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1989
Francis Marion National Forest
After Hurricane Hugo

2015
Francis Marion
National Forest

Draft Environmental Impact Statement Appendices

for the Revised Land Management Plan

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Francis Marion National Forest
Draft Environmental Impact Statement Appendices
for the
Revised Land Management Plan

Berkeley and Charleston Counties, South Carolina

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Appendix A: The Public Involvement Process

Starting in the fall of 2012, the planning team held two public meetings to kick off the plan revision process and invite the public to collaborate on the development of plan components. Between the winter of 2013 and fall 2013, the forest hosted 2 public meetings on sustainable recreation and ecological sustainability. The following six themes emerged during this series of public meetings from October 2012 through September 2013 to start the forest plan revision process.

Theme 1	**Maintain, improve, or restore the unique landscapes and features on the Francis Marion National Forest**
Theme 2	**Improve the quality of life and health for stakeholders**
Theme 3	**Respond to challenges**
Theme 4	**Share operational and planning resources among partners; keep ongoing collaborative efforts vibrant and develop new ones**
Theme 5	**Develop a monitoring strategy that provides information for rapid responses to changing conditions**
Theme 6	**Manage resources by integration and coordination**

In January 2014, a meeting occurred between USDA Forest Service officials and the Catawba Indian Nation to discuss the plan revision process and the findings in the assessment. Discussions focused on special forest products that might be of interest to local tribes.

In the winter of 2014, the assessment, need for change, and proposed management strategies were posted on-line on the public website for the Francis Marion plan revision. These documents are available at http://www.fs.usda.gov/scnfs. In February 2014, the forest hosted an open house on the proposed action, which was followed by scoping the proposed action starting in May 2014. The scoping process involved mailing a scoping letter summarizing the assessment, need for change on1996 Plan, and proposed management strategies to more than 60 people on the the Francis Marion's project mailing list. In addition, an email announcing the availability of the assessment, need for change, and the proposed management strategies was sent out to over 200 people that had signed up on the Francis Marion listserve.

The public collaborative planning process to develop plan components consisted of 5 subsequent meetings and one field trip during the spring and summer of 2014 with up to 60 participants at one meeting. Other federal and state agency representatives, local officials, adjacent landowners, non-governmental organization and user group representatives, members of the academic community, and other interested individuals participated. At each meeting participants had the opportunity to learn something about the forest resources, give suggestions for plan components, review and refine work from the previous meeting. A public meeting was held on the rolling alternative in September 2014 with approximately 80 participants. Generally, comments were favorable and supportive of the rolling alternative, which emphasizes prescribed burning, restoration of hydrologic function, and sustainable recreation opportunities.

Starting in Fall 2014, Forest Service employees have appeared monthly on Low Country Live. While topics of the interviews include a variety of subjects that relate to management of the Francis Marion, the plan revision efforts have been discussed.

Targeted outreach efforts to youth and low income populations include various activities. The Forest Service has developed partnerships with TRIO (federal program working with middle school to college level students) and the local technical colleges in SC.

- Through TRIO, the Forest Service hosts a booth at the annual TRIO conference and is developing a job shadowing program so students can learn about careers in the Forest Service.

- The Francis Marion and Sumter NFs are co-sponsors of a widget development competition that targets women in the technical college system. As part of this program, Forest Service employees discuss job opportunities in the information technology field.

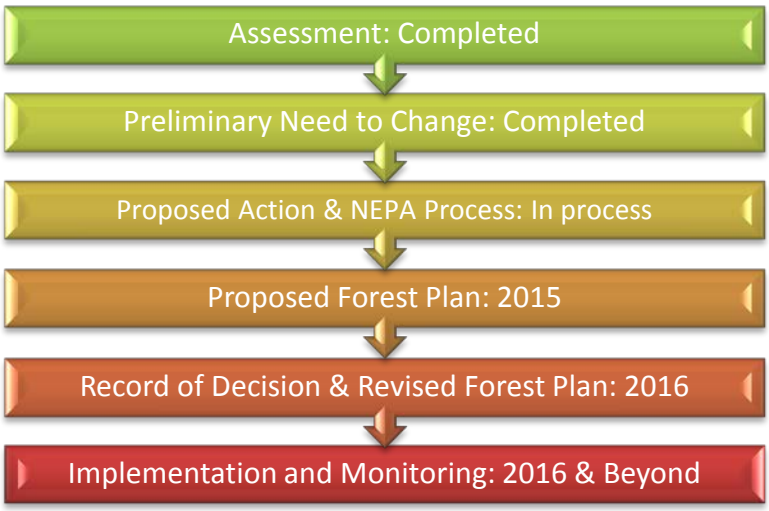
Appendix B: The Planning and Analysis Process

The National Forest Management Act of 1976 requires each national forest to develop a land and resource management plan (commonly referred to as a forest plan) and amend or revise the plan every 10 to 15 years. This appendix describes the required steps and how the Francis Marion LRMP revision process fulfilled those steps. Documents identified are included in the process record and are available online at http://www.fs.usda.gov/scnfs.

The Francis Marion National Forest Plan was approved in 1996 and forest personnel have begun revising this forest plan under guidance of the 2012 planning rule. Planning and revision for a national forest plan is an iterative process that includes three phases:

1. Assessment (36 CFR 219.6)
2. Developing, amending, or revising a forest plan (§§ 219.7 and 219.13)
3. Monitoring (§ 219.12).

The following diagram indicates the steps involved to complete Phases 1 and 2 and where we are in the plan revision process:



The 2012 Planning Regulations at 36 CFR 219.7(c) identifies the process for plan development or plan revision. The steps in this process are described below.

Identify a preliminary need to change the existing plan and to inform the development of plan components and other plan content (§ 219.7(c)(2)(i)).

Assessment

The assessment evaluated existing information, forest plan amendments and annual monitoring reports. Additionally, outcomes from public meetings and other outreach efforts were considered. All these sources provided valuable information about changes that are needed in the existing forest plan. A copy of the final Assessment is available online at the address shown on page 1.

Need to Change

The findings from the Assessment, along with the following information, were then used to develop a "Preliminary Need to Change":

- public preferences about the future of the Francis Marion National Forest (which emerged during a series of public meetings from October 2012 through September 2013);
- managers' needs; and
- Compliance with laws, regulations, and policies.

A copy of the "Preliminary Need to Change" document is also available online at the address shown on page 1.

The Preliminary Need to Change identified six themes below to start the forest plan revision process. These themes are broad concepts relating to public preferences and forest management needs:

Theme 1	**Maintain, improve, or restore the unique landscapes and features on the Francis Marion National Forest**
Theme 2	**Improve the quality of life and health for stakeholders**
Theme 3	**Respond to challenges**
Theme 4	**Share operational and planning resources among partners; keep ongoing collaborative efforts vibrant and develop new ones**
Theme 5	**Develop a monitoring strategy that provides information for rapid responses to changing conditions**
Theme 6	**Manage resources by integration and coordination**

Using these "themes" the planning team developed statements that describe specific needs for changing the existing forest plan. A management emphasis statement for each theme was then developed. While this process recommended a preliminary need to change the existing forest plan; it did not include every topic that will be addressed in the revised forest plan.

Consider the goals and objectives of the Forest Service strategic plan (§ 219.7(c)(2)(ii))

The following goals and objectives of the current Forest Service Strategic Plan, as applicable to the Francis Marion NF, are being addressed in the Proposed Forest Plan for the Francis Marion NF.

Goal 1. Restore, Sustain, and Enhance the Nation's Forests and Grasslands

Objective 1.1 Reduce the risk to communities and natural resources from wildfire

Objective 1.2 Suppress wildfires efficiently and effectively

Objective 1.3 Build community capacity to suppress and reduce losses from wildfires

Objective 1.4 Reduce adverse impacts from invasive and native species, pests, and diseases

Objective 1.5 Restore and maintain healthy watersheds and diverse habitats

Goal 2. Provide and Sustain Benefits to the American People

Objective 2.1 Provide a reliable supply of forest products over time that (1) is consistent with achieving desired conditions on NFS lands and (2) helps maintain or create processing capacity and infrastructure in local communities

Objective 2.3 Help meet energy resource needs.

Goal 4. Sustain and Enhance Outdoor Recreation Opportunities

Objective 4.1 Improve the quality and availability of outdoor recreation experiences

Objective 4.2 Secure legal entry to national forest lands and waters

Objective 4.3 Improve the management of off-highway vehicle use

Goal 5. Maintain Basic Management Capabilities of the Forest Service

Objective 5.1 Improve accountability through effective strategic and land management planning and efficient use of data and technology in resource management

Objective 5.2 Improve the administration of national forest lands and facilities in support of the agency's mission

Identify the various physical, biological, social, cultural, and historic resources on the plan area; and consider conditions, trends, and stressors (§ 219.7(c)(2)(iii & iv))

The biological, social, cultural and historic resources on the plan area; along with their conditions, trends and stressors; are described in the Plan Assessment which can be viewed online at http://www.fs.usda.gov/scnfs. Summaries of these resources, conditions and trends are also provided in Chapter 3 of this Draft Environmental Impact Statement.

In assessing the resources, conditions and trends, the sources of the scientific information used are documented in the Plan Assessment and the References section of the DEIS.

The following information and analytical tools were also used:

- Stand examination inventory data collected in the field is entered into our corporate database for tracking overstory vegetation with fields of information such as forest type, stand age, condition, and acres. Our current GIS (geographic information system) utilizes ArcGIS version 10.1, which links to our FSVeg tabular database using sde(spatial database engine) to connect to FSVeg Spatial (oracle db).
- Other types of inventory data collected and entered into corporate databases and our GIS include roads and trails and conditions, recreation sites and conditions, archeological sites, stream networks, certain wildlife habitats, fire history, digital elevation, and land ownership.
- Federal and State agency, local government and tribal websites are a source of information about other programs and plans, lists of rare species and occurrence records, some economic information, forest health information, soil and water information.

- NatureServe's ecological systems (2004) are used as a starting point to define ecosystem types on the Francis Marion NF.
- Place based knowledge and information is contributed by participants in the collaborative planning process.
- U.S. Census Bureau data is used to summarize demographics and some economic information.
- Citations listed in the References chapter provide additional information including the best available scientific information in regard to specific analysis topics.
- The Fire Emission Production Simulator (FEPS) is a tool developed by the Forest Service Fire and Environmental Applications Research Team (FERA) to produce hourly emissions and heat release data for prescribed and wildland fires.
- VSMOKE is a simple smoke screening model developed by Lee Lavdas.
- FireFamilyPlus (FFP) is a Windows program that combines fire climatology and fire occurrence analysis. FFP was used here to organize weather data from Remote Automated Weather Station(s) (RAWS) and fire occurrence data for export into the BehavePlus and ArcGIS programs.
- LANDFIRE (also known as Landscape Fire and Resource Management Planning Tool) is an interagency vegetation, fire and fuel characteristics mapping program that provides a national interagency database of spatial coverage for reference, in this case, for forested lands outside the forest boundary and within the analysis area.
- BehavePlus is a PC-based program that is a collection of models that describe fire and the fire environment. It is a flexible system that produces tables and graphs and can be used for a multitude of applications.
    - The primary modeling capabilities of BehavePlus as used for this assessment include surface fire spread and intensity.
- FlamMap is a fire behavior prediction and assessment model that is widely used across the nation and in many other countries. It was produced by Dr. Mark Finney of the Missoula Fire Lab in 2006. FlamMap here will be used to assess fire type.
- The Kernel Density tool found in the ArcGIS Spatial Analyst extension. By definition the Kernel Density tool calculates the density of features in a neighborhood around those features. Kernel Density was applied to wildland fire ignitions in order to analyze both size and frequency characteristics.
- The climate projection ensembles considered in the Francis Marion National Forest plan assessment were produced from fifteen downscaled global climate models (GCMs) by The Nature Conservancy's Climate Wizard (Girvetz et al. 2009). Examining ensembles of climate projections helps to quantify the range of possible future climates, instead of considering a single or comparing across individual GCMs. The downscaled GCMs were produced by the Coupled Model Intercomparison Project Phase 3 (CMIP3; Meehl et al. 2007), a critical source of data to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (AR4, IPCC; IPCC 2007).

Identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System (§ 219.7(c)(2)(v))

See Appendix D of this DEIS for a description of the lands identified and evaluated for possible inclusion in the National Wilderness Preservation System.

Identify the eligibility of rivers for inclusion in the National Wild and Scenic River System (§ 219.7(c)(2)(vi))

See Appendix C of this DEIS for a description of the rivers considered and determined to be eligible for inclusion in the National Wild and Scenic River System.

Determine whether to recommend any additional areas for designation (§ 219.7(c)(2)(vii))

The Plan Assessment identifies any areas that the public or other agencies have suggested/recommended for a special designation.

The alternatives in the DEIS show the additional areas that were considered for designation, and the Proposed Forest Plan shows those areas that are being recommended for a special designation.

Identify the suitability of areas for the appropriate integration of resource management and uses; including identifying lands which are not suitable for timber production (§ 219.7(c)(2)(viii))

The Proposed Forest Plan, in Chapter 3 identifies the suitability of various uses and activities within different land delineations on the Forest.

The Proposed Forest Plan (see Plan Appendix B) and the DEIS in Chapter 3 shows the identification of the lands not suitable for timber production, which is also summarized here.

Suitability for Timber Production

There are two “steps” in determining lands suitable for timber production. The first stage identifies the lands that are non-forest, lands withdrawn from timber production, lands that cannot be adequately restocked, etc. to identify the lands “may be suitable” for timber production. The second stage identifies the lands that “may be suitable for timber production” that are not appropriate for timber production. These two steps are detailed below.

Step 1: Lands That May Be Suited for Timber Production

The first step is to identify lands that are not suited based on legal and technical factors at 36 CFR 219.11 (a) (i), (ii), (iv), (v,) and (vi). For the Francis Marion National Forest this centers on two factors:

1. Lands on which Timber Production is Prohibited or Lands Withdrawn from Timber Production
2. Identifying non-forest land

The first category includes designated wilderness areas, Guilliard Lake Research Natural Area, and Santee Experiment Forest. The largest subcategories of non-forest land include brush, water and marsh, wildlife openings and rights-of-way. The land base remaining after these two categories of land are subtracted from the total land area leaves lands that may be suitable for timber production.

Step 2: Lands Suited for Timber Production

This step is based on the compatibility of timber production with the desired conditions and objectives for those lands. Desired conditions, objectives, management areas and other plan components vary among alternatives. The result of this 2 step analysis is shown in Table B-1.

The overlap of categories makes consistent acreages difficult. For example, the recommended wilderness in Alternative 3 includes acres of brush, pond pine, RCW clusters, riparian management zones, water and wildlife openings. Resolution of these differences is contained in the process record for plan revision. Note that riparian management zones are narrower in Alternative 1, the 1996 plan.

Land Stratification, Analysis Units

The following portions of this appendix discuss land stratification and timber modeling assumptions. None of the alternatives make decisions on silvicultural systems. Those decisions are made at the project level. Desired conditions and objectives drive the plan and project decisions. Modeling assumptions do not. Also note that while ecological systems have been modeled for Alternatives 2 and 3, this mapping is an imperfect approximation. Under Alternative 2 or 3, field verification and judgment of the applicable ecosystem will be used to select the appropriate desired conditions. For timber growth and yield to be modeled and analyzed, ecological systems had to be translated into forest types and grouped into analysis units.

Table B-1. Lands Suitable for Timber Production (acres)

Classification	Alternative 1	Alternative 2	Alternative 3
Total National Forest System Lands	259,625	259,625	259,625
Nonforest lands			
Water and marsh	817	817	817
Brush	6,757	6,757	6,757
Wildlife openings	555	555	555
Rights-of-way	126	126	126
Administrative sites	20	20	20
Developed recreation sites	80	80	80
Borrow pits	6	6	6
Cemeteries	6	6	6
Lands Withdrawn From Timber Production			
Wilderness areas	13,649	13,649	13,649
Santee Experiment Forest	5,966	5,966	5,966
Guilliard Lake Research Natural Area	23	23	23
Lands That May be Suitable for Timber Production	231,620	231,620	231,620
Lands where timber production is not compatible with achieving desired conditions and objectives (lands not appropriate for timber production.)	47,277	37,597	54,313
Recommended Wilderness			20,362
Pond pine forest types	5,696	6,132	5,610
Riparian management zones (w/in 100' of perennial streams or within 50' of intermittent streams in Alts 2-3)	15,212	20,969	19,975
Inventoried roadless area	1,394	1,394	
Red-cockaded woodpecker clusters	6,461	6,481	5,745
Genetic resource management area (seed orchard)	673	673	673
Special uses	18	18	18
Cedar Hill Island	802	802	802
Guilliard Lake Scenic Area	1,054	1,054	1,054
Battery Warren Historic Area	74	74	74
Big Ocean Bay	287		
Blue Springs	4		
Ion Swamp	1,101		
MA 29 Core Linkage Area	2,412		
MA 29 Outside HMA	10,330		
Sewee Historic Area	263		
Tibwin Plantation	1,149		
Watahan Plantation Historic Area	347		
Lands Suitable for Timber Production	184,343	194,023	177,307
Lands Not Suitable for Timber Production	75,282	65,602	82,318

Each of the alternatives had the following 3 analysis units:

- Upland Hardwoods
- Cypress-Tupelo
- Bottomland Hardwoods and Hardwood-Pine

For Alternatives 2 and 3, the bottomland hardwoods and hardwood-pine analysis unit also includes loblolly pine and mixed loblolly pine-hardwood forest types in what were modeled as bottomland or swamp ecosystems. The process record for the 1996 plan (Alternative 1) shows that all modeling was based on even-aged assumptions. That methodology has been followed again, except that regeneration of pine stands in the red-cockaded woodpecker habitat management area is assumed to be two-aged for consistency with current direction.

Alternatives 2 and 3 have three other analysis units. These are:

- Management Area 1, Upland Longleaf Pine
- Management Area 1, Wet Pine Savannas and Flatwoods
- Management Area 2, Loblolly Pine and Pine-Oak

The process record for the 1996 plan (Alternative 1) showed how longleaf pine and loblolly pine forest types were modeled across the forest. In Table B-2, MA is short for management area. HMA is short for habitat management area. HMAs are the designated areas which are managed for red-cockaded woodpecker habitat. The analysis unit names show whether the primary species modeled is longleaf pine or loblolly pine. The number following is the modeled rotation length in years.

Modeling Assumptions

Many modeling assumptions have already been discussed above under land stratification and analysis units. Additional assumptions by alternative are discussed below.

For **Alternative 1**,

- Rotation length for upland hardwoods is 100 years.
- Rotation length for cypress-tupelo is 120 years.
- For bottomland hardwoods and hardwood-pine the rotation is 120 years.
- For the pine analysis areas within the habitat management area for red-cockaded woodpeckers (RCW), regeneration is two-aged to be consistent with direction.
- In the HMAs, basal areas of mature stands are maintained between 70-110 square feet per acre to be consistent with 1995 RCW direction.

Table B-2. Longleaf pine and loblolly pine analysis units for Alternative 1

	Loblolly pine forest types	Longleaf pine forest types
MA26, HMA upland longleaf systems	Longleaf 120	Longleaf 120
MA26, HMA outside upland longleaf	Loblolly 100	Longleaf 120
MA26, non-HMA, upland longleaf system	Longleaf 70	Longleaf 70
MA26, non-HMA, not upland longleaf	Loblolly 60	Longleaf 70
MA27, HMA	Loblolly 100	Longleaf 120
MA27, non-HMA	Pine-hardwood 120	Longleaf 120
MA28, HMA	Loblolly 100	Longleaf 120
MA28, non-HMA	Loblolly 60	Longleaf 70
MA29, HMA	Loblolly 150	Longleaf 200
MA29, non-HMA	Unsuitable	Unsuitable

For **Alternatives 2 and 3** key assumptions for the analysis units are:

- **Management area 1 upland longleaf pine**
  - Long term management is uneven-aged. At age 120 stands enter uneven-aged management. Most stands remain even-aged over the next 5 decades.
  - Loblolly pine stands age 20-50 are converted to longleaf pine. Note: Guideline G4 addresses exceptions to the requirement of CMAI. Tree stands planned for regeneration harvest should generally have reached culmination of mean annual increment of growth. Typically, even-age regeneration harvests should not be made prior to age 35 for loblolly pine or age 50 for longleaf pine. However, plantations of loblolly pine on longleaf pine sites may be harvested for restoration purposes as soon as they are merchantable. Generally, hardwood regeneration harvests will not be made prior to age 50.
  - Loblolly pine stands over age 50 are assumed to be functional longleaf pine habitat and are not converted to longleaf pine until age 100+. These stands are maintained at basal areas between 40 and 70 square feet per acre.
- **Management area 1 wet pine savannas and flatwoods**

  The 3 assumptions above are the same, except 30% of stands are assumed to be too wet for planting and prompt conversion to longleaf pine.
- **Management area 2 loblolly pine and pine-oak**

  Management is even-aged. Rotation age is 60 years.
- **Bottomland hardwoods and hardwood-pine**

  Management is even-aged or two-aged. Rotation age is 100 years.
- **Upland hardwoods**

  Management is even-aged or two-aged. Rotation age is 100 years.
- **Cypress-tupelo**

  Management is even-aged or two-aged. Rotation length is 140 years.

Growth and Yield Modeling

Growth and volume yield were largely modeled using the Forest Vegetation Simulator (FVS). Forest Inventory and Analysis (FIA) data from South Carolina was the basis for the model simulations. The geographic sources for the plots were matched as tightly to the Francis Marion as possible while still maintaining ample sample sizes. For each analysis unit, plot data was examined to screen out forest types not matching what had been set in the filter requests. It was also examined to screen out plots with basal areas that seemed out of bounds compared to what would reasonably be expected.

The FVS model was calibrated for defect, radial diameter growth rates and basal area maximums. Francis Marion NF timber sale data was used to calibrate defect for loblolly pine sawtimber. Defect for all other species was set based on wider area averages found in FIA data. Growth and yield literature was examined to set the basal area maximums in the FVS model runs for the different analysis areas.

Results were compared to growth and yield literature and estimates made by other national forests to be sure they seemed within reason. Average volumes from first thinning sales on the Francis Marion were used for those harvests.

Volumes from the FVS analysis are in cubic feet, and the sustained yield limit (SYL) and the projected wood sale quantity (PWSQ) are calculated in cubic feet. When cubic feet need to be converted to board feet, a conversion factor of 5 board feet/cubic foot has been used.

Identify the maximum quantity of timber that may be removed from the plan area (219.7(c)(2)(ix))

After lands suitable for timber production were determined, grouped into analysis units, and yield estimates made, an estimated timber sale program was calculated for each alternative. Sustained yield limit calculations, timber scheduling and changes in vegetation species composition, condition and age were modeled using an excel workbook. Formulas that moved calendar year 2014 acres in 10-year increments were entered by vegetation type and age. The formulas accounted for acres modeled to change vegetation types due to restoration treatments. The resulting timber sale program estimates are shown below in Table B-3.

Three factors greatly affected timber scheduling and the uneven volumes from decade to decade. First of these, especially in Alternatives 2 and 3, is the intent to convert very large acreages of loblolly pine to longleaf pine in the first decade. This tends to create a large spike in harvest the first decade, and a large drop in the following few decades. This repeats when the acres regenerated to longleaf pine come of age for thinning in future decades.

Table B-3. Projected Wood Sale Quantity (PWSQ) for all products by decade (MCF/decade)

	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Alternative 1	95,470	84,244	88,229	79,102	83,846
Alternative 2	98,643	95,439	78,887	78,735	96,187
Alternative 3	100,396	93,455	78,687	81,952	97,337
Sustained Yield Limit = 113,844					

The second factor owes to the effects of Hurricane Hugo. Because of that event, the acreage in age 20-30 year old forest is quite large, comprising approximately 27% of the Francis Marion National Forest. Equally important is a following trough of very few acres 0 to 20 years of age.

Related to the first two factors, the third is a large need for thinning to maintain desired tree densities in pine stands. This need is to maintain red-cockaded woodpecker habitat, reduce susceptibility to southern pine beetle attack, and maintain tree vigor and forest health.

For Alternatives 2 and 3, mostly due to the first factor above, no harvest was scheduled in either hardwood types or cypress-tupelo in the first decade so that harvest levels would not exceed sustainable levels.

Identify questions and indicators for the plan monitoring program (§ 219.7(c)(2)(x))

See Chapter 4 of the Proposed Plan, along with Plan Appendix F for a description of the questions and indicators for the plan monitoring program.

Identify potential other content in the plan (§ 219.7(c)(2)(xi))

The "other plan content" involves:

- Identifying watersheds that are a priority for maintenance or restoration (see Chapter 2 and Appendix E in the Proposed Forest Plan)
- Describe the plan area's distinctive roles and contributions within the broader landscape (see Chapter 1 of the Proposed Forest Plan)
- Include the monitoring program (see Chapter 4 and Appendix F of the Proposed Forest Plan)
- Identify proposed and possible actions that may occur on the plan area (see Appendix C of the Proposed Forest Plan)

Identify Other Public Planning Efforts (§ 219.4(b)(2)

Charleston County updated its zoning plan and Forest personnel attended one of the meetings. Review of Charleston County and Berkeley County's land use plans did not indicate any conflicts. Language from both land use plans were used to develop desired conditions and objectives in the Resource Integration Zones. The Forest consulted with Catawba Indian Nation on their concerns. Team members made two presentations to the Charleston County Agriculture Commission, Forest Service personnel have met with City and County personnel including Emergency Management Services staff on the development of Community Wildfire Protection Plans. In addition, local city and county personnel were invited to public meetings on the Francis Marion plan revision

Considering the environmental effects of the proposal (§ 219.7(c)(1))

The process for plan development or revision also includes the step to analyze the environmental effects of the proposal and alternatives to that proposal.

Here is a description of some of the other models and tools that were used to assist in the analysis of the environmental effects of the proposal and its alternatives, which haven't been described previously:

See Appendix E of this DEIS for a description of the ecological sustainability framework used to support forest plan revision for the Francis Marion National Forest. This framework is built on a foundation of ecological system diversity.

The sediment model employed analysis tools that have been used for analyzing effects of timber sale and prescribed burning proposals on the Francis Marion NF. Many of the basic methods, which were also used for the previous forest plan, use the Revised Universal Soil Loss Equation that uses slope, rainfall, slope length, and cover. The references used were summarized by Hansen et al, 1994. Many of the references are quite old including Dissmeyer and Stump, 1978 who reported on estimates of erosion within all major physiographic areas in the southeast. The 10% figure for the sediment delivery ratio was estimated considering Roehl (1962) for terrain with more gradient and quicker response, but lowered based on the influence of increased lag time between rainfall and discharge in coastal plain (Lu, et al, 2003). The sediment model used to create the existing condition estimate used coefficients developed from Dissmeyer and Stump (1978) plus other references and cover calculations with the intent to improve coefficients to the practices of today that employ BMPs and spend more time in avoiding. The erosion estimates never were intended to be accurate and precise to fit all circumstances, but provide a consistent reference that could be applied to consider complex land use and activity conditions to produce a relative comparison by which alternatives can be compared.

The sediment and water yield estimates applied factors or coefficients to each land use activity and practice as disclosed in the EIS. A spreadsheet of existing activity and land use then added in the activities by alternative to get an estimate for sediment (tons/decade) and water yield (acre feet and % increase). To further clarify, estimates of sediment and water yield were calculated for current activities and land uses by subwatershed before adding in estimated activities by alternative. In this process, as described above, erosion was converted to sediment delivered to streams with the 10% sediment delivery ratio and then the mean suspended sediment concentration was estimated over the decade by dividing the tons of sediment by decade by estimated tons of water for the decade assuming water yield was 10 inches per year. The spreadsheets of existing sediment are a byproduct of existing land uses and practices from information in GIS. The potential activities for each alternative with sediment estimates were then added to the existing amounts by subwatershed to obtain the overall estimates.

The spreadsheets that contain acreages of activities by subwatershed were used with the coefficients for water yield increase or decline by activity to estimate water yield change by subwatershed. Even though there were some increases in water yield from some of the activities that would further reduce the concentrations, it was felt that it would be easier to compare alternatives if all just assumed the 10 inches water yield.

Social Economic Impact Analyses

This section describes the methodology and data used to model the economic impacts of public land management decisions on communities surrounding federal lands. Input-output models, such as the Impact Analysis for Planning (IMPLAN) model, provide a quantitative representation of the production relationships between individual economic sectors. Thus, the economic modeling analysis uses information about physical production quantities and the prices and costs for goods and services. The inputs required to run the IMPLAN model are described in the following

narrative and tables. The resulting estimates from the IMPLAN model, by alternative, can be found in Section 3.4.14 Social, and Economic & Benefits to People in Chapter 3. The first section of this part describes general aspects of the IMPLAN model and how it was used to estimate economic impacts. The remaining sections provide additional information on the data and methodologies used to analyze recreation, timber harvests, and federal employment and expenditures.

Forest Contribution and Economic Impact Analyses

Economic contributions associated with the Francis Marion NF were measured using IMPLAN v3 and a Forest Service developed Microsoft Excel workbook known as FEAST. IMPLAN is a widely accepted economic model commonly used for regional contribution and impact analyses, and FEAST serves as an interface between forest resource data and the IMPLAN model. The IMPLAN model provides a mathematical representation of the local economy which enables the flow of money, goods, and services to be tracked and reported in terms of regional jobs and income. After the local analysis area has been identified, IMPLAN models the way a dollar injected into one sector creates a ripple-like effect as it is spent and re-spent in other sectors of the local economy. This ripple effect, also known as the "multiplier effect," reflects changes in economic activity in sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly impacted) and induced impacts (for changes in household spending as household income increases or decreases as a result of changes in production).

The analysis conducted for the revised Francis Marion Forest Plan used two IMPLAN v3 models; an 8-county model to analyze forest resource uses (i.e. recreation and timber), and 11-county model to examine Forest Service salary and non-salary expenditures. At the time of this analysis 2012 data was the most recent IMPLAN data available, so all cost and price data were converted to 2012 dollars to ensure consistency. The current IMPLAN model represents the US economy through 440 economic sectors, 355 of which were represented in the eight county planning area and 381 were present in the eleven county study area. National IMPLAN production coefficients were adjusted to reflect the interactions between sectors active within the study area. These coefficients are calculated based data specific to the Francis Marion region of South Carolina, including employment estimates, labor earnings, and total industry output; and are used to measure the amount of local economic activity stimulated by resource outputs from the Francis Marion (i.e. recreation visits, timber harvests, and annual expenditures). IMPLAN's adjusted response coefficients are also used to measure potential changes in local economic activity resulting from resource output levels anticipated under alternative management scenarios.

Contributions and impacts to local economies are generally measured in terms of the employment and labor income they support. Although employment is expressed in number of jobs, jobs reported from IMPLAN are an annual average and not full-time equivalents. Estimates of jobs supported by activities associated with the Francis Marion include all full-time, part-time, and temporary positions. Since IMPLAN jobs are annual average monthly jobs, a job can be interpreted as 1 job lasting 12 months = 2 jobs lasting 6 months each = 3 jobs lasting 4 months, etc. Although IMPLAN provides a means by which changes in employment stemming from FS management can be measured, its data cannot determine the number of hours worked, the relative percentage of full-time to part-time employment, or identify the number of local employees associated with these annual average monthly jobs.

Since resource outputs from Francis Marion are aggregated to the forest level, response coefficients were constructed at a regional (multi-county) scale and analyses were conducted at the multi-county level. While these aggregations enable changes from the baseline to be quantified, impacts for individual counties and communities cannot be disaggregated from regional results. Since data for recreation use, timber harvests, and operating expenses is not available at a finer community level, impacts to individual counties and communities within the planning area could not be quantified.

Recreation

The Francis Marion NF supports outstanding opportunities for a wide range of recreational activities. Popular activities on the Forest include hunting and fishing, hiking, camping, OHV and horseback riding, mountain biking, and wildlife viewing. Average annual recreation visits were derived from Round 2 of the National Visitor Use and Monitoring survey for the Francis Marion and Sumter NFs. Although these forests are surveyed together as a single administration unit, visitation for the Francis Marion NF was derived from survey results collected specifically on the Francis Marion.

On their way to the planning area, and once they arrive, these visitors spend money on goods and services such as gas, food, lodging, and souvenirs. In contrast to many other resource and land uses, outdoor recreation is not captured by any one industrial sector. Instead, spending associated with recreational visits to these NFS lands stimulates economic activity in a wide range of economic sectors associated with accommodations and food service, arts and entertainment, passenger transportation, and retail trade (Marcouiller and Xia 2008).

Rather than measuring economic impacts, the economic analysis for recreation examined the local economic significance of outdoor recreation on the Francis Marion. While both impact and significance analyses measure the amount of economic activity attributable to outdoor recreation within a defined area, impact analysis only includes spending by visitors who reside outside of the local region since their spending constitutes "new dollars" being injected into the local economy. A significance analysis however, includes the effects of spending by all visitors, both those who reside in the planning area and those who do not. Since much of the spending by local recreationists would likely be shifted to other sectors of the local economy, the results of this analysis do not reflect the loss to the local economy if recreational opportunities on the Francis Marion were eliminated. Instead, the significance analysis shows the size and nature of economic activity associated with these recreational experiences to show how important they are to the local economy.

Outdoor recreationists participating in activities on public lands have unique spending profiles. Analyses of expenditures reported by national forest visitors has shown that the primary factor determining the amount of money spent on a recreational visit to public lands was the type of trip taken rather than the specific activity they intended to participate in while visiting (White, Goodding, and Stynes , 2013). Based on this assumption, annual average visitation to the Francis Marion NF was segmented into local and non-local visits and then by trip type. Trip segments examined in the significance analysis included:

Visitors who reside greater than 50 miles from the Francis Marion NF:

- Non-local residents on day trips
- Non-local residents staying overnight on the Forest
- Non-local residents staying overnight off the Forest

Visitors who live within 50 miles of the Francis Marion NF:

- Local residents on day trips
- Local residents staying overnight on the Forest
- Local residents staying overnight off the Forest

Expenditures associated with these visits were estimated using national forest visitor spending profiles developed by the U.S. Forest Service from NVUM survey responses[1] . Spending profiles for average spending forests (Table B-5) were applied to visitation estimates for the planning area (Table B-4) in order to quantify visitor spending attributable to recreation on the Francis Marion NF. Economic contributions of current recreation use levels, and those anticipated under alternative management actions, were modeled in IMPLAN to estimate the direct, indirect and induced effects of recreation related spending in terms of the employment and income it supports across the 8-county analysis area.

Table B-4. Annual Francis Marion Recreation Visits[1] by Trip Segment

	Non-local Segments			Local Segments			
	Day	Overnight on NF	Overnight off NF	Day	Overnight on NF	Overnight off NF	Non-Primary
Percent of National Forest Visitsa	11	1	3	69	4	2	10

[1] The market segments shown here relate to the type of recreation trip taken. A recreation trip is defined as the duration of time beginning when the visitor left their home and ending when they got back to their home. "Non-local" trips are those where the individual(s) traveled greater than approximately 50 miles from home to the site visited. "Day" trips do not involve an overnight stay outside the home, "overnight on-forest" trips are those with an overnight stay outside the home on National Forest System (NFS) land, and "overnight off-forest" trips are those with an overnight stay outside the home off National Forest System land.

[2] A National Forest visit is defined as the entry of one person onto a national forest to participate in recreation activities for an unspecified period of time. A National Forest Visit can be composed of multiple Site Visits.

Timber

The timber analysis examined economic activity of stumpage flowing through logging companies, sawmills, post and pole operations, and firewood sales. Baseline information on the average annual volume (cubic feet) cut on the Forest was obtained from the Region 8 Cut and Sold Report for the Francis Marion National Forest and estimates of harvests anticipated under the alternatives were provided by the forest's timber specialist (see DEIS "Forest Products/Timber Harvesting" section for additional information). The direct effects were estimated using direct response coefficients developed from a national Timber Mill Survey conducted by the University of Montana's Bureau of Business and Economic Research (BBER) (Table B-6). BBER timber response coefficients are broken into multi-state regions and are considered more accurate than those available from IMPLAN.

[1] National average spending profiles are developed for seven trip type segments: day trips and overnight trips involving stays on and off the forest for local and non-local visitors, and visitors whose primary trip purpose was not recreation on the forest. Distinct spending profiles are also estimated for high and low spending areas and for selected recreation activity subgroups.

Table B-5. Spending Profiles (in 2012 dollars) by Trip Segments for Average Spending Forests[1]

	Non-local Segments			Local Segments			
	Day	Overnight on NF	Overnight off NF	Day	Overnight on NF	Overnight off NF	Non-Primary
Lodging	0	64	183	0	31	55	136
Restaurant	16	28	119	5	7	36	95
Groceries	10	60	73	7	72	59	46
Gas and Oil	25	57	76	14	41	43	51
Other Transportation	1	2	4	0	0	1	3
Activities	4	9	29	2	4	6	18
Admissions/Fees	5	10	19	2	4	7	12
Souvenirs/Other	7	21	46	5	15	21	34
Total	**67**	**249**	**550**	**35**	**173**	**228**	**397**

[1] Dollar figures are expressed in 2012 dollars and represent the spending of the entire group on Forest Service lands and within 50 miles of the boundary of Forest Service lands during the trip. Figures have been adjusted to 2012 dollars using the Bureau of Labor Statistics' CPI Inflation Calculator, available online: http://www.bls.gov/data/inflation_calculator.htm. The spending figures depicted in this table are one of three sets of national-level spending averages developed from the NVUM data. The shown spending averages are those determined to be most-applicable to the selected forest based on statistical analysis. For more information see "Estimation of National Forest Visitor Spending Averages from National Visitor Use Monitoring: Round 2" by E.M. White, D. B. Goodding, and D. J. Stynes (2013), available online: http://www.fs.fed.us/pnw/pubs/pnw_gtr883.pdf.

Source: White, Goodding, and Stynes 2013.

Data from the forest shows that 57% of the softwood sawtimber volume and 51% of the hardwood sawtimber volume was processed in the study area. Most of that was processed by sawmills, but a small percentage was processed by veneer mills and other wood products manufacturing. Only 44% of the roundwood was processed in the study area. Of that, most was processed by pulp mills, with a small percentage going to reconstituted wood products manufacturing. Given the location of sawmills, anticipated to process volume from the Francis Marion, BBER direct response coefficients for Southeast States (which includes: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Virginia) were used to estimate direct effects associated with timber harvests on the Francis Marion(Table B-6). Indirect and induced employment and income effects were modeled using IMPLAN.

Federal Expenditures and Employment

Management of the Francis Marion National Forest directly contributes to the local economy by employing individuals living within the area and by spending federally appropriated dollars on goods and services to carry out management programs. The Francis Marion's annual appropriated budget has been gradually declining, but was assumed to stay relatively constant over the planning period. Annual expenditures on forest programs and personnel for the Francis Marion have averaged $10.4 million a year between 2009 and 2011.This was the most recent data available at the time of this analysis. It should be noted that program related expenditures do not include expenditures associated with emergency fire suppression since these cannot be considered consistent contributions to the area economy.

Table B-6. Keegan Timber Response Coefficients for Southeast States

	Direct Response Coefficients	
Industry Sector	**Employment[1]**	**Income[2]**
Logging	8	349
Sawmills	11	578
Plywood and Veneer Softwood	22	1,303
Plywood and Veneer Hardwood	80	4,133
Oriented Strand Board (OSB)	8	468
Processors of Roundwood Pulp Wood	9	1,836
Other Timber Products	30	1,174
Residue From Sawmills	4	507
Residue From Residue From Plywood/Veneer	4	507

[1] jobs per MMCF.

[2] Thousands of 2012 dollars per MMCF.

Source: Morgan et. al 2008

Although field support for the Francis Marion comes from the District Ranger's Office in Huger, financial and administrative support for the forest is provided by the Forest Supervisor's Office (SO) in Columbia,SC. To more accurately analyze how these expenditures affect employment and income, the analysis area was expanded to include the Calhoun, Lexington, and Richland. Annual expenditures were then partitioned between salary and non-salary expenditures and were bridged to IMPLAN economic sectors based on a spending profile specific to the FMNF.

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Appendix C: Francis Marion National Forest Wild and Scenic Rivers

1. Introduction

This appendix summarizes that effort for the Revision to the Francis Marion Forest Plan. It describes the assessment process, rivers considered, and then lists eligible rivers and a description of their values. This is the first step in the process toward consideration for designation.

The overall policy directed by the Wild and Scenic Rivers Act is summarized below (Section 1b and 1c):

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.
>
> The purpose of this Act is to implement this policy by instituting a national wild and scenic rivers system, by designating the initial components of that system, and by prescribing the methods by which and standards according to which additional components may be added to the system from time to time.

The WSRA directs federal agencies to evaluate potential river segments for inclusion during its land use planning, as per section 5(d)1:

> In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potentials. The Secretary of the
>
> Interior and the Secretary of Agriculture shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas within the United States shall be evaluated in planning reports by all Federal agencies as potential alternative uses of the water and related land resources involved.

2. Evaluating Rivers

The process for evaluating Francis Marion National Forest Rivers focused on determining eligibility of potential rivers. To be eligible for inclusion, a river segment must be free-flowing and, in combination with its adjacent land area, possess one or more outstandingly remarkable values.

a. Free Flow

To be eligible, a river must be "free-flowing," as defined in the Wild and Scenic Rivers Act as follows:

> "Free flowing" as applied to any river or section of a river means existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. The existence, however, of low dams, diversion works, or other minor structures at the time any river is proposed for inclusion in the [National System] shall not automatically bar its consideration for such inclusion: Provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the [National System]. (Section16(b)).

Further, the USDA-USDI Guidelines state: "[t]he fact that a river segment may flow between large impoundments will not necessarily preclude its designation. Such segments may qualify if conditions within the segment meet the eligibility criteria."

b. Outstandingly Remarkable Values

For a river to be eligible for inclusion in the National System, the river and its adjacent land area (referred to as the "river area"), must have one or more outstandingly remarkable values. Under the Act, the categories of outstandingly remarkable values: "scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values"

"Outstandingly remarkable" values are not specifically defined in the Wild and Scenic Rivers Act. As the Forest Service Handbook notes,

> There is no way to write criteria to mechanically or automatically determine that certain values are so rare or unique as to make them outstandingly remarkable. Dictionary definition of the two words would indicate that such a value would be one that is a conspicuous example of a value from among a number of similar values that are themselves uncommon or extraordinary . . . (Forest Service Handbook [FSH] 1909.12, Sec. 8.21).

However, Congressional decisions and agency practice helped the Interagency WSR Coordinating Council establish basic guidelines for defining Outstandingly Remarkable values individual to each river (from IWSRCC study process paper by Diedrich and Thomas, 1999):

> In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare or exemplary feature that is significant at a comparative regional or national scale. Dictionary definitions of the words "unique" and "rare" indicate that such a value would be one that is a conspicuous example from among a number of similar values that are themselves uncommon or extraordinary. One possible procedure would be to list all of the river's special values and then assess whether they are unique, rare or exemplary within the state, physiographic province, ecoregion, or the other area of comparison. Only one such value is needed for eligibility. The area, region or scale of comparison is not fixed, and should be defined as that which serves as a basis

> for meaningful comparative analysis; it may vary depending on the value being considered. Typically, a "region" is defined on the scale of an administrative unit, a portion of a state, or an appropriately scaled physiographic or hydrologic unit.

While the spectrum of resources that may be considered is broad, all features considered should be directly river-related. River values should meet at least one of the following criteria:

1) They must be located in the river or on its immediate shorelands (generally within 1/4 mile on either side of the river);

2) Contribute substantially to the functioning of the river ecosystem; and/or

3) Be river-dependent and owe their location or existence to the presence of the river.

The study process description developed by the IWSRCC further develops eligibility criteria for individual types of values (scenery, recreation, geology, fish, wildlife, prehistory, history, and other values) but notes:

> The following eligibility criteria are offered to foster greater consistency within the federal river-administering agencies. They are intended to set minimum thresholds to establish ORVs and are illustrative but not all-inclusive. If utilized in an agency's planning process, these criteria may be modified to make them more meaningful in the area of comparison, and additional criteria may be included.

Eligible river segments may flow between impoundments or have their flows affected by upstream water projects, but in the segment they must be generally free-flowing and without extensive channel modifications.

There is no minimum sized river or amount of flow. The WSRA notes that a river may be "a flowing body of water or estuary or section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes."

c. Rivers considered on Francis Marion National Forest

The Forest Service initially evaluated rivers within the forest boundary that were:

- Shown on a 1:24,000 scale map, (all named rivers on a 7.5 minute quadrangle map)
- Listed on Nationwide Rivers Inventory (USDI 1996), or
- Listed on American Rivers Listing (Huntington and Echeverria 1991), or
- Specifically identified through scoping or preliminarily evaluated by the ID team as having relatively high value, or
- Contain river-dependent sites listed on the National Register of Historic Places, or
- Contain designated geologic areas, or contain portions of a National Historic or National Recreation Trail where the river corridor contributes significantly to the trail's designation.

The following rivers were considered.

Name	FS Miles	Non-FS Miles	Total Miles within FS Boundary
Awendaw Creek	0.16	6.53	6.69
Echaw Creek	5.28	6.54	11.82
Hampton Creek		1.80	1.80
Santee River	0.35		0.35
Wadboo Creek	3.51	7.42	10.94
Wambaw Creek	13.93	1.99	15.92
Bark Island Slough	0.73		0.73
Bay Branch	1.55	1.61	3.16
Bell Creek	2.24	0.13	2.37
Big Morgan Branch	1.82		1.82
Browns Branch	2.96	1.76	4.72
Bullhead Run	3.64	2.87	6.51
Callum Branch	1.66	1.59	3.26
Canady Branch	0.66	1.92	2.58
Cane Branch	3.72		3.72
Cane Gully Branch	6.44	1.66	8.10
Cane Pond Branch	2.82	0.19	3.02
Cedar Creek	1.20	2.08	3.28
Chicken Creek	4.35		4.35
Cooter Creek	2.06	1.20	3.26
Dutart Creek	4.48	1.35	5.83
Gal Branch	3.02	0.01	3.02
Gravel Hill Swamp	0.62	4.26	4.89
Gum Branch	0.63		0.63
Island Branch	0.32	2.37	2.68
June Pond Strand	1.91	0.16	2.07
Little Morgan Branch	2.74		2.74
Mattassee Branch	0.13	0.37	0.50
Mechaw Creek	2.15	1.00	3.15
Mill Branch	3.01	0.49	3.51
Mill Creek	0.45		0.45
Persimmon Branch	2.90	0.18	3.08
Put-on Branch	2.21	0.89	3.10
Red Bluff Creek	2.22		2.22
Sarah Drain	0.29	0.13	0.42
Savanna Creek	3.00	3.54	6.54
Steed Creek	2.86	0.39	3.25
Stewart Creek	0.62	0.94	1.55
Velvet Branch	0.96		0.96
Wedboo Creek	5.55	2.74	8.29

Name	FS Miles	Non-FS Miles	Total Miles within FS Boundary
Whiskinboo Creek	1.78	3.31	5.10
Withey Wood Canal	2.45		2.45
Guerin Creek	3.14	0.15	3.29
Huger Creek	0.52	2.69	3.20
Quimby Creek	1.74	4.46	6.20
Alligator Creek	2.44	3.06	5.50
Beauford Branch	2.24	1.32	3.56
Bennett Branch	1.97	1.00	2.97
Buck Branch	1.02		1.02
Cooks Creek	2.39	0.00	2.40
Cropnel Dam Creek	1.27		1.27
Darlington Creek	0.96		0.96
Deep Branch	1.37	0.85	2.22
Devils Lodge Branch	0.98	0.98	1.96
Fogarty Creek	2.96	0.14	3.10
Fourth of July Branch	1.11		1.11
Fox Gully Branch	1.96		1.96
Gough Creek	2.38	0.73	3.11
Gravel Run	1.22		1.22
Halfway Creek	1.21		1.21
Harleston Dam Creek	3.28	0.01	3.30
Huitt Branch	3.25	0.64	3.88
Jericho Branch	1.25		1.25
Keepers Branch	1.27	0.46	1.73
Kutz Creek	2.66		2.66
Lachicotte Creek	2.00	0.68	2.69
Meeting House Branch	1.51	2.54	4.05
Mepkin Creek	0.94	1.17	2.11
Muddy Creek	1.86		1.86
Negro Field Branch	3.62		3.62
Nicholson Creek	6.46	0.44	6.89
Northampton Creek	1.90		1.90
Oakie Branch	2.24	0.31	2.55
Old House Creek	1.79		1.79
Old Man Lead	0.59		0.59
Pepper Gully	1.81		1.81
Turkey Creek	7.38	0.35	7.73
Washaw Creek	1.16	0.93	2.10
York Bottom Creek	0.97	2.18	3.15
Beaman Branch	0.11	2.92	3.03

Name	FS Miles	Non-FS Miles	Total Miles within FS Boundary
Broad Ax Branch		2.91	2.91
Byno Creek		0.61	0.61
California Branch		0.01	0.01
Collins Creek	0.26	4.98	5.24
Deep Creek		0.10	0.10
Doe Hall Creek		0.48	0.48
East Branch Cooper River		0.15	0.15
Fox Swamp		2.31	2.31
French Quarter Creek	0.34	4.82	5.16
Hester Canal		1.01	1.01
Jeremy Creek		0.34	0.34
Kelley Branch		1.34	1.34
Little Johnson Creek		1.05	1.05
Mary Anne Branch	0.27	2.95	3.21
Menzer Run		3.79	3.79
Mingo Branch		0.59	0.59
Montgomery Creek		2.19	2.19
Old Santee Canal		1.52	1.52
Pinckney Reserve Branch	0.15	2.23	2.38
Pole Branch		1.32	1.32
Ponteaux Branch		1.59	1.59
Sandy Point Creek		1.28	1.28
Tailrace Canal		1.58	1.58
Tibwin Creek	0.26	0.79	1.05
Walker Swamp		2.65	2.65
Wando River	3.26	3.37	6.63
Grand Total	184.82	135.41	320.23

d. Evaluation of Rivers

Several rivers were selected for further review by the interdisciplinary team input (based on free flow conditions and potential for OR values) and included the following:

- Santee River (Main, South, North, and cutoffs)
- Dutart Creek (or other river right feeder tributaries)
- Echaw Creek and feeder tributaries
- Chicken Creek
- Wambaw Creek and feeder tributaries
- Hampton Creek
- Awendaw Creek (and feeder tributaries – Steed and Bell)

- Wando River
- Guerin Creek
- Huger Creek and feeder tributaries
- Wadboo Creek and feeder tributaries

The assessment recognized that values may vary along a river and guidelines allow segments to be tailored to highlight changes in values or potential classification (wild, scenic, or recreational). In addition, rivers were evaluated to include segments that sometimes extend beyond the Forest's administrative boundary if those values also extend beyond those borders. When river segments leave the Forest or have large proportions of adjacent land in private ownership, it raises issues that are central to a suitability determination.

e. ID Team and Public Involvement

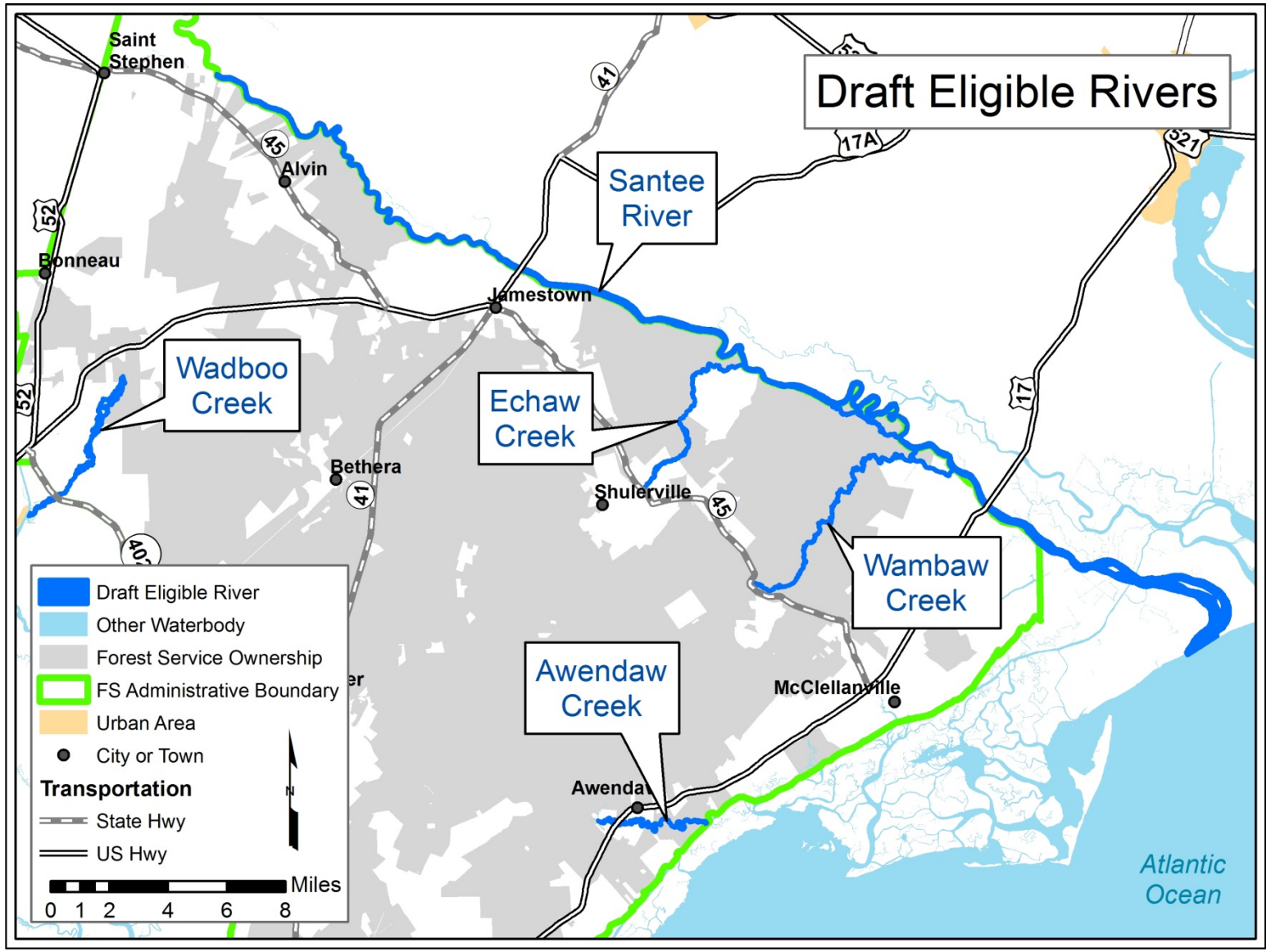
The forest plan planning team (an interdisciplinary team as well as additional natural resources specialists) met and considered the rivers and their potential OR values. The team considered the rivers and documented the outstandingly remarkable values of several rivers from the entire list. Several rivers were eliminated from the larger initial list due to very little or no ownership or are smaller tributaries to non-eligible reaches of rivers/streams.

The forest planning team has had several general planning open houses during the planning process. The forest also hosted a series of collaborative meetings in 2014, including one specific to sustainable recreation, wilderness and wild and scenic river eligibility. Following that meeting, there was a public field trip that focused on recreation, including wild and scenic rivers.

3. Eligible Rivers

Based on ID team evaluation the following rivers are eligible for wild and scenic designation (see details by river in Section II):

- Lower Santee River
- Wambaw Creek
- Echaw Creek
- Wadboo Creek
- Awendaw Creek


Draft Eligible Rivers
Santee River
Wadboo Creek
Echaw Creek
Wambaw Creek
Awendaw Creek
Saint Stephen
Alvin
Bonneau
Jamestown
Bethera
Shulerville
McClellanville
Awendaw
Atlantic Ocean
Draft Eligible River
Other Waterbody
Forest Service Ownership
FS Administrative Boundary
Urban Area
City or Town
Transportation
State Hwy
US Hwy
Miles
0 1 2 4 6 8

a. Lower Santee River

The study area includes the river from Lake Moultrie outlet to saltwater, including Chicken/Hampton Creek braids, but not including the Wadmacon Creek or the North Santee braids (which are not adjacent to National Forest lands). A potentially shorter designated segment may reach from Jamestown Bridge (Highway Alternative 17) to the coast. The width of the study corridor is approximately ½ mile (¼ mile from the ordinary high water line on both sides of the river). Boundaries could be adjusted to be wider at tributary creek mouths or to include remnant river features (e.g. Lake Guilliard) and narrower on the private land side to reduce private land oversight yet still provide a scenic or ecological buffer (e.g., 200 to 300 feet). The entire river would be classified Scenic (minimal development except at road/railroad/ intertie crossings).

Oustandingly Remarkable values

The Lower Santee River has outstandingly remarkable **ecological and cultural values**. Despite dramatic flow reductions due to the Cooper-Santee Hydroelectric Project, the "Mighty Santee" provides an important **ecological** connection between the Piedmont and the coast, offering a relatively undisturbed riparian corridor with old growth forests, coastal marshes, and estuaries. Examples of specific values include:

- The predominant landform on South Carolina's low country and Atlantic coast are vast broad river valleys, and the Santee is one of the best examples without substantial development.
- The river provides a longitudinal connection between the state's low country and the coast, offering a large, unfragmented corridor for fish and wildlife movement.
- Although the Santee corridor was extensively harvested for timber in the 1700s and 1800s, there has been less forestry activity in the past century and many areas now have late succession or mature Tupelo Cypress forests (some areas have been undisturbed for nearly 150 years). This is rare on the populated southeastern seaboard.
- Marine mammals including the West Indian Manatee (near north end of their range) and dolphins regularly use the river and adjacent coastal waters. Dolphins have been observed schooling prey fish onto riverine mudflats, a river-related behavior that may be relatively unique.
- Notable fish species include Atlantic and Shortnose sturgeon, catadromous Atlantic Eel, and Atlantic shad (16% of all shad freshwater shad catch in SC occurs in the Santee).
- Rare swallow tailed kites use the river for nesting and pre-migration staging. They nest in the larger pines and cypress on the borders of the river.
- The river has several resident raptors, including bald eagles and osprey.
- Ivory Billed Woodpeckers (North America's largest), now considered "definitely or probably" extinct, were regularly seen along the Santee swamps into the 1930s, and may have been seen as late as the 1960s, which is indicative of the habitat quality and remoteness of the area.
- The river has diverse populations of lizards and amphibians.

Culturally, the river has been a travel corridor for Indians and early European settlers, and has important cultural sites relevant to Revolutionary and Civil War history.

- The Santee can be described as a "prehistoric interstate." Indigenous peoples traveled by boat along rivers and the ocean for hunting, fishing, gathering, and trading. Coastal sites show evidence of this use (e.g., shell rings and middens); however, there are no known archeological sites on the river itself.
- Francis Marion, the Revolutionary War's "Swamp Fox," is widely credited with adapting guerrilla war strategies to frustrate British regular troops in the area. In one celebrated incident, he and his troops swam across Chicken Creek and then ferried across the larger Santee to evade British capture.
- Remnant rice plantation canals are visible on several tributaries and adjacent to the Santee and its associated braids (e.g., Hampton Creek, Chicken Creek). These plantations were critical developments in the state's history, with the planting and harvesting of "Carolina Gold" (starting about 1700) largely responsible for the huge influx of slave labor and phenomenal prosperity enjoyed by white colonists. Charlestown (now Charleston) became one of the richest and most fashionable cities on the eastern seaboard due to the rice plantation economy.
- Hampton Plantation, on the banks of a Santee River braid (Hampton Creek), offers a well-preserved example of a rice plantation with preserved buildings and grounds. The plantation house is considered one of the finest examples of a Georgian-style mansion (erected 1735). The plantation was also the residence of South Carolina's poet laureate, Archibald Rutledge (1883-1973), whose collected works in "Deep River," highlight his interest in surrounding natural features. The plantation buildings and immediate surroundings are part of a popular State Park that offers guided tours and interpretive trails. Other lands associated with the plantation are managed by the National Forest.
- The Santee River was a potentially important travel corridor during the Civil War, and a major railroad crossing near Jamestown was defended by Southern forces at a relatively well-preserved riverine earthen fort, the Warren Battery, on a bluff along a bend in the river. Although no Northern troops tested the blockade at this site, it provides an example of Robert E. Lee's general strategy of developing advantageous positions that allowed smaller units to effectively combat the larger armies of the North for most of the war. The site has been preserved with an interpretive trail accessible from land and the river; it is also on the National Historic Register.
- After the collapse of the rice plantation economy following the Civil War, many former slaves left plantations but stayed in the area, settling along the coast and rivers where their Gullah culture continued to develop in relative isolation. Speaking a unique dialect (Geechee) with remnant African vocabulary and grammar, this community developed rich story-telling, music, crafts, folk beliefs, and subsistence farming and fishing traditions influenced by West and Central African culture.

Other values

The Santee River also offers high quality fishing opportunities for regional residents, although these do not rise to the description of "outstandingly remarkable." Most of this use occurs from small powerboats. Many regional residents also use the river for canoeing, kayaking, waterskiing or similar powerboat sports, and swimming. There is a relatively unique multi-day canoeing or kayaking trip available from Lake Moultrie to the coast, offering Twain-esque scenery and wooded environments for boating, fishing, camping, and swimming. The Forest Service has developed a popular access point at McConnell Landing, which offers primitive road-accessible camping. Santee recreation use is connected to potential trips on Wambaw or Echaw creeks.

The Santee has relatively rare limestone deposits along its banks between Dutart and Chicken Creek. These are regionally unique geological features that may also feature in local history. John Lawson, an early explorer, noted limestone use in local houses that probably came from the Santee and are regionally significant in the low country because there were few other natural sources for large construction rocks.

b. Wambaw Creek

The study area includes the entire river from headwaters to its confluence with the Santee. The designated reach is the same as the designated Wambaw Wilderness, but then extends with a ½ mile corridor to the confluence. Boundaries are to be adjusted to be wider in the swampy headwaters or at tributary creek mouths. The Wilderness section of the river would be classified Wild, while the segment below Echaw Road to the confluence with the Santee could be classified scenic (slightly higher development because of the road and motorized use from Santee River recreation).

Oustandingly Remarkable values

Wambaw Creek has outstandingly remarkable **ecological, scenic, recreation, and cultural values**.

Ecologically, the river offers one of the best regional examples of a tupelo cypress black water low country stream, with diverse trees, plants, fish, and wildlife. More specific ecological resources include:

- Relatively mature cypress trees, some approaching 150 years, although none are as old as 1,500 year old trees on the Black and South River in NC.
- A considerable diversity of neo-tropical song birds. Although most occur on similar streams in the South, the Wambaw is an unmodified corridor that attracts high densities that are viewable by recreation users in boats.
- Rare swallow tailed kites use the river for nesting and pre-migration staging. They nest in the larger pines and cypress on the borders of the river.
- Wayne's black-throated green warbler, a rare sub-species of Black Throated Green Warblers, that breeds only in the South Atlantic Coastal Plain from extreme SE Virginia to South Carolina.
- The river has several resident raptors, including bald eagles and osprey.
- Several mammals, including river otters and white tailed-deer, are frequently seen.
- There are also diverse populations of reptiles and amphibians, including alligators, which are at the northern end of their range.

Scenic assets focus on the contrasting mature cypress tupelo forest, a diverse hardwood understory, and water. Although these vistas are not unique to the Wambaw, the river offers a textbook example of a scenic low country riparian area that has been minimally disturbed in the past century and a half. The river offers diversity in textures and colors in a majestic, multi-layered forest, while visitors travel on a meandering black water stream that offers longer vistas at each bend. Flowering plants, including bromeliads and orchids, further enhance the foreground of the scenery.

Recreational assets on the Wambaw include canoeing and kayaking to view scenery and wildlife, with possible connections to historical sites such as Hampton Plantation (see Santee River description above).

- Most visitors access the river at Still Landing or Echaw Road, and travel can occur between the two, or down to the confluence. Well-timed visits can take advantage of tides (in both directions) to decrease paddling effort.
- Most trips are ½ day trips to view the tupelo cypress scenery, abundant birdlife, and occasional alligators or mammals. The emphasis is on natural history and wilderness-like character (lack of development and lower use levels), although a few local users also fish.
- Commercial trips also focus on intimate experiences, with purposeful smaller groups on most trips.
- Over 60% of commercial kayakers are visitors from outside the region, illustrating that creek resources are regional attractions.
- The river can be floated onto Hampton Creek and to Hampton Plantation operated by South Carolina State Parks. Although the landing at the plantation is informal, it offers riparian access to a preserved plantation house that would be unique within the WSR system.
- There is some motorized use on Wambaw Creek from the Santee braids, although most powerboats travel at no wake speeds to explore the first mile or so of the creek's mouth or to find fishing sites. The narrow meandering creek is not conducive to higher speed travel.

Cultural assets of Wambaw Creek are similar to those on the Santee River, with a greater focus on the rice plantation period. Remnant rice plantation canals are visible and can be partially explored from Wambaw Creek. The canals were developed to control irrigation, access the fields, and transport harvested rice, providing the critical development that allowed successful production of "Carolina Gold." Together with the labor of West African slaves, the rice plantation economy allowed South Carolina to become among the wealthiest in colonial America.

c. Echaw Creek

The study area includes the entire river from headwaters to its confluence with the Santee. The designated reach would be a ½ mile wide corridor. Boundaries could be adjusted to be wider in the swampy headwaters or at tributary creek mouths. The entire river would be Wild.

Outstandingly Remarkable Values

Echaw Creek has outstandingly remarkable **ecological, scenic, and recreation values**. Although the river has similar ecological and scenic resources to Wambaw Creek, it is slightly smaller and more intimate.

Ecologically, the river offers very similar resources to Wambaw Creek, with particularly exceptional calcareous-influenced bottomland hardwood forests.

- The National Forest (via Richard Porche and Jean Everett in 2012) has identified, inventoried, and monitored a large botanical area (536 acres) along Echaw Creek. The area has been described as a "beautiful, enchanting" swamp forest – linking the area's ecological resources with their recreation appreciation values.

- The Blue Hole, a natural spring that empties into the Echaw Creek, has regionally unique turquoise waters and botanical diversity from the nearby limestone formations.

Scenic and **recreation** values on Echaw are likewise similar to those on Wambaw, but with even lower human use, thus offering even more Wilderness-like conditions for visitors.

d. Wadboo Creek

The study area includes the entire river from headwaters to its confluence with the Old Santee Canal / Cooper River. The Forest Boundary is at Highway 402, and might signify the end of the designated reach). The designated reach would be a ½ mile wide corridor. Boundaries could be adjusted to be wider in the swampy headwaters or at tributary creek mouths. The entire river would be Wild until Highway 402. If designated below the highway, the river would be classified Recreational to reflect higher use and adjacent development.

Outstandingly Remarkable Values

Wadboo Creek has outstandingly remarkable **ecological, scenic, and recreation values**. Additional notes about its values include:

- Although the river has similar ecological and scenic resources to Wambaw and Echaw Creeks (see descriptions above), it is a smaller creek in its headwaters, and has slightly different hydrologic conditions (the gradient is slightly steeper, it drains quicker, and has a sandier bottom). This creates more adventurous recreation opportunities that require greater boating maneuverability, opportunistic users (to take advantage of smaller boatable flow windows), and effort (to handle portages or other challenges negotiating the smaller stream).
- There is a well-developed and popular boat landing where the river crosses Highway 402. This is the take-out from downstream canoe/kayak use, and offers access for other craft (including powerboats) to the Old Santee Canal and Cooper River. The river south of 402 is off the National Forest and probably would not be considered for WSR designation.

Wadboo Creek also has some additional cultural values associated with Francis Marion, who used the area for encampments, and dismissed his troops at the end of the war at a documented meeting at Wadboo Creek Bridge near Highway 402.

e. Awendaw Creek

The study area includes the entire river from the confluence of Bell Creek and Steed Creek (which forms the Awendaw) to its confluence with the Intracoastal Waterway near Buck Hall access. The designated reach would be a ½ mile wide corridor. Boundaries could be adjusted to be wider to include coastal marsh and estuaries. The river would be classified Recreational to reflect higher use and adjacent development.

Potential OR Values

Awendaw Creek has outstandingly remarkable **recreation values** associated with its access to a representative coastal tidal forest and marsh environment. Its location within close proximity to Charleston and nearby tourism centers makes it attractive for non-local commercial recreation, which can help produce local economic benefits. More specific features include:

- Nearby pre-colonial shell rings and middens illustrate indigenous use of the area. Although sites on the river are not as exceptional as others on the coast, the density of sites is high, and they can be visited during short river-based trips to/from Buck Hall.
- The river offers coastal forests, marshes, and estuaries in a short mile reach; the diversity of environments enhances short boating-based visits.
- There is good fishing and crabbing near the mouth of the river.
- There are short sandy bluffs and cliffs along the river, providing topographic relief and swallow nesting sites that are unusual for the low country.
- Tidal currents provide opportunities for visitors to cover much of the river during a short visit.
- The Forest Service has developed launching facilities at Buck Hall and Rosa Green Roads for easy access.
- The river is used by motorized and non-motorized boats; several residents have private docks on the river that provide access to the Intracoastal Waterway.
- The Palmetto Trail (hiking and biking) begins at Buck Hall and follows the Awendaw for a few miles), offering land-based access to the corridor and its features.

Appendix D: Inventory and Evaluation of Areas that May be Suitable for Inclusion in the Wilderness Preservation System

D.1 Inventory and Evaluation of Lands that May be Suitable

D.1.1 Introduction

As part of the forest plan revision process, the Francis Marion conducted a forestwide inventory, evaluation, analysis and determination of lands that may be suitable for inclusion in the Wilderness Preservation System. Areas qualify for placement in inventory if they meet the statutory definition of wilderness. The forest used the Draft Forest Service Handbook (FSH) 1909.12 Chapter 70, which prescribes the inventory criteria used to determine if an area meets the statutory definition of wilderness. The Forest Service is making the process of determining whether to recommend lands for wilderness designation pursuant to the Wilderness Act or Eastern Wilderness Act more transparent and consistent across forests. Each forest, however, is unique and responsible officials should set the scope for this effort to meet the unique needs of their forests; no prescribed scope is intended. (Draft 21-19-2013 Proposed FS 1909.12, Chapter 70).

The process for the Francis Marion National Forest included the following steps:

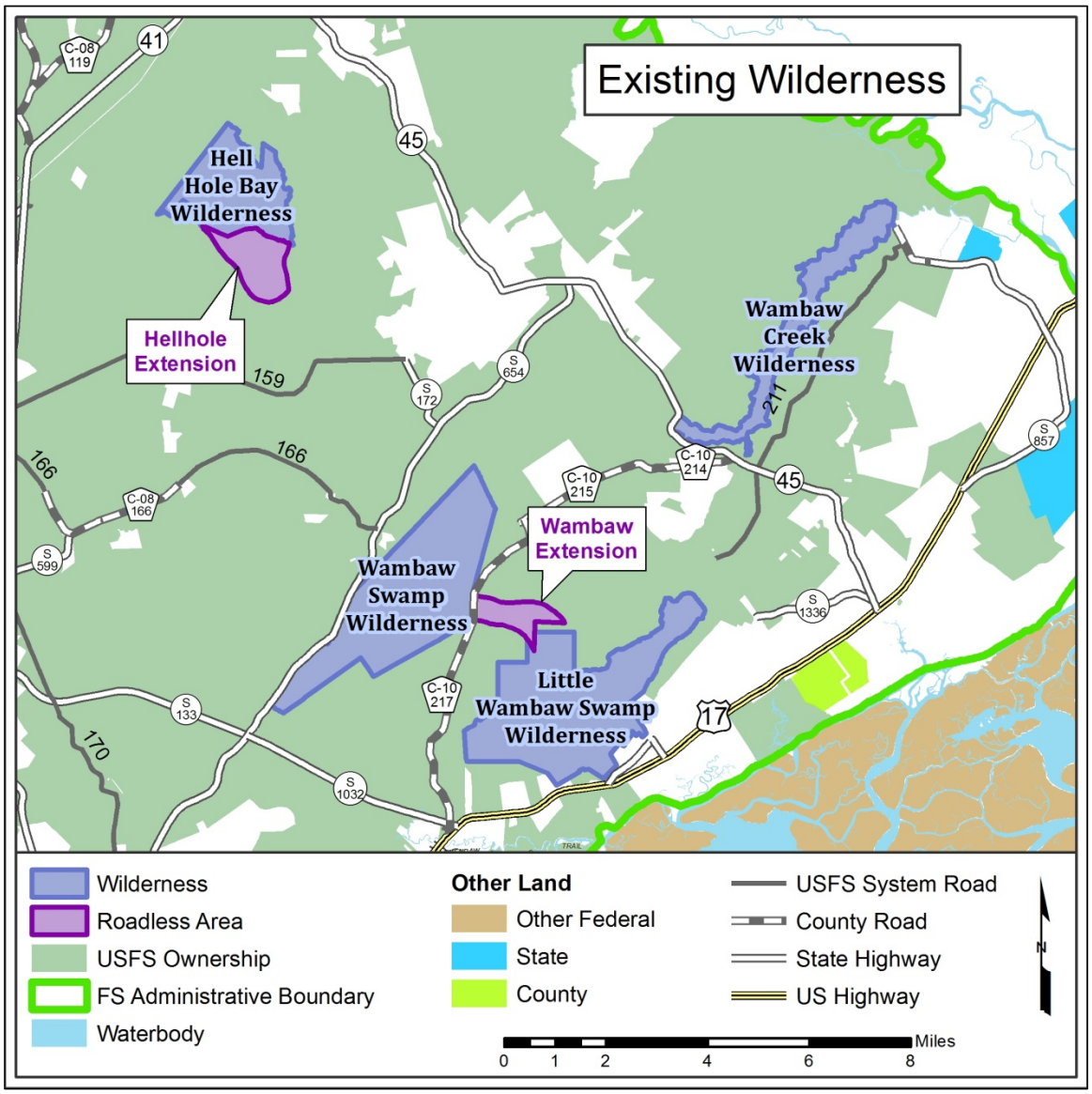
An **inventory** of all Francis Marion National Forest System (NFS) lands included:

- A forestwide analysis of NFS administered lands to identify lands that may be suitable using the Draft FSH 1909.12 chapter 70 inventory criteria.
- Analysis of areas proposed during the Forest Plan Revision Process,
- Consideration of possible additions to existing wilderness areas.

The **evaluation** of the wilderness characteristics of each area in the inventory using a set of criteria based on the Wilderness Act of 1964 and the Eastern Wilderness Act of 1975 and a documentation of each of the evaluations. Not all areas that were evaluated must be brought forward into the analysis phase.

An **analysis** of areas in the applicable National Environmental Policy Act (NEPA) documents. These areas must be identified within the applicable NEPA document as part of one or more alternatives. Not all lands included in the inventory and subsequent evaluations are required to be brought forward and analyzed for recommended wilderness in the applicable NEPA document.

The responsible official shall make a decision, based upon the analysis disclosed in the applicable NEPA document and input from tribes, State and local governments and the public, as to which areas, if any, to recommend for inclusion in the National Wilderness Preservation System. The responsible official shall identify any such lands in the final decision document for the plan.



D.1.2 Background

The Francis Marion National Forest was established in the 1930s from lands that were previously under private ownership and, in many cases, had been heavily farmed and logged. The patchwork of private and public lands that still characterize the Francis Marion means that few areas are undisturbed or unaffected by nearby human habitation. With roads that provided access to the national forest lands and also serve as through routes to private lands, areas that were available for wilderness areas are limited in size and extent on the Forest. Four wildernesses exist on the Forest. Several areas were recommended for wilderness in the RARE II process and were subsequently designated as wilderness areas by Congress in 1980. This added areas in the eastern National Forests to the National Wilderness Preservation System including the 4 wilderness areas on the Francis Marion National Forest.

In the current Forest Plan (1996), there were two areas that were evaluated as Inventoried Roadless Areas, Hellhole Bay Extension and Little Wambaw Swamp Extension. These areas are

currently managed as roadless (with limited tree cutting and road building) and maintain some characteristics similar to wilderness.

D.1.3 Identification of Lands That May Be Suitable for Inclusion in the Wilderness Preservation System

This process for identifying these lands has a sequence of steps, all of which include intergovernmental coordination as well as opportunities for public participation and collaboration, identification and inventory, evaluation, analysis, and decision. A preliminary step of reviewing all polygons of contiguous forest lands was considered, including areas less than 5,000 acres.

Developing the Inventory

Based on direction in Draft FSH 1909.12, chapter 70, section 71, the first step in analyzing suitable lands during forest plan revision was to identify and inventory all areas within NFS lands that satisfied the definition of wilderness in section 2(c) of the 1964 Wilderness Act. The criterion for the inventory follows.

Size Criteria (FSH 1909.12, chapter 70, section 71.21)

According to the Wilderness Act, a wilderness area "[h]as at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition."

Areas to be included must meet one of the following criteria:

1. The area contains 5,000 acres or more.

2. The area contains less than 5,000 acres but is of sufficient size as to make practicable its preservation and use in an unimpaired condition. Examples of such areas can be as small as a self-contained island or canyon, or large enough to be effectively managed as a separate unit of the National Wilderness Preservation System.

3. Areas contiguous to existing wilderness, primitive areas, administratively recommended wilderness, or wilderness inventories of other Federal ownership, regardless of their size.

Improvements Criteria (FSH 1909.12, chapter 70, section 71.22)

Pursuant to the Wilderness Act, include in the inventory areas "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean... as an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation;..."

A. Road Improvements

1. Include in the inventory areas that may contain the following road improvement attributes:

a. Areas that contain forest roads maintained to level 1;

b. Areas with any routes that are decommissioned, unauthorized or temporary, or forest roads that are identified for decommissioning in a previous decision document, or as identified in a travel management plan (36 CFR 212.51) or a travel analysis (36 CFR 212.5(b));

c. Areas with forest roads that will be reclassified to level 1 through a previous decision document, or as identified in a travel management plan (36 CFR 212.51) or a travel analysis (36 CFR 212.5(b));

d. Areas in forests, grasslands, prairies and other administrative units east of the 100th meridian with forest roads maintained to level 2 that are identified as closed to motor vehicles yearlong in a previous decision document, or as identified in a travel management plan (36 CFR 212.51) or a travel analysis (36 CFR 212.5(b));

e. Areas with forest roads that have been proposed by the Forest Service for consideration as recommended wilderness as a result of a previous forest planning process or that the responsible official merits for inclusion in the inventory from public involvement during the assessment.

f. Areas with historical wagon routes, historical mining routes, or other settlement era transportation features considered part of the historical and cultural landscape of the area.

g. Areas with maintenance level 2 roads that do not meet any of the criteria in subsection 2(c) below.

2. Except as provided in (1)(b), (c), (d) or (e) above, exclude from the inventory areas that contain:

a. Permanently authorized roads validated by a Federal court or the Department of the Interior for which a valid easement or interest has been properly recorded.

b. Forest roads maintained to levels 3, 4, or 5.

c. Level 2 roads that meet one or more of the following criteria and are not in proposed areas as provided in (1)(e) above:

(1) have been improved and are maintained by mechanical means to ensure relatively regular and continued use,

(2) have cumulatively degraded wilderness character or precluded future preservation of the area as wilderness,

(3) have been identified for continued public access and use in a project level or travel planning decision supported by NEPA, or

(4) otherwise preclude evaluation and consideration of the area during the public participation and intergovernmental outreach processes as potentially suitable for wilderness, based on Assessment information or on-the-ground knowledge.

3. Evaluate areas that contain forest roads maintained to level 2, or levels 3, 4 or 5 where those roads are anticipated to be disinvested to a level 2. Include such areas in the

inventory unless they are clearly unsuitable for inclusion in the National Wilderness Preservation System, based on one or more of the following factors:

a. The road has been improved and is maintained by mechanical means to ensure relatively regular and continuous use.

b. Road density is so high that either wilderness character is clearly not present, or future preservation of the area as wilderness would not be possible.

c. A project-level decision supported by NEPA analysis has been made in favor of continuous public access to and use of the road.

d. Other on-the-ground knowledge of the level 2 road that would preclude evaluation and consideration of the area during the public participation process as potentially suitable for wilderness recommendation.

B. Other Improvements

For areas east of the 100th meridian, consistent with the Eastern Wilderness Act, recognize that these improvements may achieve wilderness character through passive or active restoration. See the Draft Forest Service Handbook 1909.12, chapter 70, section 71 and Table 1.

Using these criteria, the Forests conducted a GIS analysis of existing wilderness areas and an overall forestwide review of any tracts of land that could be suitable for inclusion in the Wilderness Preservation System. It is important to note that lands included in the inventory provide a starting point for further evaluation, and their inclusion is not a designation that conveys or requires a particular kind of management.

Table D-1. Determination of whether areas with certain types of improvements were included or excluded in the inventory

Improvement Type	Remarks
Airstrips	Airstrips were excluded from the inventory, if any exist.
Heliports	These are temporary structures and included in the inventory if there were any.
Vegetation treatments that are not substantially noticeable.	These were included in the inventory.
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Timber harvest areas where logging and prior road construction are not substantially noticeable were included in the inventory. Areas where regeneration harvest had taken place within the last 20+ years were reviewed to determine if they should be included in the inventory.
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	It was determined that these vertical structures had minimal impact, including their maintenance and access requirements; therefore areas with vertical structures were included in the inventory.
Areas of historic mining where impacts are not substantially noticeable.	Areas of historic mining activity are very limited on the Francis Marion; therefore any areas were included.
Areas of mining activity where impacts are not substantially noticeable.	Areas of mining activity are very limited on the Francis Marion National Forest; therefore these areas were included in the inventory.
Range improvement areas, involving minor structural improvements (for example fences or water troughs) and non-structural improvements (chaining, burning, spraying, potholing, and so forth) that are not substantially noticeable.	There are no range improvements on the Francis Marion National Forest.
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps. As a general rule, do not include developed sites. Areas with minor, easily removable recreation developments may be included.	Areas with such as dispersed camping sites were included in the inventory as they are temporary and easily removed. Areas with developed recreation sites were excluded from the inventory. Trails are not considered to be a recreational improvement.
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	Right-of-ways that have not been cleared, if any, were included in the wilderness inventory.
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions. Areas may include minor watershed treatments that have been accomplished manually such as small hand-constructed gully plugs.	Areas of watershed treatment are very limited on the Flathead National Forest; therefore these areas were included in the inventory.
Lands adjacent to development or activities that impact opportunities for solitude. The fact that the non-wilderness activities or uses can be seen or	Areas adjacent to development or activities were included in the inventory.

Improvement Type	Remarks
heard from within any portion of the area, shall not, of itself, preclude inclusion in the inventory.	
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	Areas with structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area were included in the inventory.

D.1.4 Summary of Results

The summaries below provide an overview of the results from these analyses. Additional details for each area considered are within each detailed write-up.

Areas Inventoried

A preliminary step of reviewing all contiguous blocks of forest lands was conducted and all polygons were considered, including areas less than 5,000 acres. The following outlines the steps:

1. Changes in land ownership around wilderness areas were reviewed to see if there were any **appropriate areas for expansion** in adjacent areas. The Francis Marion has four existing designated wilderness areas, Wambaw Creek Wilderness, Wambaw Swamp Wilderness, Little Wambaw Swamp Wilderness and Hellhole Bay Wilderness Areas and two inventoried roadless areas adjacent to existing wilderness, Little Wambaw Swamp Extension and Hellhole Bay Extension. There were 4 areas surrounding the existing wilderness areas that will be included and considered
2. Any areas that are **less than 5,000 acres but of sufficient size** as to make practicable its preservation and use in an unimpaired condition. If a polygon was less than 5,000 acres and did not border an existing Wilderness or recommended Wilderness Study Area, it was reviewed for consideration if the size and/or shape would make it practical to preserve the area in an unimpaired condition. There were no areas less than 5,000 acres that could be considered practical to preserve and use in an unimpaired condition. GIS information was used and the areas were checked for roads, hydrology, improvements, and terrain. These areas, smaller than 5,000 acres were not further considered for the inventory.
3. In addition to the above, the Francis Marion utilized resource data from the GIS database as a tool to conduct analysis of any **larger blocks of land of greater than 5,000 acres** that would warrant further consideration as areas that may be suitable for wilderness. There are two areas that are over 5,000 acres. These two areas will be included and considered.

Analysis of Areas during the Forest Plan Revision Process

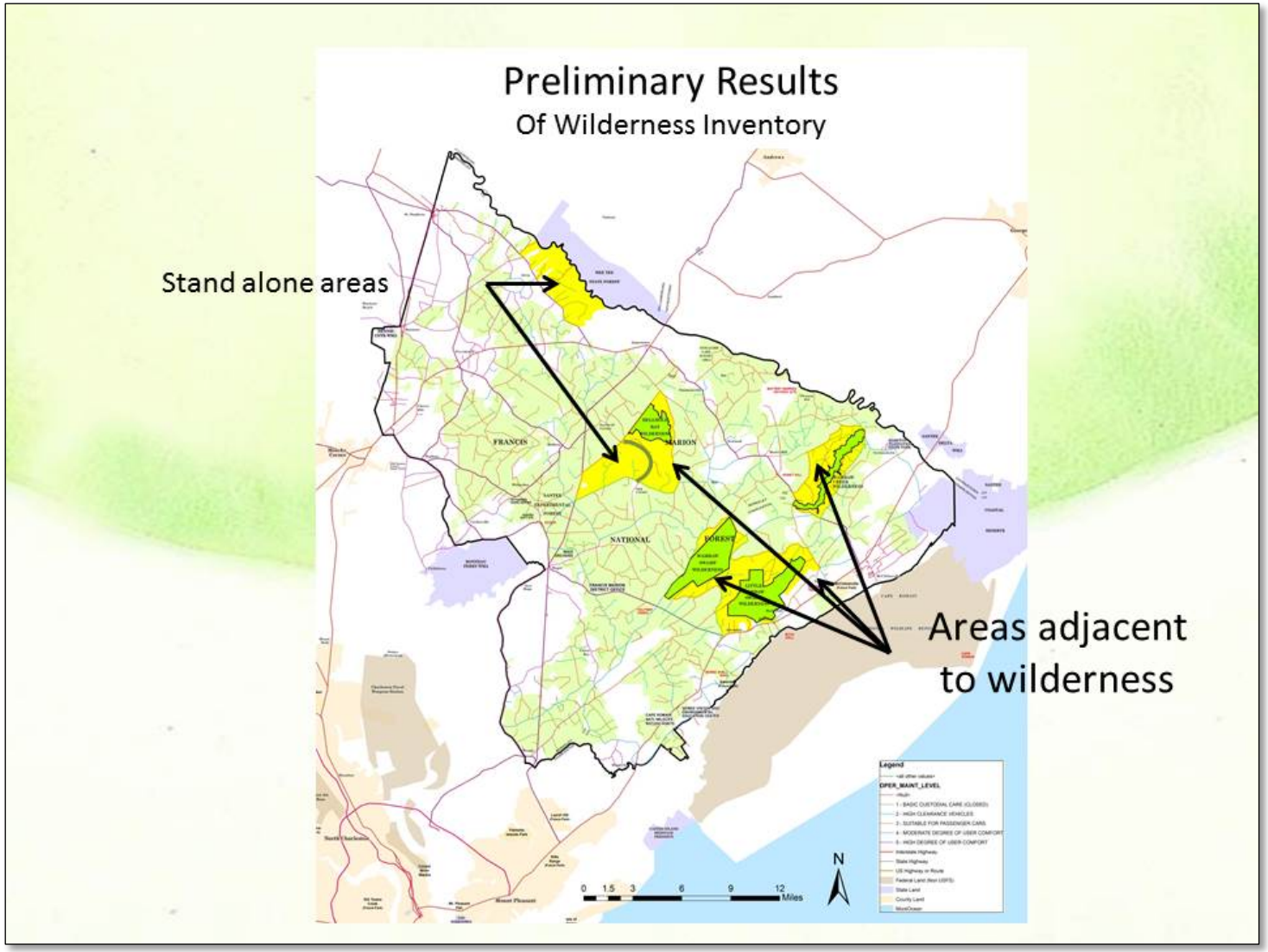
During the forest plan revision process, the forest planning team considered the additions to the existing wilderness and 2 other stand-alone wilderness areas, totaling over 31,000 acres, for evaluation. The forest planning team reviewed this information with the community and public at public meetings. No other areas were identified or brought forward during this part of the planning process.

D.1.5 Areas Included in the Inventory

There were 6 areas found on the Forests that qualified for placement in the inventory. The areas listed in Table D-2 are areas identified and included in the inventory and were carried forward for further evaluation. The wilderness evaluation, the second step, took a more detailed look at these inventoried areas to determine their wilderness characteristics using a set of criteria based on the Wilderness Act of 1964.

Table D-2. Wilderness Identification and Inventory August 2014

Area	Acres
Wambaw Creek Addition Area	5,747
Little Wambaw Swamp Additional Area	6,859
Wambaw Swamp Additional Area	2,306
Hellhole Bay Additional Area	4,535
Area A	6,643
Area B	5,098
TOTAL	31,188


Preliminary Results
Of Wilderness Inventory
Stand alone areas
Areas adjacent
to wilderness
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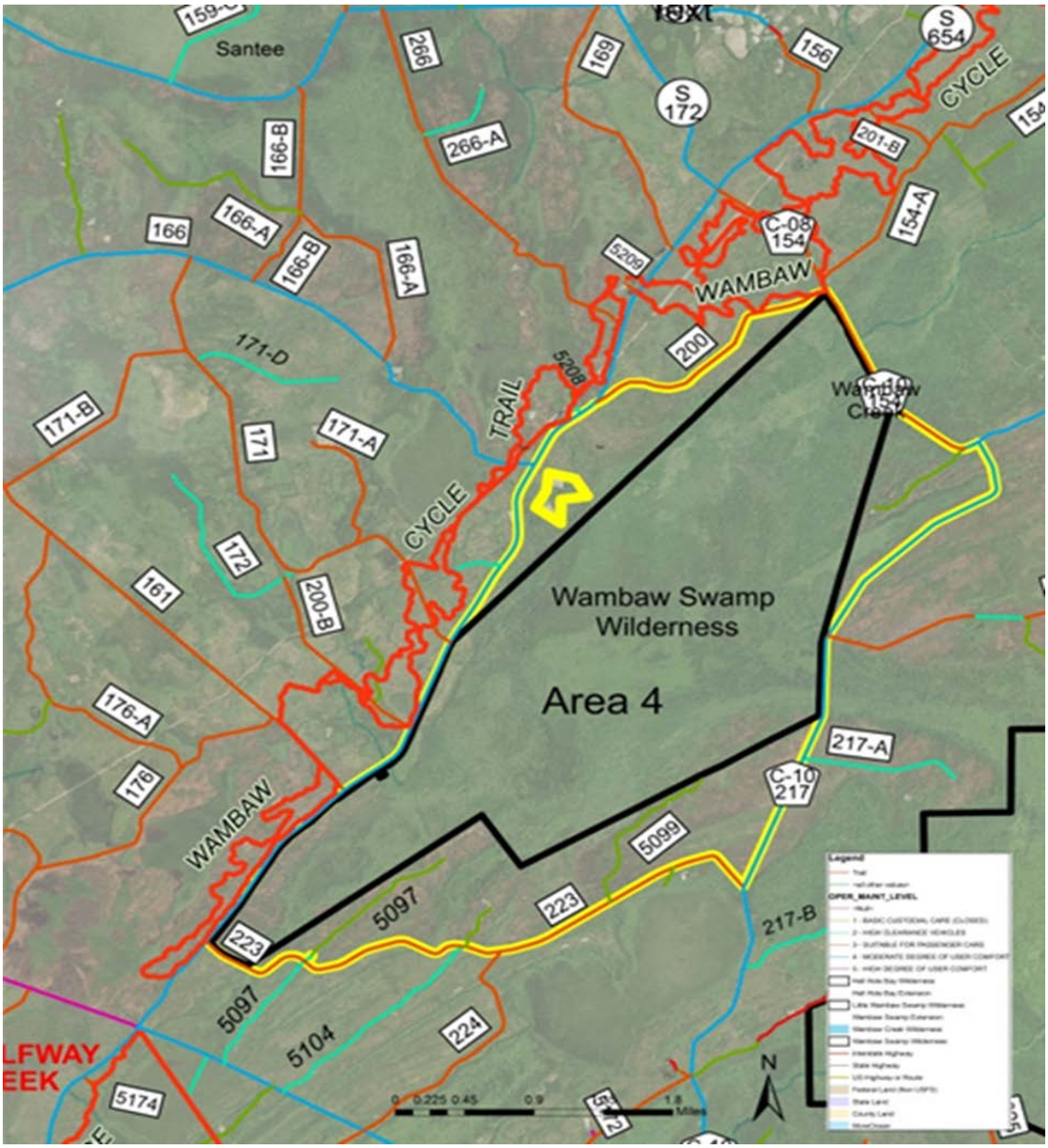
D.2 Evaluation of Lands that May be Suitable for Inclusion in the Wilderness Preservation System

Note: Wilderness evaluations begin on the next page.

D.2.1 Evaluation : Wambaw Creek Additional Area

Francis Marion National Forest, Wilderness Evaluation Worksheet

Wambaw Swamp Additional Acres **Total acres: 2,306**



Criteria 1: Evaluate the degree to which the area generally appears to be affected primarily by the forces of nature, with the imprints of man's work substantially unnoticeable.

Question 1a: What is the composition of plant communities within the area, including the communities already within the adjacent wilderness? (How many miles of maintenance level 1 roads affect the area? What is the density of the road network on the area?)

The entire area was impacted by Hurricane Hugo. Current composition of vegetation is a majority of Sweet Bay, Swamp Tupelo, Red Maple (69%), Longleaf Pine (12 %) and a mix of Cypress Tupelo and about 1 % of the area is in Loblolly Pine.

There are over 3.59 miles of closed level 1 road within the area. The majority of the area has a higher road density (more than 2 miles of road per 1000 acres).

Question 1b: What is the extent to which the area reflects ecological conditions that would normally be associated with the area without human intervention? (Describe the departure from natural range of variation in forest composition, structure, patterns and ecological processes? Describe the amount of the area that is primarily affected by the force of nature?)

The majority of the area is being prescribed burned (in existing burn units), including where appropriate into the adjacent existing wilderness.

The majority of area is in wet pine savannah and flatwoods ecogroup, upland longleaf pine woodlands and narrow forested swamps and blackwater stream floodplains. There are an additional 200 acres of pocosins. The following table shows the potential ecological groups of the area.

Potential Wilderness Area Extension (Area adjacent to Wambaw Swamp)			
Ecogroup	Total Acres (Including Wilderness)	Acres (Outside Wilderness)	Acres (Inside Wilderness)
Broad Forested Swamps and Large River Floodplain Forests	2,797	55	2,742
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	1,353	612	741
Pocosins	1,066	217	849
Wet Pine Savannas and Flatwoods	1,064	864	200
Depressional Wetlands and Carolina Bays	54	51	3
Upland Longleaf Pine Woodlands and Forests	787	569	218
Grand Total	7,121	2,367	4,753

Question 1c: What is the extent to which improvements (improvement criteria 71.22 from FSH 1909.12 chap 70) included in the inventory represent a departure from naturalness?

Improvement Type	Outcome
Airstrips	None
Heliports	None
Vegetation treatments that are not substantially noticeable.	Few WLO's in area, about 6 acres
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Some areas of thinning or biomass, since Hurricane Hugo
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	None
Areas of historic mining where impacts are not substantially noticeable.	None
Areas of mining activity where impacts are not substantially noticeable.	None
Range improvement areas	None
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps.	None
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	None
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions.	Moderate historic diking and channeling, common occurrence
Lands adjacent to development or activities that impact opportunities for solitude.	Private inholding
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	None

Criteria 2: Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Question 2a: What is available for outstanding opportunity for solitude? (Describe the proximity to private lands and non-Forest Service roads. Describe the general topography of the area in context of sight, sound, and screening.)

Over 95% of the area is in a roaded-natural ROS class, there is very small portion of semi-primitive motorized. The area is coastal plain, generally flat landform. Climate is temperate with hot, moist summers and mild winters. There is one private inholding within the area.

The area is bounded by paved county roads, along the northern edge, county roads along two other sides and gravel roads suitable for passenger cars. The area has low to moderate seasonal traffic on the gravel roads and regular traffic on the paved county roads. Along the northern boundary (Halfway Creek Road) is the 40-mile Wambaw Motorcycle Trail.

Question 2b: What is available in the area for opportunity for primitive and unconfined recreation? (Describe the types of primitive recreation activities in the area.)

Hunting is the main primitive recreation activity. Other activities for recreation are nature viewing and primitive camping. The area is entirely in the Wambaw Wildlife Management Area and has about 6 maintained wildlife openings within the area. Wet terrain and dense vegetation discourages some use.

Criteria 3: Evaluate how an area less than 5,000 acres is of sufficient size as to make it practical its preservation and use in an unimpaired condition.

This criterion wasn't included in these evaluations because it isn't applicable to additions to wilderness areas and it isn't applicable to stand alone areas greater than 5,000 acres.

Criteria 4: Evaluate the degree to which the area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Question 4a: Does the area contain rare plant or animal communities; rare ecosystem for wildlife habitat; rare ecosystem for aquatics; rare ecosystem for terrestrial; any biodiversity hotspots; coarse scale key connectivity for multiple species, or underrepresented/rare vegetation types? (Describe areas richness in terms of T&E, Species of conservation concern, area of key connectivity, etc.)

There are few surveys of invasive species in the area; however there are two occurrences of cogon grass on southern boundary along FS Road 223.

All (or portions) of over 12 foraging partitions for the red-cockaded woodpecker are located with the area.

Question 4b: Is there any outstanding landscape features such as waterfalls, mountains, viewpoints, water bodies, or geologic features? (Describe acres of distinctive scenic class or areas of outstanding geologic landscapes.)

The existing wilderness is an outstanding swamp landscape feature and there are some small portions of the area that have similar characteristics, including a connection to the Roadless Area (Little Wambaw Swamp Extension (530 acres) across county road. During the wetter season some parts of the area are flooded.

Question 4c: Is there historic or cultural resources of historic value in the area?

There are a low amount of sites within the area; however, there have been fewer inventories in this area.

Question 5d: Is there high quality water resources or important watershed features in the area?

Yes, water quality in Wambaw Swamp and its associated watershed are considered to be an important watershed feature. All watersheds on the Francis Marion are considered in fair condition based on the watershed condition class index.

Question 4e: Is there any special areas and/or research natural areas in the areas? (Describe and areas of special botanical area or research natural area.)

There are no research natural areas within the additional area. There are several stands of potential old growth forest (sweetbay, swamp tupelo, red maple and bald cypress, water tupelo) in the area.

Question 4f: Is there any scientific or education features in the area?

The area is adjacent to Wambaw Swamp Wilderness and potentially has multiple scientific and education features.

Criteria 5: Evaluate the degree to which the area may be managed to preserve its wilderness characteristics.

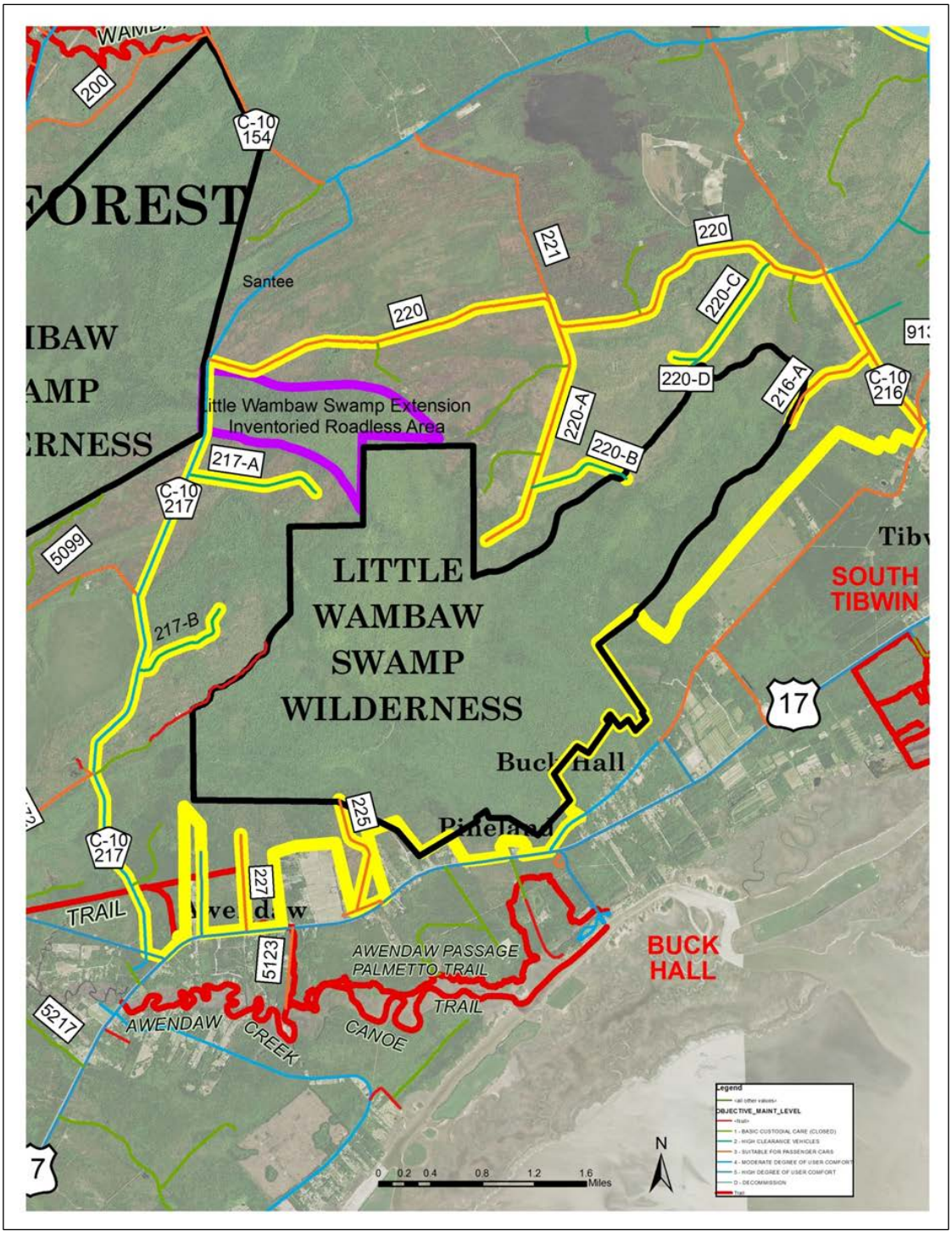
Question 5a: How can the area be managed to preserve its wilderness character? (Describe the shape and configuration of the area. Describe if there are any legally established rights or uses within the area. Are there specific Federal or state laws that may be relevant to availability of the area for wilderness or the ability to manage the area to protect wilderness characteristics? Describe the management of adjacent lands. Describe the current management of the area. Acres and % total of wildland urban interface in the area. Describe the type and extent of management restrictions within the area.)

The area is generally bounded by roads and that influence the shape. There are few open roads bisecting the area. There are no legally established rights within the area. At the present time there is no Federal or state law that affects the availability of the area for wilderness. Adjacent lands include national forest lands with forest management that includes vegetation management, RCW habitat improvements and prescribed burning. Other influences include private ownership within the area.

D.2.3 Evaluation – Little Wambaw Swamp Additional Area

Francis Marion National Forest: Wilderness Evaluation Worksheet

Little Wambaw Swamp Additional Area **Total acres: 6,859**



Criteria 1: Evaluate the degree to which the area generally appears to be affected primarily by the forces of nature, with the imprints of man's work substantially unnoticeable.

Question 1a: What is the composition of plant communities within the area, including the communities already within the adjacent wilderness? (How many miles of maintenance level 1 roads affect the area? What is the density of the road network on the area?)

The entire area was impacted by Hurricane Hugo. Current composition of vegetation is Longleaf Pine (30%) and a mix of Cypress Tupelo, Sweet Bay, Swamp Tupelo, Red Maple, Sweet Gum (about 2 % of the area is in Loblolly Pine.)

There are several occurrences of invasive species within the area, over 100 points or communities. There are over 3.45 miles of closed level 1 road within the area. Some parts of the area have a lower road density (less than .5 mile of road per 1000 acres), where directly adjacent to the existing wilderness.

Question 1b: What is the extent to which the area reflects ecological conditions that would normally be associated with the area without human intervention? (Describe the departure from natural range of variation in forest composition, structure, patterns and ecological processes? Describe the amount of the area that is primarily affected by the force of nature?)

The majority of the northern portions of the area is being prescribed burned (in existing burn units), including where appropriate the existing wilderness. The majority of area is in wet pine savannah and flatwoods ecogroup and narrow forested swamps. The following table shows the potential ecological groups of the area.

Potential Wilderness Area (Areas adjacent to Little Wambaw Swamp Wilderness)			
Ecogroups	**Total Acres (Including Wilderness)**	**Acres (Outside Wilderness)**	**Acres (Inside Wilderness)**
Broad Forested Swamps and Large River Floodplain Forests	4,543	679	3,864
Depressional Wetlands and Carolina Bays	52	52	0
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	2,198	1,632	566
Pocosins	733	646	87
Upland Longleaf Pine Woodlands and Forests	525	525	0
Wet Pine Savannas and Flatwoods	3,756	3,078	678
Grand Total	**11,807**	6,612	5,195

Question 1c: What is the extent to which improvements (improvement criteria 71.22 from FSH 1909.12 chap 70) included in the inventory represent a departure from naturalness?

Improvement Type	Outcome
Airstrips	None
Heliports	None
Vegetation treatments that are not substantially noticeable.	Few WLO's in area, 6 acres
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Some areas of thinning or biomass, since Hurricane Hugo
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	None
Areas of historic mining where impacts are not substantially noticeable.	None
Areas of mining activity where impacts are not substantially noticeable.	None
Range improvement areas	None
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps.	None
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	None
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions.	Moderate historic diking and channeling
Lands adjacent to development or activities that impact opportunities for solitude.	Private lands along southern boundary and Hwy 17.
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	None

Criteria 2: Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Question 2a: What is available for outstanding opportunity for solitude? (Describe the proximity to private lands and non-Forest Service roads. Describe the general topography of the area in context of sight, sound, and screening.)

Over 50% of the area is in a roaded-natural ROS class, there are some portions that are semi-primitive motorized and a very small portion of semi-primitive non-motorized. The area is coastal plain, generally flat landform. Climate is temperate with hot, moist summers and mild winters. There is no private land in the adjacent to the area. There are private landowners interspersed along the southern edge of the area. This southern portion of the area is within the WUI.

The area is bounded by paved roads, including Hwy 17 along the southern edge, county roads along two other sides and gravel roads suitable for passenger cars along the northern edge.

The area has moderate seasonal traffic on the gravel roads and regular traffic on the paved county road and high traffic on Hwy 17.

Question 2b: What is available in the area for opportunity for primitive and unconfined recreation? (Describe the types of primitive recreation activities in the area.)

Hunting and trail use is the main primitive recreation activity. The Palmetto Trail winds through a portion of the area. Other activities for recreation are nature viewing and primitive camping. The area is entirely in the Wambaw Wildlife Management Area and has about 5 maintained wildlife openings within the area. Wet terrain and dense vegetation discourages some use.

Criteria 3: Evaluate how an area less than 5,000 acres is of sufficient size as to make it practical its preservation and use in an unimpaired condition.

This criterion wasn't included in these evaluations because it isn't applicable to additions to wilderness areas and it isn't applicable to stand alone areas greater than 5,000 acres.

Criteria 4: Evaluate the degree to which the area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Question 4a: Does the area contain rare plant or animal communities; rare ecosystem for wildlife habitat; rare ecosystem for aquatics; rare ecosystem for terrestrial; any biodiversity hotspots; coarse scale key connectivity for multiple species, or underrepresented/rare vegetation types? (Describe areas richness in terms of T&E, Species of conservation concern, area of key connectivity, etc.)

The surveys to date include threated and endangered plants that include chaffseed, giant orchid, yellow fringeless orchid, sneezeweed. Several stands (90 acres) along the Hwy 17 included in the area have at-risk habitats that require burning. Data collection is limited in the area for invasive plants.

All (or portions) of over 20 foraging partitions for the red-cockaded woodpecker are located with the area.

Question 4b: Is there any outstanding landscape features such as waterfalls, mountains, viewpoints, water bodies, or geologic features? (Describe acres of distinctive scenic class or areas of outstanding geologic landscapes.)

The existing wilderness is an outstanding swamp landscape feature and there are some small portions of the area that have similar characteristics, including the Inventoried Roadless Area (Little Wambaw Swamp Extension (530 acres). During the wetter season some parts of the area are flooded.

Question 4c: Is there historic or cultural resources of historic value in the area?

There is a low to moderate amount of sites within the area, except on the most northern portion, where several sites are located. However, there have been fewer inventories in this area.

Question 4d: Is there high quality water resources or important watershed features in the area?

Yes, water quality in Little Wambaw Swamp and its associated watershed are considered to be an important watershed feature. All watersheds on the Francis Marion are considered in fair condition based on the watershed condition class index.

Question 4e: Is there any special areas and/or research natural areas in the areas? (Describe and areas of special botanical area or research natural area.)

There are no research natural areas within the additional area, there is one RNA within the Little Wambaw Swamp. There are several stands of old growth forest (longleaf, sweetbay, sweetgum-oak and water tupelo) in the area.

Question 4f: Is there any scientific or education features in the area?

The area is adjacent to Little Wambaw Swamp Wilderness and potentially has multiple scientific and education features.

Criteria 5: Evaluate the degree to which the area may be managed to preserve its wilderness characteristics.

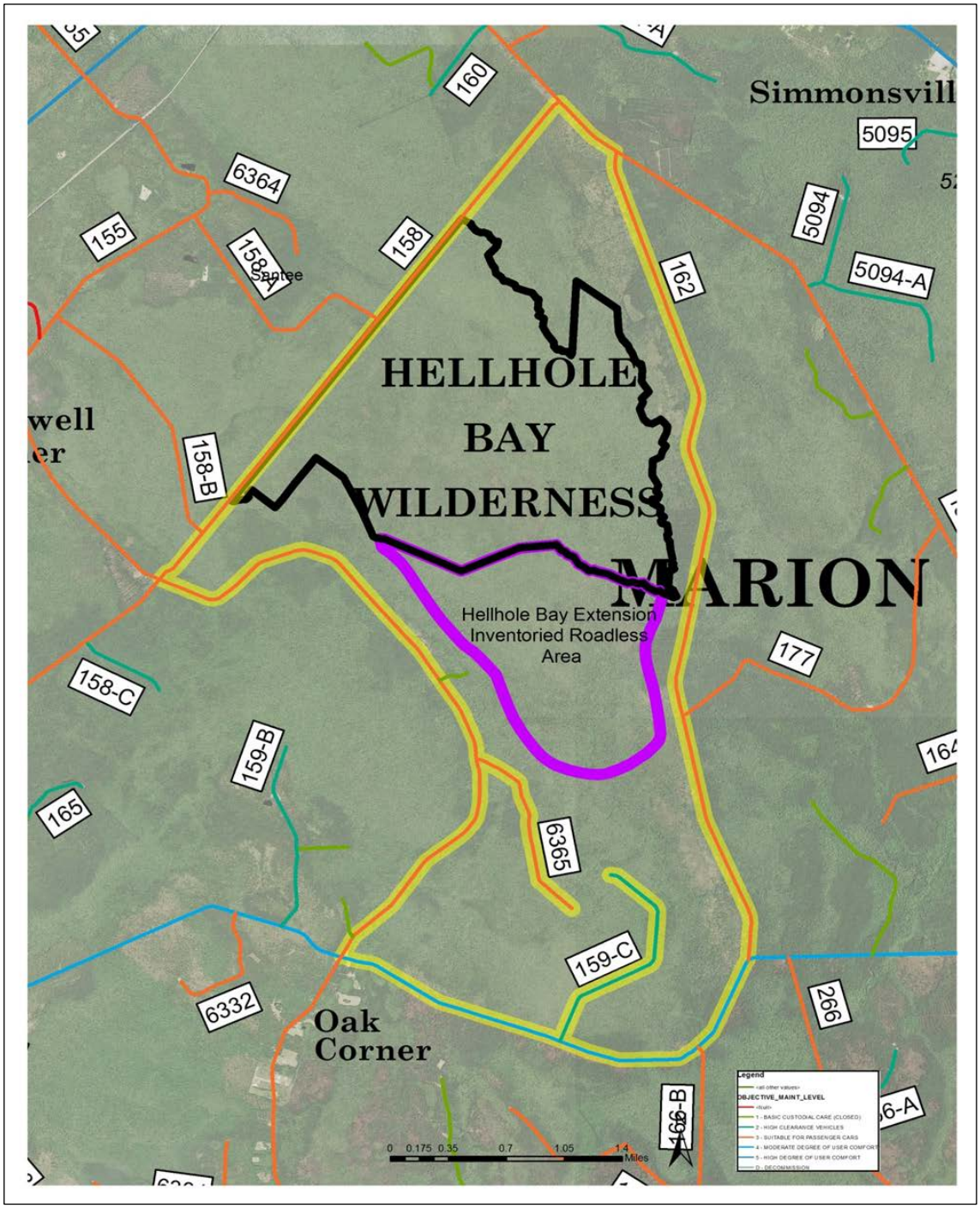
Question 5a: How can the area be managed to preserve its wilderness character? (Describe the shape and configuration of the area. Describe if there are any legally established rights or uses within the area. Are there specific Federal or state laws that may be relevant to availability of the area for wilderness or the ability to manage the area to protect wilderness characteristics? Describe the management of adjacent lands. Describe the current management of the area. Acres and % total of wildland urban interface in the area. Describe the type and extent of management restrictions within the area.)

The area is generally dissected with roads and has open roads that influence the shape, which would make the area more difficult to maintain the wilderness character. There are no legally established rights within the area. At the present time there is no Federal or state law that affects the availability of the area for wilderness. Adjacent lands include national forest lands with forest management that includes vegetation management, RCW habitat improvements and frequent prescribed burning on the northern edge. Other influences include multiple private ownerships along the southern boundary.

D.2.4 Evaluation – Hellhole Bay Additional Area

Francis Marion National Forest: Wilderness Evaluation Worksheet

Hellhole Bay Additional Area **Total acres: 4,535**



Criteria 1: Evaluate the degree to which the area generally appears to be affected primarily by the forces of nature, with the imprints of man's work substantially unnoticeable.

Question 1a: What is the composition of plant communities within the area, including the communities already within the adjacent wilderness? (How many miles of maintenance level 1 roads affect the area? What is the density of the road network on the area?)

The entire area was impacted by Hurricane Hugo. Current composition of vegetation is a majority of Cypress Tupelo (41%), Loblolly Pine (18%), Longleaf Pine (17%) and Bottomland Hardwood/Pine (14%).

There are .20 miles of closed level 1 road within the area. The majority of the area has a higher road density (more than 2 miles of road per 1000 acres). However, there is a portion of the area adjacent to Hellhole Bay Wilderness and within the Hellhole Bay Inventoried Roadless Area that has a few hundred acres of low road density (less than .5 mile per 1000 acres).

Question 1b: What is the extent to which the area reflects ecological conditions that would normally be associated with the area without human intervention? (Describe the departure from natural range of variation in forest composition, structure, patterns and ecological processes? Describe the amount of the area that is primarily affected by the force of nature?)

The majority of the area is being prescribed burned (in existing burn units), including where appropriate into the adjacent Hellhole Bay Wilderness.

The majority of area is in broad forested swamps and large river floodplain forests and wet pine savannah and flatwoods ecogroups. The following table shows the potential ecological groups of the area.

Potential Wilderness Area Extension (Area adjacent to Hellhole Bay)			
Ecogroup	Total Acres (Including Wilderness)	Acres (Outside Wilderness)	Acres (Inside Wilderness)
Broad Forested Swamps and Large River Floodplain Forests	4,716	2,770	1,947
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	250	204	47
Pocosins	71	56	14
Wet Pine Savannas and Flatwoods	1,554	1,455	100
Depressional Wetlands and Carolina Bays	36	26	10
Upland Longleaf Pine Woodlands and Forests	33	29	4
Grand Total	6,661	4,540	2,121

Question 1c: What is the extent to which improvements (improvement criteria 71.22 from FSH 1909.12 chap 70) included in the inventory represent a departure from naturalness?

Improvement Type	Outcome
Airstrips	None
Heliports	None
Vegetation treatments that are not substantially noticeable.	One WLO in area, about 6 acres
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Fewer areas of thinning or biomass, since Hurricane Hugo
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	None
Areas of historic mining where impacts are not substantially noticeable.	None
Areas of mining activity where impacts are not substantially noticeable.	None
Range improvement areas	None
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps.	None
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	None
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions.	Moderate historic diking and channeling
Lands adjacent to development or activities that impact opportunities for solitude.	None
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	None

Criteria 2: Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Question 2a: What is available for outstanding opportunity for solitude? (Describe the proximity to private lands and non-Forest Service roads. Describe the general topography of the area in context of sight, sound, and screening.)

Over 95% of the area is in a roaded-natural ROS class, there is small portion of semi-primitive non-motorized acres. The ROS of semi-primitive non-motorized generally corresponds to the Hellhole Bay Extension Inventoried Roadless Area. The area is coastal plain, generally flat landform. Climate is temperate with hot, moist summers and mild winters. There are no inholdings or other private land along the boundaries.

The area is bounded by a paved county roads and gravel roads suitable for passenger cars. The area has low to moderate seasonal traffic on the gravel roads and regular traffic on the paved county roads.

Question 2b: What is available in the area for opportunity for primitive and unconfined recreation? (Describe the types of primitive recreation activities in the area.)

Hunting is the main primitive recreation activity. Other activities for recreation are nature viewing and primitive camping. There are some trail users within the existing wilderness along an existing hike/canoe trail. The area is entirely in the Hellhole Wildlife Management Area and has one maintained wildlife openings within the area. Wet terrain and dense vegetation discourages some use.

Criteria 3: Evaluate how an area less than 5,000 acres is of sufficient size as to make it practical its preservation and use in an unimpaired condition.

This criterion wasn't included in these evaluations because it isn't applicable to additions to wilderness areas and it isn't applicable to stand alone areas greater than 5,000 acres.

Criteria 4: Evaluate the degree to which the area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Question 4a: Does the area contain rare plant or animal communities; rare ecosystem for wildlife habitat; rare ecosystem for aquatics; rare ecosystem for terrestrial; any biodiversity hotspots; coarse scale key connectivity for multiple species, or underrepresented/rare vegetation types? (Describe areas richness in terms of T&E, Species of conservation concern, area of key connectivity, etc.)

Data collection is limited in the interior of the area for invasive plants however; there are multiple occurrences of the invasive Japanese climbing grass along multiple roads that bound the area.

All (or portions) of over 5 foraging partitions for the red-cockaded woodpecker are located with the area.

Question 4b: Is there any outstanding landscape features such as waterfalls, mountains, viewpoints, water bodies, or geologic features? (Describe acres of distinctive scenic class or areas of outstanding geologic landscapes.)

The existing wilderness is an outstanding swamp landscape feature and there are some small portions of the area that have similar characteristics, including Hellhole Bay Extension Inventoried Roadless Area (Little Wambaw Swamp Extension (890 acres). During the wetter season some parts of the area are flooded.

Question 4c: Is there historic or cultural resources of historic value in the area?

There is a lower historic site density within the area; however, there have been fewer inventories in this area.

Question 4d: Is there high quality water resources or important watershed features in the area?

Yes, water quality in Hellhole Bay Wilderness and its associated watershed are considered to be an important watershed feature. All watersheds on the Francis Marion are considered in fair condition based on the watershed condition class index.

Question 4e: Is there any special areas and/or research natural areas in the areas? (Describe and areas of special botanical area or research natural area.)

There are no research natural areas within the area. There are no stands of potential old growth forest in the area.

Question 4f: Is there any scientific or education features in the area?

The area is adjacent to Hellhole Bay Wilderness and potentially has multiple scientific and education features.

Criteria 5: Evaluate the degree to which the area may be managed to preserve its wilderness characteristics.

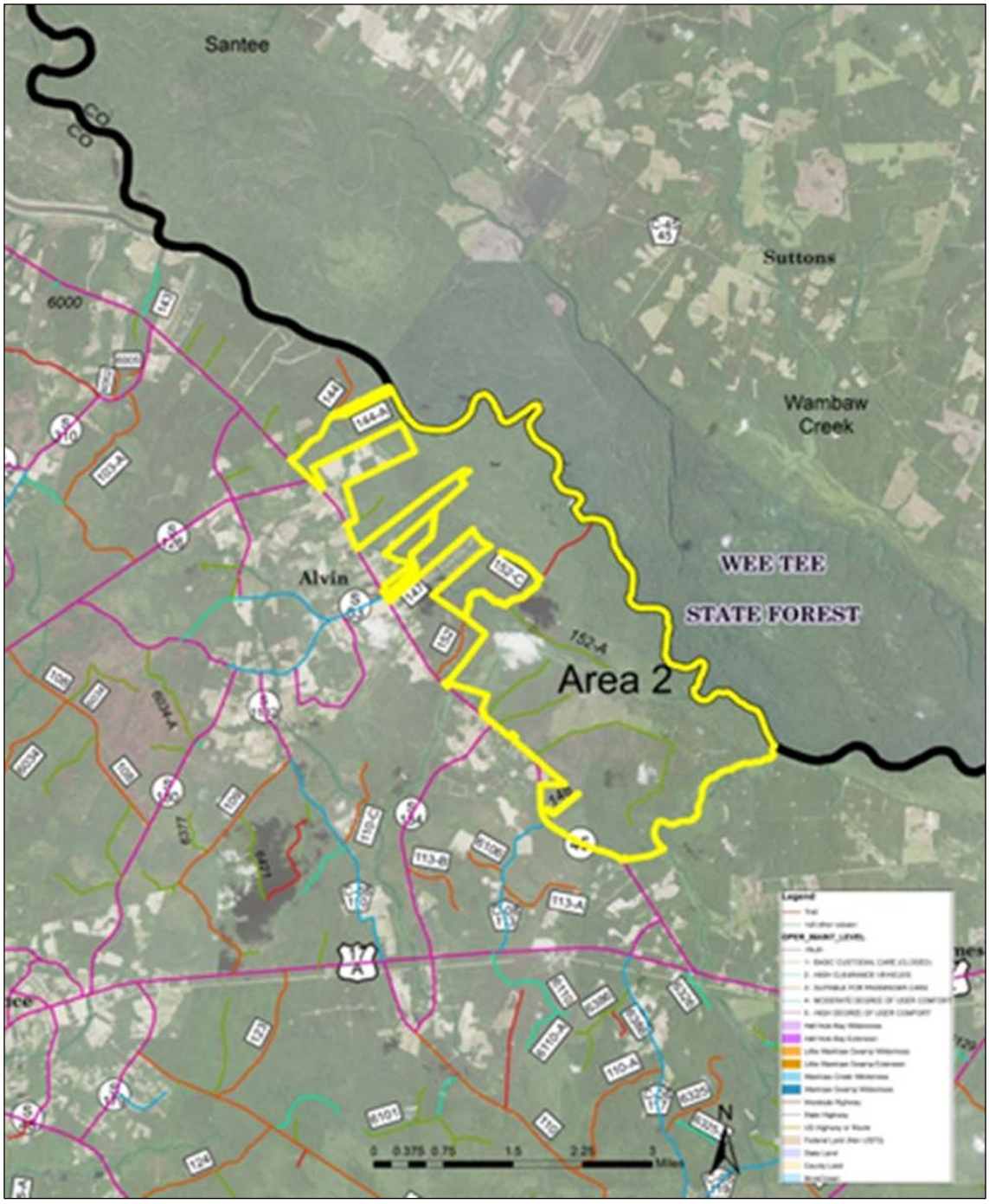
Question 5a: How can the area be managed to preserve its wilderness character? (Describe the shape and configuration of the area. Describe if there are any legally established rights or uses within the area. Are there specific Federal or state laws that may be relevant to availability of the area for wilderness or the ability to manage the area to protect wilderness characteristics? Describe the management of adjacent lands. Describe the current management of the area. Acres and % total of wildland urban interface in the area. Describe the type and extent of management restrictions within the area.)

The area is generally bounded by roads and that influences the shape. There are few open roads bisecting the area. There are no legally established rights within the area. At the present time there is no Federal or state law that affects the availability of the area for wilderness. Adjacent lands include national forest lands with forest management that includes vegetation management, RCW habitat improvements and prescribed burning.

D.2.5 Evaluation – Area A

Francis Marion National Forest: Wilderness Evaluation Worksheet

Area A **Total acres: 6,643**



Criteria 1: Evaluate the degree to which the area generally appears to be affected primarily by the forces of nature, with the imprints of man's work substantially unnoticeable.

Question 1a: What is the composition of plant communities within the area, including the communities already within the adjacent wilderness? (How many miles of maintenance level 1 roads affect the area? What is the density of the road network on the area?)

The entire area was impacted by Hurricane Hugo. Current composition of vegetation is a majority of Longleaf Pine (42%), Cypress Tupelo (43%), Sweet bay, Swamp Tupelo, Red Maple (3%), and Loblolly Pine (9%).

There are 2.8 miles of closed level 1 road within the area. The majority of the area has a higher road density (more than 2 miles of road per 1000 acres). However, there is a portion of the area that has about 1,300 acres of lower road density (less than 0.5 mile per 1000 acres).

Question 1b: What is the extent to which the area reflects ecological conditions that would normally be associated with the area without human intervention? (Describe the departure from natural range of variation in forest composition, structure, patterns and ecological processes? Describe the amount of the area that is primarily affected by the force of nature?)

About half the area is being prescribed burned (in existing burn units).

The majority of area is in Upland Longleaf Pine Woodlands and Forest and a smaller percentage is in Broad forested swamps and large river floodplain forests, oak forests and mesic hardwoods and narrow forested swamps and blackwater stream floodplain forests ecogroups. The following table shows the potential ecological groups of the area.

Potential Wilderness Area A		
Ecogroup	**Total Acres**	**% of Area**
Broad Forested Swamps and Large River Floodplain Forests	2,526	11%
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	678	11%
Pocosins	0	0%
Oak Forests and Mesic Hardwood Forests	923	14%
Wet Pine Savannas and Flatwoods	372	6%
Depressional Wetlands and Carolina Bays	11	0%
Upland Longleaf Pine Woodlands and Forests	1,932	30%
Grand Total	6,442	100%

Question 1c: What is the extent to which improvements (improvement criteria 71.22 from FSH 1909.12 chap 70) included in the inventory represent a departure from naturalness?

Improvement Type	Outcome
Airstrips	None
Heliports	None
Vegetation treatments that are not substantially noticeable.	One WLO's in area, 1 acre
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Several areas of thinning or biomass, since Hurricane Hugo
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	None
Areas of historic mining where impacts are not substantially noticeable.	None
Areas of mining activity where impacts are not substantially noticeable.	None
Range improvement areas	None
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps.	None
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	None
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions.	Minimal, if present, historic diking and channeling
Lands adjacent to development or activities that impact opportunities for solitude.	Private lands interspersed with Forest Service boundaries
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	None

Criteria 2: Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Question 2a: What is available for outstanding opportunity for solitude? (Describe the proximity to private lands and non-Forest Service roads. Describe the general topography of the area in context of sight, sound, and screening.)

Over 50% of the area is in semi-primitive motorized acres and the other portion is roaded natural, there are small areas with semi-primitive non-motorized. The area is coastal plain, generally flat landform. Climate is temperate with hot, moist summers and mild winters. There are no inholdings or other private land along the boundaries.

The area is bounded by a paved county road and gravel roads suitable for passenger cars. The area has low traffic on the gravel roads and moderate to high traffic on the paved State Highway 45.

Question 2b: What is available in the area for opportunity for primitive and unconfined recreation? (Describe the types of primitive recreation activities in the area.)

Hunting is the main primitive recreation activity. Other activities for recreation are fishing, nature viewing and primitive camping. The area is entirely in the Santee Wildlife Management Area and has 1 maintained wildlife opening within the area.

Criteria 3: Evaluate how an area less than 5,000 acres is of sufficient size as to make it practical its preservation and use in an unimpaired condition.

This criterion wasn't included in these evaluations because it isn't applicable to additions to wilderness areas and it isn't applicable to stand alone areas greater than 5,000 acres.

Criteria 4: Evaluate the degree to which the area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Question 4a: Does the area contain rare plant or animal communities; rare ecosystem for wildlife habitat; rare ecosystem for aquatics; rare ecosystem for terrestrial; any biodiversity hotspots; coarse scale key connectivity for multiple species, or underrepresented/rare vegetation types? (Describe areas richness in terms of T&E, Species of conservation concern, area of key connectivity, etc.)

There are hundreds of occurrences of the invasive Japanese climbing grass in interior of the area.

There are no foraging partitions for the red-cockaded woodpecker located with the area.

Question 4b: Is there any outstanding landscape features such as waterfalls, mountains, viewpoints, water bodies, or geologic features? (Describe acres of distinctive scenic class or areas of outstanding geologic landscapes.)

Views of the Santee River and across into WeeTee State forest are excellent on the northern boundary of the area.

Question 4c: Is there historic or cultural resources of historic value in the area?

There is a moderate to high historic site density within the area. Several sites are clustered on the higher parts of the area.

Question 4d: Is there high quality water resources or important watershed features in the area?

All watersheds on the Francis Marion are considered in fair condition based on the watershed condition class index.

Question 4e: Is there any special areas and/or research natural areas in the areas? (Describe and areas of special botanical area or research natural area.)

There are no research natural areas within the area. There are no stands of potential old growth forest in the area.

Question 4f: Is there any scientific or education features in the area?

No specific scientific or education features known specific to this area.

Criteria 5: Evaluate the degree to which the area may be managed to preserve its wilderness characteristics.

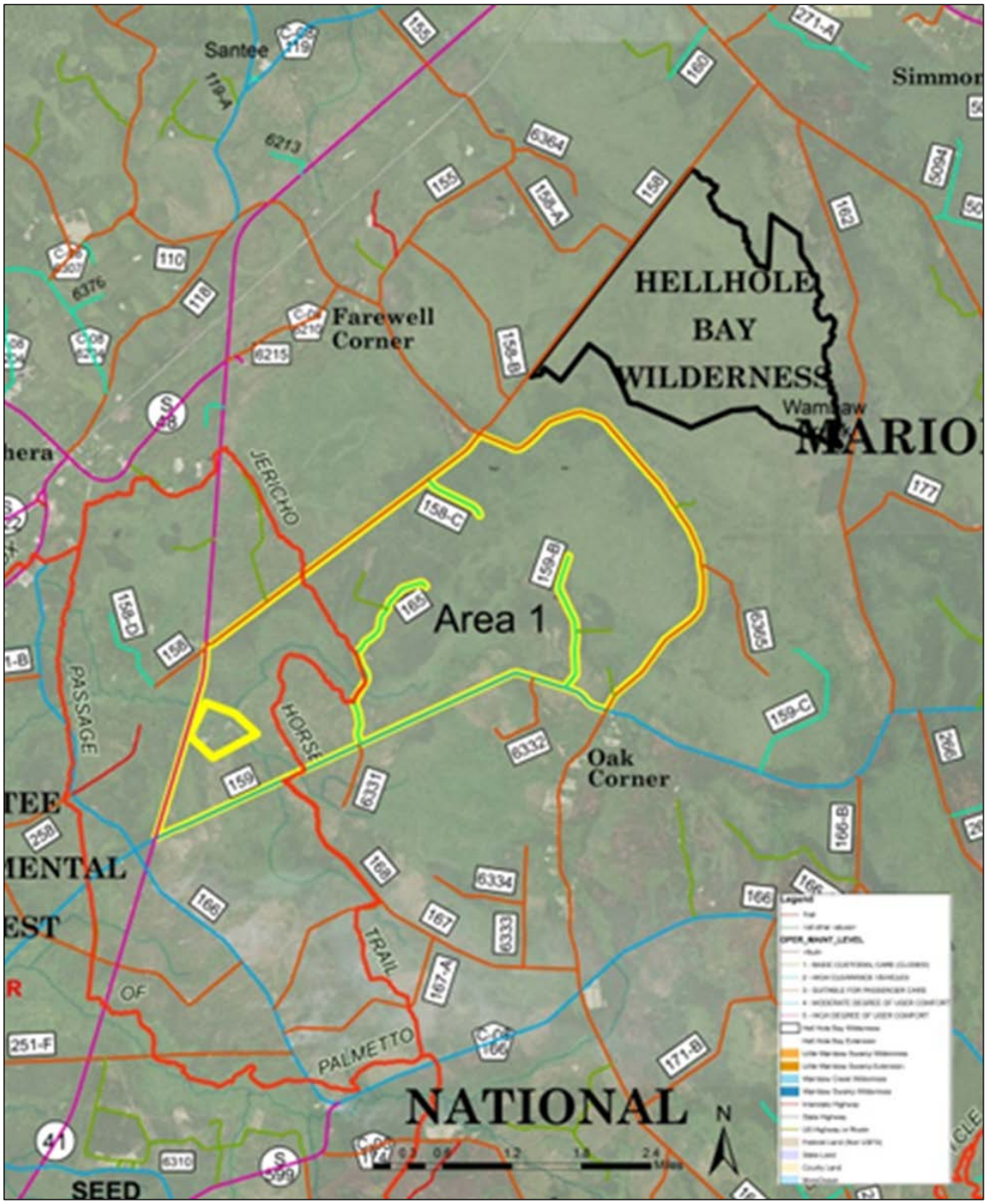
Question 5a: How can the area be managed to preserve its wilderness character? (Describe the shape and configuration of the area. Describe if there are any legally established rights or uses within the area. Are there specific Federal or state laws that may be relevant to availability of the area for wilderness or the ability to manage the area to protect wilderness characteristics? Describe the management of adjacent lands. Describe the current management of the area. Acres and % total of wildland urban interface in the area. Describe the type and extent of management restrictions within the area.)

The area is generally bounded by roads and multiple private lands on the northern portion of the area, as well as the natural boundary of the Santee River (eligible Wild and Scenic River). There is an open road bisecting the area. There are no legally established rights within the area. At the present time there is no Federal or state law that affects the availability of the area for wilderness. Adjacent lands include national forest lands with forest management that includes vegetation management, RCW habitat improvements and prescribed burning and also private lands with agricultural land uses.

D.2.6 Evaluation – Area B

Francis Marion National Forest: Wilderness Evaluation Worksheet

Name: Area B **Total acres: 5,098**



Criteria 1: Evaluate the degree to which the area generally appears to be affected primarily by the forces of nature, with the imprints of man's work substantially unnoticeable.

Question 1a: What is the composition of plant communities within the area, including the communities already within the adjacent wilderness? (How many miles of maintenance level 1 roads affect the area? What is the density of the road network on the area?)

The entire area was impacted by Hurricane Hugo. Current composition of vegetation is a majority of Longleaf Pine (42%), Sweet bay, Swamp Tupelo, Red Maple (30%), Loblolly Pine (14%), Cypress Tupelo (4%) and Bottomland Hardwood/Pine (5%).

There are 1.1 miles of closed level 1 road within the area. The majority of the area has a higher road density (more than 2 miles of road per 1000 acres). However, there is a portion of the area adjacent that has about 300+ hundred acres of lower road density (less than .5 mile per 1000 acres).

Question 1b: What is the extent to which the area reflects ecological conditions that would normally be associated with the area without human intervention? (Describe the departure from natural range of variation in forest composition, structure, patterns and ecological processes? Describe the amount of the area that is primarily affected by the force of nature?)

Less than half of the potential area is being prescribed burned (in existing burn units).

The majority of area is in wet pine savannah and flatwoods broad forested swamps and broad river floodplain forests ecogroups. The following table shows the potential ecological groups of the area.

Potential Wilderness Area B	
Ecogroup	**Total Acres**
Broad Forested Swamps and Large River Floodplain Forests	1,790
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	301
Oak Forests and Mesic Hardwood Forests	1
Wet Pine Savannas and Flatwoods	2,907
Depressional Wetlands and Carolina Bays	51
Upland Longleaf Pine Woodlands and Forests	47
Grand Total	5,098

Question 1c: What is the extent to which improvements (improvement criteria 71.22 from FSH 1909.12 chap 70) included in the inventory represent a departure from naturalness?

Improvement Type	Outcome
Airstrips	None
Heliports	None
Vegetation treatments that are not substantially noticeable.	Three WLO's in area, 4.5 acres
Timber harvest areas where logging and prior road construction are not substantially noticeable.	Few areas of thinning or biomass, since Hurricane Hugo
Permanently installed vertical structures, such as electronic installations including cell towers, television, radio, and telephone repeaters, provided their impact, as well as their maintenance and access needs, is minimal.	None
Areas of historic mining where impacts are not substantially noticeable.	None
Areas of mining activity where impacts are not substantially noticeable.	None
Range improvement areas	None
Recreational improvements, such as occupancy spots, or minor hunting, or outfitting camps.	None
Ground-return telephone lines, electric lines, and power lines if a right-of-way has not been cleared. Exclude power lines with cleared right-of-ways, pipelines, and other permanently installed linear right-of-way structure.	None
Watershed treatment areas (contouring, diking, channeling) that are not substantially noticeable, or if wilderness character can be maintained or restored through appropriate management actions.	Moderate historic diking and channeling
Lands adjacent to development or activities that impact opportunities for solitude.	Private Inholding, adjacent to SC State Highway 41
Structures, dwellings and other relics of past occupation when they are considered part of the historical and cultural landscape of the area.	None

Criteria 2: Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Question 2a: What is available for outstanding opportunity for solitude? (Describe the proximity to private lands and non-Forest Service roads. Describe the general topography of the area in context of sight, sound, and screening.)

Over 60% of the area is in a roaded-natural ROS class, there is portion of semi-primitive motorized acres. The area is coastal plain, generally flat landform. Climate is temperate with hot, moist summers and mild winters. There are no inholdings or other private land along the boundaries.

The area is bounded by a paved county road and gravel roads suitable for passenger cars. The area has low to moderate traffic on the gravel roads and moderate to high traffic on the paved SC State Highway 41.

Question 2b: What is available in the area for opportunity for primitive and unconfined recreation? (Describe the types of primitive recreation activities in the area.)

Hunting and trail use is the main primitive recreation activity. Other activities for recreation are nature viewing and primitive camping. The area is entirely in the Hellhole Wildlife Management Area and has 3 maintained wildlife openings within the area. The Jerico Horse Trail winds through portions of the area.

Criteria 3: Evaluate how an area less than 5,000 acres is of sufficient size as to make it practical its preservation and use in an unimpaired condition.

This criterion wasn't included in these evaluations because it isn't applicable to additions to wilderness areas and it isn't applicable to stand alone areas greater than 5,000 acres.

Criteria 4: Evaluate the degree to which the area may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Question 4a: Does the area contain rare plant or animal communities; rare ecosystem for wildlife habitat; rare ecosystem for aquatics; rare ecosystem for terrestrial; any biodiversity hotspots; coarse scale key connectivity for multiple species, or underrepresented/rare vegetation types? (Describe areas richness in terms of T&E, Species of conservation concern, area of key connectivity, etc.)

Data collection is limited in the interior of the area for invasive plants however; there are occurrences of the invasive Japanese climbing grass along multiple roads that bound the area and on roads interior to the area.

All (or portions) of over 7 foraging partitions for the red-cockaded woodpecker are located with the area.

Question 4b: Is there any outstanding landscape features such as waterfalls, mountains, viewpoints, water bodies, or geologic features? (Describe acres of distinctive scenic class or areas of outstanding geologic landscapes.)

No outstanding landscape features.

Question 4c: Is there historic or cultural resources of historic value in the area?

There is a low historic site density within the area; however, there have been fewer inventories in this area.

Question 4d: Is there high quality water resources or important watershed features in the area?

All watersheds on the Francis Marion are considered in fair condition based on the watershed condition class index.

Question 4e: Is there any special areas and/or research natural areas in the areas? (Describe and areas of special botanical area or research natural area.)

There are no research natural areas within the area. There are no stands of potential old growth forest in the area.

Question 4f: Is there any scientific or education features in the area?

No specific scientific or education features known specific to this area.

Criteria 5: Evaluate the degree to which the area may be managed to preserve its wilderness characteristics.

Question 5a: How can the area be managed to preserve its wilderness character? (Describe the shape and configuration of the area. Describe if there are any legally established rights or uses within the area. Are there specific Federal or state laws that may be relevant to availability of the area for wilderness or the ability to manage the area to protect wilderness characteristics? Describe the management of adjacent lands. Describe the current management of the area. Acres and % total of wildland urban interface in the area. Describe the type and extent of management restrictions within the area.)

The area is generally bounded by roads and that influences the shape. There are three open roads within the area. There are no legally established rights within the area. At the present time there is no Federal or state law that affects the availability of the area for wilderness. Adjacent lands include national forest lands with forest management that includes vegetation management, RCW habitat improvements and prescribed burning.

D.3 Analysis of Lands Suitable for Inclusion in the Wilderness Preservation System

All of the areas in the inventory of lands that may be suitable for inclusion in the wilderness preservation system were brought forward to be analyzed in the alternatives in this Environmental Impact Statement except for one – "Area A".

"Area A" was not brought forward to be further analyzed for possible wilderness recommendation in an alternative in this EIS because of the presence of Japanese climbing fern and the need to control this highly invasive species using herbicides. Additional ecosystem and watershed restoration is needed and a wilderness recommendation at this time would limit the use of heavy equipment needed to restore desired conditions. There are no proposed activities in the alternatives that would preclude a future recommendation during the next round of plan revision.

Table D-3 shows how all the other areas identified in the inventory were addressed in the alternatives.

Table D-3. Summary of Proposed Wilderness by Alternative

Existing Area	Alternative 1	Alternative 2	Alternative 3
Grand Total Wilderness	13,812	13,812	36,927
Wilderness Expansion			16,351
Inventoried Roadless Areas	1420	1420	0
Semi Primitive, Motorized	0	11,139	0

Table D-4. Draft Wilderness Recommendations by Alternative

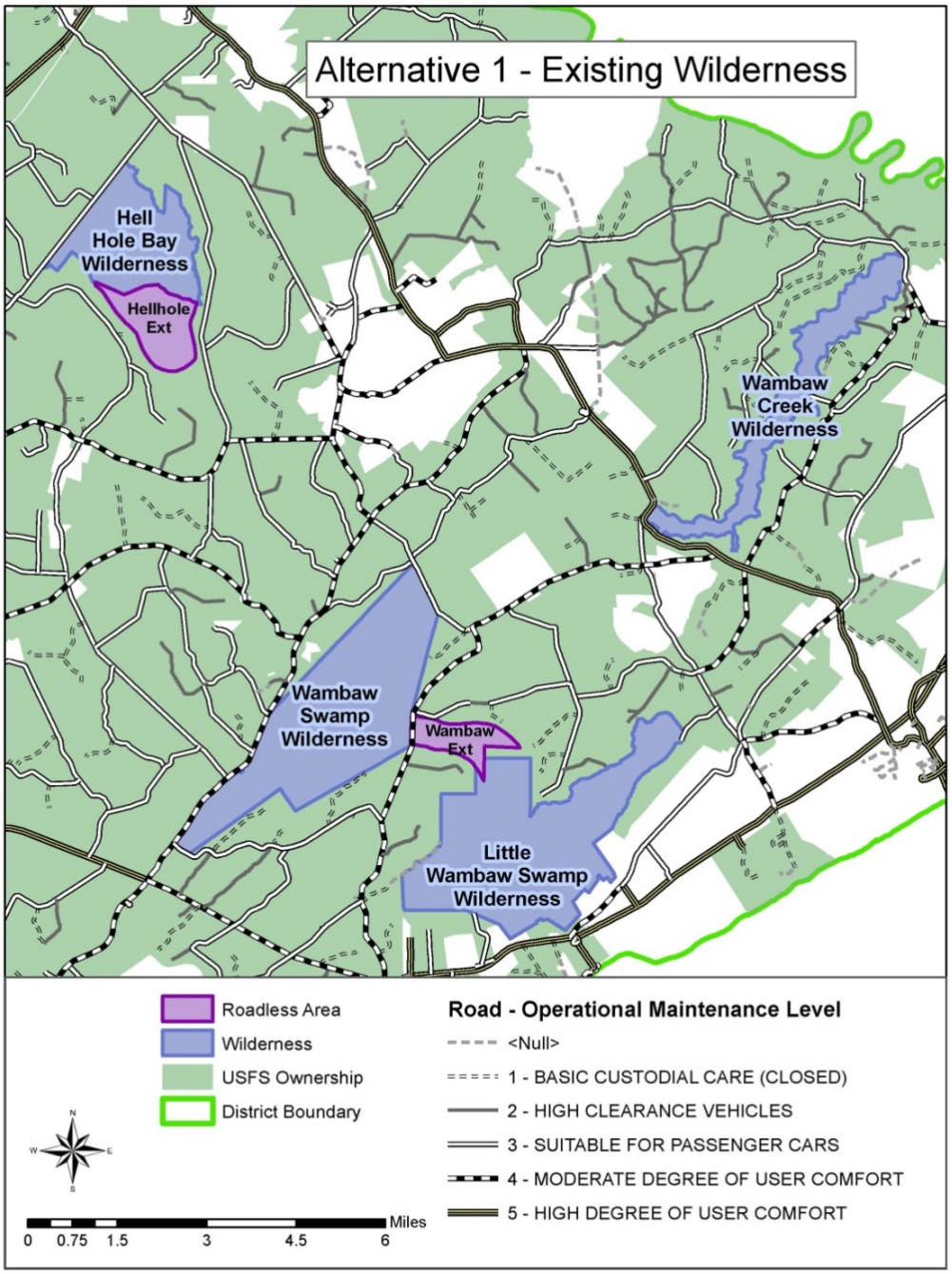
Existing Area	Recommended	Alternative 1	Alternative 2	Alternative 3
Wambaw Creek Wilderness		1,825	1,825	1,825
	Wilderness Expansion	0	0	5,747
	Semi-primitive, Motorized	0	0	0
Total Wilderness		1,825	1,825	7,572
Wambaw Swamp Wilderness		4,815	4,815	4,815
	Wilderness Expansion	0	0	1,745
	Semi-primitive, Motorized	0	1,745	0
Total Wilderness		4,814	4,815	7,560
Little Wambaw Swamp		5,047	5,047	5,047
Inventoried Roadless Area		530	530	0
	Wilderness Expansion	0	0	4,854
	Semi-primitive Motorized	0	4,324	0
Total Wilderness		5,047	5,047	9,901
Hellhole Bay Wilderness		2,125	2,125	2,125
Inventoried Roadless Area		890	890	0
	Wilderness Expansion	0	0	4,540
	Semi-primitive Motorized	0	3,650	0
Total Wilderness		2125	2125	9,080
	Area A	0	0	0
	Area B	0	0	3,814
Total Wilderness		0	0	3,814

Note: GIS acres are approximate.

Alternative 1

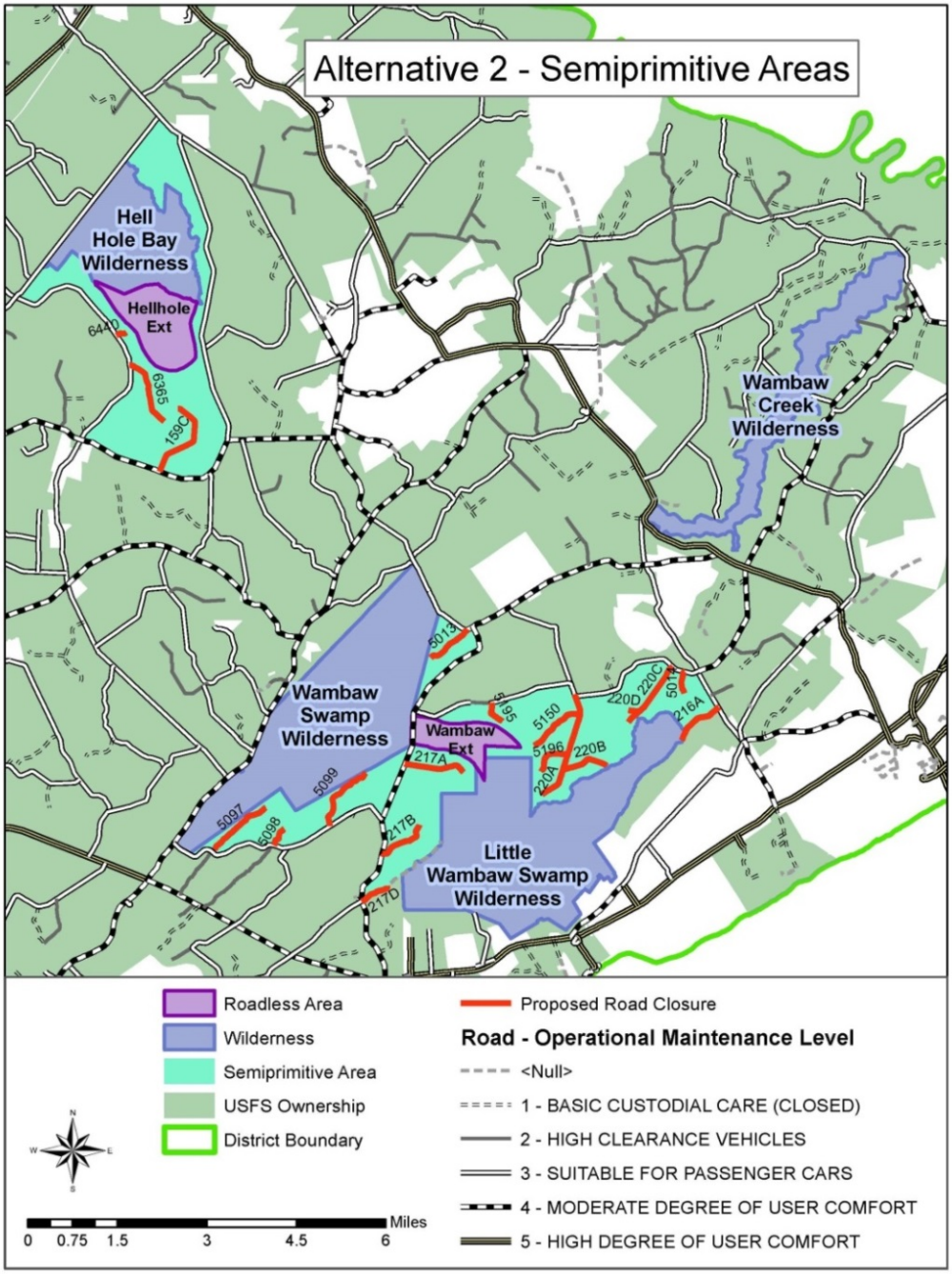
1996 Forest Plan

No additional areas were recommended for wilderness in the 1996 Forest Plan. In Alternative 1, four existing wilderness are maintained, totaling over 13,000 acres. Two inventoried roadless areas (Hellhole Ext and Wambaw Ext.) are maintained. No road closures are needed to implement this alternative.



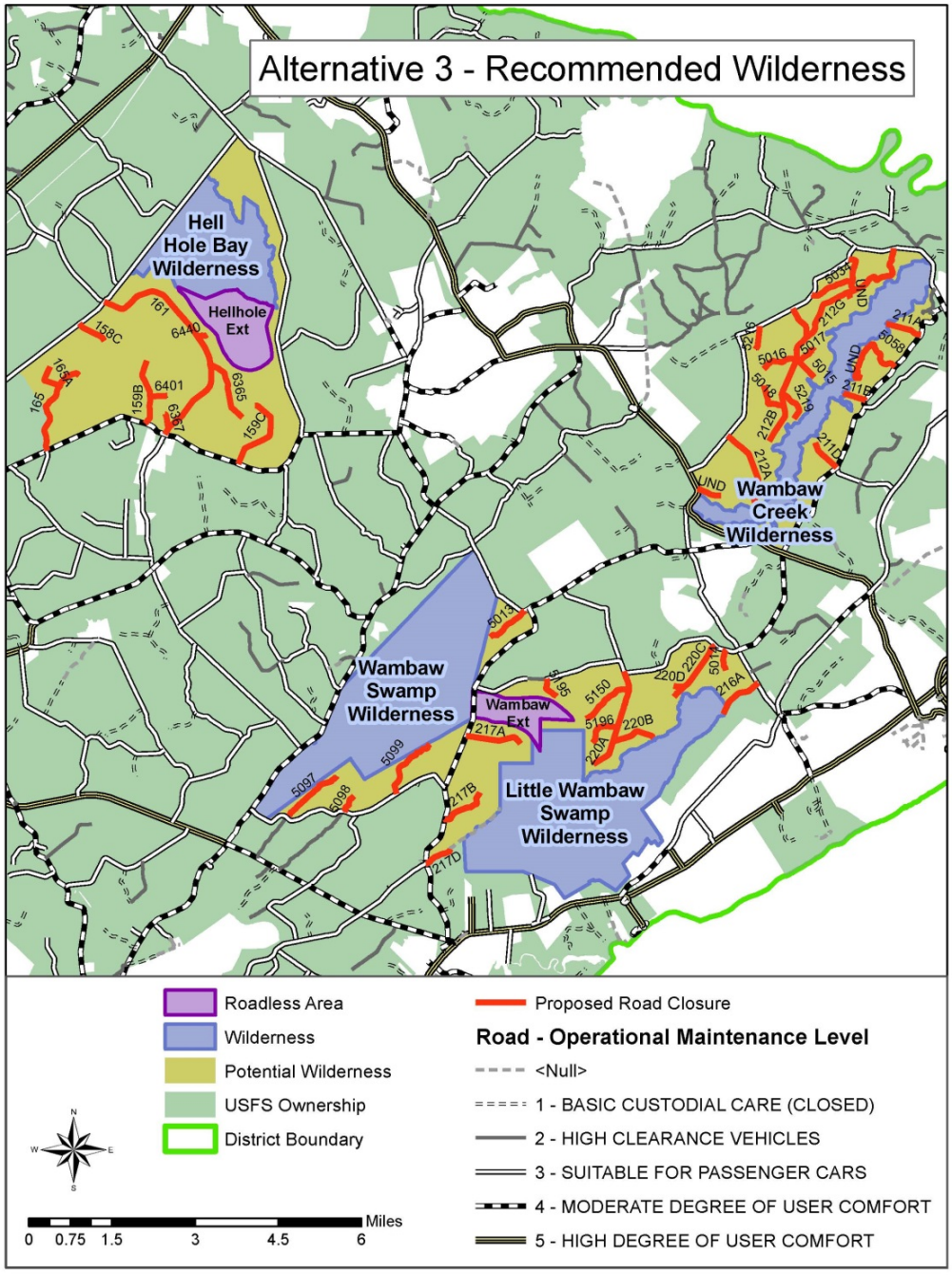
Alternative 2

Alternative 2 increases opportunities for remoteness by emphasizing a semi-primitive, motorized desired condition on national forest land adjacent to 3 existing wilderness areas. Four existing wilderness and two inventoried roadless areas are maintained. Three of those wildernesses have additional acres that emphasize a remote experience totaling over 11,000 acres, but do not restrict mechanical activities in the area (turquoise colored) in the map below. Over time with additional road closures (7 miles) in the areas improve wilderness character and lower open road density in the area. Roads that would need to be gated are highlighted in red. These gated roads would be used for administrative access. Road closure would require a site-specific NEPA decision.



Alternative 3

In Alternative 3, four existing wilderness are expanded with 4 additions totaling over 16,000 acres (including two inventoried roadless areas). Over time, additional road closures (27 miles) in the areas improve wilderness character and lower road density in the tan-colored area in the map below. Roads that would be closed and obliterated are highlighted in red. A road closure would require a site-specific NEPA decision.



Glossary

Road Maintenance levels. The level of service provided by, and maintenance required for, a specific road.

Level 1. These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are to "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps. Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for non-motorized uses.

Level 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 “No Traffic Signs,” may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to “discourage” or “prohibit” passenger cars. “Accept” or “discourage” strategies may be employed for high clearance vehicles.

Level 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The manual on uniform traffic control devices is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations. Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either to "encourage" or "accept" passenger cars. "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Level 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The manual on uniform traffic control devices is applicable. The most appropriate traffic management strategy is to "encourage" passenger cars. However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Level 5. Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. The manual on uniform traffic control devices is applicable. The appropriate traffic management strategy is to "encourage" passenger cars.

Appendix E: Ecosystems and Species Diversity Report

E.1 Introduction

The ecological sustainability framework used to support forest plan revision for the Francis Marion National forest is built on a foundation of ecological system diversity. By restoring and maintaining the key characteristics, conditions, and functionality of native ecological systems, the Forest should improve ecological system diversity but also provide for the needs of diverse plant and animal species on the forest. This report describes the analysis process used to identify, evaluate, and develop guidance for sustaining ecological diversity. Additional information is contained in the ecological sustainability evaluation tool.

E.2 Ecological Sustainability Framework

For the forest plan revision process, the Forest Service worked with a relational database, the ecological sustainability evaluation tool, based on the structure of an ecological planning tool developed by the Nature Conservancy. The ecological sustainability tool contains a framework for identifying current and desired conditions for each ecological system and identifying expected outcomes based on our management. An ecological sustainability sub-team comprised of a vegetation ecologist, wildlife biologist, hydrologist, and aquatic biologist working with partners populated a species and ecological system sustainability evaluation framework for our analysis of ecological sustainability and integrity built around principles developed by the Nature Conservancy (TNC) in their Conservation Action Planning Workbook (Nature Conservancy 2005). Although built on the TNC structure, this document uses terminology from the 2012 National Forest Planning rule rather than TNC terms to refer to parts of the ecological sustainability framework. The table below provides a crosswalk between relevant Forest Service and TNC terminology.

The following steps were used to build an ecological sustainability framework, with each step documented within the ecological sustainability evaluation tool. This iterative process was methodical and utilized sequential steps, as described below.

Table E-1. Crosswalk between Conservation Planning Term used in Forest Service Planning Direction and The Nature Conservancy's Conservation Action Planning Workbook (2005)

Forest Service Terms	The Nature Conservancy Terms
Native Ecological systems, At Risk Species (= Threatened and Endangered Species, Species of Conservation Concern)	Conservation Targets
Key Characteristics of Ecosystems or Species Groups	Key Ecological Attributes
Indicators	Indicators
Strategies (Forest Plan Components)	Strategies
Sustainability Rating	Indicator Rating

1). Identify, map, and describe ecological systems and high quality rare plant communities. We first identified, mapped, and described ecological systems on the Francis Marion National Forest considering Natureserve's Ecosystem framework and information on native ecosystems which occur or occurred historically across the landscape (Natureserve, 2012). Ecosystems were classified and mapped at both the landtype association level (LTA), and the landtype (LT) level (Simon and Hayden, 2014) using the latest information and technology available since 1996. Criteria followed the National framework of ecological units developed by the Forest Service of the U.S. Department of Agriculture in 1993 (Cleland et.al., 1997), and included consideration of landform, soils and/or geology, and potential natural vegetation. The Forest Service working with Natureserve and Simon and Hayden (2014) identified and mapped 21 ecological systems on the Forest, which were then grouped into 9 "ecosystem groups", which formed the foundation for developing restoration activities. The ecosystems and ecosystem groups represent common and rare community types, both of which are important for sustaining ecological and species diversity. We also considered descriptions and disturbance regimes for these ecosystems included in applicable LANDFIRE models.

2). Identify at risk species and associated species groups or habitats. To assess ecological conditions for providing for a diversity of species with an emphasis on species most "at risk" from extirpation in the foreseeable future, we developed a comprehensive list of potential plant and animal species known to occur on the forest with potential or predicted habitat or population declines. The ecological sustainability team compiled a list of over 140 plant, wildlife, and aquatic species as part of assessment by combining species lists from a variety of sources, including: federally-listed threatened and endangered species obtained from the US Fish and Wildlife Service, State Species of Conservation obtained from the South Carolina Natural Heritage Program, State Comprehensive Wildlife Conservation Strategy, the Birds of Conservation Concern list compiled by the US Fish and Wildlife Service, and the Forest Service's list of sensitive species. Additional species were added based on input from recognized conservation experts within the state. Species were then screened for inclusion in the framework and designated as species of conservation concern in collaboration with the Regional Forester.

The list of "at risk" species include:

- Federally -listed threatened, endangered, proposed and candidate species; and
- Species of conservation concern. Species of conservation concern are those plant and animal species whose long-term persistence within the plan area is of known conservation concern. The 2012 National Forest Planning Rule requires that species of conservation concern be "known to occur in the plan area" and that the regional forester identify the species of conservation concern for which "the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the plan area."

For analysis purposes and for developing forest plan strategies, we grouped potential "at risk" species into species groups, based on known habitat requirements, habitat threats, or habitat drivers on the forest, and assessed the ecological conditions needed to sustain those species on the forest.

3). Identify and define key characteristics and indicators for each ecosystem and species group. Assess current condition for ecological systems, species, and species groups and develop forest plan components. To identify and key characteristics and indicators for terrestrial systems, species, and species groups, we considered the input of experts knowledgeable about ecological

conditions, and our at risk species in South Carolina. We also considered those key characteristics and indicators used through other recent forest planning efforts in the Southern Region.

Current values and ratings of all indicators were estimated using a variety of methods. Most current and predicated values were derived through analysis of existing GIS databases. All indicators were combined into a composite score for each ecosystem or species group.

4). Develop forest plan components and strategies. We evaluated Forest Plan area conditions needed for all species using a coarse-filter/fine-filter approach. Forest plan components were proposed with the goal of providing ecological system sustainability including ecological conditions and habitat components for sustaining at risk species. Most plant and animal species on the forest will be sustained by maintaining and restoring the composition, structure, function, and connectivity of a diversity of ecosystems in the Plan area. Fine-filter strategies for species were developed where needed to contribute to the recovery of threatened and endangered species, conserve proposed and candidate species, and maintain or restore ecological conditions for sustaining a viable population of each species of conservation concern where possible and ecologically feasible, given the capabilities of our land base. We considered an all lands approach in providing for and maintaining ecological conditions for all at risk species.

5). Develop overall ecological sustainability ratings to assess future outcomes at both 10- and 50- year time intervals. We developed a composite condition score for assessing ecological sustainability (Table E-2) which is a composite of all key characteristics by ecosystem. We ranked each ecosystem/species group and alternative combination as poor, fair, good, or very good in terms of ecological sustainability. Rankings for all indicators are defined in the ecologic sustainability evaluation tool.

6). Other Species Considered In the Analysis and Their Relationship to Species Group and Forest Plan Components. See Table E-3.

Table E-2. Sustainability Condition Scores

Range of Condition Score	Condition	Definition of Ecological Sustainability Evaluation Score Applied to Planning Elements
3.51 – 4.0	Very Good	Element conditions are optimal; associated species' populations should remain robust and potentially even expand.
2.51 – 3.50	Good	Element conditions are acceptable; associated species' populations should remain stable.
1.51 – 2.50	Fair	Element conditions are slightly inadequate; although associated species' populations may persist for some time, they may be subject to gradual decline.
1.00 – 1.50	Poor	Element conditions are severely inadequate. Associated species' populations are expected to severely decline; localized extirpations are occurring or are imminent.

Table E-3. Other Species Considered In the Analysis and Their Relationship to Species Group and Forest Plan Components

Species Group	Latin Name	Common Name	ECOSYSTEM or SPECIES GROUP or OTHER FOREST PLAN COMPONENTS
Amphibian	*Ambystoma tigrinum tigrinum*	Eastern Tiger Salamander	Wet Pine Savanna and Flatwoods, Pond Cypress-Dominated Depression Ponds and Carolina Bays, and Upland Longleaf and Loblolly; Management Area 1
Amphibian	*Desmognathus auriculatus*	Southern Dusky Salamander	Herbaceous Seepage Slopes and Ecotones; Riverine and Floodplains;
Bird	*Ammodramus maritimus*	Seaside sparrow	Salt Marsh and Maritime Forests Forestwide
Bird	*Anas rubripes*	American black duck	Broad Forested Swamps and Large River Floodplain Forests, Blackwater Stream and River Floodplain Forests
Bird	*Colinus virginianus*	Northern bobwhite	Wet Pine Savanna and Flatwoods and Upland Longleaf and Loblolly; Management Area 1
Bird	*Dendroica virens (Wayne's Race)*	Black-throated Green Warbler	Herbaceous Seepage Slopes and Ecotones, Wet Pine Savannas, and Upland Longleaf and Loblolly; Management Area 1
Bird	*Limnothlypis swainsonii*	Swainson's warbler	Herbaceous Seepage Slopes and Ecotones, Management Area 1; Pocosins Forestwide
Bird	*Passerina ciris ciris*	Painted bunting	Salt Marsh and Maritime Forest
Bird	*Sitta pusilla*	Brown-headed nuthatch	Wet Pine Savanna and Flatwoods, Management Area 1; Upland Longleaf and High-functioning Loblolly Woodlands, Mgmt.Area1
Bird	*Hylocichla mustelina*	Wood thrush	Broad Forested Swamps and Large River Floodplain Forests, Forestwide
Bird	*Limnothlypis swainsonii*	Swainson's warbler	Broad Forested Swamps and Large River Floodplain Forests, Forestwide; Pond Cypress-Dominated Depression Ponds and Carolina Bays, Management Area 1
Fish	*Ameiurus catus*	White catfish	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Chologaster cornuta*	Swampfish	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Enneacanthus chaetodon*	Blackbanded sunfish	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Enneacanthus obesus*	Banded sunfish	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Morone saxatilis*	Striped bass	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Etheostoma serrifer*	Sawcheek darter	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Notropis chalybaeus*	Ironcolor shiner	Rivers and Streams; Riparian Mgmt.Zones

Species Group	Latin Name	Common Name	ECOSYSTEM or SPECIES GROUP or OTHER FOREST PLAN COMPONENTS
Fish	*Elassoma boehlkei*	Carolina pygmy sunfish	Rivers and Streams; Riparian Mgmt.Zones
Fish	*Elassoma evergladei*	Everglades pygmy sunfish	Rivers and Streams; Riparian Mgmt.Zones
Invertebrate	*Neonympha areolatus*	Georgia satyr	Wet Pine Savanna and Flatwoods, Management Area 1
Mammal	*Condylura cristata*	Star-nosed Mole	Pocosins, Management Area 1; Wet Pine Savanna and Flatwoods, Management Area 1; Broad Forested Swamps and Large River Floodplain Forests; Blackwater Stream and River Floodplains; Pond Cypress-Dominated Depression Ponds and Carolina Bays Management Area 1
Mammal	*Mephitis mephitis*	Eastern Striped Skunk	Wet Pine Savanna and Flatwoods, Management Area 1; Broad Forested Swamps and Large River Floodplain Forests; Blackwater Stream and River Floodplains
Mammal	*Neotoma floridana floridana*	Eastern Woodrat	Broad Non-Riverine Swamp Forests
Mammal	*Sciurus niger*	Eastern Fox Squirrel	Wet Pine Savannas, Upland Longleaf and Loblolly Woodlands, Management Area 1
Mammal	*Ursus americanus*	Black Bear	Pocosins, Broad Forested Swamps and Large River Floodplain Forests; Blackwater Stream and River Floodplain Forests; Forestwide
Mussel	*Elliptio angustata*	Carolina lance	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Elliptio congaraea*	Carolina slabshell	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Elliptio fisheriana*	Northern lance	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Elliptio roanokensis*	Roanoke slabshell	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Lampsilis splendida*	rayed pink fatmucket	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Ligumia nasuta*	Eastern pondmussel	Rivers and Streams; Riparian Mgmt.Zones
Mussel	*Villosa modioliformis*	Eastern rainbow	Rivers and Streams; Riparian Mgmt.Zones
Reptile	*Nerodia floridana*	Florida Green Water Snake	Herbaceous Seepage Slopes and Pocosin Ecotones, Pond Cypress Dominated Depressions and Carolina Bays, Broad Non-Riverine Swamp Forests
Vascular Plant	*Agalinis linifolia*	Agalinis	Pond Cypress-Dominated Depression Ponds and Carolina Bays, Management Area 1
Vascular Plant	*Agrimonia incisa*	Incised Groovebur	Upland Longleaf and Loblolly Pine Woodlands and Forests; Forestwide
Vascular Plant	*Amphicarpum*	Blue Maiden-cane	Pond Cypress-Dominated Depression Ponds and Carolina Bays,

Species Group	Latin Name	Common Name	ECOSYSTEM or SPECIES GROUP or OTHER FOREST PLAN COMPONENTS
	muehlenbergianum		Management Area 1
Vascular Plant	*Aristida beyrichiana*	Southern Wiregrass	Upland Longleaf and Loblolly Woodlands; Management Area 1
Vascular Plant	*Asplenium heteroresiliens*	Wagner's Spleenwort	Oak and Mesic Hardwood Forests; Guilliard Lake Scenic Area
Vascular Plant	*Asplenium resiliens*	Black-stem Spleenwort	Oak and Mesic Hardwood Forests; Guilliard Lake Scenic Area
Vascular Plant	*Brachyelytrum erectum*	Bearded Shorthusk	Oak and Mesic Hardwood Forests
Vascular Plant	*Cabomba caroliniana*	Carolina Fanwort	Rivers and Streams; Riparian Mgmt.Zones
Vascular Plant	*Carex chapmanii*	Chapman's Sedge	Narrow Forested Wetlands; Riparian Mgmt.Zones
Vascular Plant	*Carex decomposita*	Cypress-knee Sedge	Narrow and Broad Forested Wetlands; Riparian Mgmt.Zones
Vascular Plant	*Cayaponia quinqueloba*	Five-lobe Cayaponia	Narrow Forested Wetlands; Riparian Mgmt.Zones
Vascular Plant	*Chamaedaphne calyculata*	Leather-leaf	Pocosins
Vascular Plant	*Coreopsis gladiata*	Southeastern Tickseed	Wet Pine Savannas, Management Area 1
Vascular Plant	*Coreopsis pubescens*	Star Tickseed	Wet Pine Savannas, Management Area 1; Rare Communities
Vascular Plant	*Eleocharis tricostata*	Three-angle Spikerush	Pond Cypress-Dominated Depression Ponds and Carolina Bays, Management Area 1
Vascular Plant	*Eupatorium anomalum*	Florida Thorough-wort	Non-Riverine Swamp and Wet Hardwood Forest Associates
Vascular Plant	*Heliopsis helianthoides var. gracilis*	Pinewoods Oxeye	Oak and Mesic Hardwood Forests; Rare Communities
Vascular Plant	*Iris tridentata*	Savanna Iris	Pond Cypress-Dominated Depression Ponds and Carolina Bays, Management Area 1
Vascular Plant	*Lilium catesbaei*	Southern Red Lily	Wet Pine Savannas, Management Area 1
Vascular Plant	*Litsea aestivalis*	Pondspice	Depressional Wetlands and Carolina Bays - Forestwide
Vascular Plant	*Monotropa hypopithys*	Pinesap	Oak and Mesic Hardwood Forests
Vascular Plant	*Oenothera riparia*	Riverbank Evening-primrose	Broad Forested Swamps and Large River Floodplain Forests
Vascular Plant	*Ophioglossum petiolatum*	Longstem Adderstongue	Narrow Forested Wetlands, Management Area 1
Vascular Plant	*Parnassia caroliniana*	Carolina Grass-of-Parnassus	Wet Pine Savannas, Management Area 1
Vascular Plant	*Peltandra sagittifolia*	Spoon-flower	Pocosins

Species Group	Latin Name	Common Name	ECOSYSTEM or SPECIES GROUP or OTHER FOREST PLAN COMPONENTS
Vascular Plant	*Phaseolus polystachios var. sinuatus*	Wild Kidney Bean	Upland Longleaf and Loblolly Pine Woodlands; Management Area 1
Vascular Plant	*Physalis walteria*	Walter's groundcherry	Maritiime Forests
Vascular Plant	*Pieris phillyreifolia*	Climbing Fetter-bush	Non-Riverine Swamp and Wet Hardwood Forest Associates
Vascular Plant	*Plantago sparsiflora*	Pineland Plantain	Wet Pine Savannas, Management Area 1
Vascular Plant	*Rhexia aristosa*	Awned Meadowbeauty	Pond Cypress-Dominated Depression Ponds and Carolina Bays, Wet Pine Savannas; Management Area 1
Vascular Plant	*Rhynchospora inundata*	Narrow-fruit Horned Beaksedge	Depressional Wetlands and Carolina Bays; Management Area 1
Vascular Plant	*Rhynchospora tracyi*	Tracy's Beaksedge	Pond Cypress-Dominated Depression Ponds and Carolina Bays, Wet Pine Savannas; Management Area 1
Vascular Plant	*Rudbeckia heliopsidis*	Sun-facing Coneflower	Narrow Forested Wetlands, Management Area 1
Vascular Plant	*Sageretia minutiflora*	Tiny-leaved Buckthorn	Maritime Forests and Salt Marsh
Vascular Plant	*Sarracenia rubra var.rubra*	Sweet Pitcher-plant	Herbaceous Seepage Slopes and Ecotones; Management Area 1
Vascular Plant	*Scirpus lineatus*	Drooping bulrush	Wet Marl Forests; Rare Communities
Vascular Plant	*Sida elliottii*	Elliott’s Fanpetals	Wet Pine Savannas, Upland Longleaf and Loblolly Woodlands, Management Area 1
Vascular Plant	*Stachys aspera*	Hyssopleaf hedgenettle	Wet Pine Savannas, Management Area 1; Rare Communities
Vascular Plant	*Stachys hyssopifolia*	Hyssopleaf hedgenettle	Wet Pine Savannas, Management Area 1; Rare Communities
Vascular Plant	*Stokesia laevis*	Stokes' Aster	Wet Pine Savannas, Management Area 1
Vascular Plant	*Trichostema dichotomum*	Forked Bluecurls	Upland Longleaf and Loblolly Woodlands, Management Area 1
Vascular Plant	*Tridens caroliniansis*	Carolina Fluff Grass	Upland Longleaf and Loblolly Woodlands, Management Area 1
Vascular Plant	*Tridens strictus*	Longspike Fluffgrass	Wet Pine Savannas, Upland Longleaf and Loblolly Woodlands, Management Area 1
Vascular Plant	*Xyris elliottii*	Elliott Yellow-eyed Grass	Wet Pine Savannas, Management Area 1

E.3. Identifying, Mapping and Describing Ecological Systems

Landtype associations identified for the Francis Marion National Forest include the Cordesville, Pamlico, Princess Anne, and Talbot Marine Terraces, and the Santee River and Major Tributaries. See Figure E-1.

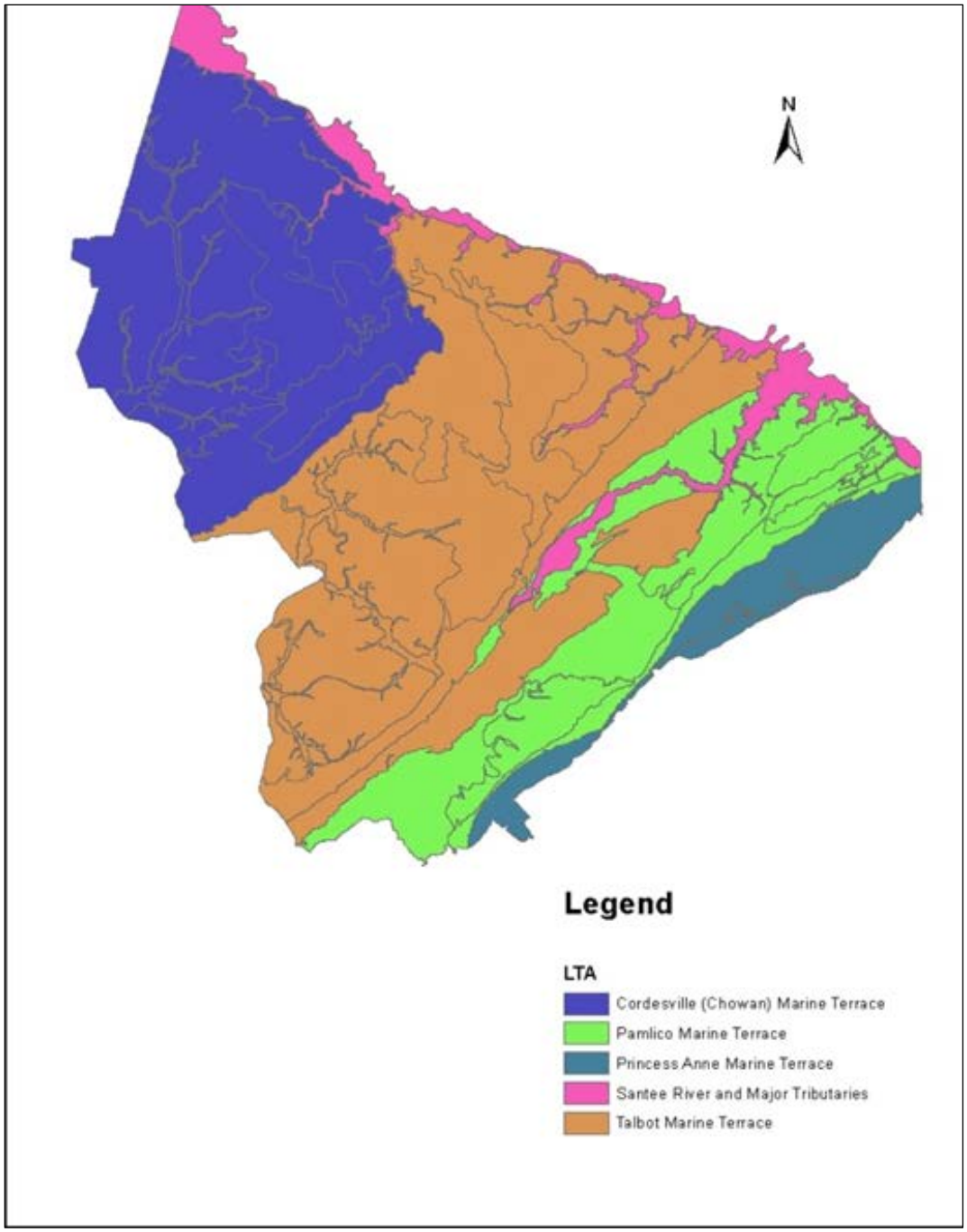


Figure E-1. Landtype Associations on the Francis Marion

Ecological systems 'represent recurring groups of biological communities were located in similar physical environments influenced by similar dynamic ecological processes, such as fire or flooding'. They provide a classification unit which is readily mappable using the latest LiDAR technology, vegetation indicator, soils, and various parameters derived from digital terrain models (Simon and Hayden, 2014). This concept of ecological systems recognizes that ecosystems 'do grade more-or-less continually across the landscape', 'rely on a combination of diagnostic classifiers of both abiotic and biotic factors to create reasonable classes of units', and 'incorporate plant community types already defined in the National Vegetation Classification (http://usnvc.org/) to help place boundaries on the system units' (Comer et.al., 2003). Boundaries of each system are based in part on the combination of component plant communities and abiotic factors. Descriptions of desired composition, structure and disturbance regimes for ecological systems consider relevant biophysical setting descriptions from LANDFIRE (www.landfire.gov/), as well as descriptions from Natureserve (2012), and Simon and Hayden (2014).

Table E-4 is a list of ecological systems (including ecosystems and ecosystem groups) found on the Francis Marion National Forest and in Table E-5 are the numbers used in the analysis including, total acreages, and a map of ecosystem groups within our proclamation boundary (see Figure E-2). Vegetation names reflect the potential natural vegetation existing on the landscape based on ecological mapping and classification.

Table E-4. Terrestrial Ecosystems and Ecological System Classification on the Francis Marion National Forest

Ecosystem	Ecological System Classification
Upland Longleaf and Loblolly Pine Woodlands and Forests	Upland Longleaf Pine Woodland (dry-mesic to mesic)
	Upland Longleaf Pine Woodland (dry to dry-mesic)
	Upland Longleaf Pine Woodland (xeric to dry)
Wet Pine Savannas and Flatwoods	Wet Pine Savanna and Flatwoods (wet phase)
	Wet Pine Savanna and Flatwoods (mesic to wet phase)
Depressional Wetlands and Carolina Bays	Carolina Bay Cypress Wetlands
	Depression Pond
Pocosins	Peatland Pocossin and Canebrake
	Streamhead Seepage Swamp, Pocosin, and Baygall
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	Narrow Non-Riverine Swamp and Wet Hardwood Forest
	Small Blackwater River Floodplain Forest
	Blackwater Stream Floodplain Forest (typic)
	Blackwater Stream Floodplain Forest (headwaters)
Oak Forests and Mesic Hardwood Forests	Dry and Dry-Mesic Oak Forest
	Mesic Slope Forest
Maritime Forests and Salt Marsh	Maritime Forest
	Salt and Brackish Tidal Marsh
Broad Forested Swamps and Large River Floodplain Forests	Broad Non-Riverine Swamp and Wet Hardwood Forest
	Large River Floodplain Forest
	Tidal Wooded Swamp

Table E-5. Ecosystem Acreage on the Francis Marion National Forest and Surrounding Areas

Ecosystem	Administrative Boundary	Proclamation Boundary
Upland Longleaf and Loblolly Pine Woodlands and Forests	51,500	100,400
Wet Pine Savannas and Flatwoods	85,500	128,400
Depressional Wetlands and Carolina Bays	8,500	11,800
Pocosins	9,300	11,000
Narrow Forested Swamps and Blackwater Stream Floodplain Forests	43,900	75,200
Oak Forests and Mesic Hardwood Forests	5,800	10,000
Maritime Forests and Salt Marsh	4,000	11,400
Broad Forested Swamps and Large River Floodplain Forests	49,200	68,100
	257,700	**416,300**

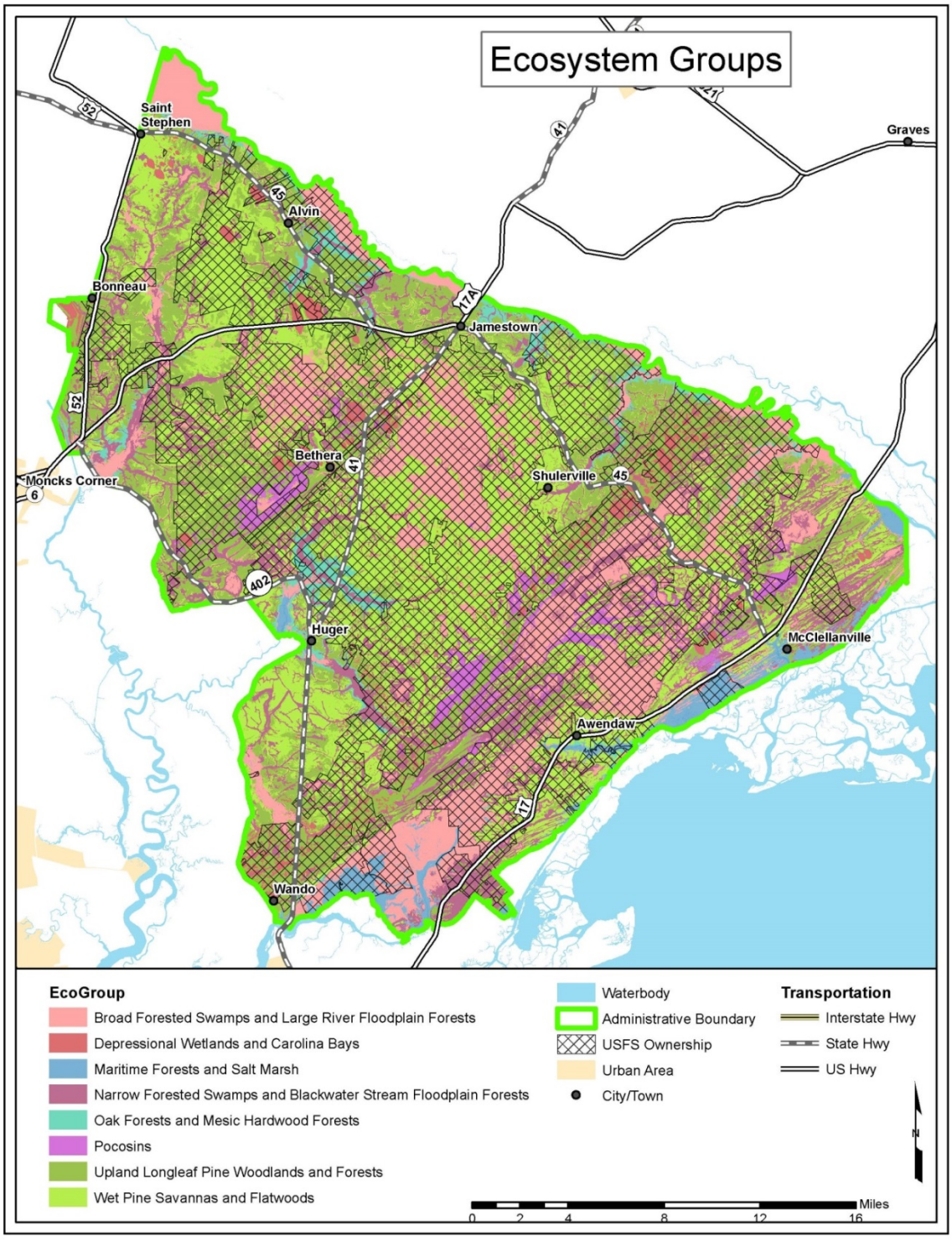


Figure E-2.Ecosystem Groups on the Francis Marion

E.4 Identifying and Defining Key Characteristics Of Ecological Sustainability and Related Performance Measures

In order to evaluate ecological sustainability, we identified key characteristics for each ecosystem or ecosystem group and species group, identified measurable indicators for each key characteristic, weighted them in importance, and defined ranges of acceptability. The following characteristics and associated indicators are important to most if not all ecological system groups and species.

Composition

Vegetation Composition. This is defined as the percent of the ecosystem dominated by characteristic native vegetation.

Indicators include % of the ecological system managed for ecosystem maintenance and restoration, and is addressed through desired future conditions and management area allocations.

Other indicators important to fire-adapted ecosystems include the percent of the spatial extent of this ecosystem with desired herbaceous groundcover. This is a data gap. Another indicator important to longleaf ecosystems is % in the maintain condition class, as described by the Longleaf Partnership Council.

Structure

Structural Diversity. This is defined as the percent of ecosystem acres with an open, grassland, savanna, or woodland canopy structure. At the landscape-level, ecological departure rankings in regard to vegetation structure were calculated using a process described by Low et.al., 2010, and using Forest age class data and 2009 LiDAR, to estimate canopy opening. Biophysical settings models from LANDFIRE were used to compare existing and predicted conditions on the forest to those which existed prior to European settlement. We strive for low levels of structural departure across the landscape compared to reference conditions.

Key Characteristic = Future Old Growth. Indicator and Description: The protection, restoration, and management of forests providing old growth conditions in the future, is important biologically, ecologically, and socially. We are following the Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region (1997), which recommends that a network of old-growth areas of various sizes be developed, including representation of all community types or ecosystems. We strive for 10% of each ecosystem type in future old growth conditions as being ecological sustainable based on expert opinion. See Appendix G for a map of Future Old Growth.

Function

Key Characteristic = Fire Regime. Indicator and Description: Percent of ecosystem acres burned every three years or more often. Lack of frequent prescribed fire, including a lack of growing season fire, is a primary threat to longleaf pine ecosystem integrity, particularly diverse herbaceous understory communities. Research shows an increase in plant species richness across a 1-3 year fire regime interval depending on openness of the canopy, and greatest herbaceous dominance at 1-2 year fire return intervals, particularly in wet pine savannas and flatwoods where the potential for competition by woody shrubs is highest (Glitzenstein et.al., 2003, 2012).

Indicator and Description: Percent of ecosystem acres burned every third burn or more often. Burning during the growing season (defined as April 1 – September 30) facilitates the restoration process and reduction of competing woody species.

Connectivity

ORV Trail Density.

Indicator and Description: Legal and illegal recreational vehicle trail density and associated fragmentation expressed in OHV miles per square mile of ecosystem/ecosystem group

Paved Open Road Density.

Indicator and Description: Paved, open public road density and associated fragmentation/ connectivity expressed in road miles per square mile of the ecosystem/ecosystem group

Unpaved Open Road Density.

Indicator and Description: Unpaved, open public road density and associated fragmentation/ connectivity expressed in unpaved road miles per square mile of the ecosystem/ecosystem group

Stressors

Sea level Rise associated with Climate Change.

Indicator and Description: Percent of ecosystem/ecosystem group impacted or likely to be impacted by saltwater intrusion as a result of climate change.

Non-Native Invasive Species Abundance.

Indicator and Description: Percent of the spatial extent of the ecosystem occupied by non- native invasive plant species.

Indicator and Description: Percent of the spatial extent of this ecosystem utilized by feral hogs.

Appendix F: Supplement to Affected Environment Section of Social, Economic and Benefits to People

This appendix supplements information presented in Chapter 3 on the social and economic environment that is potentially affected under the alternatives.

Population and Demographics

Components of Population Change – Migration. Changes in a region's population can be attributed in part to natural increases (births minus deaths) and in part to net migration, which can affect the availability of housing, services, and jobs. Migration was the driving force behind much of the population change with the state (64%) and the study area (62%) between 1990 and 2010. Although migration accounted for more than half of net population change in the majority of the counties within the FMNF's study area, natural changes were still the leading cause of population change in Berkeley (56%), Charleston (79%) and Orangeburg (97%) (Table F-1) (U.S. Census 2011).

Table F-1. Components of Population Change between 1990 and 2010

	Natural Causes	Net Migration	Net Population Change 1990-2010	Percent Change from Natural Causes	Percent Change from Net Migration
South Carolina	412,067	726,987	1,139,054	36%	64%
8 County Area	116,625	192,025	308,650	38%	62%
Berkeley	27,699	21,486	49,185	56%	44%
Charleston	43,694	11,356	55,050	79%	21%
Clarendon	1,676	4,845	6,521	26%	74%
Dorchester	14,867	38,628	53,495	28%	72%
Georgetown	4,094	9,762	13,856	30%	70%
Horry	14,505	110,733	125,238	12%	88%
Orangeburg	7,447	250	7,697	97%	3%
Williamsburg	2,643	-5,035	-2,392	34%	66%

Source: U.S. Census Bureau 2011, Table 5.

Population Density. Population density measures the number of people living per square mile within a given area. This measure can serve as a valuable indicator of the socioeconomic and living conditions of a region, including: urbanization, availability of open space, socioeconomic diversity, and civic infrastructure (Horne and Haynes 1999). In general, more densely populated areas tend to be more urban, diverse, and offer more access to public infrastructure. In contrast, less densely populated areas provide greater access to open spaces and wildlands, which may offer natural amenity values to residents and visitors. Table F-2 displays the number of people per square mile at the county, state, and national levels (U.S. Census Bureau 2010).

South Carolina has experienced substantial population growth over the last thirty years, causing the state to become much more densely populated than the nation as a whole. In 2010, nearly half

of the counties included in the FMNF study area had twice as many people per square miles relative to population density for the nation (Table F-2). While population densities surrounding the Francis Marion are high relative to the nation, population densities for Clarendon, Georgetown, Orangeburg and Williamsburg remain low (U.S. Census Bureau 2010).

Table F-2. People per Square Mile

	2000	2010
United States	79.7	87.4
South Carolina	133.5	153.9
Berkeley	130.0	161.8
Charleston	337.5	382.3
Clarendon	53.5	57.6
Dorchester	167.8	238.2
Georgetown	68.5	73.9
Horry	173.4	237.5
Orangeburg	82.8	83.6
Williamsburg	39.9	36.8

Source: U.S. Census Bureau, 2010

Although population density may indicate whether a county is classified as urban or rural, it is not a measure of the concentration of urban and rural areas within a county. Large disparities between urban and rural areas remain in terms of economic conditions, access to infrastructure and services – including public transportation, opportunities for socioeconomic mobility, and control over natural resources. Disparities are caused by natural differences, political decisions, and social factors (Figure F-1 displays the distribution of urban and rural areas within study area counties).

Urban areas account for the majority of land surrounding the FMNF. In 2010 urban areas dominated five of the eight counties which make up the study area (Figure F-1). Though little human development exists within forest boundaries, urban growth has drastically altered the rural landscape of the region and caused growing concern over urban sprawl. Increasing residential and commercial development in Berkeley and Charleston counties has overrun many small, rural and unincorporated communities and has placed added pressure on the Wildland Urban Interface (WUI) which separates the natural terrain of the FMNF from developed lands. Rapid urban expansion of the Charleston area during the 1990s gained considerable attention after county officials concluded that the rate at which land was being developed was unsustainable (Johnson et.al 2009). According to a 1997 report published by the Berkeley-Charleston-Dorchester Council of Governments (BCD COG), residential and commercial development in Berkeley, Charleston, and Dorchester counties had outpaced population growth by a ratio of 6:1 between 1973 and 1994.

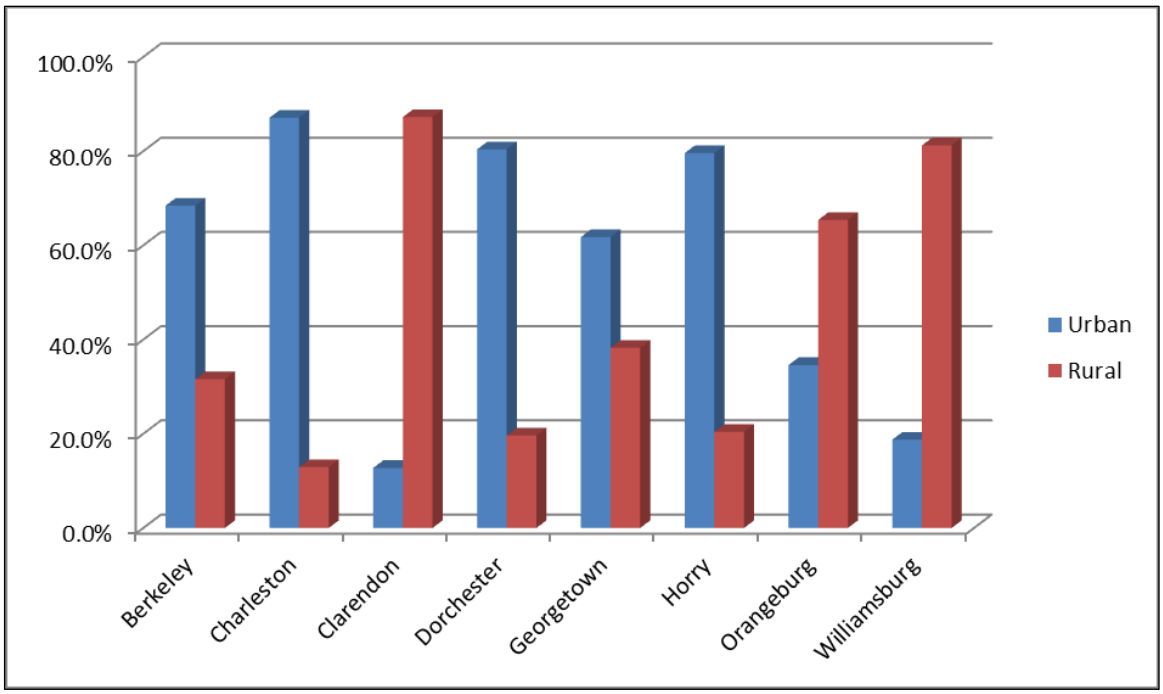


Figure F-1. Urban-Rural Distribution, 2010

Communities Interested in FMNF Management

Cultural communities of interest- protection and access to resources. Although the physical landscape of the Francis Marion has changed over time, the forest's uplands, swamps, and marshes still hold "memories" of its past prehistoric, colonial, and military significance. Today the FMNF serves as a reminder of the collective and individual roots of many Americans. The historic features which hold these memories possess heritage values which help people form attachments to places and provide an understanding of their place in the natural and cultural environment. Public comments highlighted the forest's importance to the culture and heritage of a large share of forest stakeholders. The forest is generally perceived as an important part of the cultural and heritage of the Lowcountry and attributed with protecting a number of historical sites. Many stakeholders believe that forest management of these sites increases public awareness of and access to opportunities to learn and interpret their cultural and historic significance. By preserving and facilitating the interpretation of these resources the FMNF ensures that the cultural legacy and heritage values of the Francis Marion's lands will be passed on to present and future generations.

In addition, management of forest resources, habitats and the integrity of ecosystems contributes to this community of interest's quality of life. For example, cultural practices depend on water from the FMNF. For example, indirectly cultural beneficiaries identify with cypress and habitats that depend on functioning waterways and water quality; they also directly utilize water for baptismal practices and fishing traditions.

Although comments received did not mention which cultures the forest contributed to, the FMNF is located almost entirely within a federally recognized heritage area known as the Gullah Geechee Corridor. This corridor was established in 2006 to protect and enhance resources associated with the Gullah Geechee people. The Gullah Geechee are American descendants of enslaved immigrants brought over primarily from coastal West Africa. Years of captivity and

relative isolation enabled various West African traditions, skills, and languages to fuse together, giving rise to the unique culture which has been passed down for generations. An inventory of the Corridor's historical, cultural, and natural resources, identified three forest dependent communities as having cultural landscapes[2] and ethnographic resources that increase the awareness and understanding of the culture and history of the Gullah Geechee people (Gullah Geechee Cultural Heritage Corridor Commission 2012). Located entirely within the FMNF, the communities of Awendaw, Huger, and McClellanville are recognized for helping the Gullah Geechee share their heritage by supporting six primary interpretive themes: origins and early development; the quest for freedom, equality, education, and recognition; global connections; connection with the land; cultural and spiritual expression; and Gullah Geechee language. Since the natural and cultural landscapes of these communities are synonymous with those of the forest, the management of forest resources for long-term sustainability contributes to the long-term viability of the cultures of the people living within them.

Contributions to sustainability for this community are reflected in indicators under MP6.3 and MP6.5. As described above, the FMNF is vitally important to this community and contributes to their resilience as a forest-dependent community. Ecologists have found that ecosystem resiliency is strongly correlated with ecological diversity. Social scientists have adapted these findings to develop the premise that more diverse communities generally adapt to and integrate change more rapidly and successfully than their less diverse counterparts. Community or socioeconomic resiliency relates to humans' ability to adapt to social and economic changes. Beckley et al (2002) define community resiliency as: "the capacity of humans to change their behavior, redefine economic relationships, and alter social institutions so that economic viability is maintained and social stresses are minimized."

In addition, the FMNF contributes to the range of cultural, social and spiritual needs and values; but there are no specific designated areas for management. This contribution to sustainability is decreasing as the region surrounding the FMNF is anticipated to become increasingly urban. Even assuming urban development would slow, the urban area surrounding the Charleston Metropolitan area is predicted to triple by 2030 (Allen and Lu 2003).

Educator, student and researcher community of interest. Educators, students and researchers depend upon a variety of goods and services from the FMNF such as water resources, wilderness, unique ecosystems and habitats to understand, communicate and educate. For example, the FMNF is highly valued by a large community interested natural plant and animal communities. Comments collected via Crowdbrite indicated that the FMNF was significant to them because it provided lands important to endangered species, neotropical migratory birds along the Atlantic Flyway, and to various populations displaced by extensive urban development in physical

[2] Cultural Landscapes are areas that reflect how people adapt and use natural resources, as expressed by the land organization or use, settlement patterns, circulation, or types of structures, and how the area reflects cultural values and traditions. The National Park Service categorizes cultural landscapes into four types: historic designed landscapes, historic vernacular landscapes, historic sites, and ethnographic landscapes. Cultural landscapes associated with the Gullah Geechee corridor may not be previously identified as "cultural landscapes," but can include sites that fulfill the above definition of a cultural landscape. Examples might include plantations, village sites, or other important places with ties to long-established groups identified with Gullah Geechee cultural history.

Ethnographic resources are any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. These resources generally relate to folklife, religious traditions, foodways, anthropology, ethnomusicology, or the humanities.

communities surrounding the FMNF. Several responses indicated that the FMNF was the only place to provide birders with an opportunity to see red cockaded woodpeckers or backman warblers in their natural habitat, making the Francis Marion extremely important to birding communities.

Contributions to sustainability for this community are reflected in indicators under MP6.2. The FMNF contributes to opportunities for forest-related research, extension and development, and education by providing the opportunities described above to understand, communicate and educate. By managing areas suitable for wilderness designation and protecting habitats, the FMNF contributes to sustaining communities' interests for current generations and providing opportunities to pass knowledge down to future generations. Protection, enhancement and access to these goods and services support their livelihoods. The need for this contribution is increasing in demand with anticipated increases in population within the 8-county study area.

Government, Municipal and Residential community of interest. Local governments, municipalities and residential members of the community depend upon a variety of goods and services from the FMNF. Specific interests and benefits include flood control from rainwater, property values near natural amenities on the forest (such as bodies of water), opportunity for placement of infrastructure, and reduced risk of erosion, fire and pest infestation from properly managed ecosystems.

Contributions to sustainability for this community are reflected in indicators under MP6.3. The FMNF contributes to the resilience of local governments, municipalities and residents providing the benefits described above. This need for this contribution to sustainability is increasing in demand as the region surrounding the FMNF is anticipated to become increasingly more urban. Increased urbanization of areas surrounding the FMNF increases the region's need for infrastructure and places greater pressure on forest management to provide utility right-a-ways to meet the region's growing infrastructure needs. In addition, as urban and suburban populations grow, conflicts between local residents and forest visitors may increase.

In addition, local governments are supported by receipt-sharing of federal land payments (see Forest Economic Contributions discussion below). The Payment in Lieu of Taxes (PILT) program may or may not continue to be funded, and Congress could initiate new discretionary or non-discretionary federal land payment programs over the next twenty years. State and county federal land payments, are essential to balancing tight local budgets. As these revenues are invested in the maintenance and improvement of local infrastructure and public services, they contribute to the sustainability and health of local communities by supporting a portion of the valuable services these local governments provide.

Non-Use Values community of interest (those who derive benefits from the existence and bequest values of resources, including wildlife, plant species, water bodies, landscapes, historical sites, and recreational trails). Non-use values are a type of non-market value. Non-market values can be broken down into two categories, use and non-use values. The use-value of a non-market good is the value individuals receive from the direct use of natural resource or non-market good. Within the FMNF use-values exists for recreational activities such as hunting, hiking, canoeing, and wildlife viewing. The use of non-market goods often requires consumption of associated market goods, such as food, gas and lodging expenditures incurred by forest visitors.

Non-use values of a non-market good reflect the value of an asset beyond its current use. These can be described as existence, option and bequest values. Existence values are the amount society is willing to pay to guarantee that an asset simply exists. An existence value for the FMNF might

be the value of knowing that undisturbed native plant habitat exists or the value associated with undeveloped scenic landscapes. In addition to implicit existence values, society's willingness to pay to preserve resources for future use attaches additional non-use values. The potential benefits people would receive from future use are referred to as option values when future use is expected to occur within the same generation and bequest values when preservation allows future generations to benefit from the resource use. Within the FMNF bequest and option values might exist for wildlife, plant species, water bodies, landscapes, historical sites, and recreational trails.

While non-use values may exist for many of the FMNF's natural resources, it is difficult to quantify and monetize. Since the methodologies for measuring these values can be controversial and difficult to apply, non-market goods tend to be undervalued. While it is not feasible to estimate non-market values during the planning process, it is important that forest management decision making recognizes that the value of forest resources include both market and non-market values. Many of these non-market values are discussed in other resource sections of the EIS.

Contributions to sustainability for this community are reflected in indicators under MP6.5. As described above, the FMNF is vitally important to this community and contributes to their sense of the importance of forests. In addition, the FMNF contributes to the range of cultural, social and spiritual needs imbedded in non-use values held by this community. In this manner contributions to their well-being and sustainability are maintained. For example, current management of wilderness contributes to the well-being of this community. The wilderness contribution to sustainability for this community is not changing but other non-use values associated with other resources are changing. For example, habitat for threatened and endangered species provided by the forest is becoming increasingly more important as the areas surrounding the FMNF become increasingly more urban. Even assuming urban development would slow, the urban area surrounding the Charleston Metropolitan area is predicted to triple by 2030 (Allen and Lu 2003).

Recreational community of interest - consumptive, including hunting, fishing and food pickers/gathers. Information received from the public during the assessment and public scoping revealed that recreationists highly valued the FMNF because of the opportunities for hunting, fishing and recreational food picking or gathering. Members of the public indicated they had developed strong personal bonds with the forest through years participating in these activities. Several comments highlighted that the forest supported multi-generation experiences where parents were given the opportunity to teach their children to appreciate and respect nature. Though conflicts arise over competing recreational uses, recreationists generally shared positive attitudes towards the FMNF and credited it as being as being an important recreational site in South Carolina's Lowcountry. By supporting unique recreational experiences the FMNF helps cultivate an appreciation for the outdoors that continues to be passed down to younger generations through recreational experiences thereby contributing to the longevity of recreational communities who use the forest.

The FMNF is one of the most biologically and ecologically diverse forest landscapes in the Southeast region. As discussed in the sections on Recreational Fisheries Management and Huntable and Fishable Species, the diverse natural landscapes of the forest provide habitat for many species of fish and wildlife. According to 2011 National Visitor Use Monitoring (NVUM) data, 23 percent of forest visitors participate in hunting, and 8 percent fished while recreating on the FMNF. NVUM data also indicated that hunting and fishing are two of the most popular recreational activities pursued on the FMNF, and were reported to be the primary purpose of 21 percent and 5 percent of annual forest visits respectively.

Contributions to sustainability for this community are reflected in indicators under MP6.4 and MP6.5. As described above, the FMNF is vitally important to this community and contributes to their sense of the importance of forests. In addition, the FMNF contributes to the range of cultural and social needs and values of these recreationists by providing opportunities for hunting, fishing and food picking or gathering. These contributions to sustainability are not changing however, increased demand for recreational opportunities and these contributions to sustainability are anticipated with increases in population. In addition, increased urbanization in areas around the forest affects contributions to sustainability. While living proximate to public lands may provide local residents with amenities such as convenient access to recreation, increased forest congestion causes disamenities such as crowds, litter, and noise (Garber-Yonts 2004; Bolitzer and Netusil 2000; Moore et al. 1992).

Recreational community of interest - non-consumptive, including art (writing, painting, photography) connecting with history and wildlife viewing. Information received from the public during the assessment and public scoping revealed that people associated with this community of interest valued the FMNF because of the opportunities for trail running, hiking, biking, riding OHV, writing, painting, photography, birding, connecting with history and camping. Some recreationists had developed strong personal bonds with the forest through years of participating in these activities. Several comments highlighted that the forest provided multi-generation experiences where parents were given the opportunity to teach their children to appreciate and respect nature. The FMNF was also attributed with providing people with access to free forms of entertainment, like birding and various other types of wildlife viewing; access to these activities were attributed with increasing low-income residents' access to recreational experiences. Though conflicts arise over competing recreational uses, recreationists generally shared positive attitudes towards the FMNF and credited it as being as being an important recreational site in South Carolina's Lowcountry. By supporting unique recreational experiences the FMNF helps cultivate an appreciation for the outdoors that continues to be passed down to younger generations through recreational experiences thereby contributing to the longevity of recreational communities who use the forest.

Public comments highlighted a deep appreciation for the forest's wild landscape and scenic beauty. These forest stakeholders take great pleasure in using the FMNF as a source of inspiration for writing, painting, photography or other artistic pursuits. Others use the forest as a refuge away from the people, noise, and pollution of cities and credit the scenic, undeveloped landscapes of the forest with improving their quality of life. The nature enthusiast community attributes the FMNF with contributing to the overall beauty of South Carolina's Lowcountry and valued its scenic resources for cultivating mental clarity and spiritual renewal. People associated with this community of interest escape to the Francis Marion because the exploration and quiet enjoyment of its diverse landscapes provides relief from the stress of their daily lives and promotes self-reflection and inner peace. Community members who live in cities believed that the forest's natural beauty served as a reminder of the importance of incorporating nature in to their lives and enabled them to reconnect with a rural lifestyle.

Developed heritage sites on FMNF provide an opportunity for forest visitors to connect with history. As discussed other forest resource sections, the landscape of the FMNF has a rich history which dates back more than 15,000 years. Successive generations of native and early Americans have relied on the natural resources of the FMNF to foster social, economic, and spiritual growth and traces of past forest users and uses remain scattered across the modern forest landscape. As of today more than 4,000 archaeological sites, four historic buildings, and two historic fire lookout towers have been discovered on the FMNF. With the exception of interpretive areas, the

Forest Service does not publicize the exact locations of culturally and historically significant resources to protect the integrity of forest heritage sites. Table F-3 lists the designated Interpretative Areas managed by the FMNF and the reason for their cultural and historic significance. These developed heritage sites promote local heritage tourism which enables the public to enjoy our nation's heritage through greater knowledge and appreciation of local forest history.

Table F-3. Designated Interpretive Areas for FMNF's Heritage Resources

Interpretative Areas	Cultural & Historic Significance
Sewee Visitor and Environment Education Center	Jointly operated by the Forest Service and the Fish and Wildlife Service, this 9,000 square foot facility features hands-on interpretive displays exploring the heritage and natural history of the area.
Sewee Shell Interpretive Trail	The Sewee shell rig is the northernmost prehistoric coastal shell mound along the Florida, Georgia and South Carolina coasts. Today the shell ring serves as monument to prehistoric Native American Culture and providing five interpretive sites along the scenic trail.
Battery Warren	Named after Colonel Samuel Warren, the local Revolutionary War hero who previously owned the land, the Battery served as an earthen gunning fort built to blockade Union forces from moving up the Santee River during the Civil War.
I'on Swamp Interpretive Trail	This interpretive loop follows the remnants the elaborate grid of canals and dikes to remnants of the 200 year old Witheywood Planation which was once part of the state's lucrative "Carolina Gold" rice trade. Interpretive sites along the trail provides information on the agricultural history of the region and how slaves brought over from Africa contributed to success of southern plantations.

Wildlife related activities on the FMNF are an important attraction which draws visitors to the region. According to 2011 NVUM data, wildlife related activities accounted for approximately 21 percent of all forest visits each year and nearly 26 percent of forest visitors are estimated to participate in wildlife viewing. Comments collected indicated that the FMNF was significant to them because it provided critical habitat to a wide range of terrestrial, aquatic, and avian wildlife. While public comments suggested that community members may derive pleasure from knowing habitat provided by the FMNF contributes to sustaining healthy animal and bird populations, most of the value reflected in responses from these community members was derived from birding experiences on the forest. Although wildlife enthusiasts are attracted to the forest because it provides the opportunity to observe a wide variety of wildlife in a single visit, the FMNF is world renowned for the unique bird watching experiences it supports and is designated as an Important Bird Area by both the National Audubon Society and the American Bird Conservancy. Several responses indicated that the FMNF was the only place to provide birders with an opportunity to see red cockaded woodpeckers or backman warblers in their natural habitat, making the Francis Marion extremely important to birding communities.

Contributions to sustainability from non-consumptive recreation opportunities are reflected in indicators under MP6.4 and MP6.5. The FMNF to contributes to the importance of forests to nature enthusiasts, wildlife viewers and heritage tourists; by managing the forest to protect the integrity of its resources so that it can continue to promote the mental, physical, and spiritual health of current and future generations. In addition, specific areas on the FMNF contribute to educational experiences and community sustainability.

Recreational community of interest - water (boaters, waders, swimmers and divers). Information received from the public during the assessment and public scoping revealed that people associated with this community of interest valued the FMNF because of opportunities for

canoeing, kayaking, other boating, and swimming. Several comments highlighted that the forest provided children with access to nature and that the recreational experiences it supported facilitated multi-generation forest experiences where parents were given the opportunity to teach their children to appreciate and respect nature. Though conflicts arise over competing recreational uses, recreationists generally shared positive attitudes towards the FMNF and credited it as being as being an important recreational site in South Carolina's Lowcountry. By supporting unique recreational experiences the FMNF helps cultivate an appreciation for the outdoors that continues to be passed down to younger generations through recreational experiences thereby contributing to the longevity of recreational communities who use the forest.

South Carolina benefits from an abundant supply of water in the form of lakes, streams, rivers, wetlands and aquifers and the state's water resources remain relatively clean (SCORP 2008). FMNF's watershed provides habitat for shellfish, fish and wildlife and supports recreational experiences on the forest. The diverse network of waterways, which connects slow moving blackwater creeks to the Atlantic Intracoastal Waterway, provides visitors with access to water for boating, visual aesthetics, desirable locations for picnicking, camping and other recreational activities.

According to 2011 NVUM data, approximately 9 percent of forest visitors participate in water activities while recreating on the FMNF each year. Although the forest supports motorized water activities, the FMNF's waterways and wetlands are more heavily used by non-motorized water recreationists. NVUM estimated that 8 percent of forest visitors participated in non-motorized water recreation and that these activities were reported to be the primary purpose of nearly 7 percent of forest visits each year.

Contributions to sustainability from water recreation opportunities are reflected in indicators under MP6.4 and MP6.5. The quality and quantity of forest water resources are maintained by forest management and contribute to opportunities for high quality non-motorized and motorized water recreation, on and off the forest. By supporting opportunities for unique water based recreation, the forest's water resources contribute to the quality of experience for kayakers, canoe'ers, boaters, and swimmers. These unique waterways are a big part of how this community defines the importance of forests.

Recreational community of interest - Regional and local contributions and effects. South Carolina's diverse geography and abundance of natural amenities have played an important role in making the state a retirement and recreational and tourist destination. Significant growth in services- related industries in recent years highlights the growing economic importance of the state's tourism industries and suggests that the economic drivers of the state have shifted away from agriculture related industries towards those related to tourism and recreation. According to South Carolina's 2008 State Comprehensive Outdoor Recreation Plan (SCORP), the state hosts approximately 29 million domestic visitors and nearly 1 million international visitors annually. In 2008 the state's tourism and travel industry was estimated to account for approximately 9 percent ($10.9 billion) of South Carolina's Gross State Product (GSP) and supported more than 216,000 jobs within the state, and forecasted that tourism would account for a growing share of the state's economic activity over the foreseeable future (SCORP 2008). Outdoor recreation is attributed with playing an integral role in South Carolina's flourishing tourist industry. More than 11 million South Carolina visitors annually are estimated to participate in some form of outdoor recreation during their trip. Coupled with heritage and cultural tourism, outdoor recreation is believed to provide significant economic benefits to all regions of the State, especially to rural communities (SCORP 2008). It's clear that outdoor recreation, contributes greatly to the economy by providing

jobs and income throughout the local economy and the state. Communities within the study area acknowledged the important economic contributions attributable to recreation occurring on the FMNF.

Contributions to sustainability from regional economic activity associated with recreation on the forest are reflected in indicators under MP6.3. The discussion on contributions to sustainability is covered below in the section on Forest Economic Contributions from recreation.

Timber and forest products community of interest - Regional and local contributions and effects. Although historic harvests far exceeded those in recent years, modern timber management enables the forest to provide a steady and reliable supply of forest products which contribute to sustaining communities interested in timber and wood products. Comments from the public indicated members of this community view timber harvesting in a positive light, but believe that the extraction of timber related goods needs to be done in ways which minimize adverse impacts to habitat and recreation. Recent restoration projects have provided timber and wood products for personal and commercial use and have been attributed with improving the health and function of the Francis Marion's diverse forest ecosystems. Although not all individuals interested in timber related forest products are in agreement over what the forest's annual yield should be, public comments indicated that there is a general consensus that the FMNF needs to continue to improve its timber management to ensure future forest users can rely on the these NFS lands to provide forest products for personal and commercial use.

Contributions to sustainability from regional economic activity associated with timber and wood products on the forest are reflected in indicators under MP6.1 and MP6.3. The discussion on contributions to sustainability is covered below in the section on Forest Economic Contributions from Timber &Forest Products.

Subsistence community of interest. Residents of Gullah Geechee communities maintain strong communal ties to the people and lands which make up South Carolina's Lowcountry. Although relative isolation has stifled modern economic development in the planning area's smaller communities; strong social, cultural, and economic ties to the natural environment have long sustained communities now thought to be economically suppressed. The FMNF has provided local residents with food, water, and forest products used for home heating and construction; and enabled generations of local residents to scratch out meager incomes through subsistence farming, fishing, hunting, bartering and small-scale marketing of subsistence.

Residents of these crossroad communities maintain strong communal ties to the people and lands which make up South Carolina's Lowcountry. Although relative isolation has stifled modern economic development in the planning area's smaller communities; strong social, cultural, and economic ties to the natural environment have long sustained communities now thought to be economically suppressed. The natural abundance of the lands which make up the FMNF has provided local residents with food, water, and forest products used for home heating and construction; and enabled generations of local residents to scratch out meager incomes through subsistence farming, fishing, hunting, bartering and small-scale marketing of subsistence.

Contributions to sustainability from subsistence uses on the forest are reflected in indicators under MP6.1 and MP 6.3. By managing the Francis Marion's ecosystems for ecological integrity, forest management promotes healthy, plant, fish and wildlife populations that contribute to the resilience of these forest-dependent communities. These contributions are a vital part of Gullah Geechee community needs and thus contribute to their sustainability.

Lands and natural resources administered as the FMNF enable current generations to reconnect with the values, traditions, and lifestyles of their ancestors. Although the Gullah Geechee are working hard to preserve and pass on the values, traditions, and lifestyles of their African ancestors, rapid coastal development and soaring coastal property values threaten the unique sense of place of crossroad communities and push Gullah families off ancestral lands. In the presence of these changes lands managed by the FMNF act as a protective buffer and foster community sustainability.

Forest Economic Contributions

Recreation. The Francis Marion supports a wide range of outdoor experiences which attracts thousands of local and non-local visitor's to the forest each year. According to recent results from the NVUM survey the FMNF supports approximately 430,000 visits a year. People visit the National Forest to participate in activities such as fishing, hiking, boating, mountain biking, camping, horseback riding, canoeing, wildlife viewing, and interpretation of historical sites. Deer hunting with dogs, still deer hunting, small game hunting and turkey hunting are among the most popular activities on the Francis Marion with 21 percent of visitors reporting hunting as the primary reason for their forest visit.

Opportunities for recreational, cultural, and leisure activities provided by the Francis Marion are unique and attract local and non-local visitor spending in the local eight-county economy. Visitors traveling to the forest to recreate often eat in local restaurants, shop in local retailers, and purchase gas and lodging. If recreational opportunities on the FMNF did not exist, recreationists and their recreation-related spending would likely travel elsewhere. In this manner the recreational opportunities supported by NFS lands contribute to the local economy by attracting and maintaining visitor spending in communities surrounding the forest. In total spending by recreationists on the forest supports approximately 116 local jobs and nearly $3.7 million in labor income in the eight counties surrounding the National Forest. On an annual average basis approximately 93 of these jobs and $1.8 million of the labor income attributed to forest recreation is supported in the Accommodation & Food Services, Arts, Entertainment, and Recreation, and Retail Trade sectors (IMPLAN 2012).

Contributions to sustainability from regional economic activity associated with recreation on the forest are reflected in indicators under MP6.3. The tourism and recreation industry has become an increasingly more important sector within the FMNF's study area. Trends presented in the Social and Economic Affected Environment suggest that the economic base of nearby communities is shifting towards service businesses whom rely, in part, on outdoor recreation. In addition, public comments indicate the industry is a valued part of the local economy. As a result of its economic importance and continued presence the tourism industry contributes towards the resilience of forest-dependent communities; thus contributions from the FMNF contribute to economic sustainability.

Economic activity attributed to recreation on the FMNF also contributes to long-term viability and resilience of the local economy by attracting new money (money earned outside the local economy and spent by these non-local visitors) into communities surrounding the forest. The injection of non-local dollars through purchases of gas, food, lodging, and concessions opportunities for employment and income would not exist in if the unique opportunities on the FMNF did not exist. By managing visually appealing landscapes and healthy fish and wildlife populations; forest management contributes to economic sustainability by supporting a share of employment and income in the local tourism industry.

Timber & Forest Products. Forest products have played an important role in South Carolina's history and economy. Dating back to early Colonial America, the timber industry is one of the state's oldest and most successful industrial sectors. Timber continues to be the top ranked cash crop in 45 of the state's 46 counties. With more than 13 million acres of South Carolina's forest used for the production of commercial wood products, the delivered value of products harvested from timberlands across the state was valued at nearly $679 million in 2009. Economic activity associated with timberlands can be attributed with making the state's forestry and wood products industry the state's largest manufacturing industry in 2010; employing approximately 90,624 people with a payroll of $4.1 million (S.C. Forestry Commission, 2014). Forestry, logging and wood processing also play an important role within the eight-county study area. Of the 5.2 million acres of land which make up the study area, approximately 3.1 million of these acres were timberlands (S.C. Forestry Commission, 2014) which are attributed with supporting more than 13,000 forestry and logging jobs within the FMNF study area in 2012 (IMPLAN, 2012).

In accordance with the MUSYA, the Francis Marion is managed to ensure that the forest continues to achieve and sustain a high level of timber production. In 2011 271 CCF of Sawtimber, 274 CCF of Pulpwood, 7,186 CCF of smaller Non-saw timber products (which include pulpwood and chip and saw), and 25 CCF of Fuelwood were harvested from the Francis Marion (USDA NRM 2012). While timber and wood products from NFS lands account for only a small share the region's timber, forest products from the FMNF directly supports employment in logging and wood manufacturing firms in the area and indirectly contributes to employment in a number of other industrial sectors. It is estimated that timber and wood products from the Francis Marion support a total of 57 local jobs and nearly $2.4 million in wages and proprietor's income across the eight-county study area (IMPLAN 2012). Approximately 35 of these jobs and $1.8 million of local labor income are supported in the Agriculture and Manufacturing sectors. These sectors include firms which specialize in forestry and logging and primary and secondary forest product processing.

Contributions to sustainability from regional economic activity associated with timber and forest products from the forest are reflected in indicators under MP6.1 and MP6.3. As noted above, the timber industry has been an important part South Carolina's economy for centuries and is anticipated to continue to play an important role in the Low Country's economy in the future. Public comments noted that the FMNF needs to continue to improve its timber management to ensure future forest users can rely on FMNF lands to provide forest products for personal and commercial use. Harvesting the FMNF's timber resources is done to maintain and restore ecosystem characteristics and improves the forests' resistance and resilience to stressors. In this way managing timber resources for ecosystem health increases the ability of area communities to adapt to changes in environment (such as fire, climate change, flood, insect and disease threats, etc.). As a result timber management on the FMNF can be attributed with increasing the resiliency of local communities and contributing to their socioeconomic sustainability. In addition to managing timber resources to improve stand health, management to ensure reliable future yields contributes to the continued viability, and thus sustainability, of communities dependent upon timber and forest products.

Forest Expenditures and Employment. Management of the FMNF directly contributes to the local economy by employing individuals living within the area and by spending federally appropriated dollars on goods and services to carry out management forest programs. In recent years expenditures on forest programs and personnel for the have averaged $10.4 million a year. Program related expenditures do not include expenditures associated with emergency fire suppression since these cannot be considered consistent contributions to the area economy.

Although field support for the Francis Marion comes from the District Ranger's Office in Huger, financial and administrative support for the forest is provided by the Forest Supervisor's Office (SO) in Columbia, SC. On an average annual basis, expenditures associated with the management of the FMNF support 148 jobs (direct, indirect and induced) and approximately $9.8 million in local labor income in the eleven counties which surround the FMNF and SO. These counties include Berkeley, Calhoun, Charleston, Clarendon, Dorchester, Georgetown, Horry, Lexington, Orangeburg, Richland, and Williamsburg counties (IMPLAN 2012).

Payments to States and Counties. National Forest System lands account for 5 percent of all land within the eight-county study area, and make up 25 percent of Berkeley and 10 percent of Charleston counties. Although Berkeley and Charleston counties do not receive tax revenues from these lands, they provide public services (including law enforcement, road maintenance, and emergency services) that support activities on these public lands. As a result, Berkeley and Charleston counties are entitled to monies from land payment programs as compensation for the tax-exempt National Forest System land within their jurisdiction. These programs can be categorized into two types: receipt-sharing and per acre federal land payments.

Receipt-sharing programs have been administered under the Secure Rural Schools and Community Self-Determination Act (SRSCS) and the Twenty Five Percent Fund Act of 1908. Congress recently reauthorized the SRSCS through 2016. In the absence of SRSCS reauthorization, the Twenty Five Percent Fund Act of 1908 mandates that states receive a 25-percent rolling average of revenues earned from timber sales, special use permit fees, grazing fees, and other programs that generate receipts on national forest lands. The payments are paid to South Carolina's General Government based on a 7-year rolling average of receipts from national forests. While only a small portion of these funds are returned to Berkeley and Charleston counties, the payments help fund schools and roads across the state.

In addition to receipt-sharing, the PILT program provides payments to counties to offset losses in tax revenues due to the presence of tax-exempt federal land in their jurisdictions. The authorized level of PILT payments is calculated under a complex formula. No precise dollar figure can be given in advance for each year's PILT authorized level. Five factors affect the calculation of a payment to a given county: the number of acres eligible for PILT payments, the county's population, payments in prior years from other specified federal land payment programs, state laws directing payments to a particular government purpose, and the Consumer Price Index as calculated by the Bureau of Labor Statistics.

Receipt-sharing and per acre federal land payments received by Berkeley and Charleston counties can be highly variable. Although rural communities in these counties rely on these funds to balance tight budgets, the PILT program has reverted back to a discretionary program which is highly susceptible to federal funding shortages. It is fully funded through FY15, but there is a great deal of uncertainty whether and to what degree the Payment in Lieu of Taxes program will be funded in the future. If the program continues to be fully funded, Berkeley and Charleston could potentially see an increase in PILT payments as a result of reduced receipt-sharing payments.