impacts from Hurricane Hugo have made thinning and regeneration harvests the highest priority for timber management activities in this area. Regeneration harvest would promote greater age class diversity in the long run.

MA 28 (63,523 acres)

“This management area contains an area where Forest-wide goals are to be achieved with no single goal emphasized.” The desired condition states: “Loblolly pine is the dominant species on the upland sites. There are many age classes of pine…”

This management area was designed to provide wide flexibility in management. which has left forest managers with considerable uncertainty regarding which conditions are desired. This uncertain desired condition seems to present an issue. As the largest management area of uplands outside MA 26, MA 28 seems more defined as those upland areas where prescribed fire is unlikely to be applied on a regular basis.

Significant numbers of RCW live in these areas; the lack of fire has meant considerable midstory development and intrusion which is degrading RCW habitat.

The many age classes of pine described in the desired condition are not being developed. Little to no age zero-ten forest exists in the management area.

As management area boundaries are currently drawn, parts of MA 28 are burned under prescription very frequently, while other parts of the management area are not being burned at all. As expected, this difference has greatly shaped the area ecosystems. Again the highest silvicultural priority is to thin stands to keep them healthy and to implement regeneration harvest to increase the age class diversity.

MA 29 (20,815 acres)

Goal 2 for MA 29 is to "Link wilderness areas with similar ecological units to minimize landscape fragmentation." The ecosystem portion of the desired condition states: "Most of the area contains late successional wildlife habitat, and a core linkage area exhibits old-growth characteristics. About 75 percent of the area is suitable for production. This area provides habitat linkages for wildlife to travel with fewer disturbances through a core area of the Forest."

Relatively little management has been done in this management area. Stands in the management area are now 12 years older than they were when the plan was signed. More than 25 percent of this management area is typed as pine stands. These will need some management over time, which is allowed in this management area.
The desired condition statement "a more gentle touch on the landscape" has caused some confusion and been interpreted by some as more restrictive than probably intended. This might be better worded in the context of the scale of management activities. Conventional first thinnings for example should not be considered at odds with the desired condition. Some of the existing standards/guidelines should be incorporated into the desired condition statements in the forest plan.

RCW Management, Longleaf Pine Ecosystems, and Prescribed Fire

The forest plan identified a 160,000 acre habitat management area for the RCW. This area is dominated by mixed pine/hardwood, longleaf pine, loblolly pine, and pond pine. This area is suitable for management, within which standards and guidelines included in Appendix A, of the RCW Management ROD (1995), would be followed. Current prescribed burn levels are below forest plan requirements to optimally meet the desired conditions for RCW and the fire-dependent longleaf pine ecosystem (see Table 4).

The role of frequent fire in maintaining longleaf pine woodlands and savannas, and habitat for the RCW, is well documented (USDA-FS, FEIS, 1996; USFWS, 2003). Desired conditions for RCW include groundcover of native bunchgrasses or other native fire-tolerant herbaceous plants covering 40 percent or more of the ground with sparse or no hardwood midstory. In addition, a minimum basal area of all pines greater than or equal to ten inches in diameter at breast height of 40 $ft.^2$ of basal area (USFWS, 2003) is needed. Vegetation data on forest structure and understory condition of forested stands is generally lacking.

Table 4. Prescribed Burning Relative to Forest Plan Monitoring (2003-2007)

Monitoring Item	FY03	FY04	FY05	FY06	FY07	Desired Condition
Annual acres burned on two-four year cycle during the growing season (April-September)	16,502	10,000	12,100	8,636	10,501	See Objective 5
Percent of RCW Habitat Management Area (HMA) burned last five years	48%	50%	50%	50%	50%	See Objective 1 Prescribed burning cycle of two – five years throughout the entire HMA (ROD – RCW FEIS and standard FW-83)
Percent of longleaf pine forest types burned last five years	62%	60%	61%	62%	60%	See Objective 1
Percent MA-26 burned last three years	36%	28%	30%	27%	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 two - three year cycle.

The forest plan emphasized the restoration, expansion and maintenance of longleaf pine ecosystems and related fire-dependent communities within MA 26 (sandy ridge and sideslopes, comprising 112,963 acres total), and included a standard that the management area be prescribed burned on a two-three year rotation (pp.4-11,12).

Looking only at forest types, in 2006 the forest stands database identified 49,351 acres of longleaf pine and mixed loblolly pine/longleaf pine forest types. Of this acreage, 39,854 acres occur in MA 26. The forest plan objective is to have 44,700 acres in the longleaf pine forest type within ten years and 53,500 acres in the long-term. Therefore, the forest has met its short-term objective for longleaf pine forest types.

Ecological Systems

Natureserve (2008) identifies 54 ecological systems with the potential to be found within the Outer Coastal Plain Mixed Forest Province. Based on internal review, Table 5 lists the 12 ecological systems most commonly found on the forest.

Table 5. Ecological Systems found on the Francis Marion National Forest
(Natureserve, 2008)

Ecological Systems - Atlantic Coastal Plain
Forest and Woodlands
Dry and Dry-Mesic Oak Forest
Mesic Hardwood Forest
Upland Longleaf Pine Woodland
Maritime Forest
Woody Wetlands
Blackwater stream floodplain forest; Brownwater stream floodplain forest; Small brownwater river Floodplain forest; Small blackwater river floodplain forest; Large river floodplain forest
Streamhead seepage swamp, pocossin, and baygall
Wet longleaf pine savanna and flatwoods
Non-riverine basin swamps
Clay-based Carolina bay wetland
Peatland pocossin and canebrake

(2) Old Growth

The forest plan contains forest desired conditions (p.1-4) and standards (p.3-8) related to old growth. RCW clusters and recruitment stands contribute to the old growth resource, as well as wilderness areas, special areas included in MA 8, and suitable forested lands greater than 100 years of age. As described in the revised forest plan, “[A] well-distributed network of old growth is linked together throughout much of the Forest”...and “[H]arvest activities are carefully planned to provide landscape patterns which avoid isolating old-growth areas.”

Even-aged management of pine types for the RCW requires establishment of minimum rotation lengths ranging from 70 to 120 years depending on the species of pine being managed (RCW Management ROD, p.2), and with a frequency of prescribed fire ranging from two-four years, It is also very compatible with old growth conditions, as described for the upland longleaf old growth community type in the “Guidance for Conserving and Restoring Old-growth Communities on National Forests in the Southern Region” (1997), which was approved after the revised plan was completed (1996).

The forest plan Final Environmental Impact Statement (FEIS) displays acreage in potential old growth by alternative on suitable lands (>100 years) and unsuitable lands (pp.III-33-35). Since no regeneration harvest of older age classes has occurred during the planning period, there is likely to be no effect, or beneficial effects to the old growth resources as a result of forest plan implementation.

(3) Imbedded Communities

A report on the extent, location, and composition of high calcium communities in the outer coastal plain of South Carolina was completed in 2001, identifying 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). The International Paper (IP) Wando Tract was acquired by the forest in 2004 and an ecological characterization of this tract (more widely known as Charleywood Plantation) identified a significant acreage of inland maritime forest (Porcher, 2005). District efforts to map maritime communities in 2004 resulted in 2,223 acres (Geographic Information System [GIS] data unavailable). Opportunities for restoration of maritime forests were identified within the Wando/Ion project decision.

The Francis Marion National Forest contains numerous small isolated wetland depressions, most commonly forested, and dominated by pond cypress (*Taxodium ascendens*), swamp gum (*Nyssa biflora*), pond pine (*Pinus serotina*), Virginia chain fern (*Woodwardia virginica*), and often a variety of herbaceous and graminoid species including pitcher plants (*Sarracenia*). These areas can contain open water habitat for at least a portion of the year. In 2002 and 2003, 50 pond cypress wetland depressions were surveyed on the forest and it was found that of 50 depressions surveyed, only nine had an area in excess of 2.5 acres. Diane DeSteven and Charles Harrison (2005) identified 187 depressional wetlands, of which 50 percent were less than one acre in size; only 11 percent were greater than ten acres. There are numerous reports of damage due to rutting from illegal all-terrain-vehicle (ATV) use both in proximity to and within small isolated depressions and pitcher plant bogs (Glitzenstein and Streng, 2007; Everett, 2007).

(4) Non-Native Invasive Species

The national forests in the Southern Region began implementing a noxious and invasive weed strategy in June 1999 following the signing of national Executive Order 13112. This order charged federal agencies with preventing the introduction of invasive species, detecting and responding rapidly to control new invaders, monitoring, providing restoration of native species and habitat conditions in invaded ecosystems, promoting public education on invasive species, and avoiding actions likely to cause their introduction and spread. The regional forester identified a list of non-native invasive plant species (NNIS) for the Southern Region in 2001; surveys were incorporated into existing project plant surveys on the forest beginning in 2002. Table 6e displays NNIS identified on the forest to date. The forest is actively finding, mapping and treating NNIS and significant changes in Table 6 are expected in future monitoring reports.

Table 6. Non-native Invasive Plants on the Francis Marion National Forest

Latin name	Common name	Number of Stands
Ailanthus altissima	Tree-of-heaven	1
Albizia julibrissin	Mimosa	3
Arundo donax	Giant reed	1
Firmiana simplex	Chinese parasol tree	1
Imperata cylindrica	Cogongrass	1
Lespedeza cuneata	Sericea lespedeza	10 + numerous
Ligustrum sinensis	Chinese privet	12
Lolium arundinaceaus	Tall fescue	Numerous
Lygodium japonicum	Japanese climbing fern	65
Melia azedarach	Chinaberry	1
Microstegium vimineum	Japanese stiltgrass	10
Phragmites australis var. australis	Phragmites	1
Poncirus trifoliate	Trifoliate orange	1
Triadica sebifera	Chinese tallow	7
Wisteria sinensis	Chinese wisteria	14

An invasive plant control decision allowing treatment with the use of herbicides and mechanical methods was approved on up to 3,000 acres in 2001. Herbicide treatment of the one phragmites patch has been ongoing since 2003; treatment of the one cogongrass patch, discovered in 2006, has been ongoing since 2006. Both phragmites and cogongrass, occupying less than one acre each, appear to be at low densities.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Reports

(1) Landscape Ecosystems

The 2004 Integrated Resource Review (IRR) identified a number of issues that occur across multiple management areas. Specifically, these are:

- ✓ Early successional habitat - While understory vegetation in open, frequently burned forest supplies one important type of early successional habitat, zero-three forest age classes provides a habitat that is largely absent on the forest. Such areas are important not only for wildlife habitat, but also for a flow of habitat through time. Forests that are heavy to older age classes are more subject to the effects of catastrophic events such as hurricanes, southern pine beetle outbreaks or age associated declines. This issue is most important in MAs 28 and 26, but also to a lesser degree in MAs 27 and 29.

- ✓ Growing season prescribed fire - Growing season prescribed fire remains a contentious issue with a small niche of the public. The larger management concern, however, remains the limitations on prescribed fire. This issue

primarily affects MA 26 and to a lesser extent MA 28 where fire-maintained ecosystems are managed. As management areas are currently designated however, it also affects MA 28.

- ✓ Hardwood management - The IRR basically noted that hardwood and mixed stand management has not specifically taken place with the current plan. While mature oaks are retained to the extent possible in upland areas managed for RCW, the reasons discussed in the previous section have made hardwood and mixed stand management a generally low priority. This is especially true in MA 27. However, it is probably equally important in other areas that are not burned frequently. Forest plan management direction could use more clarity in such areas.

- ✓ Conversion of loblolly pine to longleaf pine - While the plan objectives for longleaf pine types are being met, management opportunities to convert stands on appropriate sites to longleaf pine remain an important issue to this forest. This is most important in MA 26, especially if it is redefined as areas where fire adapted/dependent ecosystems are maintained. With current boundaries, this issue is also important in MA 28.

- ✓ First thinning of pine stands - The importance of moderate to low densities in pine stands for RCW habitat has made thinning harvest a vegetation management priority second only to applying prescribed fire. Yet the forest has been able to achieve only about half the amount of thinning desired by Objective 9 in the plan. Budgets, staffing limitations and costs are all factors in this issue which affects MAs 26 and 28.

Annual Monitoring and Evaluation Reports - Several monitoring items are evaluated across the entire Francis Marion National Forest, not just within individual management areas. These include the following monitoring tasks.

B-4 - Objective 4 is to increase the longleaf pine forest type to 44,700 acres. The GIS database shows 49,526 acres of longleaf pine forest types on the forest.

B-6 - Objective 5 is to restore the role of growing season fires on 16,000 acres of longleaf pine forest by having these acres burned on a 2 to 4 year cycle. The acres burned annually on a two-four year cycle during the growing season are displayed in Table 7.

Table 7. Acres of Longleaf Pine Forest Prescribed Burned on a Regular Basis

Fiscal Year	Acres
2003	16,502
2004	10,000
2005	12,100
2006	8,636
2007	10,501

B-8 - Objective 11 is to increase the acres managed as mixed pine/hardwood forest types to 14,800 in the next 90 years (78 years now). The GIS database shows 39,070 acres of mixed pine/hardwood forest types.

B-17 - Objective 9 is to create conditions on 38,000 to 50,000 acres of pine stands which release over crowded live crowns. Database information indicates 19,927 acres have been thinned from 1996 – 2007.

B-27 - Objective 12 is to maintain 5,000 to 10,000 acres of early successional habitat in the short and long term. GIS records show 819 acres in permanent openings and wildlife openings and 76 acres in the zero-three year age class.

B-28 - The monitoring item is number of acres in late successional habitat (pine greater than 80 years old, hardwood greater than 100 years old, mixed pine/hardwood greater than 100 years old.) The desired condition is at least 10 percent of each group in this late successional stage. GIS records show:

- ✓ 10,409 acres of pine types over age 80 or 7.5 percent of 138,829 acres
- ✓ 12,941 acres of hardwood types over age 100 or 16.7 percent of 77,475 acres
- ✓ 588 acres of mixed pine-hardwood types over age 100 or 1.5 percent of 39,071 acres

<u>MA 2</u> - No monitoring items specific to MA 2 are in place.

<u>MA 26</u> - Objective-1 is to have 40,000 acres of longleaf pine forest type within the next 10 years (by 2006) in MA 26. The GIS database shows 40,067 acres of longleaf pine forest types in MA 26.

<u>MA 27</u> - There are three monitoring items for this management area identified as B-9, B-10, and B-11.

- ✓ B-9 - Objective MA 27-O-1 is to have 6,700 acres managed as mixed pine/hardwood forest types. The GIS database shows 5,254 acres of mixed pine-hardwood types in MA 27. This compares with 3,646 acres of mixed pine/hardwood types in the 1996 monitoring report. The context of the current mixed pine-hardwood acreage under objective 11 (forest-wide monitoring task B-8) above should be remembered when looking at the figures for MA 27.
- ✓ B-10 - Objective MA 27-O-2 is to have loblolly pine stands by age 40 contain 30 percent of the dominant and/or codominant canopy classes in mast-producing hardwoods. An action plan was developed in 1998 to establish plots to obtain this information. However, due to budget limitations, they were not established.

- ✓ B-11 - In MA 27, what conditions are needed in stand regeneration and development to achieve objective MA 27-O-2? No determination has been made on the conditions needed to meet this objective.

MA 28 - No monitoring items specific to MA 28 are in place.
MA 29 - No monitoring items specific to MA 29 are in place.

(2) Old Growth

Old growth has not been addressed in past management reviews, audits, nor annual monitoring and evaluation reports. Forest patterns in providing for a network of old growth across a variety of old growth community types should be evaluated in light of the 1997 document "Guidance for conserving and restoring old-growth communities on National Forests in the Southern Region" (1997).

(3) Imbedded Communities

The final report of the forest integrated resource review (2004) recommended the restoration of calcareous mesic hardwood communities through the removal of pine, and consideration of regeneration, instead of thinning, to create savannas. Although savanna remnants have been protected as part of project planning, no projects have directly proposed restoration of calcareous mesic communities or savannas.

Action items in the 2003 annual monitoring report include the identification of opportunities to maintain and restore pine and pond cypress savanna communities through project planning. In addition, the need to improve baseline data on existing acreage in maritime forests and to acquire maritime forests through land acquisition was also identified.

(4) Non-Native Invasive Species

The forest plan did not address existing and desired conditions for non-native invasive plants.

2. Plants, Wildlife, and Aquatic Communities

a) Comparison of Existing Conditions/Trends to Desired Conditions

(1) Management Indicator Species

A Forest Plan amendment resulting in a change in the list of management indicator species (MIS) was signed in April, 2003. The MIS list was reduced to 11 species, nine animals and two plants, in order to increase the efficiency and effectiveness of the monitoring program and of project effects analysis. Habitats represented include early succession, pine forests and woodlands, upland hardwoods, ephemeral wetlands and bottomland hardwoods. Demand species and viability concern species are also represented.

Table 8. Forestwide MIS, Preferred Habitats and Trends

MIS Species	Preferred Habitat	Species Group	Forestwide Trend
Pinewoods tree frog	Ephemeral ponds including cypress-tupelo ponds, savannas, and pocossins	Amphibian	Habitat is stable; population declines possible due to drought
Awned Meadow Beauty	Clay-based Carolina bays, depression meadows, pond cypress ponds, and limesinks	Plant	Stable
Sweet Pitcher Plant	pocossin ecotones and savannas, particularly within areas of continuous seepage containing Sphagnum sp.	Plant	Stable; Some declines due to lack of frequent prescribed fire
Prairie warbler	Early Successional Forest	Bird	Declining
Painted bunting	Edge habitats near maritime forests	Bird	Populations are low
Red-cockaded Woodpecker	Upland Pine Forest and Woodland	Bird	Stable
Northern Bobwhite Quail	Old home sites, small open fields, grass dominated forest understories, and shrubby thickets	Bird	Steadily declining
Yellow-throated Vireo	Upland Hardwood Forest	Bird	Stable
Eastern Wild Turkey	Generalist favoring hard mast	Bird	Stable, some declines since Hugo
Northern Parula	Bottomland Hardwood Forests	Bird	Stable, some declines
American Swallow-tailed Kite	Requires large pines for nesting	Bird	Stable to upward

(a) Plants

Awned meadow beauty *(Rhexia aristosa)*

Awned meadow beauty (*Rhexia aristosa*) is a perennial herbaceous plant inhabiting clay-based Carolina bays, depression meadows, pond cypress ponds, and limesinks. Although considered rare (Natureserve, 2008), the species is locally common on the forest, particularly from ephemeral ponds in the vicinity of Halfway Creek Road. Awned meadow beauty is a facultative wetland species, declining throughout its range due to a loss of wetland habitat. As of 2008, 40 occurrences were documented from the forest.

Most notable includes several records from:

- ✓ depressional wetlands within Compartments 205 and 196 (tens of thousands of plants, Glitzenstein, 2007);
- ✓ cypress ponds within the Wando area;
- ✓ clay-based Carolina bays and limesink ecotones in proximity to the intersection of Halfway Creek and Steed Creek Roads (several hundreds of plants;
- ✓ treeless savanna ecotones (hundreds of thousands of plants);
- ✓ open herbaceous depressions;
- ✓ adjacent to powerline rights-of-way at Florida Bay/Twin Bay; and,
- ✓ Red Bluff Bay (hundreds of plants).

Damage to plants due to illegal ATV use along the powerline right-of-way near Florida/Twin Bay has been documented (Glitzenstein and Streng, 2007; Everett, 2007).

Sweet pitcher plant (*Sarracenia rubra*)

Sweet pitcher plant is a carnivorous plant inhabiting pocossin ecotones and savannas, particularly within areas of continuous seepage containing Sphagnum sp. (peatland pocossin and canebrakes; wet longleaf; streamhead seepages). The species is found locally from fire-maintained savannas and pocossins. In the vicinity of Halfway Creek Road, hundreds of plants are known to occur in the vicinity of Big Ocean Bay (vicinity of Steed Creek Road and Halfway Creek Road) and the powerline right-of-way bordering Halfway Creek Road. Several populations are contained within unique natural areas (MA 8).

Damage to plants due to illegal ATV use along the powerline right-of-way near Florida/Twin Bay has been documented (Everett, 2007).

(b) Wildlife

Trend information was obtained from *Population Trends and Habitat Occurrence of Forest Birds on Southern National Forests, 1992-2004* (GTR NRS-9). It should be pointed out that information on birds has been collected on a yearly basis for well over ten years. This information needs to be assembled and made available in the regional bird database to be used effectively.

The desired conditions for non-game wildlife species would include abundant early successional habitats maintained by prescribed fire. In addition, the forest would provide shelter and forage for a variety of neotropical migrant birds through management actions associated with timber, fire and wildlife.

Pinewoods tree frog (*Hyla femoralis)*

The Pine woods tree frog is very common throughout the coastal plain and has been observed from many locations on the forest. From 1990 -1995 William M. Estes (an amateur observer) recorded 12 occurrences within or adjacent to the Francis Marion National Forest. Data collected by the College of Charleston (Dr. John Fauth) in 1997-1998 recorded 32 observations with population estimates of greater than 10,000 individuals in 1997 and 34 in 1998. The reasons for the low numbers in 1998 can be attributed to extremely dry conditions which resulted in most of the college's study sites being dry during the breeding season. Also, in 1998 the Savannah Ogeechee Museum (Robert A. Moulis), while surveying for flatwoods salamander, observed Pine woods tree frogs from three locations within or near the Francis Marion. The forest has relied on monitoring data from the College of Charleston (Dr. John Fauth) because their research projects are long-term and can be used to establish trends. In recent years (especially 1998, 1999 and 2000), the Francis Marion National Forest experienced abnormal weather patterns that have resulted in severe drought conditions which have made monitoring trends of amphibian populations difficult. The Pine woods tree frog has been described primarily from pine habitats in the proximity of ponds. This frog requires pine flatwoods habitat near ephemeral ponds or ditches for breeding which occurs from March into summer. Other requirements for the species are pine snags and fallen pine logs that provide shelter during daytime hours and for over-wintering. Breeding habitat for the pine woods tree frog is protected during normal management activities associated with protection of wetlands and riparian areas during implementation of Best Management Practices (BMPs).

Prairie warbler (*Dendroica discolor*)

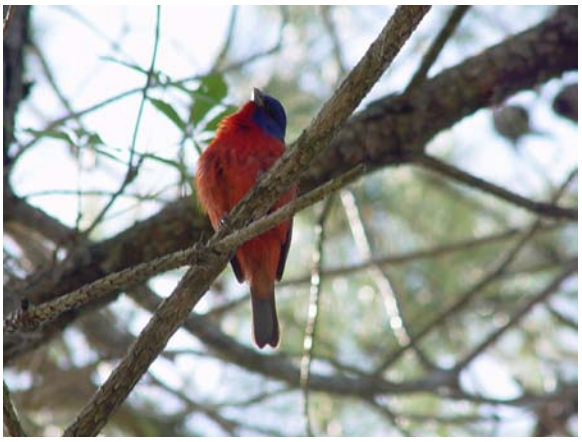
The prairie warbler is a forest-dwelling species that occupies the old fields and openings, regeneration areas and woodland/savanna habitats that contain a shrub seedling/sapling component. These habitats were abundant following Hurricane Hugo but quickly dwindled as the forest vegetation grew back. In recent years, prescribed burning, biomass and pulpwood thinning and wildlife opening maintenance have had some stabilizing effect on distribution, abundance and quality of early successional habitats preferred by this species.

The prairie warbler is a bird of conservation concern in the Southeast coastal plain. The United States Geological Survey Breeding Bird Survey indicates declining numbers for the species from 1966-2004. Likewise, Francis Marion and Sumter National Forest trends from 1992-2004 (including the piedmont) show an annual decrease of approximately 8.1 percent. However, the South Atlantic coastal plain shows an increase in populations of 6.4 percent. Areas where prescribed burning and thinning are not occurring continue to exhibit sporadic occurrences and declining abundance of this species. Regeneration harvesting has not occurred since the early 1990s and early successional habitat/inter-stand age class diversity are lacking in certain areas of the forest.

This is especially true in areas that were significantly impacted by Hurricane Hugo.

There are upwards of 33,000 acres of post-Hugo loblolly pine regeneration on the forest based on GIS data. Unless stands are frequently prescribed burned and/or have been thinned, they represent some of the poorest avian habitats on the forest. Sustainable levels of regeneration/restoration harvesting will be necessary for creating, maintaining and enhancing habitat into the future.

Painted bunting (*Passerina ciris*)



Painted buntings are a bird of the shrub lands along the Atlantic coastal plain and inland areas. Habitats that are frequently disturbed by salt spray and wind, hurricanes, fire or mechanical means, have a substantial shrub component. A preponderance of Spanish moss provides ideal habitat for this species.

The primary habitat during the breeding season is dense thickets of overgrown fields, regeneration areas two-ten years old, and mature stands with a patchy shrub understory. Woody margins and edges, hedgerows and any other dense shrubby areas also provide habitat. They are known to readily use understory of mature pine and mixed pine stands if a shrub component is patchy in distribution.

Maritime forests are used for both breeding and migration where the understory is comprised of a dense thicket of shrubs. Marine maritime forests, shrub dominated coastal zones with scattered trees, old fields and oak hammocks support the highest populations of painted buntings in and around the Francis Marion National Forest. These habitats are also highly sought after for private land development and residential housing which makes them vulnerable for rapid conversion to other land uses. Consequently habitat distribution, abundance and quality for this species in the Atlantic coastal plain are changing at a constant to accelerating rate.

Monitoring of painted buntings on the forest began in 2007 as part of a range wide population assessment being conducted over several states. There is not yet enough information to properly analyze trend information for this species at this time. Historically, however, populations of painted bunting have been steadily declining (Sauer et al., 2000) in South Carolina.

Habitat for this species is being maintained by wildlife management activities in a small number of locations resulting in limited habitat availability. Use of prescribed fire for habitat maintenance and improvement is severely limited due to smoke management restrictions and land ownership patterns. This results in fewer areas with early succession/scrub shrub understories or openings. Federal acquisition of land has proven difficult due to the high desirability of coastal environments for urban development.

Red-cockaded woodpecker *(Picoides borealis)*

RCW was identified as an MIS for the Francis Marion National Forest because of concerns for species persistence. The species was given protection with the passage of the Endangered Species Act in 1973. It is a good indicator of mature, fire-maintained open pine woodlands and will be discussed in greater detail in the PETS section of this report.

Northern Bobwhite Quail *(Colinus virginianus)*

Northern bobwhite is a bird that thrives on a diversity of habitats. The species does best in a combination of habitats created and maintained by fire, timber harvesting and agriculture. From Cox and Widner, 2008:

> The vegetation structure preferred by Northern Bobwhite includes a mix of forbs and woody shrubs with ample bare ground. This structure is ephemeral, and populations quickly decline within less than three years post fire as vegetation grows and becomes thick at ground level. While prescribed fires in other seasons may create the preferred vegetation structure, fires set during the early part of the lightning season (late April and May) maintain the structure longer than fires set during the dormant season. Lightning-season fires in May provide preferred vegetation structure that persists as much as six months longer than the structure created by dormant season burning.

Studies at Tall Timbers Research Station examined the impacts of dormant-season versus lightning-season burns on quail more directly and found that seasonal effects were insignificant at the population level (Brennan et al. 1997, 1998, Carver et al. 1997). The specific month burns are conducted is important because nesting activity varies considerably within the lightning season. Nesting activity peaked in June in these studies, so burns conducted in mid May when greater than 10 percent of the hens were incubating can provide many of the benefits of lightning-season burning without posing a threat to the majority of nests. In addition, because quail often nest preferentially in areas burned within the past two years, a lightning-season burn applied to a three-year rough actually threatens very few nests. Lightning-season burning also may improve adult survival during the late winter period (February-April).

In contrast, by extending burns over a broader window of time, more cover is provided because burns conducted later in the year take place after the vegetation burned early in the year has recovered. In addition, vegetation recovery following an early season burn takes place slowly in comparison to recovery from a burn conducted later in the year; therefore, exposure to predators following a dormant-season burn extends over a longer time period. Large-scale burning at one time can be detrimental to Northern bobwhite populations which benefit when burns are extended over several months rather than burning as much as possible within a few weeks. It is difficult to burn some altered lands outside a narrow window early in the year, and fires must be applied to these areas when the fires will be most successful. Quail also re-nest readily unless burns are conducted very late in the season, and lightning-season burning may provide additional benefits during re-nesting and brood rearing. Burning at different times of the year provides diversified patterns of plant growth and seed and insect abundances; it also exposes seeds on the forest floor. Grasshoppers and other insects increase significantly following lightning-season burning (Provencher et al. 1998); lightning-season burns also may provide a greater abundance of insects throughout brood rearing months in comparison to fires set early in the season (Brennan et al. 1995, 1997).

It is well known that range wide the Northern bobwhite is in trouble – more than a 95 percent decline in population over the last 60 years. This species, however, has the capacity to rebound up to five fold in any given year under suitable habitat conditions. This characteristic, combined with the forest's ability to easily monitor the species, provides a quick feedback loop on management actions relationships to habitat quality.

Literature suggests, however, that frequency of fire should be every third year to optimize benefits for reproduction and survival. In addition, Northern bobwhite is not a long distance colonizer. Pairs should not be expected to traverse habitats for more than a few miles (less than two) in search of "new" territory suggesting a mosaic of burned and unburned areas would be beneficial in any given year.

Yellow-throated vireo (*Vireo flavifrons*)

The yellow-throated vireo is most often associated with forests that contain a healthy component of deciduous trees. On the forest, these habitats are most often associated with bottomlands, riparian areas and upland oaks. Although Hurricane Hugo severely damaged these habitats they are once again exhibiting characteristics that are suitable for the species. Forestwide, populations of this species appear to be relatively stable.

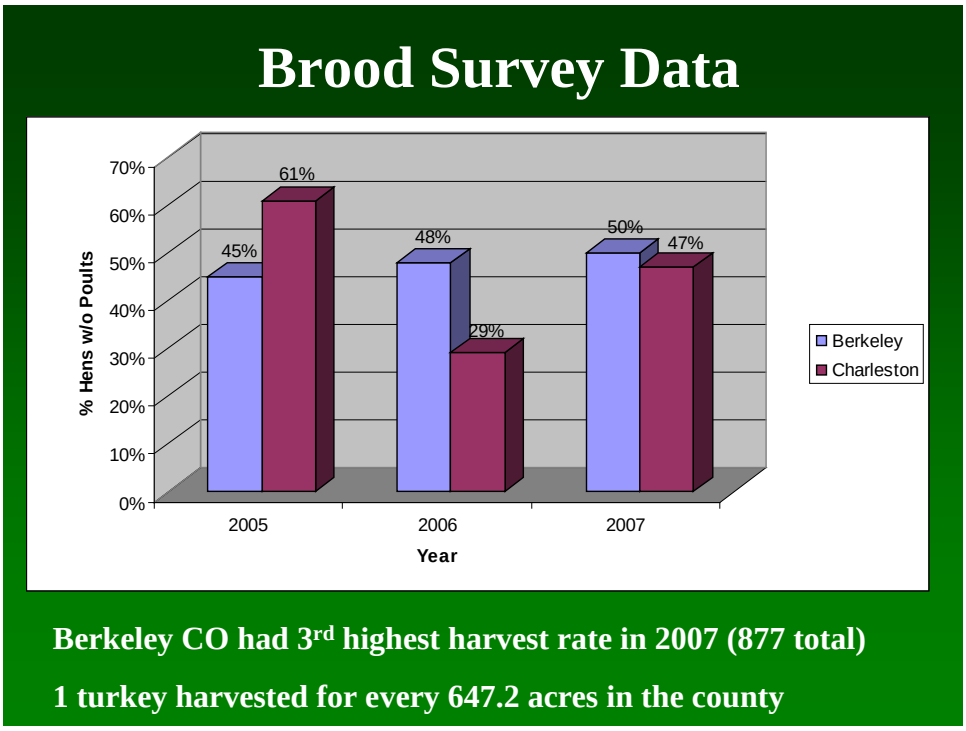
Forest plan desired conditions include sawtimber sized stands associated with old hardwoods. It is important to minimize the effects of prescribed burning on deciduous mature trees in oak dominated stands, bottomland forests and riparian areas. Retaining mast producing trees in silvicultural treatments will add to habitat quality for this species into the future.

Eastern wild turkey *(Meleagris gallopavo)*

Abundant populations of big game species and species associated with old pine stands is the desired condition on the forest. This would be accomplished through a combination of timber, fir, and wildlife management activities.

Eastern wild turkey (next pictured to the left) is an important game bird in South Carolina that does well in a variety of habitats that include forestland. The near extinction, restocking effort and abundant population of Eastern wild turkey on the forest was well-documented before Hurricane Hugo. After Hugo, wild turkey populations rapidly declined and remained low for several years. Only recently, primarily in response to a sustained prescribed burning program and an aggressive thinning strategy, have turkey numbers been showing a steady increase. Where stands are maturing in lieu of thinning, stand densities are declining enough to make them more usable for the wild turkey. Berkeley County continues to be one of the most productive turkey hunting counties in the state.

Figure 5. Berkeley and Charleston County Brood Survey Results 2005-2006



Quality of brood habitat continues to be the primary limiting factor for turkey reproduction and survival on the forest and deserves more management emphasis. Literature suggests burning every third year maximizes benefits for

turkey nesting and brood rearing and a mosaic of burned and unburned areas in the landscape benefits survival. From Cox and Widner, 2008:

> Wild Turkeys prefer to forage in southern pinelands burned within the past two years (Palmer and Hurst 1998, Sisson et al.1990, Juhan 2003), and maintaining a two-to-three-year fire frequency may be easier to accomplish when some acreage is burned in May and early June in addition to the acreage burned earlier in the year. Lightning-season fires applied to areas that have not been burned recently also are not likely to threaten many nests. Sisson et al. (1990) found that 62% of all nests occurred in mature pine forests that had been burned within the past two years. Moore et al. (2005) monitored 22 hens in areas subjected to lightning-season fires and found only 2 nests destroyed by the burns, and one of these hens re-nested. Similarly, for 64 turkey nests monitored in Mississippi (National Wild Turkey Federation 2006), only four were located in areas scheduled to be burned and only two nests were actually destroyed by lightning-season fires. Allen et al. (1996) also found that areas not burned within the past two years were almost entirely avoided by hens. Lightning-season burns also may improve brood-rearing habitats by diversifying plant growth and seed and insect abundances (Provencher et al. 1998). The average number of insects on sites treated with lightning-season fires exhibits a sharp increase in the first year after burning (Hardy 2003). Jones (2001) suggested the availability of good brood-rearing habitat might limit turkey populations on large, unbroken expanses of mature pine forest, and the grasses and forbs favored by lightning-season burns could lead to higher insect abundances for poults. Native legumes important to Wild Turkey also are promoted by lightning-season burning, and Komarek (1969) noted that Wild Turkeys frequently foraged in areas soon after prescribed burns were conducted. Sisson and Speake (1994), on the other hand, found little benefit in terms of food resources when lightning-season fires were applied to small (10-acre) plots.

Northern parula (*Parula americana)*

The Northern parula is a bird of a variety of structural forest conditions in riparian areas and bottomland forests. Although Hurricane Hugo severely damaged these habitats they continued to exhibit characteristics that were suitable for this species. Consequently, forest-wide populations of this species appear to be relatively stable. The land area in bottomland and riparian forest types has remained static on the forest and is getting older.

Desired conditions for this species; non-game wildlife species are abundant, species associated with sawtimber sized stands have increased populations, and the forest provides shelter and forage for a variety of neotropical migrants appears to be being met for this species.

American swallow-tailed kite *(Elanoides forficatus)*

This species was identified in the forest plan as an MIS due to concerns for species persistence. They serve as an indicator for mature wet loblolly forest habitats. American swallow-tailed kites are a bird of the high canopy pines in the swamps and wet bottomland forests of the coastal plain. The forest provides the current northernmost nesting range. Although there are confirmed sightings of individual nests in the Black River swamp, Big Pee Dee River swamp and Waccamaw River swamp, the Francis Marion National Forest harbors the largest kite concentration in South Carolina. Populations along the coastal plain

(which includes the forest) appear to be on an upward trend (Sauer et al., 2000) throughout the Atlantic flyway.

(c) Aquatic Community

The 2003 forest plan amendment changed from specific aquatic management indicator species to aquatic communities. Stream monitoring indicates a diverse stream fish community across the forest with the number of individuals and species varying seasonally and with rainfall. However, multi-year sampling indicates that the fish community is stable.

Table 9 represents diversity information for fish.

Table 9. Fish Survey Sites and Number of Species Captured

Stream	Site #*	Watershed	Quadrangle	# Species Captured				
				1993	2002	2003	2004	2006
Cooter Creek	12	Awendaw Creek	Ocean Bay	3	10			8
Steed Creek	30	Awendaw Creek	Ocean Bay	9	11			
Fogarty Creek	54	Wando River	Cainhoy			3	3	5
Old House Creek	55	Wando River	Cainhoy			3	5	5
Pepper Gully	23	Wando River	Cainhoy	7				9
Harleston Dam Creek	50	Quinby Creek	Ocean Bay	3		7		
Northampton Creek	14	Quinby Creek	Ocean Bay	10	4	6		9
Muddy Creek	24	Huger Creek	Huger	7	1			5
UT Fox Gully	4	Huger Creek	Bethera	10		4		3
Bullhead Run	2	Wadboo Creek	Cordesville	14		2		7
UT Cane Gully	48	Wadboo Creek	Bonneau	2				1
UT Wadboo Creek	22	Wadboo Creek	Bonneau	5		4		5
Beauford Branch	21	Wedboo Creek	Alvin	8	8	8		10
UT Meeting House	8	Wedboo Creek	Bonneau	9				7
Wedboo Swamp	9	Wedboo Creek	Alvin	6	9			
Dutart Creek	32	Dutart Creek	Jamestown	3		2		8
Gal Branch	34	Echaw Creek	Cedar Creek	9		6		
Gravel Run	46	Echaw Creek	Jamestown	8		3		
UT Echaw Creek	36	Echaw Creek	Honey Hill	11	4	13		11
Red Bluff Creek	7	Red Bluff Creek	Honey Hill	7		9		8
UT Big Morgan Creek	6	Wambaw Creek	Honey Hill	6				9
UT Cane Branch	38	Wambaw Creek	Honey Hill	7				11
UT Mill Branch	40	Wambaw Creek	Santee	8	9	5		
UT Wambaw Creek	44	Wambaw Creek	Santee	7	3	6		14

*Site numbers correspond to sites in Hansbarger and Dean 1994 report. UT = unnamed tributary.

Table 10. Fish Species Captured in Multiple Years

		1993	2002	2003	2004	2006
	# Watersheds	9	6	9	1	10
	# Streams	17	9	15	2	18
Species						
Amblyopsidae						
Chologaster cornuta	swampfish		x			x
Amiidae						
Amia calva	bowfin			x		
Anguillidae						
Anguilla rostrata	American eel	x	x	x	x	x
Aphredoderidae						
Aphredoderus sayanus	pirate perch	x	x	x		x
Atherinidae						
Labidesthes sicculus	brook silverside	x				
Catostomidae						
Erimyzon oblongus	creek chubsucker	x	x	x		x
Centrarchidae						
Acantharchus pomotis	mud sunfish	x	x	x	x	x
Centrarchus macropterus	flier	x	x	x		x
Enneacanthus gloriosus	bluespotted sunfish	x	x	x		
Enneacanthus obesus	banded sunfish	x		x		x
Lepomis auritus	redbreast sunfish	x				x
Lepomis gibbosus	pumpkinseed			x		x
Lepomis gulosus	warmouth	x	x	x		x
Lepomis macrochirus	bluegill	x	x	x		
Lepomis marginatus	dollar sunfish	x	x	x		
Lepomis punctatus	spotted sunfish	x		x		x
Micropterus salmoides	largemouth bass	x				x
Cyprinidae						
Hybognathus regius	Eastern silvery minnow					x
Luxilus cornutus	common shiner	x				
Notemigonus crysoleucas	golden shiner	x	x	x	x	x
Notropis chalybaeus	ironcolor shiner	x				
Notropis cummingsae	dusky shiner	x				
Notropis petersoni	coastal shiner	x	x			x

Esocidae						
Esox americanus	redfin pickerel	x	x	x	x	x
Esox niger	chain pickerel	x				x
Elassomatidae						
Elassoma evergladei	Everglades pygmy sunfish					x
Elassoma zonatum	banded pygmy sunfish	x	x	x		x
Fundulidae						
Fundulus chrysotus	golden topminnow			x	x	
Fundulus diaphanus	banded killifish					x
Fundulus lineolatus	lined topminnow	x				
Ictaluridae						
Ameiurus natalis	yellow bullhead	x	x	x		x
Ameiurus nebulosus	brown bullhead	x		x		
Noturus gyrinus	tadpole madtom	x		x		x
Percidae						
Etheostoma fusiforme	scalyhead darter	x	x			
Etheostoma serrifer	sawcheek darter					x
Poeciliidae						
Gambusia holbrooki	Eastern mosquitofish	x	x	x	x	x
Heterandria formosa	least killifish		x			
Soleidae						
Trinectes maculatus	hogchoker		x			
Umbridae						
Umbra pygmaea	eastern mudminnow	x	x	x	x	

Table 11. Number of Species Captured per Forest Watershed

Watershed	1993	2002-2004
Awendaw Creek	10	15
Wando River	4	13
Quinby Creek	11	11
Huger Creek	11	18
Wadboo Creek	17	13
Wedboo Creek	12	28
Dutart Creek	3	8
Echaw Creek	19	18
Red Bluff Creek	7	11
Wambaw Creek	12	23

Information on crayfish and mussels were collected in 2003 but no trend information is available.

Table 12. Crayfish Species Collected in 2003

Watershed/Stream	Species
Wando River	
Fogarty Creek, Site 54	*Procambarus (Scapulicambarus) troglodytes*
Quinby Creek	
Harleston Dam Creek, Site 50	*Procambarus (Ortmannicus) ancylus*
Wadboo Swamp	
Bullhead Run, Site 2	*Procambarus (Scapulicambarus) troglodytes*
	Procambarus (Ortmannicus) lepidodactylus
UT Wadboo Creek, Site 22	*Procambarus (Scapulicambarus) troglodytes*
Wedboo Creek	
Beauford Branch, Site 21	*Procambarus (Scapulicambarus)* sp. could either be *troglodytes* or *clarkii*
Dutart Creek	
Dutart Creek, Site 32	*Procambarus (Scapulicambarus) troglodytes*
Gravel Run, Site 46	*Procambarus* sp.
Red Bluff Creek	
Red Bluff Creek, Site 7	Procambarus (Ortmannicus) ancylus
	Procambarus (Ortmannicus) chacei
Wambaw Creek	
UT Wambaw Creek, Site 44	Procambarus (Scapulicambarus) troglodyte
	Procambarus sp.

Table 13. Mussel Species Collected in 2003

Watershed/Stream	Site #	Species
Huger Creek		
UT Fox Gully	4	*Elliptio complanata* *Elliptio* sp.
Wadboo Swamp		
Cane Gully	1	*Elliptio* sp. *Uniomerus* sp.
Wadboo Swamp	22	*Uniomerus* sp.
Echaw Creek		
Gal Branch	34	*Elliptio* sp.
Wambaw Creek		
Keepers Creek	N/A	*Elliptio complanata* *Elliptio* sp. *Uniomerus* sp.

(2) PETS

(a) Plants

Forest Plan Objective O-13 states to "[M]aintain or expand existing proposed, endangered, threatened and sensitive (PETS)…"

Monitoring efforts since 2003 have focused on federally-listed species, including American chaffseed, pondberry and Canby's dropwort.

American chaffseed (pictured left) has declined on the forest since 2003. The total number of plants has declined from 1,244 in 2001 to 499 in 2008. This species is very dependent on frequent two-three year prescribed burns. Sites within the wildland-urban interface (WUI) have not been prescribed burned at the frequency needed to maintain or expand the population (for example in proximity to US Highway17 and US Highway 41).

Two new pondberry sites have been discovered on the forest since 2003. The pondberry populations at Honey Hill, once the largest on the forest, are slowing recovering in response to hand control of vegetation

completed by the Forest Service and the South Carolina Native Plant Society. A larger scale project has been proposed to thin and prescribed burn adjacent uplands at the Honey Hill site beginning in 2009.

One Canby's dropwort population occurs in a pond cypress savanna near US Highway 17 in McClellanville, an area that is difficult to prescribed burn. The population was comprised of ten plants in 1999 and one plant in 2006. The habitat has been described in the past as high quality (Gaddy, 2006). No additional populations have been located on the forest despite searches conducted both by Forest Service personnel, partners and contractors.

To date, the database of record for PETS plants has been the South Carolina Department of Natural Resources Heritage Trust database. Table 14 displays the number and status for PETS plants as of August 2008. Updated records and monitoring information not included in the database, such as records reported by Glitzenstein (2007a and 2007b) and Danaher (2007) were also incorporated into these summaries.

Table 14 summarize status and habitats for PETS plants.

Table 14. Proposed, Endangered, Threatened and Sensitive Plants – Status and Habitat

Common Name	Latin Name	Status	Habitat
American chaffseed	*Schwalbea americana*	Federally endangered; numerous sites comprising six geographically-distinct populations; three populations in WUI nearing extirpation. The total number of plants in decline from 1244 in 2001 to 499 in 2008	Frequently burned (every two-three years) upland pine woodlands
Canby's dropwort	*Oxypolis canbyi*	Federally endangered; one small population consisting of ten plants in 1999 and one plant in 2006 (Gaddy, 2006)	Pond cypress ponds and savannas
Pondberry	*Lindera melissifolia*	Federally endangered; 12 populations and numerous sites; no fruit production at any site in 2004 or 2008; Honey Hill population increasing following experimental canopy clearing in 2003 and 2004	Margin of limesinks, cypress-gum ponds and savannas
Incised groovebur	*Agrimonia incisa*	Sensitive; five sites	Pine and pine-oak woodlands

Carolina spleenwort	*Asplenium heteroresiliens*	Sensitive; two sites	Calcareous (marl) rocky slopes/ outcrops
Many-flowered grass-pink	*Calopogon multiflorus*	Sensitive; one site	Pine savannas and woodlands
Cypress-knee sedge	*Carex decomposita*	Sensitive; no sites	Blackwater swamp forests
Pondspice	*Litsea aestivalis*	Sensitive; 58 sites	Margin of limesink depressions and Carolina bays

Boykin's lobelia	*Lobelia boykinii*	Sensitive; nine sites	Pond cypress ponds and savannas
Loomis' loosestrife	*Lysimachia loomisii*	Sensitive; eight sites	Pine savannas and pocossins
Loose watermilfoil	*Myriophyllum laxum*	Sensitive; two sites	Limesink depressions
Climbing heath	*Pieris phyllyreifolia*	Sensitive; six sites	Swamp forests
Pineland plantain	*Plantago sparsifolia*	Sensitive; ten sites	Wet savannas and roadsides over calcareous substrates
Yellow fringeless orchid	*Platanthera integra*	Sensitive; ten sites	Pine savannas
Spiked medusa	*Pteroglossapsis ecristata*	Sensitive; 13 sites	Mesic pine woodlands
Awned meadow beauty	*Rhexia aristosa*	Sensitive; 27 sites	Clay-based Carolina bays; pine and pond cypress savannas
Shortbristle sedge	*Rhynchospora breviseta*	Sensitive; two sites	Wet savannas
Coastal beaksedge	*Rhynchospora pleiantha*	Sensitive; four sites	Margin of limesink depressions
Pineland dropseed	*Sporobolus curtisii*	Sensitive; six sites	Moist gummy-clay pine woodlands
Carolina dropseed	*Sporobolus pinetorum*	Sensitive; one site	Wet savannas and ecotones
Carolina fluffgrass	*Tridens carolinanus*	Sensitive; eight sites	Upland pine woodlands

(b) (b) Wildlife/Aquatic

No flatwoods salamanders have been detected on the forest since 2003. Monitoring of previously occupied flatwoods salamander ponds on the forest were conducted by Dr. Jullian Harrison prior to 2006. A comprehensive survey

plan and contract were awarded in 2006; however, exceptionally dry conditions have kept breeding ponds from filling adequately with water. This has prevented dip-netting for tadpoles which is the primary method for sampling for flatwoods salamander. The survey has been postponed each year since 2003.

The RCW population is expanding in areas and contracting in others due to the lack of prescribed fire in the WUI and lack of foraging and nesting habitat in the wake of Hugo. The species requires open pine understories for nesting and foraging.

Table 15 displays habitat and trends of PETS animals.

Table 15. Proposed, Endangered, Threatened and Sensitive Species – Habitat and Trends

Common Name	Status	Habitat
American alligator	Federally threatened (due to similarity to the crocodile); populations stable on the forest	A variety of freshwater and brackish habitats, including ponds, marshes, rivers, lakes, and swamps
Bachman's warbler	Federally endangered; last seen on the forest in 1963	Bottomland hardwood forests
Flatwoods salamander	Federally threatened; eleven breeding ponds of which only 4 have exhibited activity in the last 20 years; one flatwoods salamander larvae detected in 2003 and none in 2004	Pond cypress and swamp tupelo ponds and savannas
Red-cockaded Woodpecker	Federally endangered; 331 potential breeding groups	Pine and pine-oak woodlands
Shortnose sturgeon	Federally endangered; one fish caught and tagged in Santee River adjacent to National Forest land in 2002	Major rivers
West Indian manatee	Federally endangered; at least 19 documented citings in the Intracoastal waterway	Shallow coastal areas including rivers and estuaries
Wood stork	Federally endangered; birds forage on the forest but not known to nest here	Swamps, marshes and ponds
Bald eagle	Sensitive; six bald eagle nests known from the forest	Mature trees near seacoasts, rivers, large lakes, and other bodies of open water with abundant fish
Carolina gopher frog	Sensitive; six known breeding ponds on the forest	Isolated wetlands within xeric to mesic pine woodlands
Bachman's sparrow	Sensitive; abundant on the forest	Open pine and pine-oak woodlands
Migrant loggerhead shrike	Sensitive; migratory subspecies not confirmed but likely to occur on the forest	Natural and agricultural fields, fencerows, and rights-of-ways during migration and winter

Atlantic sturgeon	Sensitive; species detected in the Santee River	Major rivers
Rafinesque's big-eared bat	Sensitive; 2003 survey unsuccessful in locating bats	Forested areas, in buildings, hollow trees, crevices behind bark
Southeastern myotis	Sensitive; 2003 survey unsuccessful in locating bats	Hollow trees in floodplain forests, also found in man-made structures

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

(1) MIS

(a) Plants

Forest Plan Objective O-13 states to "[M]aintain or expand existing …management indicator species…"

All known records for awned meadow beauty and sweet pitcher plant occur in MA 26 where the goal is to restore, expand and maintain the longleaf pine ecosystem using frequent prescribed fires.

Maintenance of habitats for species associated with ephemeral wetlands, both from natural area reports (Porcher, 1982, 1991, 1993) and included as forest plan and project-level standards, include the maintenance of pond hydrology by emphasizing operations on sensitive soils only when soil conditions are dry and by placing limits on soil rutting.

Ephemeral wetlands are beginning to be mapped on the forest and an integrated effort is needed to map and describe desired conditions (including habitat for awned meadow beauty and sweet pitcher plant). Awned meadow beauty is a facultative wetland species that is somewhat generally restricted to Carolina Bays, and is primarily declining on other lands due to a loss of wetland habitat through hydrologic alteration and general destruction of habitat. The seed bank appears to be buffered from natural environmental variation and is relatively secure (Sutter and Boyer, 1994). Long-term monitoring of this seed banking species is needed to determine trends at the various sites.

(b) Wildlife

Bird point counts have been conducted since 1994 using methods described in Hamel et al. (*A Land Manager's Guide to Point Counts of Birds in the Southeast*, USDA Forest Service, GTR-120, 1996).

The following information is tied to specific monitoring questions in Appendix B of the forest plan.

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

The “bird population trends report” indicates that mean observations per count for pileated woodpeckers have slightly declined from the early 1990s on the Francis Marion National Forest. However, declines in the South Atlantic coastal plain generally have been negligible.

Prairie warblers, on the other hand, have increased in the South Atlantic coastal plain while mean observations on the forest show sharp declines.

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

The report indicates that mean observations per count have slightly declined from the early 1990s on the forest; however, declines in the South Atlantic coastal plain have been sharper.

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

Analysis of the data indicates that mean observations per count have sharply declined for quail since the early 1990s; however, declines in the South Atlantic coastal plain have not been as steep.

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

There is no information on amphibians other than PETS.

(c) Aquatic Community

Fish community monitoring was conducted in streams representative of ten small watersheds across the forest. These streams are primarily third order, wadeable streams. Monitoring was focused in streams inventoried in 1993 by Hansbarger and Dean (1994) when a total of 53 streams were sampled across the forest after Hurricane Hugo. Stream population monitoring efforts in 22 of these same streams were conducted in 2002-2004 and 2006. Two additional streams were surveyed in 2003 and 2004 that were not included in the 1993 stream inventory.

Hansbarger and Dean (1994) collected 35 fish species in 53 streams across the forest in 1993. Repeated sampling in 22 of those streams in 2002-2004 and 2006 produced 37 species. The same 22 streams in 1993 contained 29 species. Five species captured in 1993 were not present in those 22 streams sampled in 2002-2004 and 2006. However, one species, the common shiner, may have been misidentified in 1993 since its range does not extend into South Carolina. Nine species captured in 2002-2004 and again in 2006 were not

present in those 22 streams in 1993, although one of those species was represented from other 1993 sampled streams. A total of 39 species have been captured in 24 streams across the Francis Marion National Forest..

All species captured in 2002-2004 and 2006 were native to the Santee Cooper Drainage (Warren, et al., 2000), except for the banded killifish. In addition, the population status of these species is considered to be currently stable throughout all or a significant portion of their range. One native species, the ironcolor shiner, captured in 1993 (in seven of the 22 streams but not during 2002-2004 and 2006) is considered vulnerable. The vulnerable population status indicates that the species may become endangered or threatened by relatively minor disturbances to its habitat or that it deserves careful monitoring of its distribution and abundance to determine its status. Introduced species were present in the 1993 surveys in streams that were not surveyed in 2002-2004 and 2006.

American eel, a catadromous species, was captured in 12 out of the 22 streams sampled in 2002-2004 and 2006 as compared to only two streams out of 53 in 1993. However, this may be attributed to a more intense sampling design. Tagged American eel were recaptured in two streams in 2004.

Existing crayfish and mussel population conditions are unknown. Crayfish and mussels were collected in conjunction with the fish community monitoring in 2003.

Fifteen recreational fishing ponds on the forest total 44 acres. These ponds are managed primarily for largemouth bass and bream and population balance is monitored periodically. Catfish are stocked in three ponds. Grass carp were stocked in ponds in 2007 for aquatic plant control. Water quality is monitored on an annual basis to determine the need for lime or fertilizer applications.

Habitat inventory protocol was developed for coastal streams using basin-wide visual estimation technique (BVET) methods (Dollof, et. Al., 1993). Habitat inventory was attempted in 2003 and 2004. In 2003, dry conditions and, in 2004, swampy conditions, restricted inventories to short segments of streams. Four streams were inventoried in 2006. During those surveys and fish community surveys, it has been observed that large woody debris is lacking in third order coastal stream systems. Glides are the dominant habitat feature in these streams. Stream substrate is primarily sand with organic matter and silt as the subordinate substrate.

Existing population conditions of aquatic invertebrate (aquatic insects, mollusks, crayfish) populations in relationship to management activities and habitat conditions are unknown.

Inventories of benthic macroinvertebrate, crayfish and mollusk communities have not been conducted.

(2) PETS

(a) Plants

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

This monitoring item is tied directly to under-represented plant communities and PETS habitat. In 2004, 2,223 acres of maritime communities were mapped. Much of the habitat is of low quality (75 percent) because of past hurricane damage or conversion to loblolly pine on acquired lands (IP Wando Tract for example). Much of this area was drained, bedded and planted for tree farms. Remnant maritime vegetation consists of such species as live oaks and cabbage palmetto. The Wando-Ion Environmental Assessment and decision have emphasized favoring restoration of maritime habitat where possible given the limitations from past alterations to wetlands that has occurred.

(b) Wildlife

The forest is home to the third largest federally endangered RCW population and is one of 13 designated core recovery populations (RCW Recovery Plan, 2003). Hurricane Hugo killed 63 percent of the RCW population, destroyed 87 percent of the cavity trees and 59 percent of the foraging habitat across the forest.

Prior to Hugo, the RCW population was at 475 breeding groups and expanding. After the storm, and with installation of over 1,000 artificial tree cavities, the population was at 361 groups in 1995. In 1996, the population began a decline that continued through 1999 to 314 groups. The decline was attributed to lack of suitable cavities and increasing midstory vegetation due to lack of prescribed fire in some areas of the forest.

In the 2000 nesting season, this decline reversed and an increase in breeding groups became evident. Breeding groups continued to increase to 345 by 2004. Populations at 350 potential breeding groups are considered recovered by the RCW Recovery Plan (2003).

The RCW population declined modestly in 2004 from 363 active clusters to 351 in 2005. There were again 363 active clusters and 331 breeding groups in 2007.

A General Management Review (GMR) was conducted on the forest in 2007. One of the recommendations was “Consider moving ahead with a Forest Plan amendment to incorporate the new Red Cockaded Woodpecker Recovery Plan for the Francis Marion NF.” The amendment is needed to address new direction particularly as it relates to foraging habitat requirements as outlined in the RCW Recovery Plan (USFWS, 2003).

Quality foraging habitat in active and recruitment stands is defined as being located within 0.5 miles from the center of each cluster and includes the following desired conditions:

- Minimum basal area of all pines greater than or equal to 10" diameter at breast height (DBH) is 40 ft.^{2}, including 18 or more stems/acre greater than or equal to 60 years old and 20 ft.^{2} basal area greater than or equal to 14 DBH;

- Groundcovers of native bunchgrass or other native, fire-tolerant, fire-dependent herbs total 40 percent or more of the ground and mid-story plants are dense enough to carry growing season fire at least once every five years;

- Foraging habitat is not separated by more than 200 feet of non-foraging areas, including hardwood forest, cleared land, paved roadways, utility rights-of-ways and bodies of water;

- Regeneration patch size is limited to less than 40 acres;

- Hardwood midstory, if present, is sparse and less than seven feet high;

- For site index greater than or equal to 60, provide 120 acres of quality foraging habitat; for site index greater than 60, provide 200-300 acres of foraging habitat-with some exceptions

Inactive RCW clusters tend to be concentrated in the WUI and/or areas where minimal management, including lack of periodic prescribed burning, has allowed midstory growth to occur. Approximately 62 vacant clusters can be found on the forest, excluding recruitment sites. Of these, approximately 40 percent are located in or adjacent to pine stands less than ten years old. Adequate foraging habitat continues to be a recurring problem.

The following figures provide information on cluster trends, breeding groups and population response to artificial cavity installation.

Figure 6. Cluster Status and Trends

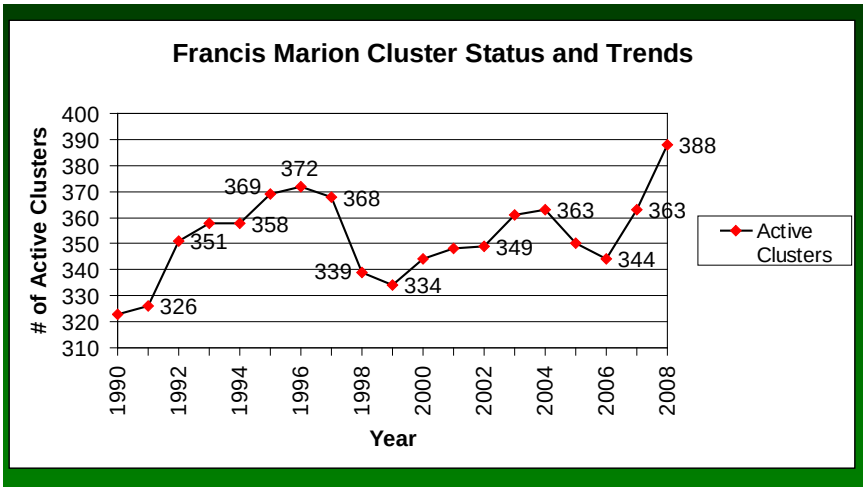


Figure 7. Potential Breeding Groups Status and Trends

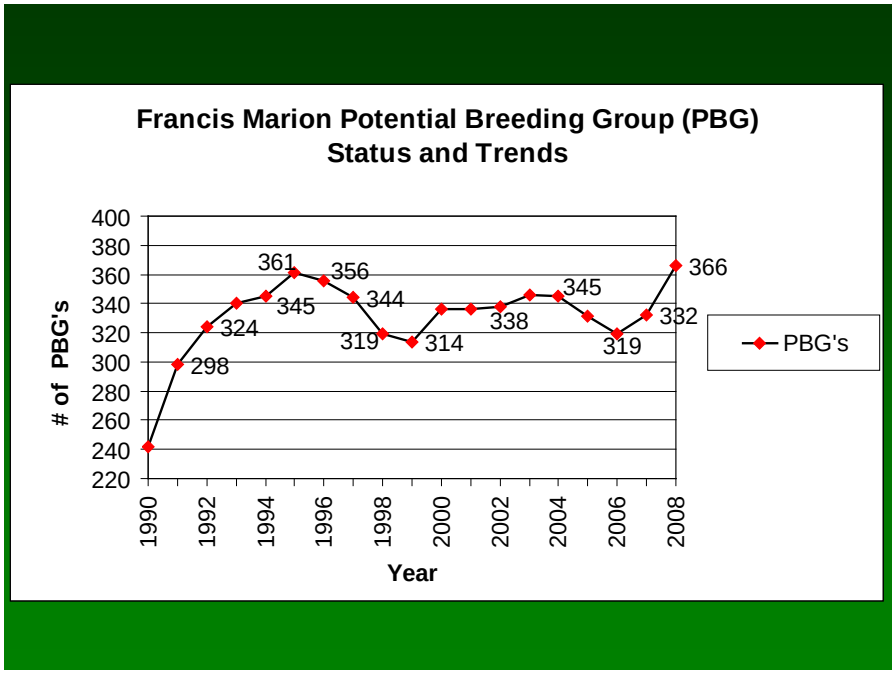
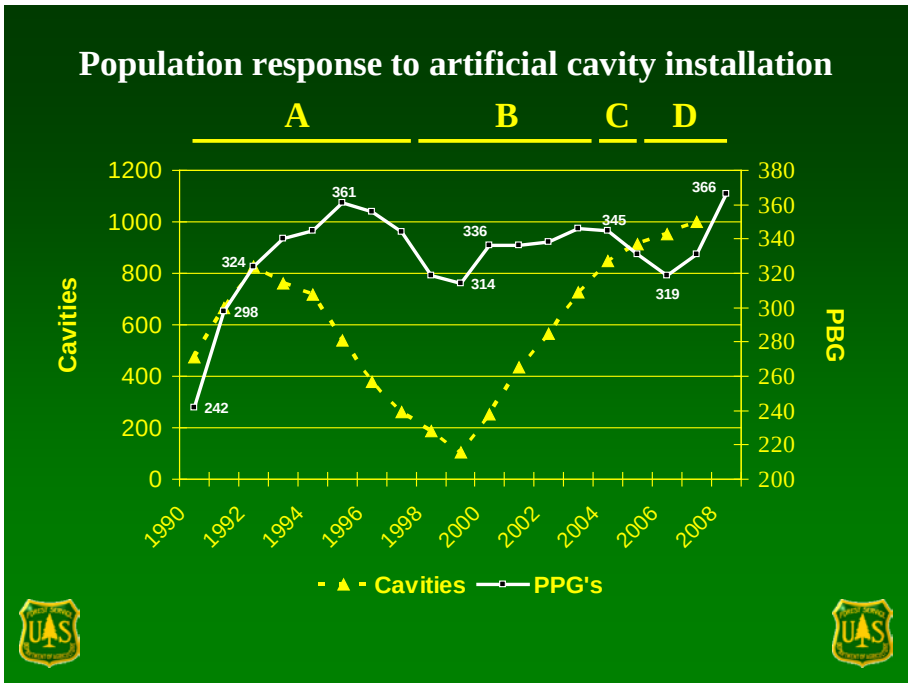


Figure 8. RCW Response to Artificial Cavity Installations



(b) Aquatic

Aquatic PETS habitats are adjacent to the Francis Marion National Forest and are not monitored by the Forest Service.

3. Soil and Water

a) Comparison of Existing Conditions/Trends to Desired Conditions

Soil impacts associated with past land uses include severe rutting, removal of nutrients (e.g., regular harvest of pine needles through illegal pine straw raking), and natural infertility associated with localized spodic[4] soils. These impacts generally occur locally and the full extent has not been documented. They are not necessarily associated with current land management practices and may be due to a legacy of past activities. Modifications to hydrologic functioning have occurred locally from roads, ditches, historic railroad trams, plantation rice culture and severe soil rutting from past logging activities.

Impacts to water are also associated with excessive levels of fecal coliform, methylation[5] of mercury due to sulphate reduction in wetlands, seasonally low oxygen with high stream temperatures, and elevated salinity impacts due to alteration of natural river flows from hydroelectric dams.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

Past monitoring and evaluation reports relative to soil and water resources have identified impacts from:

- ✓ ATVs,
- ✓ Horses,
- ✓ Hydraulic fluid and other hazardous material leaks and spills,
- ✓ Saltwater inundation reaching Wambaw Creek Wilderness and vicinity,
- ✓ Elevated fecal coliform in coastal waters; and
- ✓ Altered hydrology from past activities including roads, logging, bedding, farming, rice management, development and storm damage abatement.

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[4] Spodic soils refer to a diagnostic subsurface horizon defined by the illuvial accumulation of organic matter.

[5] Methylmercury is produced from inorganic mercury by methylation, a microbial process that is controlled by certain bacteria and enhanced by chemical and environmental variables, such as the presence of wetlands, sulfate, organic matter and oxygen. This form is highly toxic to the nervous system. More than 95 percent of all mercury in fish is methylmercury; this form of mercury biomagnifies to high concentrations at the top of food chains (Wiener et. al, 2002).

Annual monitoring was conducted on timber sales and prescribed burn blocks to determine soil and water impacts and to evaluate effectiveness of project-specific mitigation measures, BMPs and forest plan standards and guidelines. Areas were selected either randomly or because there was some special soil or water interest in that area.

Biomass and first thinnings, wildfire suppression and prescribed burning operations were monitored on the forest using procedures developed for assessing implementation of forest plan standards and guidelines for protection of water quality (BMPs). Reviews were primarily conducted by the soil and water staff and district timber staff or sale administrators. Occasionally, additional BMP checks were conducted by the South Carolina Forestry Commission in cooperation with the Forest Service. The BMP checks included both planned and unplanned visits. Overall, district personnel did an excellent job of implementing plan standards and guidelines. In addition, the following specific observations were made on some of the study sites[6]:

- ✓ Equipment was used only during dry conditions with little or no evidence of rutting or compaction.
- ✓ Streamside zones were correctly implemented on most streams.
- ✓ Prescribed fire and site preparation burns had a good cover of ground litter left thus minimizing potential soil loss.
- ✓ Use of existing fire barriers (roads, streams and wetlands) minimized the need for dozer constructed firelines thus reducing the potential for soil and water impacts.
- ✓ Firelines and water-bars were properly constructed, especially along private land boundaries.
- ✓ Bladed firelines, as opposed to plowed firelines[7], were constructed on prescribed burn areas thus greatly reducing soil disturbance and the potential for erosion and changes in hydrology.
- ✓ BMPs were effectively used (as rated on BMP scorecards) on most of the timber harvest units examined. No signs of sedimentation occurred on most units.
- ✓ There were some concerns on one area relative to hydraulic fluid leakage that required additional mitigation measures.

Rarely were standards and guidelines not followed nor was there evidence of unusual soil movement or sedimentation. In those cases, direction was provided to the districts for any mitigation or corrective action.

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[6] It should be noted that some of the sites were “problem sites” that had been previously identified by district personnel.

[7] Plowed firelines create a trench that concentrates water flow and increases the potential for soil erosion and hydrologic modification. Water will flow down the fireline and cannot be easily dispersed before it reaches a stream channel. This can lead to erosion and sedimentation of streams. Bladed firelines scrape the surface and have a much lower effect on the hydrology.

Regrowth of vegetation on constructed and reconstructed firelines was very good. Firelines were “contoured” which allowed runoff to flow off the fireline reducing soil erosion. Added measures to prevent illegal ATV use of skid roads and firelines included signing and monitoring (including the use of law enforcement). The new road and trail regulations have made it clear that “unless designated, the area is closed.”

Field reviews of selected prescribed burning activities indicate that standards and guidelines were implemented correctly. Minute amounts of sediment were observed to have been delivered to streams where equipment encroached upon or in a couple of instances, crossed wetlands or small streams.

An agreement with the Southern Research Station and College of Charleston has helped collect information and document the effects of prescribed fire, biomass and first thinning treatments on erosion, sediment, nutrients, water yield and vegetation change. In addition, added measures to correlate water tables and soil moistures for some common soil types are being used to help establish criteria which will help in the future to limit the potential for rutting and other effects from heavy equipment use.

Borrow pit restoration was performed on several sites to repair damage by off road vehicles and restore the soil and hydrology. In several instances, culvert installations were recommended along roads where reconstruction activities were occurring. Soil and water specialists made recommendations and direct contacts with site inspectors to address several South Carolina Department of Transportation (SC DOT) bridge installation sites where BMPs were inconsistent with requirements. In one instance, sediment was being delivered to a wilderness wetland area.

Field review following suppression efforts have indicated little damage to soils caused by wildfires. Fireline construction during suppression efforts has greater potential for impacts. Severe wildfires in the Little Hellhole Bay area were likely a result of drainage modification that occurred on the adjacent private lands. It is likely that the water table was lowered on the forest and contributed to the dry conditions and more severe fire intensity. In the future, we need to be aware of adjacent drainage and mining activities that drain off large quantities of water. These activities can lower groundwater levels, change plant and animal communities, and increase fire hazards.

Several flowing artesian wells on the forest should be considered for regulating the flow releases with a spigot to preserve groundwater levels. These wells have a very critical purpose for local individuals and the community during severe storm or evacuation events when safe drinking water may not be readily available. These are important features.

Intermittent water quality monitoring has been conducted on Wambaw, Turkey and Awendaw creeks and their connectivity to areas dominated by wetland ecosystems. The water monitoring report for these creeks (Plewa and Hansen, 2003) identified fecal coliform, salinity (Wambaw Creek) and methylmercury contamination in fish (Plewa, 2003) as concerns.

Reductions in flow from storage of water in Lake Marion, diversion to Lake Moultrie and the Cooper River, increased evaporation of water in shallow lakes probably contribute to the variability in downstream flows and likely account for greater tidal influences. Ocean saltwater is approximately 35 percent salt. In slightly less than two

months, the highest reading of salinity was 2.5 probable salinity units, or approximately 2.5 percent salt, which occurred on 8/4/08 at 1 a.m.. Salinity increases extend a substantial distance up the Santee River and the lower tributaries.

Equestrian use can sometimes develop issues with localized rutting, erosion and sediment. Most of the trails were located and are maintained sufficiently to limit effects. User created trails can be an issue because they are not located and reviewed with the intent to limit effects to plant and animal habitats, soil, water and cultural resources.

4. Riparian Habitats (Floodplains, Wetlands, Stream Corridors)

a) Comparison of Existing Conditions/Trends to Desired Conditions

The existing conditions relative to riparian habitats (pictured left) have been improving in general, but still reflect past land use history that led to degraded conditions. In general, forest activities have had little impact because most activities avoid, limit or mitigate impacts to riparian areas.

An increasing knowledge base is developing on the importance of isolated ephemeral wetlands as critical habitat for some PETS species including the flatwoods salamander and pondberry. Improved identification and delineation of specific wetland types will help address both specific and general management questions that are needed to determine their importance, limits and priority for management and protection.

Illegal off-trail ATV use, especially during wet weather, has adversely impacted wetland areas, soils (rutting, displacement), sensitive plant and animal habitats, archaeology sites, ground water and water quality. The adverse effects of increasing illegal off-trail ATV use within wetland and riparian habitats were not fully anticipated when the forest plan was developed. Some of this is brought on by area growth and popularity of the activity. The district has held informational sessions with user groups, used various means of increasing maintenance frequency, added various measures to help stabilize conditions and cited users where appropriate. Impacts to ATV trails and adjacent areas have been reduced with seasonal and wet period closures. The construction of 6,000 feet of barrier fencing, completed in 2007-08, blocked off access to wetland areas and off-trail use to 12 vernal ponds adjacent to the Wambaw Cycle Trail. User fees, grants from South Carolina Parks, Recreation and Tourism and SCDOT are helping offset the high maintenance costs.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

Management activities generally occur during dry periods on more sensitive soils to limit impacts from rutting and compaction. In most instances, persistent wetlands and streams are buffered from activity and avoided. Sometimes this repeated avoidance has raised concerns about the lack of management and the potential for long term adverse impacts to sustainable riparian resource values and vegetation diversity. For example, encroachment of pine during dry periods into isolated wetlands tends to remove more water than the native grasses, forbs and hardwoods. This results in the reduction in the loss of surface water through transpiration and may also lower the seasonal water table. Wildland fires during dry periods would typically remove the pine from these areas. Without some management, it takes severe wildfires to remove the vegetation and consume organic accumulations to return them to their early successional role as isolated wetlands. Lack of a mechanism to remove pine manually or mechanically eventually results in a loss of habitat as these ecological systems successionally move toward a pine/hardwood dominated system, rather than savanna habitat (pictured left), dominated by grasses and forbs.

5. Insects and Disease

a) Comparison of Existing Conditions/Trends to Desired Conditions

The desired condition in the forest plan discusses the use of integrated pest management and the incidence of fusiform rust. Fusiform rust on the forest is generally at low levels. Southern pine beetle populations have generally been low through most of the plan period. However, in 2008 southern pine beetle numbers were beginning to increase. Pest populations are cyclical and often a result of host species conditions. The dense conditions of tens of thousands of acres of young pine stands make them very susceptible to southern pine beetle attack.

Integrated pest management is evident with forest emphasis on both biomass and first thinnings to reduce susceptibility to southern pine beetle, managing mixed species stands, and managing for hardwoods on wetter sites.

One disease not mentioned in the forest plan is laurel wilt, a new disease of redbay (*Persea borbonia*) and other plant species in the family Lauraceae. Quoting from the South Carolina Forestry Commission Web site: “It is causing widespread mortality in the coastal regions of South Carolina, Georgia and Florida.” The disease is caused by a fungus (*Raffaelea* species) that is introduced into trees by an exotic insect, the redbay ambrosia beetle (*Xyleborus glabratus*), which is native to Asia and is the 12th new species of ambrosia beetle introduced into the U.S. since 1990. The disease has also been discovered in individual plants of the federally endangered pondberry (*Lindera melissifolia*), the threatened pondspice (*Litsea aestivalis*), sassafras (*Sassafras albidum*) and avocado (*Persea americana*). This disease appears destined to eliminate redbay from the forest as well as throughout the rest of its range. For more information on this disease, please refer to the South Carolina Forestry Commission Web site at http://www.state.sc.us/forest/.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

Annual monitoring reports have noted pest populations at very low levels with the exception of southern pine beetle in 2002.

6. Wildland Fire/Fuels

a) Comparison of Existing Conditions/Trends to Desired Conditions

(a) Wildland Fire Preparedness

The resources at hand (equipment, personnel and leadership) to control wildfire at this time are less than the Most Efficient Level indicated by the National Fire Management Analysis System outputs.

(b) Prescribed Fire/Fuels

Prescribed fire treatment targets varied by year from 31,598 to 44,280 acres. The prescribed fire accomplishments were between 79-108 percent of the targets. These targets include treatments for hazard fuels reduction, wildlife and PETS habitat improvement, and timber stand improvement. The most acres were burned in FY03 with 40,694 acres treated due to favorable weather conditions that allowed 22,580 acres to be burned during the growing season (April-September).

Table 16. Prescribed Fire Accomplishments by Fiscal Year and Season - Acres

FY	Acres (Dormant Season)	Acres (Growing Season)	Total Acres
2003	18,114	22,580	40,694
2004	23,688	9,184	32,872
2005	23,567	12,542	36,109
2006	19,521	11,409	30,930
2007	25,012	10,501	35,513

During FY03-FY07, 176,117 acres were treated with prescribed fire which is 94 percent of the total target of 187,822 acres. The growing season target is 16,000 acres annually. Growing season prescribed burning averaged 13,243 acres per year with a range from 9,184 to 22,580 acres. The growing season burning in the longleaf type forests continues to improve as more acres are conditioned to receive treatment.

Many variables influence the forest's ability to meet the current prescribed fire goals. The fluctuation in year-to-year accomplishments is mainly attributed to weather constraints and smoke management restrictions. The expanding WUI and its associated fire suppression costs also limit burning opportunities. At times, budget constraints also limit the availability of personnel and equipment.

The desired condition for the forest is to maintain fire adapted ecosystems using a fire return interval of once every three years. The total area that would benefit from fire is approximately 160,000 acres. The current levels of treating 30,000-40,000 acres per year falls short of the 53,000 acres needed**.** Fire is critical to restoring and maintaining RCW habitat and fire-dependent communities, thus strategies to increase the number of acres burned annually are needed. Rising operational costs coupled with flat budgets will put even more stress on an organization that is already extremely efficient.

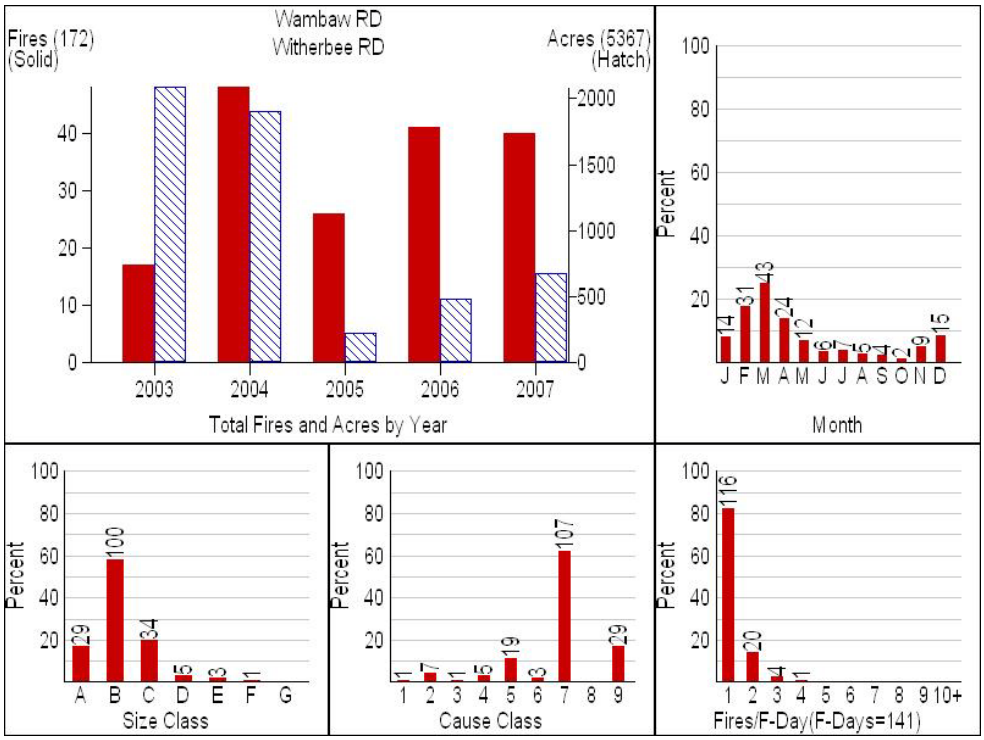
b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

(a) Wildland Fire Preparedness

Wildland fire preparedness was still below the most efficient level. As a result, wildland fire losses were not being minimized due to the funding shortfall. The forest still could not fill vacant positions in order to provide seven-day coverage, staff for multi-fire days, and provide an on going prevention program.

Shortages of fire fighting 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 at the 100 percent efficiency level and staff accordingly.

Figure 9. Displays Fire Occurrence Data 2003 - 2007



Size Class
A=0.0 to 0.25 ac; B=0.26 to 9.9 ac; C= 10.0 to 99.9 ac; D= 100.0 to 299.9 ac; E= 300.0 to 999.9 ac.

Cause Class
1=Lighting, 2=Equipment, 3=Smoking, 4=Campfire, 5=Debris Burning, 6=Railroad, 7=Arson, 8=Children, 9=Miscellaneous

Fires in the 0.1-10 acre size class account for 75 percent of the workload and are contained during the initial attack. The remaining 25 percent are in the ten plus acre size and require an extended attack, are more costly [suppression costs+ net value change (NVC)], and tie-up resources in holding and mopping up. The larger fires also cause smoke hazard mitigation issues for both highway visibility and public health concerns. The largest fire of 1,834 acres occurred in 2003. The number of fires and acres burned is down from the previous five years mainly due to a decrease in arson caused fires.

Table 17. Number of Wildfires and Acres Burned

Years	Number of fires	Acres Burned
1998-2002	623	11,796
2003-2007	172	5,367

(b) Prescribed Fire

Are sufficient longleaf pine management type acres being burned on a two-four year growing season burn cycle to achieve objectives?

The forest was not able to meet the growing season goal except in 2003. From 2004-2007 the Southeast was in a continuing drought which led to dry spring conditions severely limiting the number of days available to burn. The growing season prescribed burning in the longleaf type continues to improve and move toward meeting Objective 5.

Prescribed burning in the last five years within the RCW Habitat MA[8] (HMA) remained constant at 50 percent. This trend needs to continue since the forest is still below requirements for a prescribed burning cycle of two-five years.

The trend for prescribed burning longleaf pine forest types is consistent at 60 percent for the period. 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 30 percent of MA-26 in the last three years. This reflects minor short term changes based on fuels and weather conditions. The intent is to remain on a two-three year cycle in MA-26 with 50 percent of the area being burned over a three year period.

The information for determining the percent of acres burned in the RCW HMA and longleaf pine forests are estimates provided by district personnel. A more accurate monitoring assessment could be done if the RCW layer was available in the forest's GIS database. The current forest type layer was derived from Continuous Inventory of Stand Conditions (CISC) data and also needs to be updated to provide a more accurate assessment.

Table 18 depicts the amount of burning that has taken place over the last five years on the forest by MA. MA 26 has the greatest potential to restore longleaf pine ecosystems. A number of factors previously described have limited the amount of area that can be prescribed burn on a periodic basis. All MAs are developing a dual set of vegetation conditions relative to the frequency of prescribed fire occurrence. This has implications both for fire use to achieve management objectives relative to hazardous fuel accumulations across the forest and in the WUI, smoke management, PETS habitat, timber management, and development and maintenance of successional stages.

[8] HMA are no longer used in the Revised RCW Recovery Plan.

Table 18. Approximate Percentage of MAs Prescribed Burned from 2003-2007 – "Core Burn Area"

MA Number	MA Description	Allocated MA (Acres)	Percent MA Prescribed Burned
1	Seed Orchard and Progeny Test Areas	719	11
2	Wilderness	13,812	31
4	Santee Experimental Forest and RNAs	6,076	30
8	Special Areas	6,473	3
26	Sandy Ridges and Sideslopes	112,963	57
27	Loamy Ridges, Flats and River/Creek Bottoms	27,324	30
28	Flatwoods and loamy Ridges	63,523	51
29	Swamps and Swampy Flats	20, 815	71
-	**All Areas**	**251,705**	**50**

7. Air Quality

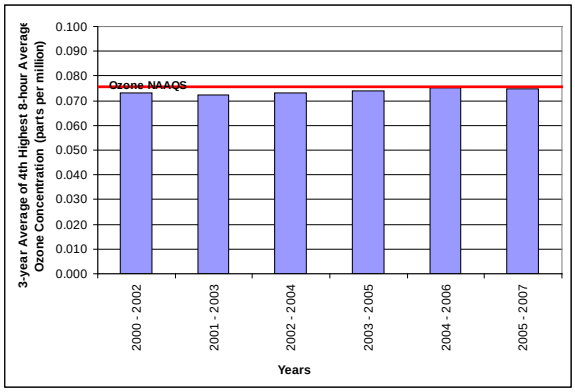
a) Comparison of Existing Conditions/Trends to Desired Conditions

1. What is the status and trend of ground-level ozone concentrations on the Francis Marion National Forest?

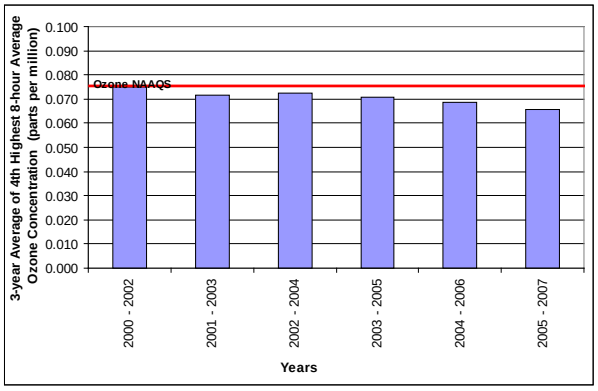
   Recently, the ozone National Ambient Air Quality Standard (NAAQS) was lowered to 0.075 parts per million. This analysis has used the 2000 -2007 ambient ozone monitoring data (Figure 10). The data from two ambient ozone monitors (Charleston and Berkeley County) show the ozone NAAQS has not been exceeded, and negative impacts to the health of vegetation sensitive to ground-level ozone are unlikely to be occurring. Furthermore, the trend in ozone concentrations at the Berkeley County monitoring site appears to be decreasing, while ozone concentrations at the Charleston County site have increased to just below the NAAQS.

Figure 10. Ambient Ozone Results in Comparison to the National Ambient Air Quality Standards for Charleston and Berkeley Counties

Charleston County



Berkeley County



Charleston Site ID: 450190046/Berkeley Site ID: 450150002

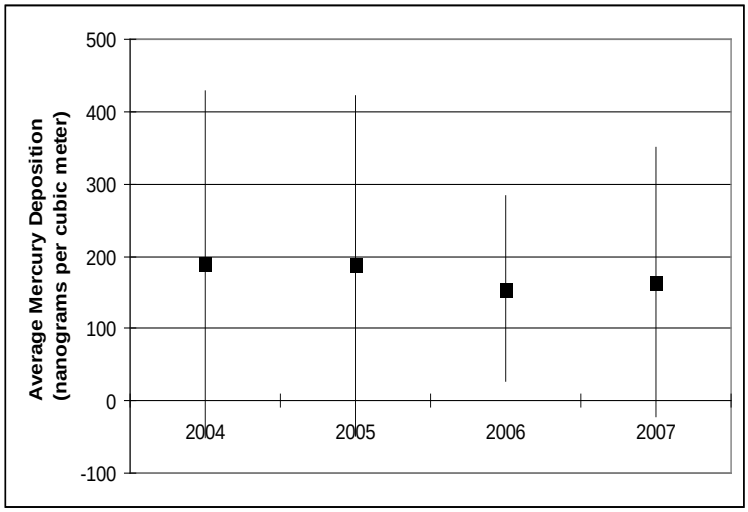
2. What is the status and trend of mercury, sulfur and total nitrogen deposition on the Francis Marion National Forest?

   The chemical transformation in the atmosphere of air pollution released from the combustion of fossil fuels (coal, oil and gas), and fertilizers and livestock production can have unacceptable impacts to terrestrial and aquatic resources. The primary air pollutants (besides ground-level ozone) of concern that are deposited from the atmosphere are sulfur, nitrogen compounds and mercury. Sulfur deposition from the atmosphere may have indirect impacts, while mercury can have direct impacts to aquatic biota, wildlife species and humans. Both mercury and the precursors to sulfur deposition are released from the combustion of coal and other industrial processes. Furthermore, mercury can be re-released into the atmosphere during prescribed and wildfires from the burning of mercury contaminated vegetation, and forest floor litter and duff. Certain bacteria play an important role by processing (consuming) sulfate compounds (from the sulfur deposition) in the environment and these same bacteria can take up mercury in its inorganic form and convert it to methylmercury through metabolic processes. The formation of methylmercury is important because its toxicity is greater than inorganic mercury; organisms that have consumed methylmercury require a considerable amount of time to eliminate it from their systems. Bacteria that consume sulfur are commonly found in wetlands, which are abundant on the forest. Therefore, the amount of sulfur deposition from the atmosphere has an influence on sulfur consuming bacteria populations and hence the amount of methylmercury in the food web.

   The bacteria containing the methylmercury may be consumed by another organism in the food web and/or the bacteria may excrete the methylmercury into the water where it is adsorbed to plankton, which are then consumed by other organisms. The level of methylmercury can be greatest in higher trophic level organisms because they accumulate methylmercury faster than they eliminate it from their bodies. Thus it is possible for potentially harmful concentrations to be found in fish, fish-eating wildlife and people. The South Carolina Department of Health and Environmental Control (SC DHEC) have posted fish consumption advisories for some fish species contaminated by methylmercury in the Cooper and Santee Rivers that border the national forest.

   Mercury deposition monitoring data (March 2004-August 2007) have been collected at Cape Romain National Wildlife Refuge (NWR), which is adjacent to the forest. Figure 11 shows the annual average (boxes) is decreasing, but the standard deviations (lines) are too large for the trend to be considered significant. The yearly average mercury deposition was between 155 and 189 (sample range was 0 to 1,061) nanograms per cubic meter.

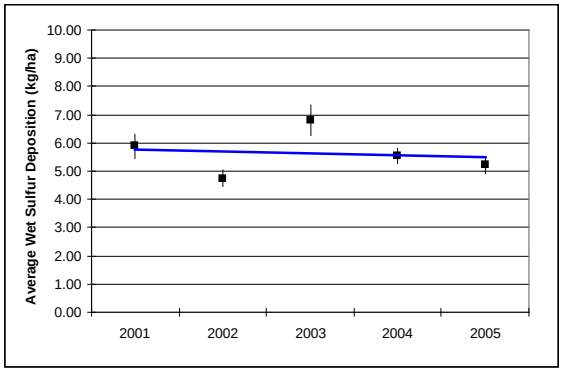
Figure 11. Average Mercury Deposition at Cape Romain NWR

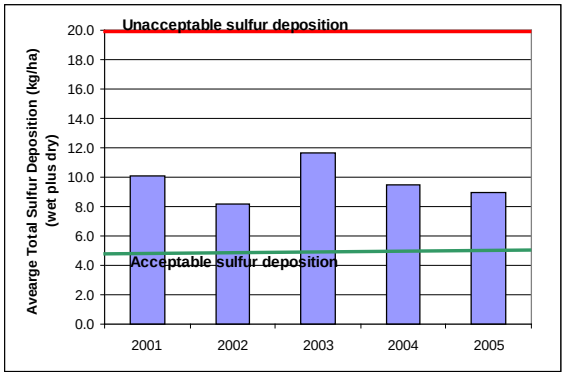


The lines show the range in standard deviation of the means.

Sulfur can be deposited from the atmosphere in wet (rainfall or snow), dry (seen as haze) or clouds/fog forms. A monitoring network does collect wet sulfur deposition and these data were mathematically extrapolated using elevation and precipitation data across a region which included the forest (Figure 12, left). There are probably only minor contributions to total sulfur deposition from clouds/fog, so the total deposition (Figure 12, right) is based upon estimates of the wet and dry components of sulfur deposition. Estimates of the wet and dry deposition were obtained from 2002 regional atmospheric dispersion modeling results and these were used to compute the ratio of total to wet sulfur deposition, which were then applied to the wet monitoring extrapolation results for each of the five years.

Figure 12. Annual Average Wet Sulfur Deposition (left) and Estimates of the Total Sulfur Deposition (right)





The black lines for the average wet sulfur deposition show the range in standard deviation of the means, and the units of sulfur deposition are kilograms per hectare (kg/ha).

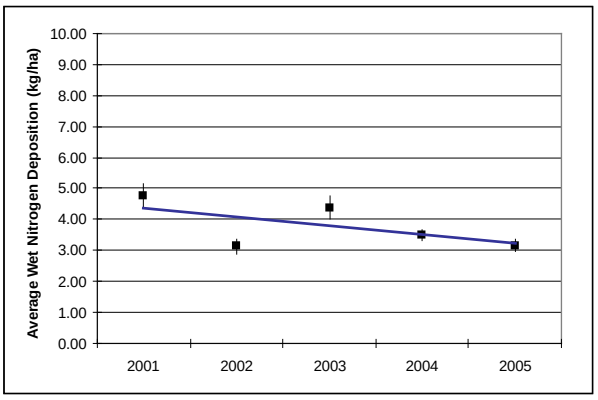
Between 2001 and 2005 the annual average precipitation on the forest ranged between 46 and 66 inches, and the annual average wet sulfur deposition decreased from 5.9 to 5.2 kilograms per hectare (Figure 12, left). The estimated

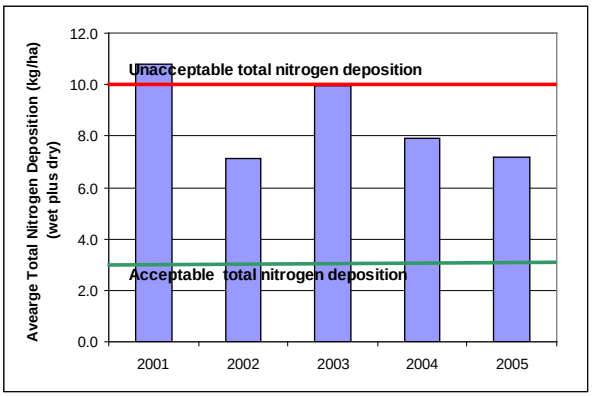
total sulfur deposition (Figure 12, right) was above a level (green line) considered acceptable and below a deposition value that is considered unacceptable (red line). The average total sulfur deposition estimates indicate more resource information needs to be collected before determining if resources are being adversely affected by sulfur deposition. However, the SC DHEC fish consumption advisories indicate sulfur deposition has been sufficient to maintain bacteria populations that are able to produce methylmercury, which accumulates in some fish species.

Excessive nitrogen deposition from the atmosphere can contribute to eutrophication of lakes, streams and estuaries. Most of the nitrogen deposition originates from ammonia fertilization to agricultural fields, ammonia released from raising livestock, and/or the conversion of atmospheric nitrogen gas into nitrogen oxides during combustion at high temperatures (such as in vehicles and coal-fired boilers). The nitrogen deposited is added to the nutrient pollution released from other sources (such as sewage effluent and run-off from fertilization). Eutrophication of an aquatic system can result in excessive plant growth and decay, increase the abundance of certain “weedy” species, and cause severe reductions in water quality. In aquatic environments, eutrophication enhances the growth of choking aquatic vegetation or algae (phytoplankton) that disrupts the normal functioning of an ecosystem, and causes a lack of oxygen in the water needed for fish and other aquatic biota to survive.

Wet deposition and total (wet plus dry) nitrogen estimates were obtained in the same manner as noted above for sulfur deposition. The average wet nitrogen deposition has decreased between 2001 and 2005 (4.8 to 3.1 kilograms per hectare (Figure 13, left)); the total nitrogen deposition from the atmosphere was above a level (green line) considered acceptable all years and below a deposition value that is considered unacceptable (red line) for four out of five years (Figure 12, right).

Figure 13. Annual Average Wet Nitrogen Deposition (left) and Estimates of the Total Nitrogen Deposition (right)





The black lines for the average wet nitrogen deposition show the range in standard deviation of the means, and the units of nitrogen deposition are kilograms per hectare (kg/ha).

3. What is the status and a trend of fine particulate emissions from prescribed fires ignited on the Francis Marion National Forest and is there any relationship with fine particulates monitoring results used to determine if a location is attaining the NAAQS?

   Between 2003 and 2007, prescribed fires were used to treat between 30,930 and 40,694 acres; and the associated fine particulate matter (PM2.5) emissions were between 1,089 and 1,432 tons annually. It should be noted there are large uncertainties in the PM2.5 emissions estimates because field measurements of fuel loading are not obtained prior to each prescribed fire. If field estimates of fuel loading were obtained, then this data, along with fuel moistures (on the day of the prescribed fire was conducted), can be used in a fuel consumption model to provide good estimates of the emissions of fine particulates.

   Figure 14 shows the rolling three-year average of acres treated and fine particulate matter emissions. At these emissions levels both the ambient 24-hour average (Figure 15) and annual average (Figure 16) have not exceeded the PM2.5 NAAQS at two urban monitoring sites near the forest. Furthermore, there does not appear to be a relationship between emissions of particulate matter from prescribed fires (Figure 14), and the amount of fine particulates measured at the urban monitoring sites (Figures 15 and 16).

Figure 14. Three Year Average Estimate of Acres Burned Using Prescribed Fire and the Three Year Average Emissions of Fine Particulates
(Tons)

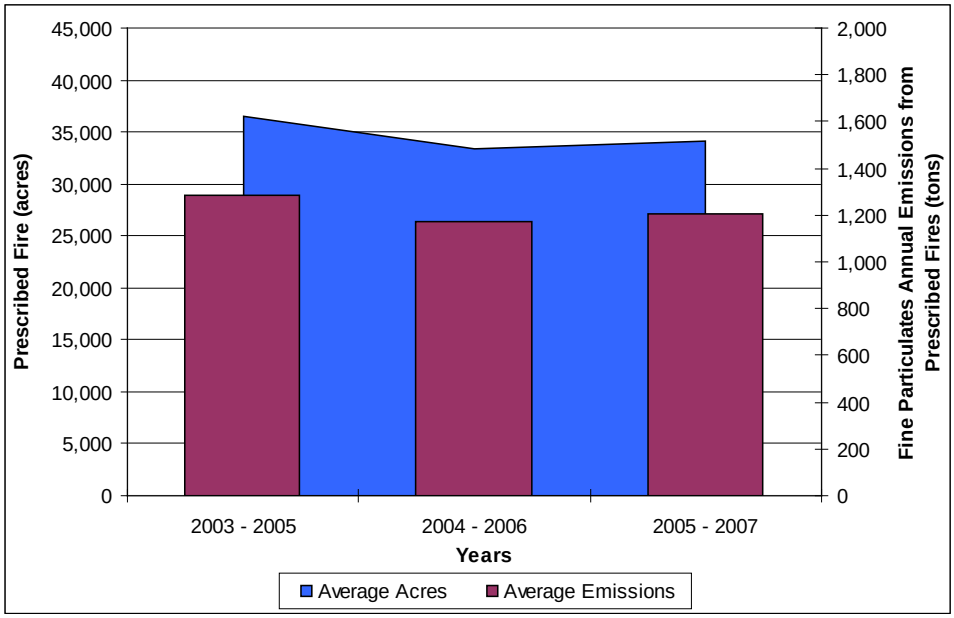
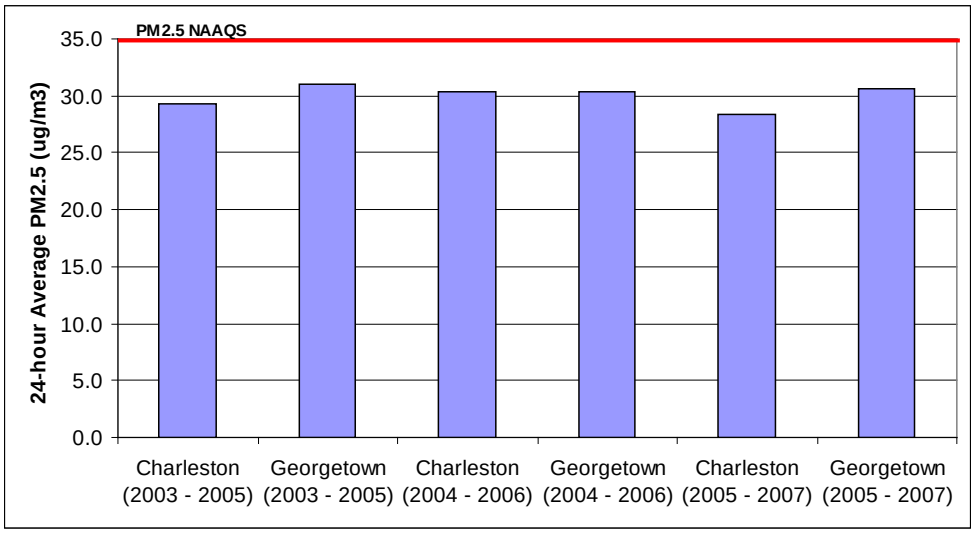
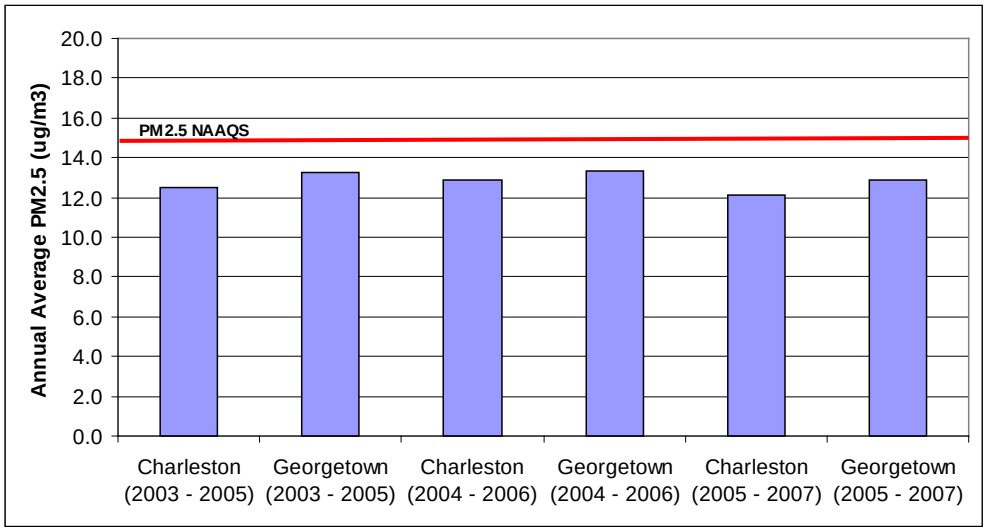


Figure 15. Twenty Four Hour Average* Fine Particulate Matter Concentrations at the Charleston and Georgetown Monitoring Sites



* 3-year average of the 98th percentile

Figure 16. Annual Average Fine Particulate Matter Concentrations at the Charleston and Georgetown Monitoring Sites



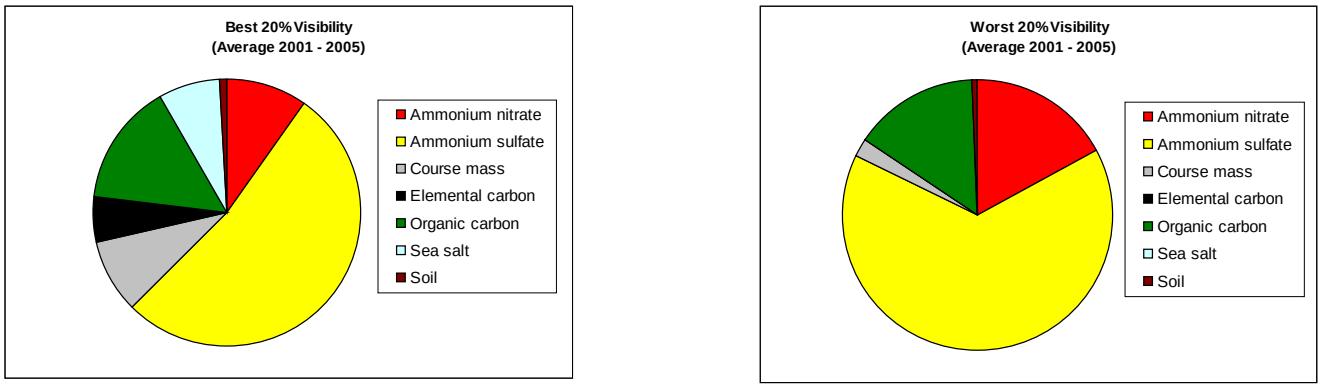
* 3-year average of the 98th percentile)

4. What is the status and trend of visibility at Cape Romain NWR and are prescribed fire emissions from the forest inhibiting the NWR from making reasonable progress in visibility improvement?

   The Cape Romain NWR is a federally mandated Class I area, and it is a national goal to attain natural background visibility by the year 2064. The federal Regional Haze Rule has determined that monitoring results need to have a calculated visibility haze index (called “Deciview”, or dv) of 12.21 dv by 2064, and visibility on the best days will not degrade. Visibility is monitored by measuring speciated fine particulate matter at Cape Romain NWR. On days

classified as having the best visibility, the haze index average (2000 – 2004) was 14.29 dv; while days classified as having the worst visibility had a value of 26.48 dv. Fine particles (PM2.5) are the primary contributor to visibility impairment and ammonium sulfates are the primary fine particle species causing the visibility impairment on the days classified with the best and worst visibility conditions; organic carbon compounds are the second most important species (Figure 17). An analysis conducted by the Visibility Improvement – State and Tribal Association of the Southeast (VISTAS) noted that wildland fires are a significant contributor to the organic carbon mass on a few days during the monitoring period of 2000 – 2004.

Figure 17. Percentage of Light Extinction Contributed by Visibility Impairing Aerosol Compound at Cape Romain NWR



The VISTAS has conducted additional studies at Cape Romain NWR to understand what sources of air pollution may be contributing to the organic carbon fine particles. The preliminary results indicate during fall and winter, emissions from vegetation burning are a significant contributor to organic carbons. The authors of the preliminary report have suggested that this is the same time period when prescribed fires are greatest and they may be a significant contributor to the portion attributed to vegetation burning. However, it should be noted that this research conducted by VISTAS is only an initial study and further studies addressing sources contributing to organic and elemental carbon will continue in the future.

The VISTAS has also conducted extensive atmospheric dispersion modeling of all types of air pollution sources (coal-fired boilers, vehicles, biogenic sources, etc.) in the region. Modeling was conducted first for “typical” emissions using 2002 meteorology; new emissions estimates were provided for 2018. Emissions from prescribed fires (estimated for 30,409 acres) were included for the forest for 2002 and then increased to represent prescribed fires on 45,000 acres. The SC DHEC concluded (using the VISTAS analysis) in their Regional Haze State Implementation Plan that: 1) large uncertainties in the prescribed fire emissions estimates can be found due to lack of field observations of fuel loading; and 2) despite the uncertainties in prescribed fire emission estimates it appears that prescribed fires are not a significant contributor to visibility impairment at Cape Romain NWR. Therefore, at this time, the prescribed fire emissions from the

Francis Marion National Forest are not inhibiting the Cape Romain NWR from making reasonable progress in improving visibility.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

There have been no management reviews of the Air program in the Region.

C. Social and Economic

1. Recreation

a) Comparison of Existing Conditions/Trends to Desired Conditions

(1) Dispersed Recreation

The Francis Marion National Forest has a large variety of dispersed recreation including hunting, fishing, primitive camping, non-consumptive wildlife uses (wildlife and fish viewing and photography) and 160 miles of trails and facilities. Use continues to increase for dispersed recreation activities and the forest is trying to accommodate this need. This trend has not changed since the plan period began.

Trails

The forest has several types of trails including equestrian, off-highway-vehicle (OHV), hiking/mountain bike, water and interpretive. Table 19 displays the current breakdown of trail types on the Francis Marion National Forest.

Table 19. Trails by Type

Trail Type	Miles
Hiking Trail*	64
Canoe/Kayak	26
Equestrian*	31
OHV*	39
Total	160

*Mountain bikes are compatible on over 120 miles of the above trails.

The Awendaw Passage of the Palmetto Trail (new trailhead pictured left) was developed for mountain biking and hiking on an interstate trail system (42 miles in length) that traverses the state from the ocean to the mountains. It connects Buckhall Recreation Area with the Swamp Fox Passage of the Palmetto Trail and receives moderate use in winter, spring and fall.

In addition, the forest has the largest public OHV facility in South Carolina: the 39 mile Wambaw Cycle Trail. The forest is closed to motorized riding except on this designated trail system. OHV use has increased at a higher rate than expected over the last five years.

Issues surrounding the management of the trail include high visitation, minimal local staffing/presence (exacerbated by the recent loss of the Senior Community Service Employment Program [SCSEP], also known as the Older American Program), sandy soils, flat terrain (making trail maintenance more challenging), open forest conditions (as a result of prescribed burning), and nearby wetlands that sometimes invite illegal off-trail use. Resource damage has occurred in areas adjacent to the trail along stream channels and in and around wetlands (vernal ponds). Damage to the trail itself has occurred during wet weather use.

To start addressing the above issues, the forest embarked on a multi-pronged effort that included:

- ✓ rehabilitation of the Wambaw Cycle trailhead and parking area (pictured above), including installation of new toilets, improved information board/signing and fencing of day use and overnight facilities (to better control traffic);

- ✓ development of a trailhead host site with water, electricity and sewer to facilitate host recruitment and increased presence at the trailhead and on the trail (and the associated benefits of such action – trail-use etiquette, peer pressure, etc.);

- ✓ improved signing (pictured below) and markers on the trail itself, along with trail tread reconstruction including trail tread hardening using plastic geo-block, and increased trail maintenance frequency;

- ✓ closure orders for resource protection (along with a hot line and web based closure information) to help mitigate impacts from wet weather riding and to facilitate trail maintenance/ reconstruction efforts; and

- ✓ periodic law enforcement to address illegal trail and off-trail use.

Much of the above initiatives were (and are) funded with fees collected at the site, as well as grants secured through the Recreational Trails Fund Program (RTP) administered by the state.

Additionally, the forestwide travel management direction addresses off-road use and complies with the National Travel Management Rule (36 CFR 212, Subpart B - Designation of Roads, Trails, and Areas for Motor Vehicle Use, November, 2005). The rule will essentially notify users to stay only on designed trails and should reduce the unauthorized use of firelines and skid roads. The map and rule hopefully will make it easier to enforce illegal uses.

In the years ahead, the forest will continue to strive to improve the operation and maintenance of the Wambaw Cycle Trail. In FY09, the Trails Unlimited Enterprise Team has been enlisted to help refine trail operations and maintenance procedures.

Equestrian use on the forest occurs primarily on the Tuxbury and Jericho Horse Trails. A study completed by PricewaterhouseCoopers confirms that equestrian use is limited mainly to spring and fall. The weather is the main determining factor for use, as well as some people's reluctance to ride during hunting seasons.

The number of trail volunteers has increased since the last plan. However, that increase was not sufficient to offset the impact to the recreation program, both dispersed and developed, from the loss of the SCSEP.

Based on the latest National Visitor Use Monitoring (NVUM) effort (2002), all visitors were less satisfied with the same things— the cleanliness of the restrooms, the availability of information on recreation and the interpretive displays, signs and exhibits. The forest has addressed some of these concerns, in particular the information and signage at trailheads. The latter should be a significant improvement since the last plan. At this time, no trend information is available to

confirm the change. However, NVUM will be redone in 2008 and should provide enough data to develop trend information.

Hunting and Fishing

Regional demands for big and small game hunting remain constant; however, on the forest, demands have increased as private landowners continue to restrict some opportunities. This trend has not changed since the plan period began. Also, shrimp baiting season continues to be extremely popular; the Buckhall Recreation Area is a popular launch (pictured right).

Non-Consumptive Uses

People also participate in a wide variety of non-consumptive activities across the forest such as bird watching, photography and nature-watching. Trend information will be available after the 2008 NVUM surveys are completed.

Wilderness and Roadless Areas

The four wilderness areas on the forest remain unchanged. Human-caused fire is allowed in portions of the wilderness to help perpetuate more natural conditions. Monitoring of non-native invasives and water quality in the wilderness areas is ongoing.

Visitor use in the wilderness areas is low due to wet, swampy conditions and the absence of land trails. Overnight use is virtually non-existent. Some boating occurs in the Wambaw Creek Wilderness, primarily on Wambaw Creek.

Roadless policy has changed several times since the last plan. However, the actual management of the two roadless areas on the forest has not. They remain in MAs with little human interaction. These low swampy areas, adjacent to existing wilderness, are often flooded.

Developed Recreation

The forest has a number of developed recreation opportunities including the Sewee Visitor and Environmental Education Center and the Buckhall Recreation Area on the Intracoastal Waterway. The forest has adequately provided for these developed

recreation pursuits during the last few years by maintaining and/or improving existing facilities and occasionally providing new ones. An example of a new facility is the Awendaw Creek Canoe/Kayak launch (pictured left), which serves multiple purposes as a trailhead for the Awendaw Passage of the Palmetto Trail and the Awendaw Creek Water Trail. The latter function has been particularly important due to the significant increase in water trail activities on the forest.

Hurricanes continue to take their toll on recreation facilities. Several facilities have been reconstructed, including the total redesign of the Sewee Shell Ring where the boardwalk system was totally destroyed by a series of hurricanes in 2004.

New major recreation project proposals are now subjected to a more rigorous evaluation process at the forest and regional level to ensure customer satisfaction, financial sustainability, environmental soundness, and improving operational effectiveness of facilities and services. Also, recreation operations and capacity to do work has changed drastically from the previous planning period with the loss of the SCSEP program. Many of the daily maintenance tasks that were done previously by the senior enrollees are now done through contracts, such as mowing and bathroom cleaning.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

<u>Recreation Opportunity Spectrum Class</u>

Field monitoring of several developed recreation and general forest areas has revealed they generally meet the Recreation Opportunity Spectrum (ROS) class they are in. Shifts in ROS class eligibility have not occurred because only minor road construction or decommissioning has been done since the forest plan was signed. ROS class eligibility changes are heavily dependent on changes in road density, which has remained fairly constant.

<u>People-at-one-time and Miles of Trails</u>

The use of people-at-one-time (PAOTs) as a measure of public satisfaction was dropped (see monitoring report FY04). PAOTs measure facility capacity and do not serve as a proxy for determining how well people enjoyed their recreational experience. However, trail mileage as a measure of customer satisfaction was kept.

The miles of trail have been increasing during the planning period, and the objective of increasing trail miles to 160 has been met.

2. Scenery

a) Comparison of Existing Conditions/Trends to Desired Conditions

The forest has Visual Quality Objectives (VQOs) but will implement the new Scenery Management System (SMS) as a component of the upcoming revision to the forest plan. Scenery conditions and trends are continuing to move favorably toward expected desired conditions.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

Resource reviews throughout the planning period show mostly success implementing the forest plan's VQOs. Occasional conflicts occurred with timber resources and fire programs regarding inadequate mitigation for recreation areas or activities, but these were mostly short term impacts.

In field monitoring of several developed recreation and general forest areas found that the areas generally meet the VQOs.

3. Heritage

a) Comparison of Existing Conditions/Trends to Desired Conditions

Sites are reviewed each year to determine current condition and to assess impacts. Table 20 shows monitoring results for the last five years.

Table 20. Monitoring Results for Heritage Sites

Archaeological Site	**2003**	**2004**	**2005**	**2006**	**2007**
Total Number Monitored	6	15	9	9	5
ARPA Investigations	0	0	0	0	0
Assets Eroding by Water	2	4	1	1	1
Assets Damaged by Forest Users	2	5	1	1	0
Assets Damaged by Forest management		0	0	0	0
Assets undisturbed	2	6	7	7	4

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

No management reviews have occurred in the last five years.

4. Forest Products

a) Comparison of Existing Conditions/Trends to Desired Conditions

The desired conditions and objectives discuss or point to three main items regarding forest products:

- ✓ The forest plan anticipated harvest levels at approximately 50 percent of the levels of the past decade. From 1997-2007, average annual harvest was 16,751 ccf/year. From 1980-1989 (before Hurricane Hugo) average annual harvest was 57,820 ccf/year. Conversion factors between units of measure changed in these time periods. If one accounts for this difference, the average annual harvest from 1980-1989 would calculate to 41,300 ccf/year. With this adjustment, harvest levels were approximately 41 percent of the level of the past decade. In the last five years, biomass and pulpwood thinnings have increased. The first regeneration harvest to promote conversion to longleaf pine ecosystems is proposed beginning in 2009.

- ✓ The desired condition in the forest plan envisioned that "The quantity and quality of hardwood products have increased, and the amount sold has also increased." This has not happened. Only minor amounts of hardwood products have been sold.

- ✓ Objective O-9 in the forest plan states, "Create conditions on 38,000 to 50,000 acres of pine stands which release overcrowded live crowns, increase residual stand growth potential, allow more sunlight to the forest floor and increase suitable habitat for the red-cockaded woodpecker." From 1996-2007, 19,927 acres of pine stands have been thinned, roughly half of the objective. However, in the last five years, biomass and pulpwood thinnings have increased.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

Annual monitoring reports provided the acres of thinning accomplished from 1996 through 2006. The 2004 Integrated Resource Review (IRR) recognized first thinning as an issue. At the time, the regional office was just beginning to provide some of the sale preparation tools (designation-by-spacing) and timber sale contract tools (weight scale sales) needed to more effectively meet the recognized need. Acres of thinning offered for sale have increased significantly in recent years, but not to the level to meet this objective over a ten-year period.

The 2004 IRR recognized the opportunity for biomass sales which have been implemented over the years since. The opportunity for biomass sales is likely to pass soon; however, stands of the appropriate size are quickly growing into more valuable products of larger sizes.

The 2004 IRR recognized the costs of archaeological surveys and plant surveys as a limiting factor. This problem remains.

The IRR also recognized that the plan thinning objective may not be reasonable given current personnel and budgets.

5. Minerals

a) Comparison of Existing Conditions/Trends to Desired Conditions

No activity has occurred on the forest over the past five years. The forest received an inquiry for marl and limestone, but since the agency could only give them a five year minerals material contract, the inquirers have not pursued it further. They need a longer term commitment for a potential investment of $350,000,000.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

There have been no reviews or audits or discussion in monitoring reports.

From past evaluations, mineral activities in the Dutart Creek vicinity on private lands may be impacting ground water or could be causing land subsidence. However, the forest has not been monitoring these impacts. Other mining issues are presenting themselves on a piecemeal basis on the edge of the forest that may have impacts in the future.

6. Land Ownership and Special Uses

a) Comparison of Existing Conditions/Trends to Desired Conditions

From FY03-FY07, ten land purchases totaling 7,308 acres were bought for $16,164,584.00.

Urbanization on private land adjacent to the forest is occurring at a faster rate than other forests in the Southern Region. Acquisition funds have been very limited the past several years as the timber industry has divested large acreages within the forest. Land acquisition is becoming more difficult. It is becoming increasingly difficult to acquire public access through road easements as private landowners are less willing to allow public access across their land.

Increased demands are being made on the infrastructure needed to support development adjacent to the forest, including the demand for special-use authorizations. Examples include requests to expand roads and utilities (power, telephone, and gas). Development on adjacent properties has led to more issues with trespass, illegal trails, title claims, encroachments, and law enforcement problems such as poaching, illegal posting of NF land, and user conflicts. These actions pose a serious threat to national forest management, specifically for forest health, protection of threatened and endangered species, and multiple use-land management objectives. Some forest management activities, such as prescribed burning and timber harvest, will become difficult to implement because of health concerns and opposition from neighbors.

In 2005, the forest finalized its Land Ownership Adjustment Strategy (LOAS), which is tiered to the forest plan. The forest developed criteria to guide the future direction of land adjustments. Some goals in the plan were to consolidate fragmented lands, dispose of isolated lands that have lost national forest character and have become difficult to manage, and encourage conservation organizations and state and local governments to acquire conservation easements on non-federal lands to limit development adjacent to the forest. The forest has shared the LOAS with partners, local governments, and other large landowners within the forest boundary. This communication at the local level is beneficial in providing information to local decision makers. The ability of the forest to continue processing land adjustments will have a direct and lasting impact on other management efforts, from timber and fire management to recreation and public access.

Table 21. Land Purchases from FY03-07

Tract Name	Number	Acres	Purchase Year	Purchase Price
IP Wando	F-203, a-e	3,841	2003	$8,965,000
Busch	F-181	365	2003	$1,000,000
Bradsher II	F-198	188	2003	$1,640,000
Gilliard	F-202	7.5	2003	$37,500
Flynn	F-82	151.2	2004	$357,000
Plum Creek	F-84, a-c	1,184	2004	$1,798,000
Honey Hill	F-86	676	2005	$1,760,000
Carroll	F-90	50	2005	$167,464
Murrell	F-101	96	2007	$412,800
South Eatmon	F-84e	29.5	2007	$54,500

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

The forest has substantially documented the issues (threats), limitation and opportunities posed by urbanization and loss of open space. In addition, other factors outlined in the assessment, such as prescribed burning and timber harvest, will become increasingly difficult to implement because many of the new neighbors are not informed or aware of the important dynamics of living so close to the natural environment. All of these factors will have a significant negative impact on the forest ability to process and administer lands special use cases and meet Forest Plan objectives.

The stage is set for new collaborative efforts and the forest has identified key opportunities to begin informing, educating and influencing local land use/zoning plans. The FMS LOAS has been shared with many partners to help them understand the forest's priorities for protection/acquisition of key properties and of issues that may result from rapid urbanization. It is important for the forest to raise awareness of the issue of loss of open space with local communities/governments, non-governmental organizations, state, and other federal agencies. A good reference is the USFS Open Space Conservation Strategy. Also, it is important to aggressively pursue funding and

support for priority land adjustments realizing the outlook for substantial Land and Water Conservation Funds is not good.

7. Access/Travel Management

a) Comparison of Existing Conditions/Trends to Desired Conditions

Table 22 shows FY03-FY07 road information. Prior to the plan revision, road reconstruction and construction was accomplished primarily through the timber sale program. Development of the forest's transportation system was substantially completed prior to the year 2000. As a result of Hugo, biomass and first thinnings have been the primary silvicultural need since the mid 1990s. However, these are low value sales that generate little money for the necessary road work to keep roads up to standards. Presently, road work in timber sales is mostly system road maintenance and use of temporary roads accomplished using road purchaser provisions in the timber sale contract.

With the continued reduced funding levels for road maintenance, there will be an associated reduction in the serviceability of the road system. This could result in a future need for road reconstruction.

Table 22. Road Information

Activity	Unit of Measure	FY03	FY04	FY05	FY06	FY07	Ten-year Plan Estimate
Road Construction	Miles	0.0	0.0	0.0	0.0	0.2	15
Road Reconstruction	Miles	0.2	6.3	1.7	36.7	2.0	63
Timber Roads	Miles	25.0	27.0	8.6	38.2	25.4	N/A
Roads Decommissioned	Miles	6.0	6.0	0.0	1.0	0.6	N/A
Open Roads	Miles	430.5	432.7	433.4	433.2	433.1	446
Closed Roads	Miles	126.4	127.2	131.0	131.0	131.0	172

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

A forest-wide roads analysis was completed approximately five years ago. Specific recommendations and opportunities were identified as follows:

- ✓ Inventory and evaluate road signs and install signs that meet Forest Service and highway standards.
- ✓ Close unneeded forest jurisdiction roads per revised plan guidance and reduce maintenance level of roads where appropriate to reduce cost.
- ✓ Seek other funding sources such as deferred maintenance, capital improvement, or road and trail deposit fund (10 percent funds).

- ✓ Obtain National Forest System funds to assist counties in road maintenance and reconstruction critical to forest management.

- ✓ Evaluate that proper drainage structures, including ditches and ditch lead off structures, are installed along roads or used for road crossings.

The forest has acquired additional mileage through recent land acquisitions; this has increased the deferred maintenance backlog. The placement of these additional roads into closed Maintenance Level (ML) 1 has added to the forest goal of lands more than ¼ mile from an open road.

Lack of funding has resulted in choices on the level and degree of maintenance needed, such as whether to close roads, conduct spot surfacing, provide maintenance to surface drainage, culverts, bridges and aggregate surfacing. Roadside mowing, trimming heavy vegetation and other measures are still necessary for safety but limited funding is not meeting the need.

The following is the critique from the 2007 GMR.

> The forest has been a leader in the region in the use of stewardship contracts and most recently stewardship agreements. In FY06, the region allocated CWK2 funds to help in road maintenance associated with increased use of transportation system roads in conjunction with the removal of large quantities of woody biomass.
>
> The forest is doing an excellent job of using stewardship contracts and agreements to reduce hazardous fuels, improve forest health, and rebuild roads. They have surveyed the roads in the targeted areas and developed a plan and program for the reconstruction and maintenance requirements. They are currently relying heavily on CWK2 funds to supplement their efforts. These funds may or may not be available in future years.

8. Collaboration

a) Comparison of Existing Conditions/Trends to Desired Conditions
Memorandums of Understanding, cooperative agreements, partnerships and challenge cost share agreements were developed and participation of groups and individuals were encouraged in the following:

- ✓ The forest has continued participation in the Non-point Source Memorandum of Understanding with the South Carolina Forestry Commission and SC DHEC. The agreement will be updated in 2009.

- ✓ The forest has been involved intermittently with the State of South Carolina in BMP compliance checks with the South Carolina Forestry Commission relative to timber harvesting (Clean Water Act Section 319). Several sites are reviewed each year for BMP compliance. In addition, the soil and water staff also provides input into activity assessment, design, and mitigation, and conduct

some additional monitoring of BMP compliance relative to ground disturbing activities.

- ✓ The Forest Service, Southern Research Station and the College of Charleston are collaborating on a variety of issues relative to the effects of prescribed fire, biomass treatments, thinning and other land management on erosion, water quality, groundwater levels, rutting, soil disturbance, soil productivity, nutrient losses and vegetation change. Research studies are often connected to ongoing forest management activities. The forest soil and water professionals have provided both technical development and maintenance of agreements.

- ✓ The soil and water professionals have continued to be instrumental in developing and expanding the program to collect native plant seed, provide testing, viability checks, plant, harvest and utilize native seed, mulch and planted plugs for ground disturbing activities. Efforts to expand study of sweetgrass, a culturally important species, have also been supported with various activities on the national forest. These combined efforts with native plants have helped contribute to the viability of the Francis Marion Seed Orchard program, adding diversity to funding opportunities during a time when the superior tree and some of the other silvicultural program elements have declined.

- ✓ The forest has an agreement for more than six years with the University of South Carolina to provide graduate level students in GIS to support program work on the forest and on the districts.

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

No information to report.

9. Jobs and Income

a) Comparison of Existing Conditions/Trends to Desired Conditions

Nine incorporated towns lie within or next to the forest. Between 1980 and 1990, the area experienced a substantial population growth, with Berkeley County increasing by 35.9 percent and Charleston County increasing by 6.7 percent. Social and economic forces are altering the pattern of living in the small communities. First, many people are commuting to the four main employment markets in the area; consequently, these people are no longer economically dependent on the small communities. Second, communities on the periphery of the forest are experiencing an influx of new residents from the Charleston area who are part of an urban culture. Consequently, a more urban population is now using the forest.

Hurricane Hugo drastically reduced the supply of the pine growing stock by 53 percent and hardwood growing stock by 18 percent in the 23 county-wide affected area. Surveys show that the primary effects of the reduced supply are being felt more by

solid wood products industries than by paper companies. A quantifiable future demand level for wood products on the Francis Marion National Forest cannot be made in light of the numerous unknown conditions brought about by the hurricane. However, short-term demand has increased due to the greatly reduced supply, and long-term demand is expected to increase based on national and regional demand trends (USFS1996a).

b) Results from Past Management Reviews, Audits, Annual Monitoring and Evaluation Report

No information to report.

D. Evaluation of New Information

1. Emerging Issues

The 14 significant issues addressed in the revised forest plan were re-examined for this Five-Year Review.

The following are the significant planning issues as defined in the Record of Decision signed on December 18, 1995:

1. *Recreational Facilities - The issues are how many and what types of recreational facilities will be provided.*

2. *Trail System - The issues are the number of miles provided for each use and the compatibility of uses on the same trail.*

3. *Scenery along Travelways - The issue is how the scenery adjacent to roads and trails will be managed.*

4. *Off-highway Vehicle Travel - The issues are where, when and what type of off-highway vehicle use is permitted.*

5. *Roads - The issue is what combination of open and closed roads is provided.*

6. *Habitat for Game and Non-game Wildlife - The issue is the management emphasis given to game verses non-game animals.*

7. *Protection of Threatened, Endangered, and Sensitive Plants and Animals - The issue is the method and intensity of management for the protection of threatened, endangered, and sensitive plant and animal species.*

8. *Timber Management Strategy-the issues are: (1) The amount of land on which timber production is allowed (suitability); (2) The amount of wood products offered for sale (ASQ) for the first 10 years of the Plan; and, (3) The system of management (even-aged or uneven-aged) and the associated regeneration methods.*

9. *Corridors Connecting Wilderness Areas - The issue is how land adjacent to wilderness areas will be managed.*

10. *Herbicides - The issue is the degree of herbicide use allowed to manage vegetation.*

11. *Prescribed Burning - The issues are the amount and timing of prescribed burning.*

12. *Distribution and Mix of Tree Species - The issues are: (1) How the hardwood component within pine stands will be managed.; (2) How hardwood inclusions and transitions zones will be managed.; (3) The relative amounts of tree species across the Forest.; (4) The management of mixed pine/hardwood stands on the Forest.*

13. *Wetlands - The issue is the level of management activities occurring in wetlands.*

14. *Revenue and Jobs – the issue is the role the Forest should have in providing job opportunities for local residents and revenues to county governments.*

An interdisciplinary review was conducted of the current forest plan on June 24-25, 2008 with district and supervisors' office personnel. An evaluation was done of the current plan relative to current and emerging issues, desired conditions, goals and objectives, standards and guidelines and management areas.

Issue 1 – Recreation Facilities

Discussion:

A Recreation Facility Analysis was conducted on the forest to help facilitate a sustainable and well-rounded program that better aligns with public demand and is within the constraints of limited resources and work capacity. The intent of the analysis was to:

- ✓ Improve customer satisfaction;
- ✓ Provide recreation opportunities consistent with the forest's recreation "niche" and the its special characteristics;
- ✓ Operate and maintain a financially sustainable and environmentally sound recreation sites program;
- ✓ Improve operational effectiveness;
- ✓ Eliminate "deferred" maintenance costs at recreation sites.

The issue statement needs to be refined to represent the above approach to recreation facilities. Concerns with recreational facilities include biophysical impacts, public demand, financial and environmental sustainability, and periodic routine maintenance. Better ways are needed to operate and maintain the Wambaw Cycle Trail given increased demand for that facility and limited work capacity on the forest – this includes increased law enforcement presence, more volunteers, and effective use of fee dollars and grant funds.

Issue 2 – Trails System

Discussion: Evolving sub-issues involve:

- ✓ Concern nationally with dispersed vs. designated horse trail use – specifically, the "Right to Ride" Legislation. Biophysical impacts associated with cross-country horse travel are of concern;nationally efforts are underway to keep horse use dispersed on national forest system lands rather than restricting use to designated trails.

- ✓ Concerns with prescribed fire adjacent to trails where trails are used as firelines with equipment either widening the trail tread or crossing the trail. Specific concerns with the Wambaw Cycle Trail have to do with the resulting open forest after treatment which sometimes encourages off-trail travel and associated impacts.

- ✓ All-terrain-vehicle users want more trails to accommodate their type of use. Nationally, off-road riding is the outdoor recreation activity with the fourth highest percent change in total annual participant days from 2005-2008 (Cordell, et. al., 2008).

Issue 3 - Scenery along Travelways

Discussion: This issue can be handled in desired condition description. The new SMS will need to be incorporated into plan revision.

Issue 4 – ~~Off-highway Vehicle~~ All-Terrain-Vehicle Travel

The term "OHV" implies a wider range of vehicle types including vehicles such as 4X4 pick-ups. The term OHV should be replaced with the term "ATV" which implies a stricter definition of vehicle size/width.

Discussion: This issue is evolving into concerns about:

- ✓ Illegal user-created trails and associated resource damage.

- ✓ Portions of some existing trails being properly located creating maintenance problems and raising long-term sustainability concerns.

Issue 5 - Roads

Discussion: This issue still probably centers around the amount of open and closed public access.

- ✓ Open roads have been reduced to address concerns with long term maintenance and sustainability; this could create problems in the future with public access.

- ✓ Concerns with mowing and brushing and the introduction of non-native invasives plant species and timing of maintenance operations are detrimental to promoting/keeping native plants within rights-of-way.

Issue 6 – Habitat for Game and Non-game Wildlife

Discussion: This issue is still relevant.

- ✓ This issue should be expanded to include costs to maintain habitat for non-game species. In addition, it should include the need to plant wildlife openings with food crops to attract certain species (i.e. quail).

Issue 7 – ~~Protection~~ Management of Threatened, Endangered, and Sensitive Plants and Animals

Discussion: Change the heading from "protection" to include "management" of PETS. Considerable effort was placed in the current forest plan to restore RCW habitat and species associated with longleaf pine ecosystems. This has and will continue to provide habitat for other fire-dependent species.

Evolving sub-issues involve:

- ✓ The expanding WUI and the impacts it is having on maintenance of fire-dependent habitat (particularly in the southwest portion of the forest) is a growing concern. Other threatened and endangered species found on the forest in addition to RCW include American chaffseed, Canby's dropwort, pondberry, incised groovebur, Carolina spleenwort, American alligator, Bachman's warbler, flatwoods salamander, shortnose sturgeon, West Indian manatee and wood stork. Numerous birds, amphibians, reptiles, fish and mammals that are listed on the regional forester's sensitive species list are also found. Portions of the forest are not prescribed burned on a regular enough basis or not at all due to smoke risks and higher costs associated with burning in these areas where habitat exists or historical occurrences of species have been documented.

- ✓ Need to identify desired conditions for other TES species in areas of historical occurrence and/or identify adjustments in current management area boundaries.

Issue 8 – Timber Management Strategy

- ✓ The vegetation management needs are greater than the current wood products offered for sale.

- ✓ Regeneration harvest is needed to achieve a better distribution of early successional habitat and to provide more resilience to catastrophic events.

- ✓ The potential for impacts to forest health (southern pine beetle) and habitat for PETS exist in a large number of overstocked stands. This will continue for some time into the future.

Issue 9 – Corridors Connecting Wilderness

Discussion: The current forest plan has addressed this issue adequately and it can be handled in desired condition descriptions in certain areas.

Issue 10 - Herbicides

No changes.

Issue 11 – Prescribed Burning

Discussion: The issue of growing and dormant season burning is still relevant. There is some confusion over dates as a definition of the start or stop for growing season burns versus physiological conditions.

A "core" burn area has been established on the forest where prescribed burning has been done more or less on a regular basis. This has led to RCW populations and other TES species thriving and expanding in this area but declining in other areas that are less frequently burned. The highest priority areas from a biological and ecological perspective for frequent and/or growing season prescribed burning on the forest need to be identified.

Sub-issues involve:

- ✓ The public is concerned with impacts to wildlife, especially during growing season burns. Prescribed burning may impact large woody debris in smaller intermittent streams.

- ✓ The WUI results in longer burn frequencies and higher costs. Public concerns focus around smoke management from a public health, visibility and hazards from smoke on roadways standpoint.

- ✓ What will the impacts be from changes in Air Quality Regulations (Regional haze)? Charleston County is not meeting emission standards for ozone.

- ✓ The desired vegetative condition statements for MA 26 (this area has the highest potential for restoration of longleaf pine ecosystems) and MA 28 need to reflect both the impacts of periodic prescribed burning in some areas and lack of or infrequent burning in other areas.

- ✓ A number of areas are not burned enough to create or maintain fire-dependent ecosystem conditions, especially where historic or known populations of threatened, endangered and sensitive species are located.

- ✓ What are the priorities for prescribed burning?

Issue 12 – Distribution of Mix of Tree Species

Discussion: This issue can be expanded to include identifying amounts, distribution, and sustainability of pine savanna habitat and continued management of hardwoods along transition zones and as inclusions within stands. Outside the "core burn area," the desired condition may need to reflect that hardwoods are seen as a significant component of stands.

Frequency and distribution of prescribed burning is leading to development of multiple desired condition capabilities within existing management areas. These different desired conditions need to be better defined. The amount and distribution of longleaf pine ecosystem restoration in MA-26 given limitations with burning and the encroachment of the WUI needs to be reevaluated.

Issue 13 –Wetlands

Discussion: A new management prescription is needed to include riparian corridors following current Region 8 guidelines.

Sub-issues include:

- ✓ Aquatic organism passage

- ✓ Connectivity of road ditch lines and ephemeral ponds with streams and wetlands and how they influence biodiversity of species and habitats.

Issue 14 - Revenue and Jobs

Discussion: This is less of an issue now with the focus shifting to the forest's ability to provide eco-tourism opportunities. Payments to counties have been stabilized by changes in laws but it is unclear whether this will be reauthorized again.

Emerging Issues

Impacts of NNIS on biodiversity – The issue is where to prioritize control, prevention, and eradication of NNIS. Are there priority species for treatments?

Discussion: Better inventory and mapping of locations is needed including in the wilderness areas. Better coordination is needed with state agencies since their list of species is different from the forest's. This difference causes conflicts in mixed ownership (federal/private) where the forest's emphasis may not be the same as the state's or private landowners'. What are the priority areas for treatments (wilderness areas, botanical areas, etc.)?

Other Forest Products – The issue is what other forest products the forest will offer.

Discussion: There are demands for the forest to supply other products including such things as pine straw, sweet grass, reptiles/amphibians, pitcher plants, and cypress knees.

WUI – The issue is the impacts of the growing WUI on the forest's ability to manage resources, prescribed burn and provide for public safety.

Discussion: Local communities have submitted annexation proposals that create the potential for user conflicts on the forest and could also raise issues of federal/state supremacy. Demands on Forest System roads by local residents to ingress/egress homes and subdivisions as well as use by busses/trucks continue to increase. County development plans include the construction of additional major roads across the forest in highly sensitive wetlands/estuaries. Development of residential areas adjacent to the forest has increased the demand for utility services which has prompted an increase in special use permits. Rapid rural development affects the LOAS and places increased urgency on land purchases to consolidate ownership to effectively manage resources. The ability to prescribed burn on a periodic basis is reduced due to smoke and burn hazards and increased costs. This can lead to increased fuel hazards creating long term public safety issues.

Early Successional habitat – The issue is how much and where the forest should emphasize early successional and shrub/scrub habitat.

Discussion: This habitat would be supplied by timber harvesting to develop younger tree stands less than ten years old. Distribution of this habitat is important for wildlife and plants over the long term. Younger stands distributed across the forest in various stages of development would provide a buffer from catastrophic events. Some of this early successional habitat could be provided by regeneration harvesting in younger pole and small sawtimber stands that have developed in the wake of Hugo.

Mixed Loblolly/Longleaf Stands – The issue is how much there is on the forest and its distribution.

Discussion: Mixed stands of loblolly and longleaf pine are included with the longleaf forest type and many stands are frequently prescribed burned and mimic longleaf pine ecosystems. RCW and other fire-dependent species rely on these mixed stands. Site conditions vary considerably making it difficult to manage for just one species. Drought years, when combined with burning, have led to the establishment of more longleaf pine; in less frequently burned areas more loblolly pine understory occurs.

Mixed Pine/Hardwood, Hardwood/Pine Stands – The issue is how these mixed stands should be managed.

Discussion: Little management activity and prescribed burning has taken place in these stands. What should be the desired condition in these areas and what is and should be the distribution across the forest?

Dog Hunting – The issue is how much and where this activity should be allowed on the forest.

Mining – The issue is increasing demand for sand and limestone on the forest and what and where (if at all) this use should be allowed.

Discussion: A geologic suitability analysis needs to be completed to determine the suitability of the forest to supply minerals, oil and natural gas.

Special Uses – The issue is salt water intrusion into freshwater areas which is impacting native plants and wildlife.

2. Changes in National/Regional Policy/Direction

Four basic levels of planning guide the overall management of national forests and grasslands:

1. Strategic planning which takes place at the highest level and identifies strategic priorities for the agency that are implemented over a period of time through annual agency budgets. These priorities are based on national assessments of natural resources and are responsive to social and political trends.

2. Business planning by national programs, regions, research stations and the Northeastern Area which translates broad strategic direction into regionally specific work that contributes to the agency's mission.

3. Unit planning (i.e. the Francis Marion Revised Forest Plan) which provides an inventory of resources and their present conditions on a particular management unit. This inventory, coupled with the desired condition for the resources, is the basis for annual work planning and budgeting.

4. Annual work planning which identifies the projects that units propose for funding within a fiscal year. This level of planning involves the final application of strategic direction into a unit's annual budget to move its resources toward the desired future condition.

Numerous changes in national and regional policy and direction have occurred since the forest plan was signed. The Government Performance and Results Act (1993) was enacted to improve federal program effectiveness and public accountability by promoting a new focus on results, service quality and customer satisfaction.

Administrative procedures and processes governing preparation of projects to reduce hazardous fuels and restore healthy ecological conditions on Federal land have also undergone changes. In 2002, the Healthy Forests Initiative (HFI) was established to reduce administrative process delays on the implementation of projects. The Healthy Forests Restoration Act (HFRA) was passed in December 2003 and was primarily intended to provide improved statutory processes for hazardous fuel reduction projects on certain types of at-risk national forest and Bureau of Land Management lands. Forest

Service Handbook, FSH 1909.15, Chapter 30 established Categorical Exclusion number 10 to address hazardous fuels reduction activities using prescribed fire and/or mechanical activities. This category has been vacated by the courts and can no longer be used.

In October 2002, the ROD for the Supplement to the Final Environmental Impact Statement Vegetation Management in the Coastal Plain/Piedmont was signed. It was the forest's first plan amendment. Its guidance was added to clarify direction concerning requirements for conducting project-level inventories. In April 2008 this amendment was vacated by the United States District Court for the Northern District of Georgia, Atlanta Division.

The new planning rule was signed on April 21, 2008. This final rule describes the National Forest System (NFS) land management planning framework; sets up requirements for sustainability of social, economic, and ecological systems; and gives directions for developing, amending, revising, and monitoring land management plans. It also clarifies that, absent rare circumstances, land management plans under this final rule are strategic in nature and are one stage in an adaptive cycle of planning for management of NFS lands. The intended effects of the rule are to strengthen the role of science in planning; to strengthen collaborative relationships with the public and other governmental entities; to reaffirm the principle of sustainable management consistent with the Multiple-Use Sustained-Yield Act of 1960 (MUSYA) and other authorities; and to streamline and improve the planning process by increasing adaptability to changes in social, economic, and environmental conditions. This rulemaking is the result of a United States District Court of Northern California order dated March 30, 2007, which enjoined the United States Department of Agriculture (the Department, the Agency, or the USDA) from putting into effect and using the land management planning rule published on January 5, 2005 (70 FR1023) until it complies with the court's order regarding the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the Administrative Procedure Act (APA)(*Citizens for Better Forestry* v. *USDA*,481 F. Supp 2d 1059 (N.D. Cal. 2007)). The purpose of this final rule is to respond to the district court's ruling. This final rule replaces the 2005 final rule (2005 rule) (70 FR 1022, Jan. 5, 2005), as amended March 3, 2006 (71 FR10837) (which was enjoined by the district court's ruling) and the 2000 final rule (2000 rule) adopted on November 9, 2000 (65 FR 67514) as amended on September 29, 2004 (69 FR 58055). The 2008 planning rule is currently in litigation.

The following comments are from Forest Service Chief Abigail R. Kimbell

> In my travels and discussions this year, three themes in particular have stood out: climate change; water issues; and the loss of a connection to nature, especially for kids. History will judge the conservation leaders of our age, including our own leadership in the Forest Service, by how well we respond to these challenges.
>
> These are not new topics for us, but they offer a context to build upon or within. Recognizing that context means using our knowledge of cross-cutting issues at the broadest scale to better care for the land and serve people.
>
> ***Climate change*** can have significant impacts to the lands we manage and is in the news everywhere. The Forest Service manages National Forests and Grasslands to provide the needs of today and for future generations to sustain their diversity and productivity. We have developed materials to help you better understand climate change from both a global and local perspective. Forest Service researchers have studied the impacts of

climate change and air pollutants on forests and grasslands over thirty years. This research already identifies trends and subsequent effects to ecosystems across the United States. We are developing a national framework for guiding and directing land management activities in light of expected changes. In some landscapes, the changes in management will be significant, based on anticipated regional and local effects of a changing climate.

We will also focus on ***water***. Climate change has been linked to declining snow packs, retreating glaciers, and changing patterns of precipitation and runoff. The evidence shows that we are entering a period of water scarcity not seen in our history. The national forests were created in part for "securing favorable conditions of water flows," the importance of which has grown as populations have grown. The Forest Service can make a difference by managing vegetation to restore ecological processes and functions, including the recharging of streams and aquifers.

The third focus area is ***reconnecting people, especially kids, with nature***. The challenges associated with climate change and water will not be resolved in a few years. It will take generations. Kids must understand why forests are so valuable so they will grow into citizens who support conservation. Building on the Forest Service traditions of conservation education, we will work with partners to ensure that American children have the opportunity to experience the great outdoors, whether it is a remote mountain wilderness or a spot of nature in the heart of a city.

It is important to remember two key things: first, many of the tools and approaches we have used to accomplish our land management objectives will continue. In particular, forest health restoration, open space, managing recreation and invasive species will still serve as a way of focusing and prioritizing our work. Second, strong community relationships, partnerships, and collaborative work will be more important than ever in delivering the Forest Service Mission.

The Forest Service has always risen to the great conservation challenges, and I am confident that we will continue to do so. I deeply respect and appreciate your commitment and professionalism in your work. Thank you for working safely and steadily to accomplish our mission.

The Forest Service Mission;

Sustain the health, diversity and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

E. Evaluation of Need to Change Existing Plan Direction

1. Desired Conditions

A desired condition (DC) is defined as a narrative description of the condition of land and resources expected to occur when goals and objectives and their associated standards and guidelines for an area are fully achieved. The forest-wide DC emphasizes the significant differences between the future Forest and the present. It is described in Chapter 2 of the revised plan. The following table compares the desired condition from the current forest plan to minor changes recommended by the Interdisciplinary (ID) Team.

Table 23. Desired Condition from Current Forest Plan and Recommended Changes

	Desired Condition – From current Forest Plan	Recommended Rewrites and/or Comments
Air	Air quality is maintained. Air quality on Forest Service lands near Cape Romain Wildlife Refuge complements the high air quality standards found at Cape Romain which is a Federal Class I area. Portions of the Forest may experience some localized and temporary reduction in air quality as a result of prescribed fire.	Air quality is maintained. Air quality on Forest Service lands complements the air quality found at Cape Romain which is a Federal Class I area. Portions of the forest may experience some localized and temporary reduction in air quality as a result of prescribed fire.
Communities, Groups, and Life-styles	As Charleston, Georgetown and Moncks Corner continue to grow and provide employment opportunities, people living in communities within or adjacent to the Forest are less economically dependent on the area. The Forest provides a refuge from the fast pace of the city and offers a tranquil retreat. The cultural heritage (including opportunities to hunt, fish, gather forest products, etc.) of the residents who occupy areas within and near the Forest is maintained.	As coastal South Carolina continues to grow and provide employment opportunities, people living in communities within or adjacent to the forest are less economically dependent on the area. The forest provides a refuge from the fast pace of the city and offers a tranquil retreat. The cultural heritage (including opportunities to hunt, fish, gather forest products, etc.) of the residents who occupy areas within and near the forest is maintained. **Comment:** broaden to include recreational opportunities
Economy	The Forest continues to contribute to the economic well being of local communities. As a result of the extensive hurricane damage, there is a major reduction in monetary returns to the counties from timber receipts. The economic diversity of the local economy is increased, while the economic dependency associated with wood and paper manufacturing decreases slightly. There is an increase in income and jobs related to non-timber products such as recreation and wildlife. Wildlife Management Area fees and recreational user fees comprise a larger portion of the revenue collected.	**Comment:** broaden to include tourism
Fire	Wildfires are actively suppressed in a cost–efficient manner. The risk of resource damage and danger to the public as a result of wildfires decreases as a result of prescribed burning and a reduction of the fuels created from Hurricane Hugo. Prescribed fire is a common practice. There is evidence of fire in most upland pine stands. Areas associated with the longleaf ecosystem are frequently burned. Growing-season burns are also common in these areas. Fewer prescribed fires of lower intensities are found in mixed pine/hardwood stands as well as transition areas between uplands and lowlands. The evidence of	Wildfires are actively suppressed in a cost–efficient manner. The risk of resource damage and danger to the public as a result of wildfires decreases as a result of prescribed burning and a reduction of fuels. Prescribed fire is a common practice. There is evidence of fire in most upland pine stands. Areas associated with the longleaf ecosystem are frequently burned. Growing-season burns are also common in these areas. Fewer prescribed fires of lower intensities are found in mixed pine/hardwood stands as well as transition areas between uplands and lowlands. The evidence of fire in these areas ceases near wetter sites and areas with natural barriers to fire. Fire plays an increased role in maintaining the forest's ecosystems.

	fire in these areas ceases near wetter sites and areas with natural barriers to fire. Fire plays an increased role in maintaining the Forest's ecosystems.	
Health, Safety, and Energy	Public health and safety associated with the use of the Forest improves. As a result of an increase in prescribed fire, forest fuels are reduced which, therefore, reduces the risk of wildfire and the smoke generated by wildfire. High levels of safety and health standards are maintained on the Forest. Extra precautions are taken to ensure safe and successful growing-season, prescribed burns. Safety factors increase as a result of restricting off-highway vehicles (OHVs) to trails and creating additional miles of trail for specific uses. The total relative energy consumption associated with the Forest decreases slightly. All facilities are well maintained.	Public health and safety associated with the use of the forest improves. As a result of an increase in prescribed fire, forest fuels are reduced which, therefore, reduces the risk of wildfire and the smoke generated by wildfire. High levels of safety and health standards are maintained on and off the forest. Safety factors increase as a result of restricting off-highway vehicles (OHVs) to trails and creating additional miles of trail for specific uses. The forest provides opportunities to use woody fuels for energy production. The total relative energy consumption associated with the forest decreases slightly. All facilities are well maintained.
Heritage Management Program	The Forest is rich in history with numerous historical sites related to early colonization. As a result of this rich history, numerous additions have been made to the *National Register of Historic Places*. Significant cultural and historical sights are protected, managed and interpreted.	The purpose of the Heritage Resources Program is to provide interpretive, educational and other experiential programs, site stewardship, and scientific/technical services to the Forest Service, other governmental entities, the public, Indian tribes, and future generations so they can apply the best available information to land and resource management, be informed participants and public advocates for America's heritage and ultimately preserve a treasured and irreplaceable resource. The Forest Service will identify and preserve forest heritage resources and provide for their enjoyment by the public now and in the future. The three key components are Stewardship Public Service Context for natural resource management Stewardship - Identify, monitor and protect non-renewable heritage resources on the Francis Marion National Forest. The Forest Service is recognized as a national leader in heritage conservation. Looting and vandalism have all but disappeared on National Forest lands and priority sites are stabilized and monitored to protect significant values. Heritage resources are fully integrated into land and resource planning. Tribal relationships are based on trust that facilitates resolution of heritage issues. Project support is efficient and cost-effective, thanks to state-of-the-art tools and streamlined compliance procedures. Site and

		survey information is accurate, up-to-date, and incorporated into GIS. Artifacts and records are appropriately curated and available for study. Exciting knowledge about the past is synthesized and readily available for public interpretation and natural resource management. Public Service Identify and provide opportunities to the public to understand, enjoy, and appreciate their heritage on the Francis Marion National Forest. Through quality experiences, fascination with the past is transformed into understanding and appreciation. People look to National Forests to experience heritage sites in natural settings that still preserve a sense of place and offer the thrill of discovery. Forests offer an amazing range of heritage opportunities and experiences filled with learning, adventure, and fun. Those experiences come in a variety of forms including interpretation, educational tours, volunteer opportunities to assist with research and management, and special events. Heritage volunteer opportunities keep up with the demand. Heritage tourism contributes to rural community viability through involvement of local partners. The public knows that Forest Service takes care of heritage resources. Visitors gladly pay fees for quality heritage experiences and the satisfaction of knowing they are helping care for special places. People find out about heritage experiences in many ways, including the World Wide Web. Context for Natural Resource Management Apply heritage information in the course of natural resource management. Understanding the role of human beings in past and present ecosystems provides a context for understanding contemporary landscapes and natural resource issues. Knowledge about past cultures and traditional communities helps us appreciate human and ethnic diversity in the work place, in our interactions with constituents, and in our daily lives. Heritage resources are an essential component of ecosystem analysis and forest health assessments. An energized Forest History Program provides insights into Forest Service beginnings and how our programs and policies have evolved in response to an ever-changing society. Land managers recognize that socio-cultural values have always shaped perceptions about the environment, including our own, and will continue to define natural resource issues. An energized Forest History Program

		provides insights into Forest Service beginnings and how our programs and policies have evolved in response to an ever-changing society. The Heritage Research Work unit provides exciting products and conceptual tools that open new doors for heritage contributions to natural resource management. *The past serves as an anchor for the present. It shows us how we came to be who we are and, perhaps, hints at where we are going as a society.*
Insects and Disease	Integrated pest management continues to be used as the strategy in managing pest populations. There is some evidence of natural disturbances from insects and diseases. The incidence of fusiform rust is slightly higher due to the greater emphasis on hardwood and mixed stands. Annosum root rot may be a problem at times because of the large amount of thinning. However, both annosum and fusiform are carefully monitored and corrective action taken when visible. Insects and diseases play a role in the Forest ecosystem. They contribute to many ecological processes including nutrient recycling, plant succession and forest dynamics. A higher level of tree mortality occurs because of older aged pine stands with reduced vigor and increased susceptibility to pests.	
Land Ownership and Adjustment	The pattern of National Forest ownership has improved as private land in-holdings have been acquired and isolated Federal tracts have been exchanged. The Forest is more consolidated, and the number of isolated tracts has decreased. Land adjustments through purchases, exchanges and donations include an array of unique plant and animal habitats, riparian areas, geologic features, cultural resources and unique recreational opportunities.	
Minerals	The landscape of the Forest shows some signs of mineral activity. Since the potential for oil and gas resources in the Atlantic coastal plain is low, most signs of activity are from gravel and sand pits, ceramic, heavy metal and pigment operations.	The landscape of the forest shows some signs of mineral activity. Since the potential for oil and gas resources in the Atlantic coastal plain is low, most signs of activity are from gravel and sand pits, ceramic, heavy metal, pigment operations and limestone quarries.
Old-Growth	Most areas on the Forest exhibit some old-growth attributes. Large, old trees are found throughout the Forest. The Forest is also characterized by a wide variation in tree size and spacing, with many gaps in the canopy. A multi-layered understory of younger trees is also found in old-growth areas. Portions of the Forest exhibit accumulations of large, dead, standing	

	and fallen trees. Many trees have broken or deformed tops and root decay. In many areas, old-growth stands of various forest types have been retained to provide vital components of the ecosystem. A well-distributed network of old growth is linked together throughout much of the Forest. Fragmentation of old-growth stands is limited to avoid isolating such diverse habitat. Harvest activities are carefully planned to provide landscape patterns which avoid isolating old-growth areas, and in some cases corridors are provided between blocks of old growth to avoid such isolation. The Forest contains more, larger contiguous blocks of old growth. Several old-growth core areas have been identified and serve as blueprint areas. These areas contain all the components of a functioning ecosystem for old growth.	
PETS - Animals	The Forest provides adequate habitat for various animals whose populations were previously threatened by dwindling population numbers. Riparian areas including stream-sides, bays, ponds, depressions, etc. support viable populations for many amphibians such as flatwoods salamander and gopher frog. Other formerly sensitive reptile populations such as the eastern glass lizard, southern hognose snake, and northern pine snake, are also maintained at viable levels. There is a thriving recovered population of red-cockaded woodpeckers. Red–cockaded woodpecker habitat is managed on about 120,000 acres of pine types. Populations of formerly sensitive bird species including Bachman's sparrow, loggerhead shrike, Henslow's sparrow and American swallow-tailed kite are increasing, and they are no longer considered at risk.	**Comment:** Combine PETS – Animals and plants into one category
PETS - Plants	As a result of maintaining and enhancing various functioning ecosystems such as longleaf pine ecosystems, plant species which were previously in danger of becoming extinct are now thriving. American chaffseed is a common sight in the longleaf pine community as are populations of pondberry in wetter sites around ponds. All plant species which were once considered sensitive are thriving at viable levels.	As a result of maintaining and enhancing various functioning ecosystems such as longleaf pine ecosystems, plant species which were previously in danger of becoming extinct are now thriving.
Recreation	The Forest is a popular destination for a wide range of recreational visitors. There are more opportunities to enjoy both dispersed and developed recreational	Re-write and update this section to incorporate language that emphasizes the importance of aligning the program to the forest niche, and providing a mix of recreational opportunities in line

	activities. Of the recreational activities offered on the Forest, about half are developed activities and half are dispersed activities. The quality of facilities is higher, and the user can expect to pay more fees for using the Forest. There are more miles and variety of trails including OHV, bicycle, canoe, hiking, and horse. Off–highway vehicles travel only on designated trails. Trails are in better condition and allow for shorter routes by including loops in their design. Several new developed recreational facilities exist including boat ramps, horse camps, campgrounds, and canoe access areas. Visitors enjoy a wide diversity of recreational experiences. The physically challenged enjoy more opportunities because of the barrier-free facilities. The Forest is a primary place for the public to enjoy hunting and fishing. Non-consumptive use has also increased, and many people come here to bird watch, photograph, and simply enjoy nature. There is a greater emphasis in areas offering semi-primitive recreational opportunities. The interpretive program is much more developed. There are increased interest and understanding of the natural environment and the coastal region of South Carolina by both visitors and residents. The Sewee Environmental Education and Visitor Center provides quality environmental education and interpretive opportunities.	with public demands and recreation use trends. Financial and environmental sustainability are also constraints that need to be woven into the desired condition. Get away from talking about quantities and percentages of offerings as this changes over time based on demand and supply factors. Describe how the Sewee EE VC contributes to the forest niche and serves as a base of operations to go out and explore the forest.
Roadless Areas	Two roadless areas are maintained. These areas are adjacent to the wilderness and provide opportunities for isolation, solitude, and more primitive recreation.	
Soil and Water	Soil productivity is maintained. Soil quality and nutrient cycling processes are maintained. Large woody debris, leaf litter and other organic matter are retained on many areas to fulfill an important ecological role in providing soil organic matter, plant nutrients, and energy for soil micro-organisms. Soil structure is maintained except for areas such as construction sites, roads, skid trails and some log landing areas.	**Comment:** Include in the desired condition statements about ground water, instream flows, mercury levels, riparian, and wetlands. Soil productivity and nutrient cycling processes are maintained. Large woody debris, leaf litter and other organic matter are retained on many areas to fulfill an important ecological role in providing soil organic matter, plant nutrients, and energy for soil micro-organisms. Soil structure is maintained except for areas such as construction sites, roads, skid trails and some log landing areas.

	The streams, ponds, wetlands, and riparian areas of the Forest reflect healthy, functioning ecosystems. Natural woody debris is found in streams. This debris serves an important ecological function. It maintains channel stability, stores and routes sediment, and provides habitat requirements for anadromous and resident fish. Riparian areas with diverse stands of trees provide streamside vegetation that helps to maintain stream temperatures needed for fish habitat. High water quality is maintained and in some cases improved. Streams have little sediment because of careful management of timber harvest activities, roads, and similar soil disturbing activities. Aquatic ecosystems remain intact and serve as habitat for a variety of fish and invertebrates. Wetlands are protected and continue to serve as vital functioning ecosystems.	The streams, ponds, wetlands, and riparian areas of the forest reflect healthy, functioning ecosystems. Natural woody debris is found in streams. This debris serves an important ecological function. It maintains channel stability, stores and routes sediment, and provides habitat requirements for anadromous and resident fish. Riparian areas with diverse stands of trees provide streamside vegetation that helps to maintain stream temperatures needed for aquatic habitat. High water quality is maintained and in some cases improved. Streams have little sediment because of careful management of timber harvest activities, roads, and similar soil disturbing activities. Aquatic ecosystems remain intact and serve as habitat for a variety of fish and invertebrates. Wetlands are protected and continue to serve as vital functioning ecosystems.
Timber	About 75 percent of the Forest is classified as suitable for timber production. The Forest is capable of sustaining timber harvesting without impairing the health of ecosystems and in a manner compatible with other forest uses. However, for the upcoming decade, harvest levels will roughly be 50 percent of the past decade. For the long term, harvest levels will be closer to 75 percent of historic levels. The Forest will retain a relatively high level of sawtimber inventory. The Forest continues to produce large, quality sawtimber products; although in the short term, most volume from timber harvested is pulpwood from thinnings. The quantity and quality of hardwood products have increased, and the amount sold has also increased. Most upland pine areas show signs of even-aged management. However, some stands which are on drier sites show uneven-aged timber management. Clearcutting has dramatically decreased, usually found in those areas to be converted from loblolly to longleaf, or areas with clay soils managed for longleaf. Timber harvests associated with natural regeneration such as seed tree and shelterwood methods are common.	
Transportation System	The construction of new roads is minimal, and the amount of reconstruction has decreased. Road closure is emphasized	**Comment:** Add language that system roads including those acquired with new land acquisitions are reconstructed and maintained to

	in some areas of the Forest to enhance roadless area characteristics and to provide more primitive recreational experiences. The road system continues to provide adequate access for the public to enjoy the Forest.	standard.
Vegetation	Throughout the forest landscape, there is an ecologically sound distribution of vegetative communities. Much of the vegetative patterns reflect natural disturbances as well as planned harvest activities. The longleaf pine ecosystem has been expanded and comprises almost 21 percent of the Forest. Although the acreage of longleaf has increased and is abundant on the drier sites, loblolly pine is still the dominant species on the upland sites. Bottomland and swamp hardwoods dominate the wetter sites. The amount of mixed pine and hardwood stands has increased. Natural transitions between uplands and lowlands are common. Mast-producing hardwoods are common in many areas, and the hardwood component within loblolly pine stands is increased in many areas. Growing-season burns are common in the area managed for the longleaf communities; as a result, these areas tend to have few hardwoods and a sparse understory. A diverse understory of vegetation such as grasses and forbs are found in these regularly burned areas. Portions of the Forest are influenced by their proximity to the coast. A maritime zone contains vegetation which is tolerant to wind and salt spray. Estuaries are common and are affected by tidal action and freshwater drainage from rivers and land. Freshwater, brackish, and tidal marshes and their associated plant communities are found along the coastal borders of the Forest. The landscape is diverse with different levels of structure and various sizes of even-aged and uneven-aged stands. The overstory contains different sizes, ages and densities of trees. The forested landscape includes understories varying from dense vegetation to open areas. Scattered throughout are openings in the tree canopy in a variety of shapes and sizes. The effects of natural disturbances (fire, storms, insects and diseases) and their recovery processes are common. Vegetative patterns are influenced by timber harvest but to a lesser extent than	

	in previous decades. After several decades, large, old trees dominate the forest. Through harvest, regeneration, and natural disturbance, a mosaic of forest types and structures are spread across the landscape.	
Visual Quality	The landscapes around most travel routes continue to be managed to reduce the visual impacts of activities that might be seen by a passer-by. Generally, visual quality has improved. A greater portion of the Forest is classified as retention or partial retention. There is less evidence of human activities to the casual visitor. Although human activity may be evident in some areas, the activities remain subordinate to the characteristic landscape.	Update language to conform to the new Scenery Management system.
Wilderness	The four wilderness areas continue to be managed under the provisions of the Wilderness Act. The wilderness qualities have been enhanced by a management area which links the wilderness areas together. This area of linkage is characterized by a general semi-primitive experience. Periodic fire occurs in the better-drained uplands of these areas.	
Wildlife and Fisheries	Both game and non-game wildlife species are abundant. Forage and cover quality and quantity have improved. A good distribution in tree age classes provides for a variety of habitat. Both early and late successional habitats are available after the first few decades. Prescribed fire maintains the early seral condition in the next 10 years. About 20 percent of the Forest is at least 90 years old at the end of the first decade. This increases to over 50 percent of the Forest in the long term ensuring adequate habitat for late successional species. As a result of prescribed fire and timber harvests which create the early seral stages of grass-forb habitat, the yellow-breasted chat, eastern bluebird, eastern king snake and white-eyed vireo continue to thrive in healthy populations. White-tailed deer and northern bobwhite quail populations are at levels which support harvest opportunities. Species associated with sawtimber-sized trees and over-mature stands have increased populations. Pileated woodpeckers, eastern gray squirrels, and red-eyed vireos, species	

	associated with old hardwood, are abundant. Species associated with old pine stands such as the pine warbler, eastern wild turkey, eastern fox squirrel, and red-cockaded woodpecker have also increased. The Forest provides shelter and forage for a variety of neotropical migrants, and serves as important habitat for these birds as they migrate through or nest here. Riparian areas and other wetlands serve as suitable habitat for thriving populations of wintering waterfowl, Prothonotary warblers, southern dusky salamanders, and brown water snakes. High–quality aquatic habitat is maintained. Streams and ponds are relatively free from sediment. Tessellated darters and speckled madtoms are common. High populations of popular game fish such as the largemouth bass and redbreast sunfish ensure ample fishing opportunities. Both anadromous and resident fish populations are thriving.	

2. Forest Goals and Objectives

Each goal has one or more objectives associated with it, defining how that goal will be accomplished. Objectives are concise statements describing a specific result or condition desired that will contribute to goal achievement. Objectives are the second step in making the forest-wide DC narrative description operational.

No changes have occurred in the forest plan's objectives since the decision was signed, however, some of the objectives were re-evaluated by the IDT during this five year review and are include in the table.

Forest Goals

G-1 - Provide for Forest Diversity

This goal needs to be expanded to include species diversity. It also needs to include age class, structural diversity and distribution across the forest.

G-2 - Protect and Conserve Unique Areas

This goal should be expanded to include ecological and biological areas.

G-3 - Provide for High Quality Recreation

This goal should be expanded to reflect the opportunities in line with the forest niche, public demand and customer satisfaction, and financial and environmental sustainability.

G-4 - Contribute to Local Community and Social Considerations

This goal should be balanced with also needing to maintain/restore natural resources.

G-5 - Consolidate Ownership and Acquire Unique Areas

This goal should be expanded to include watersheds, fisheries, heritage sites and additional PETS habitat, especially in likely areas of restoration of longleaf pine ecosystems. Emphasis should be placed on managing rather than maintaining public access.

G-6 - Establish and Manage Trees for Present and Future Generations

Change to manage and maintain trees for present and future generations and include the importance of other forest related resources as well. Include as a goal to manage healthy and sustainable forests.

G-7 - Protect and Manage Habitat for Sustainable Populations of Native Wildlife

Emphasis should be place on sustainable (instead of viable) populations of native and desired non-native species (wildlife, aquatic and plants). Also, emphasis should be placed on controlling NNIS.

G-8 - Incorporate an Ecological Approach to Management of the Forest

Major ecological systems and subsets should be identified with emphasis on riparian soil and water protection.

Forest Plan Objectives

The following is a summary of the IDT review of forest plan objectives and recommended changes and comments.

Table 24. Forest Plan Objectives

Objective Identifier	Objective Statement	Comment
O-1	Maintain a red-cockaded woodpecker population of 450 clusters.	The current number of managed clusters is 407. The FM is currently providing birds for recovery efforts elsewhere and this is likely to continue into the future. This objective needs to be revised to better reflect the US Fish and Wildlife Service, *2003 Recovery Plan for the Red-cockaded Woodpecker.* Population goals should be based on limitations imposed on prescribed burning in the WUI. Frequent prescribed burning in the “core burn area” has developed and is maintaining desired habitat conditions. However, increase urban

		growth and smoke management has reduced or eliminated burning in other parts of the forest. This has limited forest-wide expansion of RCW populations and has actually led to declines in the southwest corner of the forest.
O-2	Have 48,000 acres (20 percent of forested acres) typed and managed as potential hard mast producing hardwoods in the next 10 years. This can include hardwood, hardwood/pine or pine/hardwood forest types.	Vegetation data indicates that this has been exceeded. This objective should be deleted and include in desired conditions for management prescriptions.
O-3	Increase the acres greater than ½ mile from an open road to 24,000 acres in the next 10 years.	This has not been achieved during the planning period but progress has been made on closing and obliterating roads. Having a greater acreage from open roads improves turkey habitat. Increase the acreage in the objective.
O-4	Increase the longleaf pine forest type to 44,700 acres within the next 10 years, and 53,500 acres in the long term.	The first part of the objective has been achieved and progress is being made on achieving the rest of the objective.
O-5	Restore the role of growing-season fires on 16,000 acres of longleaf forest type in the next 10 years and on 40,000 acres in the long term by burning on a 2-4 year cycle.	The objective should be modified to drop specific reference to growing season burning in the longleaf forest type specifically. Growing season burning is beneficial to a variety of ecosystems. Air quality may become a limiting factor to growing season burning by 2018.
O-6	Manage recreational experiences, facilities and activities to meet the adopted Recreation Opportunity Spectrum. (see ROS map, page S-7)	delete
O-7	Increase the developed recreational facilities capacity to 2,200 people-at-one-times (PAOTS) within the next 10 years and to 2,600 PAOTs in the long term.	Delete – replace provide a mix of recreation facilities in line with the forest niche, public demand and customer satisfaction, and financial and environmental sustainability.
O-8	Increase the trail system to 160 miles within the next 10-years.	The objective has been met and the emphasis should shift to provide a mix of trail opportunities in line with the forest niche, public demand and customer satisfaction, and financial and environmental sustainability.
O-9	Create conditions on 38,000 to 50,000 acres of pine stands which release overcrowded live crowns, increase residual stand growth potential, allow more sunlight to the forest floor and increase suitable habitat for the red-cockaded woodpecker.	Significant progress has been made on thinning overcrowded stands, however, limited budgets and personnel have prevented reaching the objective. A better range would be 25,000 – 50,000 over a ten-year period.
O-10	Manage visual resources to meet the adopted visual quality objective. (See VQO map, page S-8)	Delete. Develop as a standard.
O-11	Increase the acres managed as mixed pine/hardwood forest types to 14,800 acres in the long term.	Have exceeded the objective by 2 ½ times. Lack of burning has increased this forest type, especially in areas that are not frequently burned due to smoke hazards and urban encroachment. Emphasis will need to shift to maintenance of this type in the long term.
O-12	Maintain 5,000 to 10,000 acres in early successional habitat (0-3 year age class, permanent openings, wildlife openings, road rights-of-way, utility rights-of-way) in the short and long term.	This objective has not been met but is still needed. It needs to be expanded to include other types of early successional habitat and should include creating additional habitat.
O-13	Maintain or expand existing proposed,	This needs to incorporate known historic

	endangered, threatened and sensitive (PETS), and Management Indicator Species and communities (MIS). (For MIS population and habitat objectives see 5-6 - 5-8.)	occurrences of PETS and desired conditions that would restore and maintain functioning ecosystems. Drop reference to MIS.
O-14	Identify and maintain existing acreage in pine and pond cypress savanna, forested pond cypress/swamp tupelo ponds, southern Atlantic maritime forest, bay swamp pocossin, coastal plain calcareous mesic forest and sandhill longleaf woodland.	Include objectives for restoration of rare communities of savanna/woodlands.
O-15	On managed Forest ponds, sustain 200-300 pounds/acre of bass and bluegill at a ratio of 1:6 bass to bluegill.	Change objective to maintain or improve habitat on current Forest ponds.
O-16	Sustain the habitat capability for the following population densities of wildlife species in the long term in suitable habitat: eastern wild turkey – 1 turkey/75 acres; white-tailed deer – 1 deer/30-40 acres, and northern bobwhite – 1 quail/10 acres.	Change focus to types of habitat needed to support sustainable populations of primary game species.
New objective	Aquatic Restoration	A new objective should be identified to restore a certain number of miles of stream habitat
New objective	Water Quality Improvement	A new objective should be identified to close or rehabilitate roads to improve protect water quality
New objective		Watersheds are managed (and where necessary restored) to provide resilient and stable conditions to ensure the quality and quantity of water necessary to protect ecological functions and support intended beneficial water uses.

3. Standards and Guidelines

While goals and objectives define where the forest is headed for a particular area, standards and guidelines define the decision space within which the forest can operate to work towards achieving goals and objectives. Standards and guidelines are the specific technical resource management directions generated for a DC. They provide the last link in making that DC narrative description operational.

Standards are a definite rule, principle or measurement. Standards define the operational space for achievement of forest plan goals and objectives, and assure compliance with laws, regulations, executive orders and policy direction. Deviation from a standard requires a forest plan amendment.

Guidelines are used as a steering or preferred course of action. They promote the achievement of forest plan goals and objectives in a manner that permits necessary operational flexibility to respond to variations over time. Deviation from a guideline will usually not require a plan amendment, but the rationale will be documented in the project decision document.

The standards and guidelines in Chapter 2 of the plan apply forest-wide, providing the basic foundation for all resource management. They constitute the bulk of the direction necessary to meet forest-wide goals, desired future condition, and objectives. Additional specific direction pertaining to a particular MA or SMA is in Chapter 3 of the plan.

Most forest-wide standards and guidelines have remained unchanged in the forest plan. Those that did change were a result of a plan amendment and are listed, along with the changes.

Plan Amendments

The following non-significant forest plan amendments were completed in the last six years.

Amendment 1 (October 2002): This amendment provides direction for the preparation of site-specific Biological Evaluations (BE) including inventory requirements for PETS species. It makes the process of conducting BEs more efficient and consistent throughout the Southern Region.

Amendment 2 (May 2003): This amendment revises the 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 that plan and begin managing these lands through site-specific projects.

Forest-wide standards and guidelines were reviewed by the ID team in May 2008. The following table reflects areas of agreement and disagreement among resource specialists, forest staff and the district ranger regarding future changes. It is intended to provide a starting point in any future forest plan revision effort discussions.

Table 25. Forest Standards and Guidelines

	Keep	Delete	Comments
FW-1	*	*	
FW-2		*	Should address Regional Haze Program.
FW-3	*		
FW-4	*		
FW-5	*	*	Take out steep slopes
FW-6	*	*	
FW-7	*	*	Dozer firelines - direct away from water, block to prevent unauthorized use
FW-8	*	*	
FW-9	*	*	
FW-10		*	
FW-11		*	Incorporate BMPs
FW-12	*	*	
FW-13	*	*	
FW-14		*	
FW-15		*	
FW-16		*	
FW-17	*		
FW-18	*		

FW-19	*		Drop word “age”
FW-20		*	
FW-21	*		
FW-22	*		
FW-23	*		
FW-24		*	
FW-25	*		
FW-26	*		
FW-27	*		
FW-28		*	
FW-29		*	Delete – required by labeling
FW-30	*		
FW-31		*	Obsolete handbook reference
FW-32		*	Delete-tractor spraying is considered broadcast, need exception for ROWs
FW-33		*	
FW-34		*	
FW-35		*	
FW-36		*	Manual direction
FW-37		*	
FW-38		*	
FW-39		*	
FW-40		*	Replace with the following “An herbicide risk assessment is done as part of the NEPA process for each project including herbicide use.”
FW-41		*	
FW-42		*	
FW-43		*	Manual direction
FW-44	*	*	End sentence at National Forest lands, from NHPA, Section 106
FW-45	*	*	from NHPA, Section 106
FW-46	*	*	from NHPA,Section 106
FW-47	*		
FW-48	*		
FW-49		*	
FW-50		*	
FW-51		*	
FW-52		*	
FW-53		*	
FW-54	*	*	We do not used pile and burn anymore
FW-55	*	*	
FW-56		*	
FW-57	*	*	Drop – “or access” as it promotes temporary roads
FW-58		*	
FW-59	*		
FW-60		*	
FW-61		*	
FW-62		*	
FW-63		*	

FW-64		*	
FW-65	*	*	
FW-66		*	
FW-67		*	
FW-68		*	
FW-69		*	
FW-70	*	*	Do not need separate riparian direction for bugs, establish riparian management areas
FW-71	*	*	
FW-72		*	
FW-73		*	
FW-74	*	*	Add – to provide public access
FW-75	*		
FW-76	*		
FW-77		*	
FW-78		*	
FW-79	*		Move somewhere else, not PETS
FW-80	*	*	Move somewhere else, not PETS
FW-81	*		Move somewhere else, not PETS
FW-82	*	*	Move somewhere else, not PETS
FW-83	*	*	Outdated reference, change to follow recovery plans
FW-84	*	*	Change to specify selective methods and flexibility for application at the site-specific level and herbicides that are not mobile in soil
FW-85	*	*	Refer to FW-83
FW-86		*	
FW-87		*	
FW-88	*		update
FW-89	*	*	Reword into “develop and perform” add cultural into the wording
FW-90	*	*	
FW-91	*	*	Add trail structures
FW-92	*		Reword – delete handbook reference
FW-93		*	
FW-94		*	
FW-95		*	Bedding no longer used
FW-96		*	Piling no longer used
FW-97	*		Delete – last part of sentence “plus……,link to BMP or Riparian corridor
FW-98	*		Add off-site mixing and cleaning
FW-99	*		Need an exception for invasive plants, address riparian objectives and Forest health
FW-100	*	*	Need to treat invasives to bank or phragmites in/near marsh
FW-101	*	*	Reword to address riparian corridor
FW-102	*	*	Add – locate log landings outside riparian corridor
FW-103	*	*	Revise – drainage away from water sources
FW104		*	
FW105		*	

FW106		*	
FW107		*	
FW108		*	
FW109	*		Reword to include exceptions to BMPs as in the Sumter Plan for LWD
FW110		*	Reword to include language that says "…revegetation as project progresses"
FW111	*		Revise – to be more analytical than descriptive
FW112		*	
FW113		*	Required by law
FW114		*	
FW115	*		Link to establish riparian corridor/desired conditions
FW116	*	*	
FW117		*	
FW-118	*	*	This is SU permit standards
FW-119	*	*	
FW-120	*	*	Add – This limit may be exceeded for conversion from loblolly to longleaf pine
FW-121		*	
FW-122		*	
FW-123		*	
FW-124		*	
FW-125		*	Not a standard – Replace with: An even-aged regeneration area will no longer be considered an opening when the reestablished stand has reached an age of five years (see Sumter Forest Plan language).
FW-126	*		Delete the word "Regional) and replace the existing table with the one in the footnote[9]
FW-127	*		Add – by RAP analysis; see Sumter forest Plan
FW-128	*		Road Policy requires RAP to id need roads and obliterate temporary roads
FW-129		*	
FW-130	*		Delete – "….and on cut and fill slopes of all roads"; include – allow natives to seed-in naturally when soil erosion is not a problem (public

9

Minimum Stocking Guides	
Forest Type	Minimum Number of Seedlings for Adequate Stocking
Loblolly Pine	300
Slash Pine	300
Longleaf Pine	300
Hardwoods	100

			expressed concern)
FW-131		*	Cannot do this with current budget
FW-132		*	Required by law
FW-133		*	
FW-134		*	
FW-135		*	
FW-136		*	
FW-137		*	
FW-138		*	
FW-139		*	
FW-140		*	
FW-141		*	
FW-142		*	
FW-143		*	
FW-144		*	
FW-145	*		Forest silviculturist will revise standard
FW-146		*	
FW-147		*	Not good for imazapyr - could not be applied next to tolerant pines which would be non-target immediately adjacent
FW-148	*		Major rewrite
FW-149	*	*	Difficult to match with budget/timing of mowing and brushing
FW-150		*	
FW-151	*		Use Sumter FW-22 wording
FW-152	*		Combine 151 and 152
FW-153		*	
FW-154	*	*	Reword – “managed fisheries”
FW-155	*	*	Change to emphasize low standard roads

4. Suitability of Areas

The Forest Service is required to identify lands unsuited for timber production (16 USC 1604(k); 36 CFR 219.14). This identification process involves three stages of analysis. Stage 1 analysis identifies lands tentatively suitable for timber production. Stage 2 analyses are designed to explore the financial attractiveness of varying intensities of timber management on lands identified as tentatively suitable for timber production. Stage 3 analysis identifies lands as unsuited for timber production under the alternative selected as the Revised Forest Plan.

No changes to land suitability have occurred since the forest plan was signed.

5. Special Areas

a. Ecological Areas

<u>Special Areas and Rare Communities</u>

The revised plan includes objectives to identify and maintain plant communities including Southern Atlantic maritime forest, coastal plain calcareous mesic forests, pocossins, pine and pond cypress savannas, pond cypress and swamp tupelo ponds, xeric longleaf woodlands, and Southern mixed hardwood forests. These plant communities are included within MA 8, but are also found embedded throughout the general forest area. Some of these communities have the potential to be more widespread in distribution (example pocossins and pine savannas) whereas others are more commonly imbedded within a larger forested matrix and may not be large enough to be mapped.

The Francis Marion and Sumter National Forest Management Indicator Species Population and Habitat Trends Report (2001) included baseline acreages and a discussion of trends and status for these community types. Inventories and studies conducted since 2001 have resulted in the refinement of communities and ecological systems found on the forest, but vegetation inventories and databases that incorporate attributes related to wildlife habitat, plant habitat and timber are still needed.

Recent landscape-level vegetation management projects on the forest have included provisions to maintain and protect both high quality hardwood and wet savanna community remnants.

a. Riparian Areas, Wetlands, Forested Wetlands

The forest contains extensive areas of riparian areas and wetlands that are contained with the palustrine, lacustrine, riverine and estruarian systems (Cowardin, 1975). Palustrine wetlands are inland, non-tidal areas that lack flowing water. Lacustrine areas are connected to lakes. Riverine wetlands are connected to rivers and streams. Estruarian wetlands have tidal influence to varying degrees that result in elevated salinity, water quality, and habitat changes. Isolated ephemeral wetlands like Carolina bays, limestone sinks, and pocosins have no flow outlets, accumulate organics or peat and are specific habitats for specific species, some of which are PETS.

Forested wetlands and riparian areas typically contain bottomland hardwood species and/or other species that are adapted to saturated or flooded conditions, such as cypress, tupelo, cottonwood, willow, green ash, overcup oak, water hickory, sugarberry, sycamore, cherrybark oak, swamp chestnut oak, pond pine and other species. A listing of shrubs, forbs, vines and other vegetation are also used to aid in delineation. The hydrologic sources of moisture for these areas vary, but may include rainfall, streamflow, flooding, tides, lakes, ponds and groundwater sources. Impermeable or restricted soils types may sometimes lead to perched water tables. Geologic controls within the coastal plain development and formation of coastal flooding and recession periods, as well as other phenomena, have created a myriad of physical features and circumstances that detain and retain water or saturation for extended periods of time. Wetlands on the Francis Marion National Forest include both jurisdictional areas as defined and regulated by the Army Corps of Engineers (Corps) and non-jurisdictional wetland areas that meet some or all of the Corps' criteria (i.e., soils, plants and hydrology), but are either isolated or for some reason are not currently regulated. In some instances, wetlands within the coastal zone may be also regulated by the state coastal zone agencies. Wetland management is also addressed

in Executive Order 11990, which indicates primarily that our activities will avoid altering, converting or losing wetlands to non-wetlands. In addition, opportunities to restore the hydrology of former wetlands would be given a high priority.

5. MAs/MA Direction

Chapter 3 in the revised plan defines MA and sub-MA goals, desired conditions and standards and guidelines. No major changes have occurred in the plan's management area allocations.

MA 1 – Seed Orchard ~~and Progeny Test Area~~

- ✓ The progeny test areas are not managed separately on the forest.
- ✓ The amount of area dedicated to the seed orchard needs to be reevaluated to determine if some areas can be put back into other MAs.
- ✓ Standards and guidelines should be changed to allow more flexibility for wildland fire use if meeting management objectives and include prescribed burning.

Table 26. MA 1

Standards/Guidelines	Keep	Delete	Comments
MA1-1		*	Change to a fire management strategy for the area
MA1-2		*	FSH direction

MA 2 – Wilderness

- ✓ Update fire language to reflect fire use to restore or maintain desired conditions.

Table 27. MA 2

Standards/Guidelines	Keep	Delete	Comments
MA2-1		*	Change to a fire management strategy for the area
MA2-2	*		
MA2-3	*		
MA2-4	*		
MA2-5	*		
MA2-6	*		
MA2-7	*		
MA2-8	*		
MA2-9	*		
MA2-10	*		
MA2-11	*		
MA2-12	*		
MA2-13	*		
MA2-14	*		
MA2-15	*		

MA2-16	*		
MA2-17	*		Expand to include ability to use fire to restore and maintain natural vegetation conditions.
MA2-18	*		
MA2-19	*		

MA 4 – Santee Experimental Forest

- ✓ Take out Research Natural Area (RNA) Guilliard Lake and put in MA 8. Take out reference to designating Honey Hill Limesink as RNA.

Table 28. MA 4

Standards/Guidelines	Keep	Delete	Comments
MA4-1		*	
MA4-2		*	
MA4-3			

MA 8 – Special Areas

- ✓ Tibwin Plantation is both an historical and a botanical area.
- ✓ The Honey Hill Limesink is no longer being considered for RNA status.
- ✓ All area descriptions should be rewritten and updated to reflect current status and additional areas may be added during revision.

Table 29. MA 8

Standards/Guidelines	Keep	Delete	Comments
MA8-1	*		
MA8-2		*	Rewrite, it is not clear what the direction is.
MA8-3		*	Include in desired condition statement
MA8-4		*	
MA8-5		*	

MA 26 – Sandy Ridges and Sideslopes

- ✓ Refinement of areas suitable for longleaf pine restoration need to be identified based on soils mapping and prescribed burning frequency.

Table 30. MA 26

Standards/Guidelines	Keep	Delete	Comments
MA26-1		*	Not a standard
MA26-2		*	Not a standard
MA26-3		*	Not a standard
MA26-4		*	Not a standard

MA26-5		*	Not a standard

MA 27 – Loamy Ridges, Flats and River/Creek Bottoms

- ✓ Have not met MA27-O-1 objective in this management prescription but have in other areas.
- ✓ Remove MA27-O-2 and emphasize maintaining mixed stands of pine and hardwoods giving the diversity of ecotypes in the MA.
- ✓ Reanalyze what is considered as likely MA 27 areas and consider adding areas north of US Highway 17A that are currently in MA 26.
- ✓ Establish another MA for riparian areas.

Table 31. MA 27

Standards/Guidelines	Keep	Delete	Comments
MA27-1		*	
MA27-2		*	
MA27-3		*	
MA27-4		*	
MA27-5		*	
MA27-6		*	
MA27-7		*	

MA 28 – Flatwoods and Loamy Ridges

- ✓ The DC for this MA needs to be reconsidered especially maintaining loblolly pine as the dominant species.
- ✓ In or out of the “core burn area”

Table 32. MA 28

Standards/Guidelines	Keep	Delete	Comments
MA28-GDL-1		*	

MA 29 – Swamps and Swampy Flats

- ✓ This MA should be included with Riparian Corridors, Wetlands and Ephemeral Ponds.

Table 33. MA 29

Standards/Guidelines	Keep	Delete	Comments
MA29-1			
MA29-2	*		Modify to allow herbicides to control invasives
MA29-3			
MA29-4			
MA29-5			

7. Monitoring and Evaluation

Monitoring and evaluation provide information to determine whether programs and projects are meeting forest plan direction. Overall direction for the monitoring and evaluation of forest plans is found in FSM 1922.7; FSH 1909.12,6; and 36 CFR 219.12(k). Chapter 5 of the revised plan provides information on how the implementation of the plan is monitored and evaluated.

When the forest monitors how well it is meeting forest plan desired future conditions, goals and objectives, and standards and guidelines, it is monitoring how effectively it has addressed the public issues and management concerns raised during the forest planning process. As detailed in Chapters 1 and 2 of the Francis Marion National Forest Final Environmental Impact Statement, public issues and management concerns were the foundation upon which desired future conditions, goals and objectives, and standards and guidelines were established. New issues that arise during the implementation of this revised forest plan may result in additional monitoring items being added to our annual monitoring program.

Three types of forest plan monitoring were conducted: Implementation monitoring; effectiveness monitoring; and validation monitoring.

Implementation monitoring determines if plans, prescriptions, projects and activities are implemented as designed and in compliance with forest plan objectives, requirements, and standards and guidelines. Evaluation of implementation monitoring may require adjustment of prescriptions and targets or changes in plan or project administration. (FSM 1922.7)

Effectiveness monitoring determines whether plans, prescriptions, projects and activities are effective in meeting management direction, objectives, and standards and guidelines. Evaluation of the results of effectiveness monitoring is used to adjust forest plan objectives, targets, prescriptions, standards and guidelines, conservation practices, mitigation measures and other BMPs and could result in change to or amendment of the forest plan. (FSM 1922.7)

Validation monitoring is designed to ascertain whether the initial assumptions and coefficients used in development of a forest plan are correct or if there is a better way to meet forest planning regulations, policies, goals, and objectives. Evaluation of this type of monitoring can result in amendment of forest plans and may be used to recommend

changes in laws, regulations, and policies that affect both the plan and project implementation. (FSM 1922.7)

Monitoring task sheets are located in Appendix B in the revised forest plan and were used to further develop the details, priorities and budgeting for monitoring. Changes to task sheets do not require a Forest plan amendment unless the desired future conditions, goals and objectives, or standards and guidelines being monitored change, or the monitoring questions and/or monitoring level changes.

8. Annual Budgets and Activities

The incremental implementation of forest plan management direction is accomplished through the annual program of work. Since outputs are not hard and fast decisions within a plan, all conditions required for producing outputs, such as annual budget appropriations, are not controlled entirely by the forest. Outputs and activities in individual years can vary significantly, depending on available funds. Upon approval of a final budget for the forest, the annual program of work is adjusted to the final budget and then carried out.

Table 34. Activities and Budget for FY03-FY07

Activity	Unit of Measure	FY03	FY04	FY05	FY06	FY07	Ten-year Plan Estimate
Maintained Permanent Wildlife Openings	Acres	720	720	720	720	819	810
Covert Loblolly to Longleaf	Acres	0	0	0	0	0	7,700
Establish Regeneration	Acres	0	0	0	0	0	16,150
Fertilization	Acres	0	0	0	0	0	600
Intermediate Stand Treatments	Acres	0	0	2,000	4,223	947	22,500
Regeneration Harvest	Acres	0	0	0	0	0	3,600
Thinning Harvest	Acres	2,228	983	2,280	3,736	1,696	44,000
Volume offered for Sale	MMCF	2.3	0.8	2.6	6.2	3.2	33
Dormant Season Prescribed Burning	Acres/Year	19,027	24,426	23,381	19,521	25,012	26,000
Growing Season Prescribed Burning	Acres/Year	22,500	7,110	11,862	11,409	10,501	4,000
Annual Payments to Counties	M$	897	908	929	938	937	68
* Annual Budget	MM$	11.4	13.6	10.8	10.2	9.4	N/A

* 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. Timber roads are those roads under timber sale contract. Permanent wildlife openings do not include maintained linear wildlife strips.

F. Science Consistency

1. Documentation of Best Available Science

Planning teams are required to ‘‘integrate knowledge of the physical, biological, economic and social sciences, and the environmental design arts in the planning process’’ (§ 219.5(a) of 1982 planning rule). The 2008 Planning Rule requires the responsible official to take into account the best available science. The agency proposes the words ‘‘take into account’’ because this term better expresses that formal science is just one source of information for the responsible official and only one aspect of decision-making.

The responsible official may use independent peer reviews, science advisory boards, or other appropriate review methods to evaluate the application of science used in the planning process. Forest Service directives (FSH 1909.12, chapter 40) set forth specific procedures for conducting science reviews.

The agency is committed to taking into account the best available science in developing plans, plan amendments, and plan revisions as well as documenting the consideration of science information. Under this proposed rule, the responsible official must: (1) document how the best available science was considered in the planning process within the context of the issues being considered; (2) evaluate and disclose any substantial uncertainties in that science; (3) evaluate and disclose substantial risks associated with plan components based on that science; and (4) document that the science was appropriately interpreted and applied. Any interested scientists can be involved at any of the public involvement stages (36 CFR 219.11 of proposed 2007 Planning Rule).

The following recommendations have been developed (June 21, 2007 Memo to Regional Planning Directors) for documenting consideration of best available science in planning and project level environmental analyses:

- ✓ What constitutes best available science might vary over time and across scientific disciplines. As a general matter, we show consideration of the best available science when we insure the scientific integrity of the discussions and analyses in the project NEPA document. Specifically, the NEPA document should identify methods used, reference scientific sources relied on, discuss responsible opposing views, and disclose incomplete or unavailable information, See 40 CFR, 1502.9 (b), 1502.22, 1502.24.

- ✓ The project record should reference all scientific information considered: papers, reports, literature reviews, review citations, peer reviews, science consistency reviews, results of ground-based observations, and so on. The specialists report in the record should include a discussion substantiating that consideration of the aforementioned material was a consideration of the best available science.

- ✓ The responsible official should include a statement in the record of decision, decision notice, or decision memo showing consideration of the best available science as the basis for the decision. For example: “My conclusion is based on a review of the record that shows a thorough review of relevant scientific information,

a consideration of responsible opposing views, and the acknowledgment of incomplete or unavailable information, scientific uncertainty, and risk" and then briefly mention specific things from the record.

The following lists some ways best available science was used to provide quality information for preparing this document:

- ✓ 2000 Census Data: Internet queries were used as a means to collect raw and interpreted data from the US Census Bureau for much of the demographic and income information in this Review.

- ✓ MIS Population and Habitat Trends (May, 2002): The Francis Marion and Sumter National Forests compiled information on the status and trends of management indicator species. This information was used to amend the forest plan.

- ✓ Yearly monitoring is done on the RCW and information is compiled in a status report that indicates current status of the species and habitat.

- ✓ PETS List Updating: The forest's list of PETS species are updated periodically. These updates are reflected in the tables and discussion and information was also incorporated in site-specific NEPA analysis and decision documents prepared during this time.

2. Documentation of Risk and Uncertainty (Associated with Factors Influencing Conditions and Trends)

The responsible official must take into account the best available science, and document in the plan that science was considered, correctly interpreted, appropriately applied, and evaluate and disclose incomplete or unavailable information, scientific uncertainty, and risk. This evaluation and disclosure of uncertainty and risk provide a crosscheck for appropriate interpretation of science and help clarify the limitations of the information base for the plan.

For any type of planning, some risk and uncertainty will exist when trying to predict unexpected events and the short and long-term consequences of those events. Catastrophic events like hurricanes, wildfire, flooding, and insect epidemics are hard to predict with any certainty. If these unplanned events occur, either separately, or concurrently, the plan's expected outcomes could change. Changes in public laws, court decisions, and budget appropriations could constrain or redirect planned outcomes. Also, events that occur on private lands may indirectly or cumulatively affect conditions needed to attain outcomes planned for the forest.

The management direction (goals, objectives, DCs, standards and guidelines) in the revised plan makes the basic assumption that our desired outcomes will remain "desirable" for at least a decade, and that any unplanned natural or man-made events will be at a scale small enough to not be a significant threat to achieving the planned objectives. This assumption is also predicated upon many smaller resource-based cause-and-effect assumptions that need validation over time through the monitoring system

developed for the plan. For this reason, the forest relies predominately on its annual monitoring reporting to assess changing conditions and new risks as they develop, and adapt management direction as necessary to reach the Plan's desired outcomes.

V. Existing Condition/Desired Condition Photographs

The following photographs represent project work completed to reach or move closer to the desired condition for a sampling of forest resources.

Flatwoods Salamander Habitat Improvement Work

Before Treatment

After Mechanical Chipping Treatment

Flatwoods Salamander Habitat Improvement Work

After Prescription Burning – 4/15/2008

Vegetation Regrowth – 6/30/2008

Flatwoods Salamander Habitat Improvement Work

Sunset Pond – Before Prescribed Burn

Sunset Pond - After Prescribed Burn

Sunset Pond – Vegetation Regrowth

RCW Midstory Treatments

Understory Vegetation Conditions before Treatment

RCW Midstory Treatments

Understory Vegetation Conditions after Treatment

Prescribed Fire Used as Maintenance Tool in Thinned Stands

Fuel Model 7

Fuel Model 2

Managed Pine

Desired Condition for Young Pine Stands

Desired Condition for Longleaf Pine Ecosystem (Note: RCW Cavity Trees)

Desired Condition for RCW Cluster Site (Note: maintained by prescribed fire)

Burning Around Cavity Tree

Typical Post Hugo Pine Stands

Pine Stand (Compartment 21) – Before Biomass Thinning

Pine Stand (Compartment 21) - After Biomass Thinning

Wambaw Cycle Trail - Improvement Work

Existing trail condition before work

After completion of trail work (Note: barrier fence to prevent illegal off-trail use)

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