

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA, 16 U.S.C. §§797(e) and 803(a)(1), require the Commission to give equal consideration to developmental and nondevelopmental uses of the waterway on which a project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreational, and other nondevelopmental values of the waterway equally with the project's electric energy and other developmental values.

This section presents our recommendations for the project and our rationale in balancing the developmental and nondevelopmental values for the plan best adapted to comprehensive development of the waterway. Our balancing analysis considers our comparative environmental analysis of the alternatives (section 3.0, *Environmental Analysis*), their economic effects (section 4.0, *Developmental Analysis*), and their consistency with relevant fish and wildlife agency recommendations and comprehensive plans (sections 5.2 and 5.3, respectively).

#### 5.1.1 Statutory Requirements

*Section 18 Fishway Prescriptions:* Pursuant to section 18 of the FPA, NMFS and the FWS provided preliminary prescriptions for upstream and downstream fishways. The FWS included a modified prescription in appendix A of the FSA. Interior withdrew its preliminary prescription in favor of the FSA, by letter filed May 17, 2007. NMFS, however, is not a party to the FSA. NMFS filed its modified fishway prescription on July 20, 2007. Staff has independently reviewed the prescriptions and we provide our comments and analysis of the FWS and NMFS prescriptions in section 3.3.2, *Aquatic Resources*, and we provide our recommendations below in the *Fish Passage and Protection section*.

NMFS and FWS also requested that the Commission reserve their authority to prescribe additional fishways or modified fishways at a later date, and that request for reservation of authority was not withdrawn by FWS subsequent to the FSA. Section 18 of the FPA provides the Secretary of Interior and Secretary of Commerce the authority to prescribe fishways. Upon receiving a specific request from Interior or Commerce, it is appropriate for the Commission to include a license article that reserves Interior's and Commerce's authority to prescribe fishways. We recommend such an article for the Santee Cooper Project.

*Section 4(e) Conditions:* As described in Section 2.3.2.5, *Section 4(e) Conditions*, the FWS submitted five preliminary 4(e) conditions to mitigate for impacts from the Santee Cooper Project on "reservations" (the Santee NWR) managed by FWS. The FWS withdrew its preliminary section 4(e) conditions in lieu of the conditions agreed to in the FSA.

### 5.1.2 Recommended Alternative

Based on our independent review and evaluation of the proposed project, the agency and interested party alternative, the FSA alternative, and the no-action alternative, we select the FSA alternative, with some modifications by staff, as the preferred alternative.

We recommend this alternative because: (1) issuance of a new license would allow SCPSA to continue to operate the project as a dependable source of electric energy for its customers; (2) the electricity generated by the Santee Cooper Project (total installed capacity of about 134.5 MW) would avoid the need for an equivalent amount of fossil-fuel fired electric generation and capacity, continuing to help conserve these nonrenewable energy resources while reducing atmospheric pollution; and (3) the recommended environmental measures would protect and enhance aquatic and terrestrial resources, improve public use of recreational facilities and resources, and maintain and protect historic and archaeological resources within the area affected by project operations.

We recommend that most of the terms of the FSA be adopted and made conditions of the license to be issued for the Santee Cooper Project, although there are four specific measures that we do not recommend. These include the dam removal plan for the Granby dam on the Congaree River, and the Santee Basin Fisheries Enhancement Fund (discussed in section 2.3.1 *Final Settlement Agreement*). These measures do not appear to have a clear nexus to the project (are not tied to either project effects or purposes) or are located outside of the project boundary. Although the Fisheries Enhancement Fund could be used for activities in the project area, project-specific measures are not described in the FSA and funded measures could occur anywhere in the Santee River Basin. Two measures to be implemented at the Santee NWR are not recommended (discussed below in section *Santee NWR Improvements*). Insufficient information has been provided for staff to evaluate the two measures for the Santee NWR. SCPSA may elect to provide any of these measures as terms of a Settlement, but based on the limited information provided we can not recommend them as license conditions.

We recommend the following measures proposed by SCPSA, with modifications discussed below. Measures in *italics* identify staff-modified measures. Our rationale for adopting or not adopting specific measures follows the list of recommended measures.

#### **Project Operations**

- formalize the rule curve for reservoir operations;

#### **Water Resources**

- continue providing a weekly average flow of 4,500 cfs from Jefferies station to minimize shoaling in Charleston Harbor and prevent saline waters from reaching Bushy Park industrial complex;

### **Aquatic Resources (including RTE)**

- increase locking operations for fish passage at Pinopolis lock - a minimum of 6 per day, when weather conditions permit;
- formalize use of manatee exclusion devices at Pinopolis lock, and modified lock operations when manatees are present;
- prepare and implement a shortnose sturgeon enhancement plan *in consultation with FWS, SCDNR, and NMFS to ensure that restoration goals for the species are addressed*;

### **Terrestrial Resources**

- develop and implement an aquatic plant management plan that addresses the control of non-native species;

### **Recreation and Land Use**

- *continue to administer the existing shoreline management programs and policies under the existing CLMP*;
- provide improvements to Old Santee Canal Park and Overton Park, provide improved bank fishing access and parking at several locations, provide deep water access improvements at several landings, install mooring piers at several locations and construct a two-lane boat launch at Richard Landing at White Point (completed in 2004);
- install enhanced channel markers;

### **Cultural Resources**

- Implement a PA including preparing an HPMP to guide SCPSA's management of the project's historic properties during the term of the license.

In addition to the above measures proposed by SCPSA in the application, we recommend the following measures.

### **Project Operations**

- provide seasonal minimum flows below Santee dam of 1,200 cfs May through January and 2,400 cfs February through April, for the protection and enhancement of aquatic habitat and for anadromous fish migration and spawning;
- develop a low flow/emergency contingency plan (drought contingency plan) for the operation of the project during low inflows and/or drought;

- develop an adaptive management program to assess the effectiveness of recommended flows in providing aquatic habitat, enhancing water quality, and providing navigation. The program would include:
  - a. Developing a project operations and downstream flow monitoring plan to ensure compliance with the recommended reservoir rule curve and minimum flow/attraction flow schedules; and
  - b. SCPSA Coordinating a Technical Advisory Committee for instream flows to review flows and make recommendations to the Commission for review and approval.

### **Water Resources**

- water quality monitoring and remediation as part of the adaptive management program;

### **Aquatic and Terrestrial Resources (including RTE)**

- construct fish passage facilities and implement entrainment protection measures including:
  - a. *A fish passage implementation plan and fishway design and construction plans for all fishways.*
  - b. Post-construction fishway effectiveness evaluation plans for all constructed fishways.
  - c. Fishway attraction flows within the range of high and low passage design flows for all fishways.
  - d. Santee dam: diadromous fish population monitoring in the Santee River downstream of the dam, construction and operation of a trap and sort facility and eventually a permanent fish passage facility, and eel passage study and measures.
  - e. Pinopolis lock and dam: increased locking events for fish passage, improved fish monitoring system, additional attraction flows, and eel passage study and measures. If determined inadequate, construction of upstream passage facility at Pinopolis dam.
  - f. Operation and maintenance plan for all constructed fishways.
  - g. Evaluation and modification plans for all constructed fishways.
  - h. Post-licensing downstream fish passage/confirmatory survival studies to quantify downstream passage of diadromous fish at the Santee dam, Pinopolis lock, and the Jefferies powerhouse, to determine the need for downstream passage facilities for diadromous species, and construction of downstream fish passage facilities, as appropriate.
- prepare species management plans for federally listed threatened and endangered wildlife species (e.g., red-cockaded woodpecker) within the project

boundary and affected by project operations, as appropriate, and incorporate those plans into the existing CLMP for the project;

- provide improvements to Santee NWR including pumping station maintenance, a navigation channel in Jack's Creek, aquatic nuisance weed control and vegetation removal, erosion control measures, woody debris habitat enhancements, pine/hardwood habitat improvements, and habitat enhancements on Persanti Island.

### **Recreation and Land Use**

- develop a recreation plan and update it every 6 years for the life of the license;
- revise the CLMP (shoreline management plan) and update the plan every 10 years for the life of the license.

## **5.1.3 Discussion of Recommended Alternative**

### **Formalize the Existing Rule Curve**

As described in section 2.1.1, *Existing Project Facilities and Operation*, the project is currently operated as a semi-peaking facility. To maintain minimum flows in the Santee River bypassed reach, the Santee Spillway Hydroelectric Station is operated continuously, providing flows of at least 500 cfs to the downstream reach. The remaining inflow to the project is diverted for generation at Jefferies station and at the Corps' St. Stephen Project. Jefferies station provides a maximum weekly average flow of 4,500 cfs to the Cooper River, for the purposes of limiting sedimentation in Charleston Harbor and preventing saline waters from reaching to the Bushy Park industrial complex. Remaining inflow is utilized at St. Stephen after all other water usage demands have been fulfilled. While Jefferies and St. Stephen are operated as peaking projects to some degree, operation of the stations are managed such that the lake level rule curve is followed.

Based on our analysis of available information, aquatic and terrestrial resources within the project reservoirs are adequately protected under the existing rule curve. While we recommend additional enhancement measures that are expected to improve conditions for these resources, the existing rule curve provides multiple benefits and should be maintained.

The existing rule curve allows for a seasonal range of water levels in Lakes Marion and Moultrie. Water levels generally range from an elevation of 75.5 feet during the summer to just above 72.0 feet during winter drawdown, which typically occurs in January. Although lake levels have typically followed the rule curve, considerable variations occur due to the combination of inflows, both seasonally and annually, and water use demands associated with providing downstream flows and power generation. The proposed rule curve is designed to anticipate and provide adequate storage for normal seasonal inflows, as well as provide flood management associated with high inflows during the winter and early spring. In addition, emergency operation provisions

allow the impoundments to be temporarily drawn down to accommodate flood flows associated with hurricane conditions in late summer and early fall. This flood storage function provides a means to manage outflow from the project, which maintains more stable downstream water levels than may occur otherwise.

During a typical dry year lake levels are adjusted to accommodate minimum flow requirements downstream of Santee and Pinopolis dams for aquatic habitat and salinity abatement. As discussed in section 3.3.1, *Water Resources*, in the typical dry year scenario, there would be insufficient inflows to maintain both existing lake level targets and minimum flow priorities the entire year. Any lake drawdown could result in dewatered nests for substrate spawners, entrapment of young and fry in shallow pools, and/or desiccation and loss of rooted aquatic vegetation beds required for cover by some species. The degree of these effects would depend on the rate and duration of the drawdown. In addition, the timing of the drawdown would likely be during the lower-flow summer/fall months, outside the spawning season for both resident and migratory fish species, when lake level fluctuations would have the greatest potential effects. Generally, during typical average and wet years, inflows would maintain lake levels within the rule curve.

The diversity of wetland types and plant communities around the lake indicate that wetland-dependent wildlife species appear well-supported by the existing reservoir rule curve, and the number and variety of species inhabiting the area is indicative of a healthy wetland system. Abundant vegetated shorelines in coves and wetland habitat along the perimeter of the lakes indicate that the short duration winter drawdown, which would continue under the rule curve, does not adversely affect this habitat. Recreational use of the lakes would also be generally unaffected by continued operation of the reservoirs under the existing rule curve. The peak recreation season occurs during the period of the year when the lakes are maintained near full pool.

The proposed rule curve would: (a) continue to protect reservoir resources; (b) provide for relatively stable lake levels during most of the year; and (c) provide flood control. Therefore we recommend including the existing reservoir rule curve as a condition of the license. Because this rule curve is the same as that currently followed by SCPSA, there would be minimal costs in formalizing the rule curve.

### **Downstream Flows**

The stakeholders made several recommendations regarding flow releases from the project. SCPSA proposes to continue providing a weekly average flow of 4,500 cfs to the Cooper River from Jefferies station, and a continuous minimum flow of 5,600 cfs from St. Stephen station to the lower Santee River, if available, from February 1 to April 15. Under the terms of the FSA, SCPSA, SCDNR, and FWS propose a minimum flow from Santee dam of 1,200 cfs from May through January and 2,400 cfs from February through April. The current minimum flow from Santee dam (originally recommended by SCPSA) is 500 cfs.

The 4,500-cfs flow into the Cooper River was determined by the Commission in 1995 to be the flow necessary to provide adequate control over salinity intrusion at the downstream Bushy Park industrial complex and limit shoaling effects caused by high inflows to Charleston Harbor. We reviewed this earlier Commission finding, consider this a critical function of project operations, and recommend that this flow requirement be maintained as a condition of any new license.

The 5,600-cfs flow from St. Stephen recommended by the agencies is intended to provide adequate flows for anadromous fish migration and spawning in the lower Santee River and to provide adequate attraction flows for fish passage at St. Stephen. Because the St. Stephen Project is not part of the Santee Cooper Project, we cannot make a recommendation regarding this proposed flow. However, operations at St. Stephen have a direct effect on management of water levels in the project impoundments, downstream flows, and fish passage into the project reservoirs and to the upper Santee River. As described in section 3.0 of this FEIS, continuation of this flow, which is currently provided on a voluntary basis, would be appropriate as part of the overall water management of the Santee Cooper system and for fish passage.

The existing continuous minimum flow of 500 cfs from Santee dam is mostly provided through the operation of the Santee Spillway Hydroelectric Station and is typically closer to 600 cfs, to ensure compliance with the 500-cfs license requirement. Under these flow conditions, the bypassed reach has historically experienced short periods of low DO levels. These flows also limit the amount and suitability of aquatic habitat and do not provide adequate depth for small boat navigation in two downstream riffle areas evaluated using SCDNR navigability criteria. Therefore, it is expected that upstream migration of fish would be hindered at these riffles, particularly the larger individuals of shortnose and Atlantic sturgeon.

As a result, CCL and American Rivers recommended a seasonal minimum flow in the Santee bypassed reach calculated as a percentage of inflow, after flows in the Cooper River and fish passage flows at St. Stephen have been provided. This recommendation included a minimum flow of 1,600 cfs or 25 percent of inflow to the project from May through January, and 30 percent of inflow for February through April, when available. This would equate to a minimum flow of at least 1,000 cfs more than is currently provided by generation at the Santee spillway station. However, following the filing of the agency and other party minimum flow recommendations, SCPSA, SCDNR, and FWS entered negotiations that resulted in the FSA, which included the minimum flow provision of 1,200/2,400 cfs. NMFS recommends seasonally varied flows ranging from 2,300 to 5,000 cfs at Santee dam.

Our analysis (section 3.3.2, *Aquatic Resources*, and 3.3.5, *Recreation Resources*) indicates that a flow of 1,200 cfs from May through January would provide adequate navigability for both boater access and fish movement. Although the 2003-2004 small boat navigation study showed that a bypassed reach flow of 1,300 cfs would enable SCDNR navigability criteria to be met at the shallower of two downstream riffle areas

(Normandeau, 2005c), a flow of 1,200 cfs would provide minimum depths for passage of smaller boats. Three transects along each of the two riffles were plotted and water surface elevations were measured at flow releases of 900, 1,100, and 1,400 cfs. At the 1,100-cfs release, water depths of at least 2 feet were measured at all six transects. Interpolation of study data shows that contiguous passage areas (2 feet or greater in depth) are available at widths ranging from 30-feet to 350-feet at flows of 1,100 cfs. Although no criteria are available regarding the contiguous channel width needed for shortnose sturgeon passage, the depths do meet the minimum 2 feet necessary for unimpeded swimming by shortnose sturgeon adults (Crance, 1986). Therefore, we conclude that the proposed flow regime of 1,200 and 2,400 cfs would allow migrating sturgeon to navigate through the riffle areas.

Our analysis also indicates that flows between 600 and 2,300 cfs would provide increases in WUA for several fish species and lifestages (see discussion in section 3.3.3.2), and although a flow of 1,200 cfs was not specifically modeled, it would provide some increase in available aquatic habitat.

Study results from MesoHABSIM show that a minimum flow of 2,300 cfs during the anadromous fish passage/spawning season would substantially improve habitat for the sturgeon species and other anadromous species in the Santee River bypass. Therefore, a sustained flow of 2,400 cfs during the spring spawning season would provide increased habitat availability under stable flow conditions in the bypassed reach. This stable flow regime would minimize the potential for adverse effects associated with frequent watering and dewatering of aquatic habitat that could occur under the previously recommended agency flow regime that would be based on a percentage of inflow, which would be variable depending on weather conditions and upstream hydropower operations. Therefore, we recommend a minimum flow regime consistent with the FSA of 1,200 cfs from May through January and 2,400 cfs from February through April.

There are a variety of water supply demands that already exist. When coupled with the lack of sufficient inflow during dry years to meet these flow needs, we conclude that provisions for balancing the need for minimum flows and maintaining lake levels should be incorporated into the drought contingency plan discussed below.

Our recommended minimum flows would reduce generation at the project. To meet these new flow requirements, any flow in excess of about 600 cfs (the capacity of the Santee Spillway Hydroelectric Station) would need to be spilled at Santee dam, instead of being used for power generation at the Jefferies and St. Stephen station. Our recommended flows would result in an estimated annual loss of approximately 2,600

MWh (\$137,800 per year) at Jefferies station<sup>37</sup> and 27,200 MWh (\$1,441,600 per year) at St. Stephen during a normal water year. However, the environmental benefits realized in the 37-mile-long Santee River bypassed reach, including improved habitat for alosid species, the federally listed endangered shortnose sturgeon, and Atlantic sturgeon, along with improved conditions for boating and fishing, would outweigh the value of lost generation.

### **Drought Contingency Plan and Project Operations and Downstream Flows Monitoring Plan**

SCDNR, Interior, CCL, and American Rivers recommend a drought contingency plan (low inflow protocol). The FSA includes a drought contingency plan as a mechanism to coordinate operations between the Santee Cooper and St. Stephen projects, and ensure that adequate downstream flows are provided in the Santee River during periods of low inflow. As discussed in sections 3.3.1 and 3.3.2, *Water Resources* and *Aquatic Resources*, inflows to the project are generally adequate to meet existing downstream flow demands in wet and normal water years. During a representative wet year, our recommended minimum flows could be maintained in all but 2 weeks, while during a normal water year, these flows could not be provided 5 to 17 percent of the time seasonally, which would require some use of reservoir storage to maintain the flow. Use of this storage, however, would not result in substantial reservoir drawdowns. A continuous minimum flow of 2,400 cfs for 7 days, if provided entirely from storage, would reduce lake levels by approximately 0.2 foot. Similarly, a 1,200-cfs minimum flow for 7 days would draw down the lake by less than 0.1 foot. During normal water years, however, such minor drawdowns would be replenished relatively quickly by inflow.

Increasing the minimum flows at Santee dam would place an additional burden on the project's ability to meet all downstream flow demands during dry water years. During dry (or drought) years, existing flow needs cannot be met without some use of reservoir storage resulting in lower impoundment levels. As such, increasing minimum flows in the Santee River bypassed reach would put further pressure on the project's ability to provide required downstream flows by requiring use of reservoir storage

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<sup>37</sup>The water use model developed by staff prioritizes flows to the Cooper River through generation at Jefferies to ensure that the existing 4,500-cfs average weekly flow is provided. Based on our analysis of inflows to the project for a normal water year (1997), this flow would be compromised for 1 week of the year to provide our recommended minimum flow to the Santee River bypassed reach. While this is presented as lost generation potential, it is also possible that minimal deviation from the rule curve (i.e., less than 0.01-foot reservoir drawdown) could occur for that week to ensure this weekly average flow would be provided to the Cooper River. If the Santee River bypass flow were not supplemented by using lake storage, the resulting loss in generation at Jefferies would be 2,600 MWh.

between 59 and 75 percent of the time, seasonally. Furthermore, minimum flows for Jefferies and St. Stephen would also not be met on many occasions, without the use of reservoir storage. If the 5,600-cfs spring-time minimum flow at St. Stephen was provided entirely from storage for 9 consecutive weeks, lake levels would be drawn down by approximately 4.4 feet. Although that would only occur in extreme conditions, a drawdown of that extent could affect fish and wildlife resources and recreation within the riparian shoreline zones.

Based on the above, a drought contingency plan should be developed for the project, to balance competing water resource needs for the Santee Cooper lakes. Development of a drought contingency plan would: (a) assist in operating the project during low inflows and/or drought conditions; (b) provide a means to prioritize water needs such that SCPSA and the agencies can cooperatively determine whether flow obligations can be temporarily suspended, or the reservoir rule curve modified to allow drawdowns to meet flow needs; (c) serve to limit adverse effects on resources from fluctuating lake levels or reduced downstream flows; and (d) ensure that appropriate consideration is given to generation needs and the protection of aquatic resources, RTE species, and public recreation. Therefore, we recommend SCPSA develop a drought contingency plan in consultation with USGS, FWS, NMFS, SCDNR, SCDHEC, CCL, and American Rivers. We estimated the cost of developing the plan to be \$100,000, with an annual implementation cost of \$10,000, resulting in an annualized cost of \$18,700. This would be a relatively modest cost to the project, but would result in substantial benefits for project operations and balancing downstream flow needs with lake level interests.

In concert with a drought contingency plan, an operations and flow monitoring plan for both project developments would further define the criteria by which compliance with the proposed guide curve and minimum flow schedule would be met, and would provide a mechanism to periodically confirm that the project is in compliance with a new license. Incorporating the guide curve in an operations plan would help to ensure that recommended water levels are maintained during the recreation season and that stable water levels are maintained, to the extent possible, for species that utilize near-shore aquatic and terrestrial habitat. We recommend development of such a plan, which should result in minimal additional costs to SCPSA. By incorporating the components of operations and flow monitoring within the drought contingency plan, SCPSA would not incur additional costs for plan development.

### **Adaptive Management Program**

CCL, American Rivers and NMFS recommend an adaptive management program to determine the long-term ability of increased minimum flows in the Santee River bypass to meet ecological and navigational objectives. NMFS's plan consists of monitoring flows and water quality to evaluate the biological response and effectiveness of instream flows, and developing a team to evaluate the monitoring data. NMFS's plan is similar to plan outlined in the FSA.

Under the CCL and American Rivers plan, SCPSA would monitor flows over the next 10 years to determine if the flow regime recommended above (e.g., increased minimum flows) meets ecological and navigational objectives, such as fish staging and spawning, sandbar and floodplain inundation, salinity abatement, and aquatic habitat maintenance. If objectives are not met, SCPSA would implement an alternative flow regime that apportions between 20 and 40 percent of project inflow to the Santee River.

We conclude that it would not be appropriate to recommend specific, future measures (i.e. an alternative flow regime that apportions 20 to 40 percent of project inflow to the Santee River) based on the unknown future results of monitoring. Because the plan outlined in the FSA does not include specific measures, measurable indicators, or monitoring provisions for such issues as sandbar and floodplain inundation, salinity abatement, water quality, and recreational navigation, staff recommends SCPSA develop and implement a more comprehensive Adaptive Management Plan than that reflected in the FSA. We recommend an adaptive management plan consisting of two components: (1) developing a plan to monitor flows and water quality, and (2) SCPSA coordinating a Technical Advisory Committee to review the results of monitoring. The adaptive management program would serve as a comprehensive plan for implementing the flows and protocols outlined in appendix B of the FSA. Long-term flow and water quality monitoring of project waters would be integral to the adaptive management program, as would aquatic habitat monitoring and recreation needs assessments. Annual review of flows and implementation of the adaptive management program would be undertaken by the Technical Advisory Committee.

We estimated a cost of \$500,000 to develop and implement our recommended plan, resulting in an annualized cost of \$43,600. This would be a modest cost to the project, but it would provide the benefits of assessing the effects of any minimum flows required by the license, with a mechanism to adjust those flows based on the monitoring study results.

These two main components of the recommended adaptive management plan are discussed below.

#### Operations, Flow, Water Quality Monitoring Plan

It would be appropriate to monitor the effects of increased minimum flows at the project, to determine if the intended ecological benefits (i.e. improved water quality, habitat suitability, and recreational navigation) are realized. We recommend a plan to monitor and evaluate these components over the first 10 years of the license. This timeframe would be an adequate period for evaluating environmental effects during normal, high, and low water years. The SCPSA should develop the plan, in consultation with FWS, NMFS, SCDNR, SCDHEC, and include methodologies and measurable indicators for assessing the environmental objectives of higher minimum flows in the Santee River bypassed reach, along with a provision to evaluate future alternative flow releases, if needed, based on the monitoring results.

### Technical Advisory Committee

The FSA includes a provision to form a Technical Advisory Committee to conduct an annual evaluation of the effects of instream flows on resources in the Santee River bypassed reach, and on power generation at the project. The committee would provide a mechanism for formalized oversight of measures intended to improve habitat conditions and manage project inflows. The committee would interpret the results of the operations and flow monitoring plan, serve to coordinate monitoring with the drought contingency plan, and provide a forum for developing recommendations for the Commission to evaluate in the event resource objectives are not being met. We note that while the committee may provide recommendations for changes in project operations and flows, all recommendations would be subject to Commission review and approval prior to being implemented.

While the FSA includes a measure to form a Technical Advisory Committee, the Commission may only require measures from the licensee. The Commission only has jurisdiction over its licensees and cannot enforce the provisions of a settlement against other parties, such as federal and state agencies, or private parties. Therefore, we recommend that SCPSA consult with the appropriate state and federal agencies with jurisdiction over water and aquatic resources in the Santee River, and other interested parties, and invite these parties to participate in the Technical Advisory Committee as described in the FSA. SCPSA would incur minor additional costs in coordinating a Technical Advisory Committee, as most costs would be included in the individual operations and flow monitoring plans.

### **Flushing Flows**

The Forest Service recommends providing an annual flow of 40,000 cfs for channel flushing, extensive flooding, bankfull or nearly bankfull flows, and channel maintenance functions. As discussed in section 3.3.2.1, SCPSA (2005c) determined that a flow of 20,000 cfs provides 100 percent floodplain inundation for the 37-mile reach of the Santee River below Santee dam, and USGS gage data indicate that such flows have occurred naturally between 75 to 86 percent of the time during the past 40 years of record. Historic flow data also shows that flows of 40,000 cfs have occurred about half the time under existing conditions. Because flows providing full floodplain inundation would occur a majority of the time under existing conditions, a required flushing flow release would not have a substantially different effect on downstream resources from what now occurs. Therefore, we do not recommend this measure.

### **Fish Passage and Protection**

Through implementation of the 2001 final “Santee Cooper Basin Diadromous Fish Passage Restoration Plan” (FWS, NMFS, and SCDNR, 2001) federal and state agencies are actively working to restore diadromous fishes to the Santee River Basin. The final restoration plan provides a framework for rebuilding populations of the Santee Basin’s diadromous fishes through restoration of access to former spawning and nursery habitat.

The goal of the plan is to increase abundance and health of the Santee Basin's diadromous fish populations using adaptive management, including upstream passage and downstream passage and protection for American shad, blueback herring, shortnose and Atlantic sturgeon, and American eel.

As detailed in section 2.3.1.3, NMFS and Interior/FWS filed preliminary and modified section 18 fishway prescriptions, which require fish passage measures at Pinopolis lock and dam and at Santee dam. SCPSA is also proposing fish passage and protection measures at the project under the terms of the FSA, which was also signed by FWS and SCDNR. The FSA includes as appendix A the modified FWS prescription for fish passage, but does not include any specific provisions for passage of shortnose and Atlantic sturgeon, which are components of the NMFS prescription. Although NMFS is not a party to the FSA, it indicated it considered the fish passage measures included in the FSA in developing its modified fishway prescription.

Maintaining effective upstream and downstream fish passage and limiting downstream passage mortality rates at the Santee Cooper Project is essential for restoring diadromous fish runs in the basin, because the projects serve as the corridor for diadromous fish to access a majority of the historical habitat. Target species include alosids and sturgeon. Alosids occur in large numbers and depend on adults reaching upstream spawning areas and juveniles successfully emigrating from the system. The sturgeon species occur in smaller numbers and could be significantly affected by even relatively low mortality rates.

While these factors may support a recommendation for implementing upstream and downstream fish passage at the project in the near term, additional information regarding the existing populations of migratory species is necessary to determine appropriate methods, designs, and timing for additional fish passage and protection. Fish passage in the FSA consists of a series of individual measures and the FSA does not include a plan which brings all the component measures together under one review process. In addition, a mechanism is needed for FERC review before implementing or installing passage measures. Therefore, we recommend that a fish passage implementation plan be developed by SCPSA, in consultation with FWS, NMFS, SCDNR, and SCDHEC. The plan should identify additional information necessary to develop site-specific measures and designs, and include a schedule for (a) collecting the necessary information; (b) development of upstream and downstream passage designs, as necessary, to accommodate all target species; (c) submittals to agencies and the Commission for review and approval of designs; (d) construction of the fish passage facilities; and (e) development and implementation of effectiveness studies, with provisions for identifying potential future enhancements, if needed. The plan should also include a provision for annual progress reports to the Commission and the agencies, which would present information on fish passage counts for project facilities, and progress made in implementing the fish passage measures required by the license.

Adopting an implementation plan of this nature would ensure a wholistic approach to developing and constructing fish passage at the project. Such a plan would assure that the project contributes to the restoration goals of maintaining and rebuilding diadromous fish populations in the Santee River Basin by restoring access to existing and former spawning and nursery habitat. We estimate that developing a fish passage implementation plan would cost \$225,000, with an annual reporting cost of \$15,000, resulting in an annualized cost of \$34,610.

While we conclude that implementing fish passage and protection measures at the Santee Cooper Project is necessary, the measures prescribed by the agencies are costly and would significantly affect project economics. Therefore, the following provides our assessment of the benefits and costs of measures that have been prescribed or proposed. Developing the above described fish passage implementation plan would help to better define which of the following measures are in fact needed, and when. As noted in section 4, *Developmental Analysis*, Interior and SCPSA identify higher costs associated with installation of fish passage facilities than we estimated in our draft EIS analysis, ranging from a total cost of \$33,850,000 (identified by SCPSA as a conservative cost estimate for the FSA/Interior fish passage program) to \$54,800,000 (the cost of NMFS prescribed measures as estimated by SCPSA). We estimate a total cost for all fish passage measures, including future provisions for downstream protection measures, would be \$47,575,000, with an annual cost of \$370,000, resulting in a total annualized cost of \$4,517,170. Certain specific cost components are described below.

While costs for facilities required by the NMFS prescription have not been provided by NMFS, we agree with the SCPSA assessment that the costs for NMFS' prescribed measures may be higher. In fact, NMFS stipulates in its modified fishway prescription filed July 20, 2007, that its prescription would likely be more costly than the SCPSA alternative. The most notable difference between the Interior and NMFS prescriptions is that NMFS requires installation of downstream passage/protection measures without advance downstream passage studies, and provides specific design criteria. Interior and the FSA approach downstream passage in a step-wise scientific manner rather than assuming the best solution and constructing it, as prescribed by NMFS. The lack of downstream passage studies prior to construction could result in a need for significant post-construction modifications to achieve effectiveness goals. The NMFS prescription also requires installation of a fish lift with trap and sort facilities at Santee dam 1 to 3 years sooner than the Interior/FSA timeframe, and requires more extensive upstream passage studies at Pinopolis lock and dam, targeting sturgeon.

#### Pinopolis Lock

Diadromous fish are currently passed upstream on the Cooper River at Pinopolis lock and on the Santee River at the St. Stephen station. SCPSA's proposal to increase attraction flow and locking events would enhance upstream alosid migrations, but may not support the objective of enhanced upstream passage for bottom-dwelling migrants such as sturgeon that currently do not effectively move upstream past the upper lock sill.

In addition, the alosid passage data for the lock appear inadequate to accurately assess the effectiveness of upstream passage for target species. Thus, FWS and NMFS prescribe an operations plan and effectiveness evaluation for the lock, as well as new fish counting technology at Pinopolis lock (also proposed by SCPSA).

We conclude that SCPSA's proposed hydroacoustic system is likely to improve fish counting at the lock, thus we recommend adopting this measure. We are concerned; however, that it is unclear as to whether or not current passage is reaching management goals. If the existing passage rates for alosids are not meeting the overall objectives, we do not see improved counting technology as the answer to the larger issue of providing effective passage. Therefore, we also recommend, as part of the overall fish passage plan, an operations and effectiveness evaluation that would determine if fish passage objectives are being met, and include provisions to implement future enhancement measures if passage objectives are not being met at the lock. This would ensure that adequate passage is occurring at the lock, contributing to the restoration of migratory fish to the Cooper River. We estimate that the cost for SCPSA to install the new fish counting system would be \$300,000 (\$26,150/yr annualized cost). We also estimate that the cost for implementing the effectiveness evaluation would be \$120,000 (\$10,460/yr annualized cost).

SCPSA proposes to increase the number of locking events. We conclude that increasing the number of locking events would likely increase the number of fish passed through the lock, and recommend this measure be implemented as a condition of the license. Energy losses for this measure would be small; about 550 MWh valued at \$29,000 annually if the increased locking attraction flows is passed through the lock instead of used for generation at Jefferies station or the St. Stephen Project. Both FWS and NMFS also prescribe an increase in attraction flows at the lock. FWS/the FSA did not specify the amount or duration of flow, but NMFS prescribes a minimum flow of 600 cfs. We cannot estimate the cost (potential lost generation) for the unknown FWS attraction flow, but we estimate that the 600-cfs attraction flow required by NMFS would result in an energy loss of 3,000 MWh worth \$160,000 annually.

If the effectiveness evaluation for the Pinopolis lock shows that passage objectives are not being met at the lock, an alternative means for providing upstream passage may be necessary. Installing a fish lift or dedicated fish lock may be necessary to achieve the passage and restoration goals for target species, including sturgeon. For the purposes of analyzing the cost implications of constructing a dedicated upstream passage system in the event the Pinopolis lock is deemed inadequate for fish passage, we estimated the cost to construct an upstream fish lift/elevator system at Jefferies powerhouse, sized to accommodate passage of both alosids and sturgeon species. We estimate a capital cost of \$10,000,000 and an annual cost of \$60,000, which equates to an annualized cost of \$931,710. We are not, however, recommending this facility at this time, because the effectiveness studies of the lock must first be completed.

Interior and NMFS prescribe the installation of an eel fishway at the Jefferies station/Pinopolis lock, to allow juvenile American eels to pass upstream and utilize the rearing habitat available in the Santee Cooper lakes and upper portions of the Santee River Basin. Interior prescribes this fishway by year 3 of the license, while NMFS does not specify a date for an eel fishway but indicates that all upstream fish passage facilities must be operational by the fifth migration season after license issuance. Currently, there may be some eel passage through the lock, but studies show that juvenile eels more effectively pass obstructions such as dams by utilizing very low flow migratory routes, such as leakage areas through cracks in the dam, or very shallow water flow over the crest of a dam. The eel fishway prescribed by the agencies is a relatively standard design that has been installed on other east coast hydroelectric projects, and takes advantage of the eel's preference for very low flow passage routes. Based on our analysis herein, we recommend that an upstream eel ladder be constructed at Pinopolis/Jefferies as a condition of the license, to ensure that juvenile eels are able to effectively move upstream to habitat in the project lakes and in the upper river. We estimate that the Pinopolis/Jefferies eel ladders would have a capital cost of \$375,000, and minimal operating costs, resulting in an annualized cost of \$32,700.<sup>38</sup>

Some of these fish passage measures are relatively high cost items. Nonetheless, these costs are necessary and appropriate to provide effective fish passage at the Pinopolis lock and Jefferies station, and to achieve fish passage goals for the river basin.

#### Santee Dam

Diadromous fish now ascend the Santee River and into the Rediversion canal where they can access the Corp's St. Stephen fish passage facility, which is not part of the Santee Cooper Project. Anadromous fish ascending the Santee River past the Rediversion canal may use habitat in the bypassed reach, but cannot be recruited further up the Santee watershed because there are no fish passage facilities at Santee dam. With an increase in minimum flows from Santee dam, as we recommend, the numbers of anadromous fishes moving up to Santee dam would increase over existing conditions, increasing the need for fish passage at the dam. Both FWS and NMFS prescribe the installation of a trap and sort facility at Santee dam (by year 6 to 8 of the license for FWS and by year 5 for NMFS), and eventually a full-capacity fish lift (3 to 5 years after the fish trap capacity is reached for FWS, and 10 years after license issuance or 2 years after the trap capacity is reached for NMFS). Neither agency is requiring immediate installation of these facilities at Santee dam; we agree that it is not clear that fish runs are sufficient to justify passage facilities at this time.

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<sup>38</sup>Eel passage studies outlined in the FSA (experimental eel sampling studies at Santee dam and Pinopolis lock to determine the best fishway location and operational period) would be needed to determine the appropriate eel passage designs and operational considerations.

Both agencies are instead requiring, for the first 3 to 5 years of the license, baseline population monitoring to determine the numbers of diadromous fishes using the Santee River bypassed reach downstream of Santee dam for migration and spawning. We agree that such studies should be conducted, and also recommend a fish passage implementation plan, supported by the monitoring and assessment studies, that would inform the agencies, SCSPA, and the Commission as to the need and appropriate timing for implementation of fish passage at Santee dam. Timing for implementation of fish passage facilities on other Atlantic coast rivers has often been based on achievement of specific target population sizes. In this case, SCPSA and the agencies should define a target population that must be passed at the project to populate available upstream spawning habitat, and an implementation trigger number (primarily for clupeids). The trigger number would be based on an appropriate number of fish approaching and attempting to pass Santee dam that would indicate increasing populations requiring passage, but at the same time would allow sufficient lead time for designing and constructing the facilities prior to the time that fish runs reach a critical level requiring passage. Following installation, effectiveness testing should occur to assess the need for facility modifications to achieve fish passage effectiveness goals.

Upstream passage at Santee dam, if eventually required, would need to accommodate blueback herring, American shad, shortnose and Atlantic sturgeon, as well as American eel. Upstream eel passage at the site would be provided by eel “ladders,” as we described for Pinopolis. We recommend immediate development of upstream eel passage per the agencies’ fishway prescriptions and as provided for in the FSA, because providing passage would have immediate benefits at Santee dam, in that such facilities would facilitate passage and improve passage success at the dam. We estimate that the eel ladders at Santee dam would have a capital cost of \$375,000, and minimal operating costs, resulting in an annualized cost of \$32,700.

Upstream passage for other species should be implemented in three phases as prescribed by FWS and NMFS. The first phase would be the baseline population study described above, to first determine the size and characteristics of the existing populations downstream of Santee dam. The population study would be followed by construction of a trap and sort facility (phase 2) to determine the numbers of anadromous fish actually approaching and attempting to pass Santee dam. The third phase would be construction of a permanent fish lift/elevator system if the numbers of fish entering the trap and sort facility justify a permanent facility. We are also recommending a shortnose sturgeon enhancement plan (described below), so any fish facilities to be installed at Santee dam should include design considerations for sturgeon passage.

We estimate the baseline population study, which could also identify the optimum locations for any eel ladders (the first facilities to be installed), would have a capital cost of \$300,000, and an annualized cost of \$26,150. We also estimate the cost for an interim trap and sort facility and a permanent fish lift/elevator system for alosids and sturgeon, based on other facilities constructed on the east coast, with an upstream exit flume and typical attraction flows. We estimate the capital cost of both an interim trap and sort

facility and a permanent fish lift (combined) to be \$15,000,000, with an annual operating cost of \$100,000, resulting in an annualized cost of \$1,407,570. The final cost of any facilities constructed would depend on the final design criteria adopted, which would be based on the “design population” of fish to be passed and the specific layout requirements (number of fish entrances, hopper size, etc.). The cost for these fish facilities would be relatively high, but if the population monitoring studies indicate that large numbers of fish are available to use the facilities and continue migrations to upstream spawning habitat that is currently under-utilized, it would be worth the cost.

### Downstream Passage

Interior and NMFS prescribe downstream passage measures at both Santee dam and Pinopolis lock and dam. Interior prescribes downstream passage evaluation studies at both developments, and the installation of downstream passage facilities only after the completion of the studies and a demonstrated need for the facilities. NMFS, however, prescribes full-depth bar racks or overlay screens and a multi-level bypass and discharge conduit to be constructed by the third outmigration season after license issuance, without any preliminary downstream passage studies.

We agree that the license should include provisions for the protection of downstream-migrating fishes. The importance of minimizing downstream passage mortality varies among species and life stages and should be directly linked to the restoration and recovery goals for the Santee and Cooper River systems. Alosid species depend on out-migrating juveniles safely passing downstream to the ocean to mature before returning to spawn as adults. Some post-spawning adults also out-migrate and return to spawn in future years, and are important components of the spawner population because of their larger size and greater number of eggs. For shad, approximately 10 percent of South Carolina shad populations may repeat spawn. Higher mortality rates on out-migrating adults would further reduce the number of repeat spawners and adversely affect future year classes. For Atlantic and shortnose sturgeon, which are large, long-lived and have a population strategy relying on adults spawning multiple years, safe downstream passage of large adults is more critical. Adult American eel are also relatively large fish that emigrate to marine waters prior to spawning, and spawning success would be enhanced by safe downstream passage.

There are no dedicated downstream fish passage facilities at the project, except Pinopolis lock where some fish safely pass downstream during locking operations, thus it is probable that at least some diadromous fish lifestages (juveniles and adults) experience delay, injury and/or mortality while attempting to pass downstream through the project powerhouses. Downstream protection measures are essential for minimizing delay and mortality during this out-migration, and for supporting the overall fish restoration goals in the Santee and Cooper rivers, including for a listed species, the endangered shortnose sturgeon. Under the goals of NMFS 1998 final recovery plan for the shortnose sturgeon, a number of measures are identified to prevent extinction, including assessing mortality from incidental capture and eliminating barriers to movement. While large sturgeon

populations do not currently exist upstream of the project, improvements to existing fish passage facilities and construction of additional fish facilities would improve conditions for downstream fish passage and contribute to the recovery of shortnose sturgeon, and to the restoration of the shad and herring populations.

The costs associated with the Interior and NMFS prescribed downstream passage measures would likely have significant cost implications for the project. We cannot, however, estimate the cost of the Interior-prescribed measures, because those measures would depend on the results of the prescribed (and FSA proposed) downstream passage evaluation studies, which could show that such measures are not needed at some project facilities. We estimated the capital cost to provide the NMFS-prescribed full depth bar racks and bypass systems at both Jefferies and Santee stations to be \$16,125,000, which equates to an annualized cost of \$1,405,640. Although we conclude that downstream fish passage and protection measures may be necessary, we do not recommend that the NMFS-prescribed measures be adopted at this time. Installation of such costly protection measures would be premature without definitive downstream passage information, which would be obtained through the evaluation studies prescribed by FWS and included in the FSA. Therefore, we recommend that the downstream passage evaluation studies be conducted at both the Jefferies and Santee stations, to quantify the fish entrainment and mortality that is occurring, prior to constructing downstream passage facilities. This would be consistent with Interior's final prescription, would help determine whether current powerhouse passage is significantly affecting diadromous species, and would facilitate restoration of anadromous fish (including shortnose sturgeon) to the Santee River Basin. While NMFS prescribed a similar study in its preliminary prescription, it does not include it in the final prescription. We estimate the capital cost to conduct the downstream passage evaluation investigations to be \$1,550,000, with an annualized cost of \$135,120.

#### Summary of Staff Recommendations Related to Fishway Prescriptions

We acknowledge the mandatory nature of the Interior and NMFS fishway prescriptions. Nonetheless, we have included our independent analysis of these prescriptions in this section and in section 3.3.2.2 of this FEIS. Based on our independent analysis, we recommend that the fish passage measures associated with Interior's fishway prescription (which is consistent with the FSA) be made requirements of the license. We do not recommend some of the provisions of NMFS's fishway prescription for the following reasons:

- NMFS requires that a trap and sort facility (with specific design criteria) be constructed at Santee dam within 5 years of license issuance. While the population monitoring studies below Santee dam prescribed by both Interior and NMFS may find that this schedule would be appropriate, we conclude that the studies should first be completed, to determine if adequate numbers of fish are available for transport, before a set schedule for construction is required. Interior prescribes a range of years (6 to 8 years after license issuance) as the

target period for installation of the trap and sort facility, depending on the results of the population monitoring, which is a more reasonable timetable for development. Although specific design criteria for a trap and sort facility would be required, we also conclude that it is premature to prescribe those criteria before knowing the extent of the target fish populations. We recommend that the final design criteria for the trap and sort facility be completed in consultation with the state and federal agencies once the target fish population is known.

- NMFS also requires that a permanent fish lift with specific design criteria be constructed at Santee dam by year 10 of the license, or within 2 years of the trap and sort facility reaching its capacity, whichever is earlier. As with the trap and sort facility, we do not recommend a set schedule for construction of the permanent fish lift (10 years after license issuance); rather it should be based on when the trap and sort facility reaches its capacity. If the target fish populations do not increase significantly by year 10, under the NMFS prescription a permanent fish lift would still be required. As above, we recommend that the final design criteria for the permanent fish lift be completed in consultation with the state and federal agencies once the target fish population is known.
- NMFS prescribes the design and schedule for installation of downstream passage facilities at both the Santee and Pinopolis developments (within 3 years of license issuance), without the benefit of downstream passage evaluation studies, which would identify if there is a need for downstream passage facilities (high entrainment mortality) and where the greatest need for passage would be. We conclude that prescribing the specific design and schedule for these facilities is premature, and recommend the phased approach of the Interior prescription, which requires downstream passage evaluation studies prior to making a decision on the need for and design of downstream passage facilities.

We cannot make a direct comparison of the estimated costs for the Interior and NMFS prescriptions, because Interior does not prescribe specific design criteria for potential future facilities (particularly downstream passage facilities), and even though NMFS provides more specific criteria, there are still unknowns about what may actually be built. The costs for future facilities would likely range widely depending on the actual facilities constructed. SCPSA estimated costs ranging from \$33,850,000 for the FSA/Interior fish passage measures to \$54,800,000 for the NMFS prescribed facilities. We estimate a total cost of \$47,575,000 for all prescribed facilities, for those facilities where we can make general assumptions about what might be constructed. NMFS, in its modified prescription filed July 20, 2007, stipulates that its prescription would likely be more costly than other alternatives, although it did not estimate the difference. We conclude that all the alternative fish passage facilities would be high-cost measures for the project, with the NMFS prescribed facilities probably the highest cost, because NMFS

requires that those facilities be constructed on a set timetable not dependent on study results, with no option to modify designs to less expensive alternatives.

### **Manatee Exclusion Devices at Pinopolis Lock**

In its comments on the draft EIS, SCPSA indicates that it has (a) installed manatee exclusion devices at Pinopolis lock, and (b) modified lock operations when manatees are present in the chamber. SCPSA also proposes to prepare a management plan for the manatee. Currently, SCPSA works cooperatively with SCDNR to address issues associated with manatees in the lock. We conclude the proposed measures, including maintenance of exclusion devices and a formalized plan to protect manatees at the project, are warranted to improve survival of this federally listed species. We therefore recommend that manatee protection measures be required as a condition of any new license issued. We estimate that the capital cost for preparing a manatee protection plan would be \$25,000 with an annualized cost of \$2,200.

### **Shortnose Sturgeon Enhancement Plan**

The Santee River watershed supports a diverse coastal ecosystem. The Santee and Cooper rivers provide habitat, as well as serve as a migratory corridor, for numerous anadromous and catadromous fish species, including the shortnose sturgeon. Construction of the Santee Cooper Project, and the creation of Lakes Moultrie and Marion, altered the distribution of shortnose sturgeon, as has flow alterations, in the Santee and Cooper rivers. The Pinopolis and Santee dams currently hinder movement of sturgeon within the Santee River Basin. Existing upstream fish passage facilities at the Santee Cooper Project and the Corps' St. Stephens Project are not designed to attract or pass bottom-oriented species such as shortnose sturgeon. Moreover, neither the Santee nor Pinopolis dams are equipped with downstream fish passage facilities. Flow management associated with the operation of the Santee Cooper and St. Stephen projects affect the amount, quality, and distribution of sturgeon habitat in the Santee and Cooper rivers.

The FSA includes, and NMFS recommends, that SCPSA develop and implement a shortnose sturgeon enhancement plan. We recommend adopting such a plan as part of any new license issued for the project. The plan should address the need to monitor, evaluate, and manage instream flows to enhance sturgeon in the Santee and Cooper rivers during the license term. The plan should also have the goal of improving passage, as well as reducing entrainment and mortality, of the species. The plan should be developed in consultation with NMFS, FWS, and SCDNR. Such consultation would help ensure that the goals and objectives of the Shortnose Sturgeon Recovery Plan (NMFS, 1998) are accounted for in the planning process and any decisions made, relative the Santee Cooper Project, to facilitate the management and recovering of the species in the Santee and Cooper rivers. In addition, developing this plan in consultation with the agencies would allow SCPSA to identify priorities that could include Priority 1 recommendations from the Recovery Plan. Addressing these recommendations as part of SCPSA's plan would

assist in the recovery of shortnose sturgeon in the Santee and Cooper rivers. The cost to develop this plan is estimated to be about \$15,000, and we assume implementation of the plan to be included in the overall cost of fish passage measures.

### **Nuisance and Invasive Plant Management Plan**

FWS recommends a plan and the FSA includes measures to manage nuisance and invasive aquatic plant species adjacent to or encroaching into the Santee NWR. Historic efforts of the subcommittee of the South Carolina Aquatic Plant Management Council have been successful in controlling Hydrilla. This has been achieved through use of grass carp and aquatic habitat improvement efforts. Large amounts of water hyacinth have been reported in the northern section of Lake Marion in the past, which has hampered efforts to pump water from the lake into the Santee NWR. Although maintenance efforts have improved water transfer, controlling nuisance vegetation along the border of the Santee NWR would have additional benefits beyond water transfer, such as allowing for the re-colonization of native species. Furthermore, early detection of and response to new occurrences of invasive and/or potentially invasive aquatic plants in the project area would be beneficial in preventing these species from overtaking areas currently populated by native vegetation.

We recommend that SCPSA, in consultation with other members of the Aquatic Plant Management Council subcommittee, develop a nuisance and invasive plant management plan, incorporating elements of existing management strategies and monitoring to ensure that efforts to further reduce the presence of *Hydrilla* and water hyacinth within project waters. Because management strategies are currently being implemented, we expect this effort would have a nominal cost of \$25,000, and annual cost of \$10,000, resulting in an annualized cost of \$12,600.

### **Recreation Plan and Facilities**

There are multiple private, commercial, and public recreation sites at the Santee Cooper Project that provide facilities such as fishing piers, boat launches, swimming areas, scenic overlooks, playgrounds, picnic areas, and camping. The Santee Cooper region supports more than 3 million visitor days each year. It appears that most project-related public recreation sites are able to accommodate current levels of recreational use experiencing between 50 and 70 percent capacity, on average.

SCPSA proposes to provide an additional classroom at Old Santee Canal Park; provide additional picnic shelters and paved parking at Overton Park; construct a two-lane boat launch at Richard Landing at White Point (currently under construction); and install aluminum mooring piers at Thornley (including any required excavation), Low Falls, Calhoun, and Biggins. In addition, SCPSA proposes to provide improved bank fishing access and parking on the Diversion canal, below Santee dam, and at the Duck Pond Access off Highway 6. SCPSA also proposes upgrading several existing boat landings to facilitate deep water access, including maintenance excavation activities. SCPSA also has proposed enhancing channel markers on Lake Marion.

SCDNR and Interior recommend several recreational improvements, in addition to those proposed by SCPSA, including the following: (a) improved bank fishing access and parking in the Pinopolis station tailrace and the Old Highway 301 causeway and bridge; (b) an additional boat navigation channel across Lake Marion; and (c) a periodic update, in consultation with appropriate state and federal agencies, of a project Recreation Management Plan (RMP).

FWS recommends and the FSA proposes to mark and snag a navigation channel through Jack's Creek to minimize disturbances to migratory waterfowl caused by boater traffic in Steven's Creek. It is not certain whether a new navigation channel through Jack's Creek would reduce boater traffic in Steven's Creek because it may still be used by boaters as a "shortcut", as noted by FWS. However, we do recommend this measure due to the potential for a low cost enhancement to reduce the disturbance of waterfowl in Steven's Creek and adjacent Santee NWR.

The population of the five-county region, known as Santee Cooper Country, has grown 11.1 percent from 1990 to 2000 and is projected to grow another 21.66 percent by the year 2025. If participation in recreation increases at the same rate, one can expect to see increased demand for recreation sites in the future. Therefore, we recommend all the recreation measures described above, with the exception of SCDNR's recommendation for an additional navigation channel across Lake Marion. The SCDNR provided no details on the need for the boat channel, nor provided any design information. Thus, there is insufficient information in the record for staff to make a recommendation for this measure. Adopting the remaining measures would provide enhanced recreational opportunities with minimal additional cost. In addition, through use of Form 80 monitoring of facility usage, the need for additional facilities in the future would be evident should overuse appear to be an issue.

Because the additional boat launch at Richards Landing proposed by SCPSA was under development in 2003 and is now complete, we have not included the costs for this facility in this FEIS. We estimate the cost to construct the proposed mooring piers at several locations to be \$375,000, with annual operations and maintenance costs of \$8,000, for total annualized costs of \$40,700. We estimate the cost of the SCPSA-proposed recreational enhancements of an additional classroom at Old Santee Park, picnic shelters, and paved parking at Overton Park to have a construction cost of \$100,000, and O&M cost of \$5,000, for a total annualized cost of \$13,700. Our estimated cost to provide improved bank fishing access and parking, reflective markings and/or lights marking the navigation channel across Lake Marion, and a new navigation channel in Jack's Creek is \$125,000 with O&M cost of \$5,000, resulting in an annualized cost of \$15,900.

Planning for future recreational needs (including the type of facilities appropriate to meet usage needs) is not specifically addressed by any existing SCPSA management documents, including the CLMP. However, lands that can potentially be developed for future recreation sites are classified in the CLMP. Moreover, the South Carolina SCORP

does not specifically address future recreation needs at the Santee Cooper Project. The southeast region has and continues to experience increasing development pressure, particularly at lakes where significant shoreline development potential exists. As other lakes become more developed and overcrowded, people will begin to seek alternate locations for development and recreation. A RMP, as recommended by SCDNR, would provide a method for monitoring public access needs over time and, in coordination with required FERC Form 80 filings, would provide a mechanism to address trends in use, multiple types of use (e.g., camping, swimming, sightseeing, boating, fishing, etc.), population growth, development, and the need to manage future congestion. The results could be used to identify and plan for future access and facility needs. FERC Form 80 forms are updated every 6 years, thus would provide a more frequent reporting period than the 10-year plan recommended by SCDNR.

Although the SCDWRM and USCG are responsible for the enforcement of boating regulations on the lake, a Recreation Management Plan would compliment SCPSA's Lake Zoning and Public Safety Plan. The plan would provide a means for utilizing this information to manage access to the lake and the river such that future development is located in appropriate areas and at appropriate levels. Thus, we recommend development of a Recreation Management Plan, to be updated in concert with FERC Form 80 reporting efforts (i.e. every 6 years), to manage for future recreational use and demand at the project. We estimate the cost of developing the plan to be \$25,000, with annual O&M costs of \$5,000 for existing facilities, resulting in an annualized cost of \$7,200.

### **Comprehensive Land Management Plan and Shoreline Management Plan**

SCPSA currently uses several documents to guide its land use management decisions for project lands, which are part of the existing CLMP. The component documents of the CLMP define land use categories, identify land use issues, publicly accessible recreation areas and boat launch sites, and outline the general land use permitting policies. In addition, certain land use categories are protected by more specific guidance including: Natural Area Management Plan; Forest Management Plan; Shoreline Erosion Control Plan; Lakes Zoning Plan; and the Santee Cooper Lakes Boating Access Facilities Master Plan.

The SCDNR recommends that a comprehensive SMP be updated every ten years. Among the CLMP and its associated documents, only the Shoreline Erosion Control Plan includes a reference to a review and, if necessary, revision of the plan every five years. Though many of the measures typically included under a SMP are contained within SCPSA's existing CLMP, additional components could be incorporated to further protect project resources. These include guidelines to address provisions for future recreational needs, management of areas identified as culturally sensitive (through the development of the HPMP discussed below) and the plant species discussed in section 3.3.5, *Threatened and Endangered Species*. The revised CLMP should also include components to address management planning for the protection of potential habitat that may be utilized by RTE

species within the project boundary, including the red cockaded woodpecker, bald eagle, wood stork, spotted turtle. The revised CLMP could also govern management of Persanti Island and Polly-Cantey Bay as Natural Areas, to restrict development, dredging or excavation, enhance wildlife habitat, prevent erosion, and limit human-caused degradation. Outreach programs could also be incorporated to provide for public education to actively inform the public of how and where project resources may be used and manage public access.

As discussed in section 3.0 of this FEIS, issues relating to the need for coordinated management of shoreline use and habitat protection exist at the project. Over the past several years it has become evident that other lakes in the southeast region are experiencing increased development pressure. More than one-half of project lands are designated as Forest Management, over one-fifth of the project lands are designated Natural Areas, and nearly ten percent of project lands are designated Recreation (actual and proposed) Areas. As a result, more than 83 percent of project lands are either undeveloped or minimally developed.

While we applaud SCPSA's efforts to manage project lands to address ongoing development, regional trends suggest a need for proactive management in the future. Therefore, we recommend revisions to the CLMP that would incorporate the type of programs described above and that do not currently exist under the CLMP. Because many of the programs typical to SMPs are currently in place, it would be a minor effort to incorporate the plans and other programs outlined above into the existing CLMP. We also recommend that the revised CLMP include 10-year updates of the various components of the plans it encapsulates. A provision for 10-year updates would provide for an adaptive land use management program that would continue to address land used demands within the project boundary while maintaining necessary protective measures for ecological resources at the project. We estimate a cost of \$30,000 to revise the CLMP, including the development of the new provisions identified above, with an annual cost of \$110,000 to administer the plan. This would result in a total annualized cost for the CLMP of \$112,600.

### **Santee NWR Improvements**

The FSA lists 12 provisions for improvements to the Santee NWR including: (1) repairing the Timber Island Field pump motor; (2) servicing seven motor pumps; (3) providing 3,000 gallons of fuel for pumping needs; (4) clearing a navigation channel at Jack's Creek; (5) aquatic nuisance weed control measures; (6) removing vegetation from the exterior canal and interior dikes of Timber Island Field; (7) implementing erosion control measures along Shuler's Point and the southern tip of 100-acre Island; (8) placing large woody debris in deep water for fish habitat; (9) supporting moist soil impoundment irrigation options on the Bluff and Cuddo Units; (10) expanding an observation platform on Wrights Bluff nature trail; (11) reducing density of 40 acres of pine/hardwood habitat on Pine Island Unit; and (12) removing invasive species on the Bluff Unit.

All of these measures, except for items 9 and 10, appear to be associated with maintenance of habitat on the NWR, which is partially located on project lands or waters. The FSA provides no detail or discussion on the recommendation for soil irrigation options on the Bluff and Cuddo Units (item 9) and the provision for a White's Bluff observation structure (item 10). Therefore, there is insufficient information in the record for staff to determine whether there is a nexus to the project or assess why the measures are needed. The Commission must ensure that its decisions on settlements are supported by substantial evidence. Settling parties must demonstrate how a condition is related to project purposes or to project effects. The parties must provide support for each settlement item, showing a nexus between the proposal and the impacts of the project, as well as to project purposes, and also explain how the proposal would accomplish its stated purpose. We are not recommending these two measures, but note that the settling parties are also free to enter into an off-license or "side" agreement for these measures.

The aquatic nuisance weed control measures are considered under the aquatic plant management plan proposed by SCPSA. We recommend that these measures (except items 9 and 10) be included as conditions of the license. Because many of these measures have already been implemented by SCPSA, the additional cost for these measures would be minor.

### **Programmatic Agreement and Historic Properties Management Plan**

SCPSA proposes to manage historic properties by implementing a PA among the Commission, the SHPO, and the Advisory Council. Implementation of the PA would be accomplished through the development of a HPMP for the management of historic properties within the Santee Cooper Project boundary. The PA would also include procedures for the interim management of historic properties at the project during the period between the issuance of a new license and the approval of the HPMP.

Implementing a PA, including development and implementation of an HPMP, would obligate SCPSA to consider the effects on historic properties when evaluating additional developments at the project proposed either by SCPSA or requested through the land management permitting process. The HPMP would provide operational guidance to SCPSA staff in implementing the requirements of the PA. The inclusion of a monitoring program in the HPMP, as recommended by the SHPO, would have a beneficial effect upon archaeological sites by identifying threats and appropriate protective measures on a regular schedule. Therefore, we recommend implementing a PA, including development of a HPMP, developed in coordination with the Recreation Management Plan and SMP, as part of any new license issued for the project. We estimate the cost to develop and implement the PA and HPMP to be \$20,000, resulting in an annualized cost of \$1,700.

## 5.2 RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

### Recommendations Pursuant to Section 10(j) of the FPA

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. Moreover, section 10(j) states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission's REA notice, issued March 3, 2006, Interior, FWS, NMFS, and SCDNR filed letters providing comments, as well as recommendations, for the Santee Cooper Project, pursuant to section 10(j).<sup>39</sup> Subsequently, SCDNR and FWS became signatory parties of the FSA, which resolves recommendations pertaining to fish passage and instream flows. By letter filed July 20, 2007, NMFS filed modified 10(j) recommendations that include: (1) instream flows for the Santee River; (2) an adaptive monitoring and evaluation program for instream flows; (3) an instream flow operations plan for the Jefferies Station (provides flows for the Cooper River); and (4) a shortnose sturgeon protection and recovery plan.

Table 21 lists the agencies' 10(j) recommendations. Table 21 also summarizes our analysis of those recommendations, including whether the recommendations are adopted under the staff alternative. We find that one measure recommended by FWS (modified rule curve for project reservoirs), and one measure recommended by NMFS (minimum flow releases at Santee dam) may conflict with the public interest and comprehensive planning standard of sections 4(e) and 10(a) of the FPA. We discuss these measures following table 21.

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<sup>39</sup>Interior, FWS, and SCDNR letters were filed May 8, 2006, and the NMFS letter was filed May 5, 2006.

Table 21. Analysis of fish and wildlife agency section 10(j) recommendations for the Santee Cooper Project. (Source: Staff)

	<b>Recommendation</b>	<b>Agency</b>	<b>Within the scope of 10(j)?</b>	<b>Total Annualized Cost (\$)</b>	<b>Staff Recommending?</b>
1	Modified rule curve to maintain full pond levels at Lake Marion in winter months	Interior, FWS	10(j)	\$395,000	No
2	Post licensing study of effects of winter drawdown on migratory waterfowl and recreational access	SCDNR	10(a)	\$2,615	No
3	Conduct water quality monitoring and remediation, as necessary, in Lake Marion and the Santee River	SCDNR, Interior	10(a)	\$21,800	Yes, in part. Monitoring downstream of Santee dam included as part of the adaptive management program
4	Increase instantaneous minimum flows from Santee dam to 5,000 cfs (for shortnose sturgeon) or 2,300 cfs (for diadromous fish) from Feb-April and 2,300 cfs for the remainder of the year.	NMFS	10(j)	\$3,344,300	No
5	Increase continuous minimum flows at Santee dam to 2,400 cfs (February-April) and 1,200 cfs (May-January)	Interior, FWS, SCDNR	10(j)	\$1,579,400	Yes, in agreement with FSA
6	Develop a drought contingency plan for the operation of the project during low inflows and/or drought	Interior, SCDNR, FWS, NMFS	10(j)	\$18,700	Yes, in agreement with FSA

	<b>Recommendation</b>	<b>Agency</b>	<b>Within the scope of 10(j)?</b>	<b>Total Annualized Cost (\$)</b>	<b>Staff Recommending?</b>
7	Form a Technical Advisory Committee for Instream Flows	FWS, SCDNR	10(j)	\$0	Yes, in agreement with FSA
8	Adaptive Management Program for instream flows (includes flow management team, flow monitoring and evaluating biological effectiveness of flows)	NMFS	10(j)	\$43,600	Yes, Staff recommends 10-year monitoring plan.
9	Flow operations plan for Jefferies Station	NMFS	10(j)	\$18,700	Yes, as part of overall monitoring plan
10	Flow and fish passage operations plan for St. Stephen	NMFS	10(a)	N/A	No, St. Stephen is not a project facility
11	Shortnose sturgeon protection plan which includes monitoring and evaluation of instream flows to protect sturgeon.	NMFS	10(j)	\$1,310	Yes
12	Protected species management plan. Develop and implement a red-cockaded woodpecker management plan for Persanti Island	Interior, SCDNR, FWS	10(j)	\$12,600	Yes
13	Provide improved bank fishing access and parking, and enhanced channel markers.	Interior, SCDNR	10(a)	\$15,900	Yes
14	Implement a recreation management plan, and update the plan every	SCDNR	10(a)	\$7,180	Yes, but we recommend updating plan

	<b>Recommendation</b>	<b>Agency</b>	<b>Within the scope of 10(j)?</b>	<b>Total Annualized Cost (\$)</b>	<b>Staff Recommending?</b>
	10 years				every 6 years
15	Revise the existing CLMP programs and update the plan every 10 years for the life of the license	SCDNR	10(a)	\$112,600	Yes

### Modified Rule Curve

We do not recommend adopting a modified rule curve for the project reservoirs as recommended by Interior, which would eliminate the current winter drawdown period and result in nearly full reservoir levels throughout the year. Although such a modified rule curve would provide permanent wetting of shoreline habitats through the year, there is no indication that the existing short winter drawdown of about 4 feet, which generally reaches its maximum in December, is adversely affecting shoreline resources. The shorelines of both lakes Marion and Moultrie have diverse wetland/riparian vegetation, and the lake fishery shows no signs of adverse effects due to lake drawdowns. Thus, there appears to be little biological basis for maintaining full lake levels year-round.

The modified rule curve recommended by Interior would require more water be spilled at the Santee dam, resulting in both a loss of energy generation at the Santee Cooper Project and reduction in the dependable peaking capacity at the Corp's St. Stephen Project. SCPSA estimates a potential energy loss of 6,557 MWh per year (valued at \$347,521 per year) at Santee Cooper. This type of operation would also reduce any flood storage capability for the project, potentially increasing flood flows in the lower Santee River during the spring runoff period. We conclude that the potential environmental benefits would not outweigh the cost of implementing Interior's recommended rule curve. For the above reasons, we make a preliminary determination that this recommendation is inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

### Minimum Flows at Santee Dam

We recommend adopting the minimum flow provisions at Santee dam which are included in the FSA, as discussed in section 5.1. Our recommendation differs from that recommended by the NMFS and other parties for a seasonal minimum flow in the Santee bypassed reach calculated as a percentage of inflow (with an absolute minimum of 1,600 cfs), after flows have been provided to the Cooper River and to St. Stephen during fish passage season. The FSA minimum flow would provide more stable continuous flows for the benefit of aquatic habitat and navigation in the Santee River bypass and is more easily achieved during periods of low inflow to the project, while resulting in less of an

impact on power generation at St. Stephen. Implementing NMFS's recommended flow would cost \$3,344,300/yr, while the FSA flow would cost \$1,579,400/yr, or about \$1,764,900 less. We conclude that the potential environmental benefits would not outweigh the cost of implementing NMFS's recommended flows. For the above reasons, we make a preliminary determination that this recommendation is inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

### **Recommendations Under Section 10(a) of the FPA**

Recommendations filed by the federal and state fish and wildlife agencies that we considered outside the scope of 10(j) have been considered under section 10(a) of the FPA. Table 21 identifies six measures which we considered under 10(a).

We do not recommend two 10(a) measures as follows:

#### Operations Plan for St. Stephens

NMFS recommends a flow and fish passage operations plan for St. Stephen on the Re-Diversion canal. NMFS recommends this plan for the coordinated operations of St. Stephen with the Santee Cooper Project for instream flows and fish passage. The St. Stephen Project, however, is owned by the Corps and is, therefore, outside of the Commission's jurisdiction. As such, the Commission will not require a flow and operations plan for St. Stephen.

#### Post-licensing Study on Effects of Winter Drawdown

SCDNR recommends a post-licensing study of the effects of the reservoir rule curve on waterfowl habitat and public recreational use of the resource. Based on information for the project area regarding the diversity of wetland types, plant communities, and hydrologic regimes, among others, we do not expect that continued operations under the proposed action, which would maintain the current reservoir rule curve, would adversely affect the wetlands and wildlife in the project area. Wetland-dependent wildlife species appear well-supported, and the number and variety of species inhabiting the area is indicative of a healthy wetland system. We estimate the cost of conducting such a study is about \$30,000, however, there is little basis for requiring such a study in a system that appears healthy under the proposed reservoir rule curve. We conclude that the potential environmental benefits would not outweigh the cost of conducting the study.

We recommend the remaining four 10(a) measures which are addressed in the specific resource sections of this document.

### 5.3 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires FERC to consider the extent to which a proposed project is consistent with existing federal and state comprehensive plans, as defined in Section 2.19 under Part 2 of Chapter 1, Title 18, Code of Federal Regulations. The following presents a current listing of Commission-approved comprehensive plans that may be applicable to the relicensing of the Santee Cooper Hydroelectric Project:

Atlantic States Marine Fisheries Commission. 1995. Interstate fishery management plan for Atlantic striped bass (Report No. 24). March 1995.

Atlantic States Marine Fisheries Commission. 1998. Interstate Fishery Management Plan for Atlantic Striped Bass (Report No. 34). January 1998.

Fish and Wildlife Service. No date. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp

Fish and Wildlife Service and Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. Department of the Interior. May 1986.

Fish and Wildlife Service, National Marine Fisheries Service, and South Carolina Department of Natural Resources. 2001. Santee-Cooper Basin Diadromous Fish Passage Restoration Plan. Charleston, South Carolina. August 28.

National Marine Fisheries Service. 1998. Fishery Management Report No. 31 of the Atlantic States Marine Fisheries Commission. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). July 1998.

National Marine Fisheries Service. 1998. Final Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.

National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission: Shad and River Herring [includes Alewife (*Alosa pseudoharengus*), Blueback Herring (*Alosa aestivalis*), Alabama Shad (*Alosa alabamae*), American Shad (*Alosa sapidissima*), and Hickory shad (*Alosa mediocris*)] – Amendment 1 to the Interstate Fishery Management Plan for Shad and River Herring. April 1999.

National Marine Fisheries Service. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for Shad and River Herring. February 9, 2000.

- National Marine Fisheries Service. 2000. Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fishery Management Plan for American Eel (*Anguilla rostrata*). Prepared by the American Eel Plan Development Team. April 2000.
- National Park Service. 1982. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C.; January 1982.
- South Carolina Department of Health and Environmental Control. 1985. Water Classifications and Standards, and Classified Waters. Columbia, South Carolina, June 1985.
- South Carolina Department of Health and Environmental Control. 1988. Statewide Water Quality Assessment, FY 1986-1987: A Report to Congress pursuant to Section 305(b) of the Clean Water Act. Columbia, South Carolina. May 1988.
- South Carolina Department of Health and Environmental Control, Bureau of Water Pollution Control. 1989. Assessment of non-point source pollution for the State of South Carolina. Columbia, South Carolina. April 1989.
- South Carolina Department of Health and Environmental Control. 1989. Non-point source management program for the State of South Carolina. Columbia, South Carolina. April 1989. 227 pp. South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management 2000. 2000. Charleston Harbor Special Area Management Plan. Charleston, South Carolina. February 2000.
- South Carolina Department of Natural Resources. 1998. South Carolina Water Plan. Columbia, SC. 1998.
- South Carolina Department of Parks, Recreation, & Tourism. 2002. South Carolina's Statewide Comprehensive Outdoor Recreation Plan (SCORP). Columbia, South Carolina. 2002.
- South Carolina Department of Parks, Recreation, & Tourism. 2002. The South Carolina State Trails Plan. Columbia, South Carolina. 2002.
- South Carolina Water Resources Commission. 1985. Instream Flow Study – Phase I: Identification and Priority Listing of Streams in South Carolina for Which Minimum Flow Levels Need to be Established. Report No. 149. Columbia, South Carolina. June 1985.
- South Carolina Water Resources Commission. 1988. Instream Flow Study – Phase II: Determination of Minimum Flow Standards to Protect Instream Uses in Priority Stream Segments. Report No. 163. Columbia, South Carolina. May 1988.

South Carolina Water Resources Commission and National Park Service. 1988. South Carolina Rivers Assessment. Columbia, South Carolina, May 1988.

South Carolina Wildlife and Marine Resources Department, Division of Wildlife and Freshwater Fisheries. 1989. South Carolina Instream Flow Studies: A Status Report. Columbia, South Carolina. June 1, 1989.

The continued operation of the Santee Cooper Project, as recommended in this FEIS, would comply with the 19 comprehensive plans listed above. One of the Commission-approved comprehensive plans, however, warrants further discussion. The Santee-Cooper Basin Diadromous Fish Passage Restoration Plan was jointly prepared by FWS, NMFS, and SCDNR, and submitted to the Commission for consideration as a comprehensive plan, where it was ultimately approved. SCPSA was not given the opportunity to review and comment on the plan prior to the agencies' submittal of the document to the Commission. As a result, SCPSA filed a letter with the Commission, on December 12, 2001, commenting on the restoration plan. In a January 6, 2004, meeting, the resource agencies indicated that the plan is considered a "living document" and that the agencies were looking forward to SCPSA's input into plan revisions/updates.