

Exhibit E-7 Rare, Threatened and Endangered Species

Rare, Threatened and Endangered Species
Study Plan

PARR HYDROELECTRIC PROJECT

(FERC No. 1894)

RARE, THREATENED AND ENDANGERED SPECIES STUDY PLAN

Prepared for:

**South Carolina Electric & Gas Company
Cayce, South Carolina**

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Fairfield Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1).

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as the licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGOs), and interested individuals. Collaboration and cooperation of stakeholders is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWCs), including members from among the interested stakeholders, with the objective of achieving consensus regarding the identification and proper treatment of these resource issues in the context of a new license.

In preparation for relicensing, SCE&G formed a Rare, Threatened and Endangered Species Technical Working Committee (“RT&E TWC” or “TWC”), which is comprised of interested stakeholders who are working with SCE&G to identify potential issues, make biological study recommendations, and provide technical and experience-based input related to rare, threatened and endangered (RT&E) species potentially residing in the Project area. SCE&G is planning to conduct a literature-based study to compile existing information on federally and state listed RT&E species in the immediate project area. SCE&G will use this information in developing their license application for Federal Energy Regulatory Commission (FERC).

2.0 STUDY OBJECTIVES

The objective of this study is to characterize the present status of RT&E species at the Parr Fairfield Hydroelectric Project by providing information regarding the availability of RT&E habitat and characterize the known status of RT&E species within the Project boundary and Project vicinity. The presence or absence of select species will be verified through targeted field studies, including the Rocky Shoals Spider Lily Study, the Spiny Crayfish Study, and the Monticello Mussel Study.

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

This study will focus on all areas within the FERC Project boundary, including Parr and Monticello reservoirs, the immediate vicinity of the Project in Fairfield and Newberry counties, and the area downstream of Parr Shoals Dam extending to and including Frost Shoals in Richland County. RT&E species that are deemed as potentially occurring within the Project Area and from Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island, along with the known presences of available RT&E habitat, will be evaluated. As this study is a desktop exercise, no field reconnaissance will be implemented. The study is scheduled to commence in 2015.

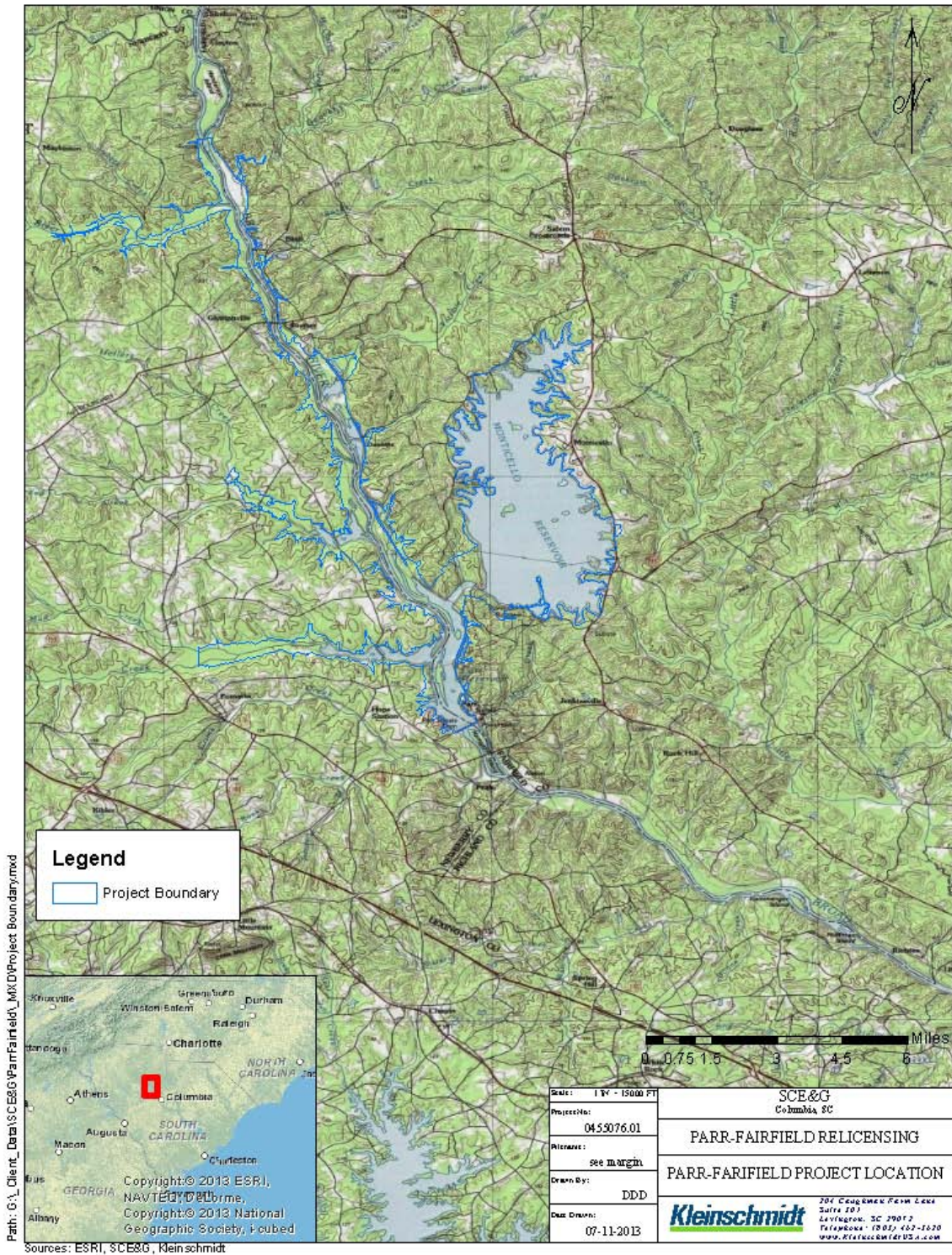


FIGURE 1 PARR-FAIRFIELD PROJECT LOCATION MAP

4.0 COLLECTION METHODS AND ANALYSIS

In order to appropriately characterize the present status of RT&E species in the Project vicinity, information will be collected from various sources, including the South Carolina Department of Natural Resources (SCDNR) and the U.S. Fish and Wildlife Service (USFWS) RT&E databases.

As an initial step, a list of RT&E species documented as occurring in the counties surrounding the Project and downstream (Newberry, Fairfield and Richland) will be compiled based on the USFWS and SCDNR county level listings. Additional key species may be added at the request of TWC members, if agreed to be appropriate. The federal, state and global status of each of these species will be summarized, along with counties of occurrence. As a second step, known ranges of these species, along with occurrence data from the SCDNR Natural Heritage Program and other survey data, will then be used to eliminate species occurring in the counties but not in the Broad River Basin. Habitat requirements of each of the remaining species will then be summarized and compared to available habitat within the Project boundary and the area downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island. This analysis will yield a list of species that potentially occur within the Broad River Basin, and that have suitable habitat within the Project Boundary and downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island.

5.0 SCHEDULE

Research and data collection efforts will begin no later than the spring of 2015. A final report summarizing the study findings including the compiled spreadsheets will be issued within 120 days of the completion of data collection. Study methodology and timing may be adjusted based on consultation with resource agencies and interested stakeholders.

6.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, USFWS, RT&E TWC and other relicensing stakeholders.

Exhibit E-7 Rare, Threatened and Endangered Species

Rare, Threatened and Endangered Species
Desktop Assessment

PARR HYDROELECTRIC PROJECT

FERC No. 1894

RARE, THREATENED AND ENDANGERED SPECIES DESKTOP ASSESSMENT

Prepared for:

**South Carolina Electric & Gas Company
Cayce, South Carolina**

Prepared by:

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December 2015
Revised September 2017

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FERC No. 1894**

**RARE, THREATENED AND ENDANGERED SPECIES DESKTOP ASSESSMENT
SOUTH CAROLINA ELECTRIC & GAS COMPANY**

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**PARR HYDROELECTRIC PROJECT
FERC No. 1894**

**RARE, THREATENED AND ENDANGERED SPECIES DESKTOP ASSESSMENT
SOUTH CAROLINA ELECTRIC & GAS COMPANY**

1.0 INTRODUCTION

The Parr Hydroelectric Project (Project) (FERC No. 1894) is located along the Broad River in Newberry and Fairfield counties, South Carolina and is owned and operated by South Carolina Electric & Gas Company (SCE&G). The Project consists of two developments, including the Parr Shoals Development and the Fairfield Pumped Storage Development. The Project location is depicted in Figure 2-1.

In preparation for relicensing, SCE&G consulted with local, state and Federal agencies and other interested stakeholders to identify potential impacts of Project operations on natural resources. A Rare, Threatened and Endangered Species Technical Working Committee (“RT&E TWC” or “TWC”) was formed and is comprised of representatives from the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), South Carolina Department of Natural Resources (SCDNR), South Carolina Department of Health and Environmental Control (SCDHEC), non-governmental organizations (NGOs), SCANA/SCE&G and other interested individuals. In addition to several field surveys for selected species, the TWC agreed upon a literature-based assessment to summarize the status of federally and state listed rare, threatened and endangered species (RT&E) occurring in the Parr Hydroelectric Project vicinity. As outlined in the RT&E Species Study Plan (Appendix A), the objective of this assessment was to identify those species potentially occurring in the Project vicinity, which includes habitats within the Project Boundary and in the downstream reach of the Broad River that is influenced by the Project (Richland County), based on review of occurrence data and habitat requirements. We also note that site-specific surveys are being conducted for American eel and Broad River spiny crayfish, and as such, only life history information is included for these species.

2.0 CONSULTATION HISTORY

During initial consultation, the USFWS provided county-level listings of RT&E species occurring in the two county regions surrounding the Project (Fairfield and Newberry counties; Appendix B). At the May 16, 2013 RT&E TWC meeting, the TWC discussed several species that should be addressed during relicensing (meeting notes are in Appendix C). SCDNR requested that the TWC add eight species to this analysis that are not state or federally-listed, but are considered state conservation priority species (Table 4-3). Based on a review of the initial draft of this report, two additional mussel species that are not state or federally listed but are state conservation priority species (yellow lampmussel and Roanoke slabshell) were also added to this analysis (Table 4-3). The TWC agreed that SCE&G would conduct a literature-based review to determine habitat requirements for each of these species and compare those requirements with typical habitat types known to occur in the study area for this report.

The RT&E TWC met again on October 22, 2013 to discuss the Rare, Threatened and Endangered Species Desktop Assessment Study Plan (study plan in Appendix A; meeting notes in Appendix C). At this meeting, the TWC agreed to extend the study area to include areas of the Broad River downstream of the Project Boundary. More specifically, they agreed that the study area would include habitats within the Project Boundary (Project Area) (Figure 2-1), as well as the reach of the Broad River from Parr Shoals Dam through Frost Shoals, near Boatwright Island (Figure 2-2). This area encompasses three counties in South Carolina: Newberry, Fairfield and Richland counties.

In addition, the USFWS revised their initial species list and included several Federal At-Risk species and several species of “Birds of Conservation Concern” for the southeast region (email dated August 24, 2015). We reviewed this list and updated this analysis to include all of the species requested by the USFWS.

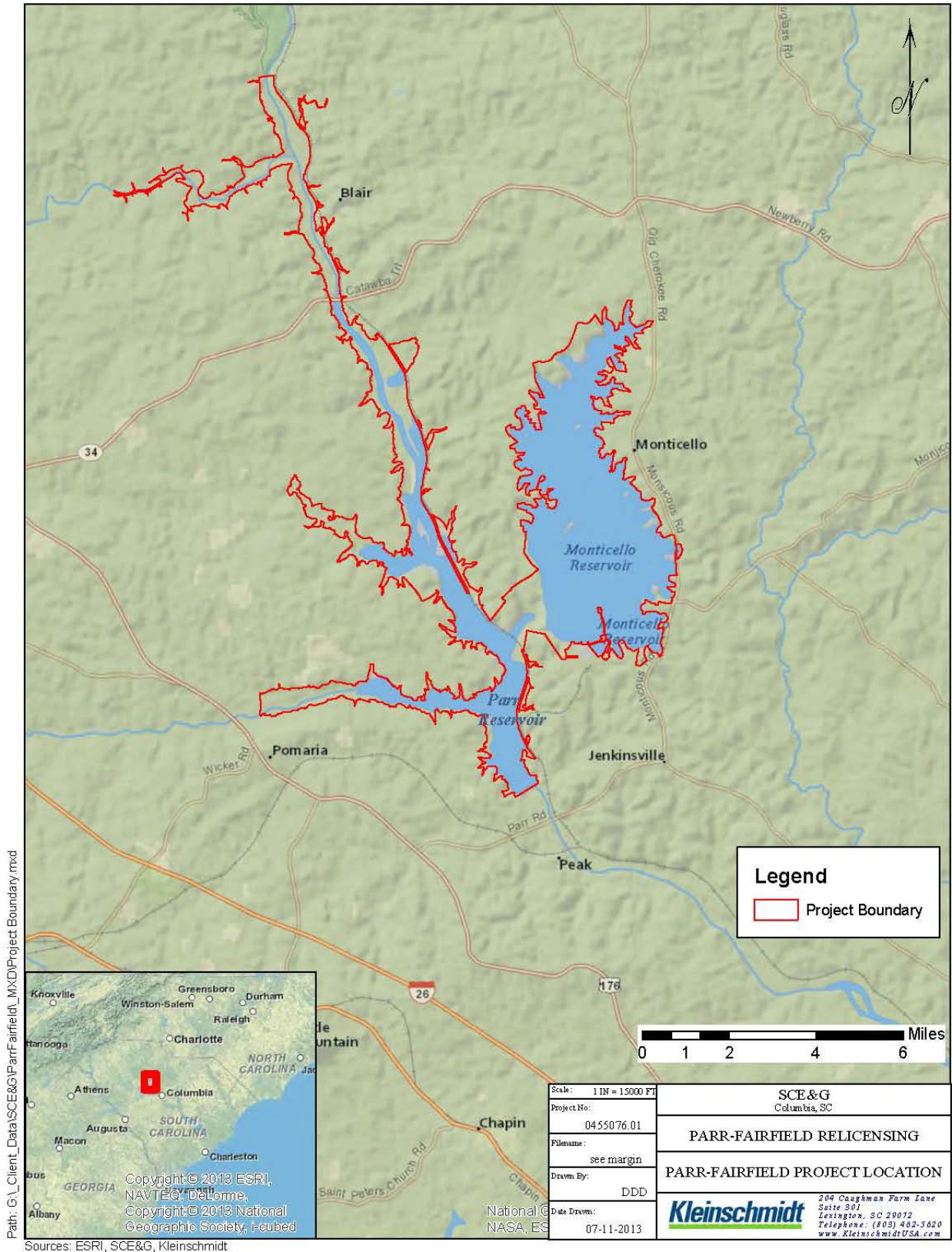
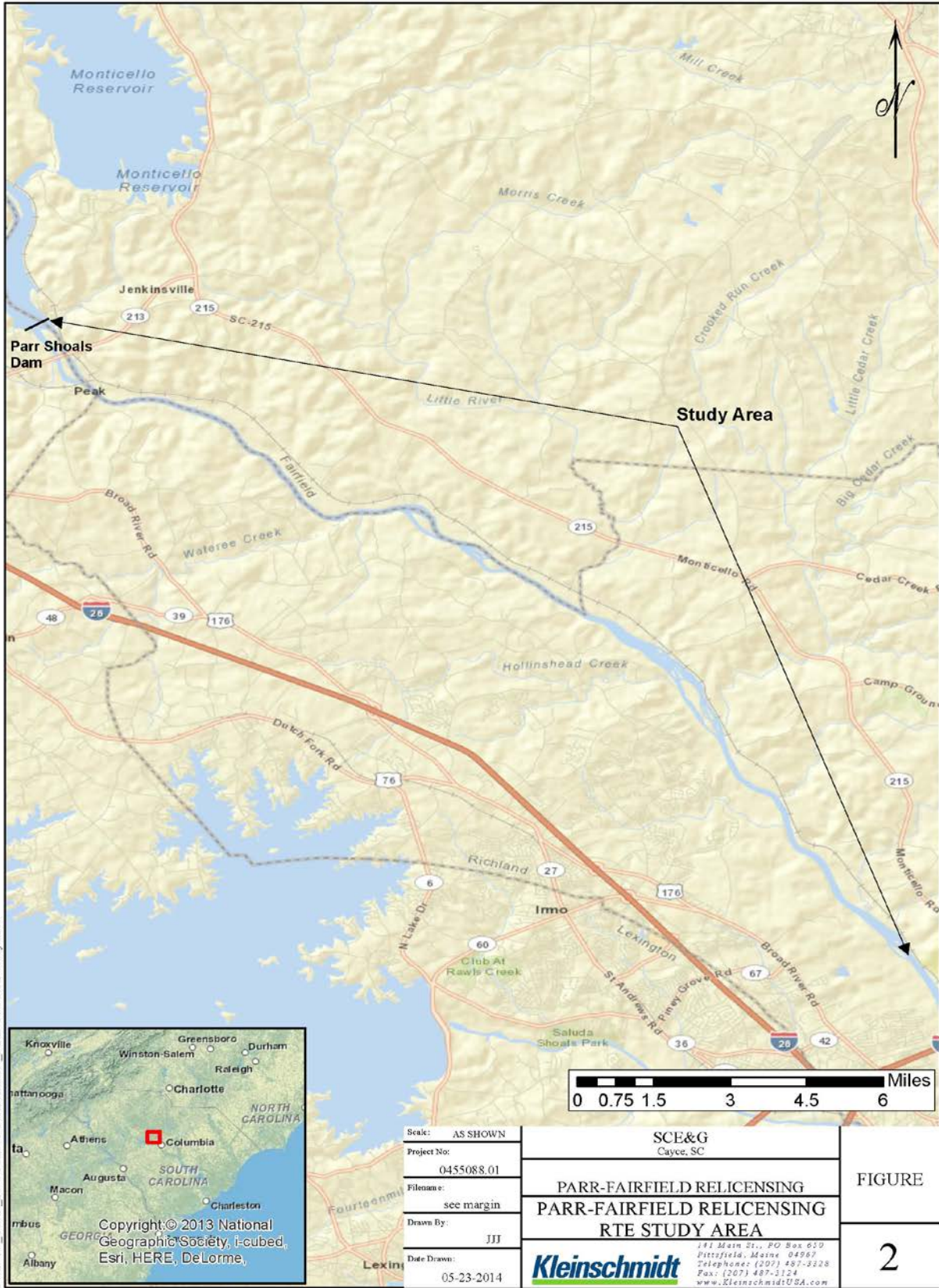


FIGURE 2-1 PARR HYDROELECTRIC PROJECT LOCATION MAP



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Scale:	AS SHOWN
Project No:	0455088.01
Filename:	see margin
Drawn By:	JJJ
Date Drawn:	05-23-2014

SCE&G Cayce, SC	
PARR-FAIRFIELD RELICENSING PARR-FAIRFIELD RELICENSING RTE STUDY AREA	
Kleinschmidt	
111 Main St., PO Box 610 Pittsfield, Maine 04967 Telephone: (207) 487-3228 Fax: (207) 487-3124 www.KleinschmidtUSA.com	

FIGURE
2

Source: ESRI, Kleinschmidt

FIGURE 2-2 DOWNSTREAM RT&E STUDY AREA

3.0 METHODOLOGY

As an initial step, the USFWS county-level listings for Newberry, Fairfield and Richland counties were reviewed to identify species potentially occurring in the study area that are federally listed as threatened or endangered under the US Endangered Species Act of 1972 (ESA), or are candidates for such listing. Additionally, at the request of USFWS, county-level listings for Newberry, Fairfield and Richland counties were reviewed to identify species potentially occurring in the study area that are considered at-risk species. USFWS also requested that a number of birds that are included on the 2008 Birds of Conservation Concern list be included for review. SCDNR county-level listings for the three counties were also reviewed to identify species that are state listed under the South Carolina Nongame and Endangered Species Conservation Act of 1974. Bald eagle, which was removed from the federal endangered species list in 2007, was included in the assessment because of its continued protection under the Bald and Golden Eagle Protection Act of 1938. As previously noted, ten species that are considered priority species in the SCDNR's State Wildlife Action Plan (SCDNR 2015), and are documented as occurring in the three counties of interest, were also added to the analysis (Table 4-3). Known ranges, life history and habitat requirements for each of these species were then summarized and compared to conditions occurring in the study area to determine the potential for occurrence and to identify potential Project effects.

4.0 SPECIES DESCRIPTIONS AND ANALYSIS

4.1 FEDERALLY LISTED SPECIES – THREATENED OR ENDANGERED

Ten species that are federally listed as threatened or endangered, or are candidates for such listing, are included on the USFWS county-level listings for the three counties of interest (Table 4-1). None of the federally listed species on Table 4-1 have critical habitat designated in the study area. Life history information and habitat requirements for these species, as well as their status within the study area and potential to be affected by continued operation of the Project, are summarized below.

TABLE 4-1 FEDERALLY LISTED AND CANDIDATE SPECIES OCCURRING IN RICHLAND, FAIRFIELD, AND NEWBERRY COUNTIES, SOUTH CAROLINA (SOURCE: USFWS 2013A)

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS ¹	STATE STATUS ²	COUNTIES
Birds				
Bald eagle	<i>Haliaeetus leucocephalus</i>	P	T	Newberry, Fairfield, Richland
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	E	Richland
Wood stork	<i>Mycteria americana</i>	T	E	Newberry, Richland
Fish				
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	E	E	Richland
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	E	E	Richland
Mammals				
Northern long-eared bat	<i>Myotis septentrionalis</i>	T		
Invertebrates				
Carolina heelsplitter	<i>Lasmigona decorata</i>	E		Newberry, Fairfield, Richland
Plants				
Canby's dropwort	<i>Oxypolis canbyi</i>	E		Richland
Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E		Richland
Smooth coneflower	<i>Echinacea laevigata</i>	E		Richland

¹ Federal Status – E (listed as Endangered under ESA); T (listed as Threatened under ESA); C (Candidate for Federal listing); SC (Federal Species of Concern); P (Federally protected).

² State Status – E (state listed as endangered); T (state listed as threatened)

4.1.1 BALD EAGLE

The bald eagle was removed from the federal list of threatened species in 2007 (USFWS 2007a) but remains protected as a state endangered species under the South Carolina Nongame and Endangered Species Conservation Act, and federally under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (16 U.S.C.668-668d) (72 FR 37345-37372). Bald eagles are found throughout North America, typically around water bodies, where they feed primarily on fish and carrion. Studies suggest that reservoirs, especially those associated with hydroelectric facilities, are particularly attractive to foraging bald eagles (Brown 1996). Eagles nest in large trees near water and typically repair and use the same nest for several years, (Degraaf and Rudis 1986). In South Carolina, the distribution of eagle nesting has expanded from the coast to encompass more inland areas. This expansion has been attributed to the construction of approximately 491,000 acres of large reservoirs in the state since the early 1900s (Wilde et al. 2003). In South Carolina, the number of estimated nesting pairs has increased from 13 in 1977 to 181 in 2003 (Wilde et al. 2003).

Status in the Study Area

Bald eagles are commonly observed in the study area (SCE&G 2010), with Monticello and Parr reservoirs, as well as the lower Broad River, providing abundant foraging habitat.

Determination of Effect

Continued operation of the Project is not likely to result in negative effects on eagle foraging or nesting. SCE&G tracks bald eagle nesting in the Project Area and utilizes this information to minimize potential impacts of various shoreline management activities on eagle nests. Specifically, SCE&G refrains from issuing shoreline permits for activities within 660 ft of an active nest during the nesting season (September through May) and 330 ft during the non-nesting season. This policy is in adherence to the USFWS habitat guidelines for nesting bald eagles (USFWS 2007b). SCE&G also frequently consults with USFWS Ecological Services staff regarding proposed activities in the vicinity of known nests.

4.1.2 RED-COCKADED WOODPECKER

The red-cockaded woodpecker (RCW) is endemic to open, mature, and old growth pine ecosystems in the southeastern United States (USFWS 2003). Over 97% of the pre-colonial era RCW population has been eradicated, leaving only roughly 14,000 RCWs living in about 5,600 colonies scattered across eleven states, including South Carolina. RCW decline is generally attributed to a loss of suitable nesting and foraging habitats, including longleaf pine systems, due to logging, agriculture, fire suppression, and other factors (USFWS 2003). Suitable nesting habitat generally consists of open pine forests and savannahs with large, older pines and minimal hardwood midstory or overstory. Living trees, especially older trees that are susceptible to red-heart disease making them more easily excavated, provide the RCWs preferred nesting cavities. Suitable foraging habitat consists of open-canopy, mature pine forests with low densities of small pines, little midstory vegetation, limited hardwood overstory, and abundant bunchgrass and forb groundcover (USFWS 2003).

Status in the Study Area

There are no known reports of RCWs in areas surrounding the Project or along the lower Broad River. Further, there is no known longleaf pine savanna habitat in the study area.

Determination of Effect

Based on the lack of suitable habitat, it is very unlikely that this species occurs in the study area and thus would not be affected by continued operation of the Project.

4.1.3 WOOD STORK

The wood stork is a large, colonial wading bird and is the only stork species that breeds in the United States (USFWS 1996). It was federally listed as endangered in 1984, primarily due to loss of wetland habitat throughout its range, but recently its status has been changed from endangered to threatened due to significant population recovery (USFWS 2012b). It uses a variety of wetlands for nesting, feeding, and roosting. Nesting colonies (rookeries) in South Carolina are typically surrounded by extensive palustrine forested wetlands. Nests are usually located in the upper branches of large black gum or cypress trees, and several nests are typically located in

each tree. Like most wading birds, storks feed primarily on small fish. Shallow, open water is required for successful foraging, and depressions where fish become concentrated during periods of falling water levels are particularly attractive sites. Currently, nesting of the species in the United States is thought to be limited to the coastal plain of South Carolina, North Carolina, Georgia, and Florida (Murphy and Hand 2013), which is consistent with recent survey work that found no nesting on the adjacent Saluda Hydroelectric Project (Kleinschmidt 2005).

Status in the Study Area

Periodic foraging of wood storks has been documented in the adjacent Saluda River Basin (Kleinschmidt 2005). Shallow backwaters in the study area, particularly in the upper reaches of the Parr Reservoir, may provide foraging habitat for transient wood storks. Although habitat is present, wood stork use of these areas has not been documented.

Determination of Effect

Project operations are expected to result in no effects on wood storks or their habitat. In fact, fluctuating water levels in Parr Reservoir could enhance foraging habitat by periodically trapping fish in shallow pool areas.

4.1.4 ATLANTIC STURGEON

The Atlantic sturgeon is a large (up to 5.5m in length), long-lived (up to 60 years) anadromous species that was historically present in the Santee Basin at least as far inland as the fall line (Newcomb and Fuller 2001). The Carolina Distinct Population Segment of Atlantic sturgeon, which includes the Santee Basin population, is federally listed as endangered (77 FR 5914), primarily due to overharvesting for flesh and eggs (caviar) during the early to mid-20th Century, as well as habitat degradation and blockage of access to historical spawning grounds (NMFS1998a).

The Atlantic sturgeon is considered estuarine anadromous, spending most of its life in estuarine and ocean environments and undertaking spawning migrations into riverine systems during late-winter and spring months (NMFS 1998a; Marcy et al. 2005). Spawning typically occurs over hard bottoms of clay, rubble, or gravel, with flowing water and temperatures of 14 - 24°C. After

spawning, females typically return to estuarine environments within 4 to 6 weeks, while males may remain in the river through the fall. Juveniles of this species remain in the natal rivers for three to five years before migrating to the ocean (Marcy et al. 2005).

Status in the Study Area

Atlantic sturgeon were historically present at least as far inland as the fall line (Newcomb and Fuller 2001). Current upstream distribution in the Santee Basin is thought to be limited by the lack of passage for Atlantic sturgeon at the Santee Cooper Dams¹. This information indicates that this species does not occur in the Project study area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.1.5 SHORTNOSE STURGEON

The shortnose sturgeon is federally listed as endangered and is thought to have occurred historically in the reach of the Broad River encompassed by the Project (Welch 2000, Newcomb and Fuller 2001). Shortnose sturgeon are amphidromous (semi-anadromous) spending portions of their life cycle in low salinity estuaries and portions in freshwater rivers (NMFS 1998b; Kynard 1997; Buckley and Kynard 1985). Shortnose sturgeon begin migrating to spawning areas of inland riverine reaches in the spring (typically mid-February through March in South Carolina) when water temperatures rise above 9 °C (Kynard 1997, Hall et al. 1991). Shortnose sturgeon spawning has been documented in the Congaree River near the City of Columbia over substrates of sand, gravel and rock, at temperatures ranging from 9.7-15.6°C, and dissolved oxygen concentrations of 10.6-12.5 mg/L (Collins et al. 2003).

¹ Bill Post (SCDNR), personal communication, April 24, 2014.

Status in the Study Area

Population groups of shortnose sturgeon are known from downstream of the Santee-Cooper dams in the lower Santee and Cooper rivers (Collins et al. 2003). An additional dam-locked spawning population of shortnose sturgeon has been documented in the Santee-Cooper lakes (with Lake Marion and its tributaries harboring the most significant number of fish) and upstream in the Congaree River. Radio-telemetry studies have documented migration of shortnose sturgeon as far upstream on the Congaree as the Blossom Street Bridge adjacent to the City of Columbia (Finney et al. 2006). However, consultation with SCDNR Diadromous Fish Program staff suggests that this occurrence was based on a small number of observations (2 fish) and that their radiotelemetry data suggest that shortnose sturgeon activity is primarily limited to areas downstream of Granby Lock and Dam². Granby Lock and Dam is located approximately one mile downstream of the Blossom Street Bridge and approximately five miles downstream of the Columbia Hydroelectric Project Fishway (fishway). The fishway was designed to provide passage of blueback herring and American shad to historic spawning grounds in the Broad River downstream of Parr Shoals Dam and was intended to be “sturgeon friendly”. Shortnose sturgeon have not been documented upstream of the Blossom Street Bridge in recent history, nor have any been documented passing into the study area through the fishway since annual monitoring began in 2007. In August of 2015, the Water Quality, Fish, and Wildlife Resource Conservation Group (RCG) identified that peaking flows from the Project could impact spawning habitat for shortnose sturgeon downstream in the Congaree River. SCE&G is examining this issue and will include those results in the Determination of Effect for this species prior to filing the Final License Application.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species within the study area due to a likely lack of occurrence. It should be noted, however, that SCE&G is currently performing a study to determine if peaking flows from the Project influence a documented shortnose sturgeon spawning area downstream of the study area in the Congaree

² Bill Post (SCDNR), personal communication, April 24, 2014.

River. As previously noted, this Determination of Effect will be updated prior to issuance of the Final License Application, pending results of the aforementioned study.

4.1.6 NORTHERN LONG-EARED BAT

The northern long-eared bat is a species federally listed as threatened (USFWS 2015b). The full range of this species spans much of the eastern and north central United States as well as the majority of Canada. The main cause of their population decline is disease; specifically white-nose syndrome (USFWS 2015b). White-nose syndrome has spread rapidly since its first occurrence throughout the northeastern and midwestern United States.

Northern long-eared bats exhibit “delayed fertilization,” in which the female stores the male’s sperm after mating through the hibernation period (USFWS 2015b). In spring, after hibernation has ended, the stored sperm fertilizes a female’s egg. The females migrate south and roost in small communities of 30 to 60 bats (USFWS 2015b). The northern long-eared bat gives birth to one pup that is able to fly 18 to 21 days after birth. This bat hibernates in the winter in humid caves with a constant air temperature and spends summers roosting in trees and snags (USFWS 2015b). Males and non-reproductive females may roost in cooler areas such as caves.

Status in the Study Area

Until recently, the USFWS listed the following South Carolina counties within the range of the northern long-eared bat: Laurens, Anderson, Pickens, Greenville, Spartanburg, Oconee, Abbeville, Cherokee, Union, and York (USFWS 2015b). During the fall of 2016, the species was observed on the South Carolina coast in Beaufort County. In 2017, five additional northern long-eared bats were found in Charleston and Berkeley counties, South Carolina. The individuals collected in these counties included a lactating female and two juveniles, suggesting this species uses coastal areas to reproduce during the summer months (SCDNR 2017). While no northern long-eared bats have been identified in the Project area or its surrounding counties, the presence of hibernating (wintertime) northern long-eared bats in the upstate and breeding (summertime) northern long-eared bats along the coast suggest that the species could potentially occur in appropriate habitat within the midlands of South Carolina.

Determination of Effect

While day to day Project operations are unlikely to affect bat species, their winter hibernation caves, or their summer roosting trees, listed below are voluntary conservation measures suggested by the USFWS that may be taken into consideration by SCE&G to reduce impacts of activities on northern long-eared bats if populations or specific habitat are identified by the USFWS (USFWS 2016).

- Conduct tree removal activities outside of the northern long-eared bat pup season (June 1 to July 31) and/or the active season (April 1 to October 31). This will minimize impacts to pups at roosts not yet identified.
- Avoid clearing suitable spring staging and fall swarming habitat within a 5-mile radius of known or assumed northern long-eared bat hibernacula during the staging and swarming seasons (April 1 to May 15 and August 15 to November 14, respectively).
- Manage forests to ensure a continual supply of snags and other suitable maternity roost trees.
- Conduct prescribed burns outside of the pup season (June 1 to July 31) and/or the active season (April 1 to October 31). Avoid high-intensity burns (causing tree scorch higher than northern long-eared bat roosting heights) during the summer maternity season to minimize direct impacts to northern long-eared bat.
- Perform any bridge repair, retrofit, maintenance, and/or rehabilitation work outside of the northern long-eared bat active season (April 1 to October 31) in areas where northern long-eared bats are known to roost on high bridges or where such use is likely.
- Do not use military smoke and obscurants within forested suitable northern long-eared bat habitat during the pup season (June 1 to July 31) and/or the active season (April 1 to October 31).
- Minimize use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application.
- Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution by angling lights downward or via other light minimization measures.
- Participate in actions to manage and reduce the impacts of white-nose syndrome on northern long-eared bats. Actions needed to investigate and manage white-nose syndrome are described in a national plan the USFWS developed in coordination with other state and federal agencies.

4.1.7 CAROLINA HEELSPLITTER

The Carolina heelsplitter is the only South Carolina freshwater mussel currently listed as federally endangered (Price 2006). Although it was once found in large rivers and streams, the Carolina heelsplitter is now restricted to cool, clean, shallow, heavily shaded streams of moderate gradient. Stable streambanks and channels, with pool, riffle and run sequences, little or

no fine sediment, and periodic natural flooding, appear to be required for the Carolina heelsplitter.

Status in the Study Area

Carolina heelsplitter is known to occur in isolated populations distributed in the Savannah, Pee Dee, and Catawba drainages and is not known to occur in the Broad River Basin (Price 2006) or within the study area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.1.8 CANBY'S DROPWORT

Canby's dropwort is a perennial plant that grows in coastal plain habitats including wet meadows, wet pineland savannas, ditches, sloughs, and around the edges of cypress-pine ponds (USFWS 2010). The healthiest populations seem to occur in open bays or ponds, which are wet most of the year and have little or no canopy cover. Ideal soils for Canby's dropwort have a medium to high organic content and a high water table. They are also acidic, deep, and poorly drained.

Status in the Study Area

Canby's dropwort is a coastal plain species and thus would not be expected to occur in the portion of Richland County occupied by the study area. This assumption is consistent with result of surveys by Nelson (2006, 2007), which failed to document the species on the adjacent V.C. Summer Nuclear Station site.

Determination of Effect

Because Canby's dropwort is not expected to occur in the study area, continued operation of the Project would likely result in no effect on the species.

4.1.9 ROUGH-LEAF LOOSESTRIFE

Rough-leaf loosestrife generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil), on moist to seasonally saturated sands, and on shallow organic soils overlaying sand (NatureServe 2013). Rough-leaf loosestrife has also been found on deep peat in the low shrub community of large Carolina bays (shallow, elliptical, poorly drained depressions of unknown origin). The grass-shrub ecotone, where rough-leaf loosestrife is found, is fire-maintained, as are the adjacent plant communities (longleaf pine-scrub oak, savanna, flatwoods, and pocosin). Suppression of naturally occurring fire in these ecotones, results in shrubs increasing in density and height and expanding to eliminate the open edges required by this plant.

Status in the Study Area

The pine pocosin and Carolina bay environments required by this species do not occur in the Piedmont; therefore, rough-leaf loosestrife is extremely unlikely to occur in the study area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.1.10 SMOOTH CONEFLOWER

Smooth coneflower is typically found in open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium and calcium rich soils associated with amphibolite, dolomite or limestone (in Virginia), gabbro (in North Carolina and Virginia), diabase (in North Carolina and South Carolina), and marble (in South Carolina and Georgia) (USFWS 2012a). Smooth coneflower occurs in plant communities that have been described as xeric hardpan forests, diabase glades, or dolomite woodlands. Optimal sites are characterized by abundant sunlight and little competition in the herbaceous layer. Natural fires, as well as large herbivores, historically influenced the vegetation in this species' range. Many of

the herbs associated with smooth coneflower are also sun-loving species that depend on periodic disturbances to reduce the shade and competition of woody plants.

Status in the Study Area

The diabase glade habitat required by this species is not known to occur in areas around Monticello and Parr reservoirs or along the lower Broad River. Although no site-specific surveys have been performed, surveys by Nelson (2006, 2007) failed to document smooth coneflower on the adjacent V. C. Summer Nuclear Station Project area and concluded that appropriate habitat for the species does not occur on the site.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.2 FEDERALLY LISTED SPECIES – AT-RISK SPECIES

The USFWS lists an additional seventeen species as At-Risk Species for the three counties of interest (Table 4-2). Only life history information is included in this section for Broad River spiny crayfish and the American eel, since site-specific surveys are being performed. Rafinesque’s big-eared bat is not discussed in this section, as it is also a South Carolina state-listed species, and is discussed under section 4.3. The Newberry burrowing crayfish and the robust redhorse are state conservation priority species, and are discussed under section 4.4. Life history information and habitat requirements for the twelve remaining species, as well as their status within the study area and potential to be affected by continued operation of the Project, are summarized below.

TABLE 4-2 FEDERALLY LISTED AT-RISK SPECIES OCCURRING IN RICHLAND, FAIRFIELD, AND NEWBERRY COUNTIES, SOUTH CAROLINA

COMMON NAME	SCIENTIFIC NAME	COUNTIES
Amphibians		
Chamberlain’s dwarf salamander	<i>Eurycea chamberlaini</i>	Richland
Crustaceans		
Broad River spiny crayfish	<i>Cambarus spicatus</i>	Fairfield, Richland

COMMON NAME	SCIENTIFIC NAME	COUNTIES
Newberry burrowing crayfish	<i>Distocambarus youngineri</i>	Newberry
Fish		
American eel	<i>Anguilla rostrata</i>	Newberry, Fairfield, Richland
Blueback herring	<i>Alosa aestivalis</i>	Newberry, Fairfield, Richland
Robust redhorse	<i>Moxostoma robustum</i>	Richland
Mammals		
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	Richland
Tri-colored bat	<i>Perimyotis subflavus</i>	Newberry, Fairfield, Richland
Mollusks		
Savannah lilliput	<i>Toxolasma pullus</i>	Newberry, Richland
Plants		
Bog spicebush	<i>Lindera subcoriacea</i>	Richland
Ciliate-leaf tickseed	<i>Coreopsis integrifolia</i>	Richland
Georgia aster	<i>Symphyotrichum georgianus</i>	Fairfield, Richland
Purple balduina	<i>Balduina atropurpurea</i>	Richland
Sandhills lily	<i>Lilium pyrophilum</i>	Richland
Spathulate seedbox	<i>Ludwigia spathulata</i>	Richland
Wire-leaved dropseed	<i>Sporobolus teretifolius</i>	Richland
Reptiles		
Southern hognose snake	<i>Heterdon simus</i>	Richland

4.2.1 CHAMBERLAIN'S DWARF SALAMANDER

Chamberlain's dwarf salamander is a distinct species similar to the more common dwarf salamander. Chamberlain's dwarf salamander varies from the more common species by being lighter in color, with a yellow underside that is void of markings. This species is very small, averaging approximately 2.5 cm in total length (SCDNR 2015).

Chamberlain's dwarf salamander deposits eggs in aquatic habitats and has aquatic larvae that inhabit wetlands until metamorphosis. It is usually found in wet areas, such as seepages near small streams and wetlands, under leaf litter and small debris (SCDNR 2015).

Status in the Study Area

Although Chamberlain's dwarf salamander is known to exist in Barnwell, Allendale and Pickens counties in South Carolina, little data exists on the population status of the species (SCDNR 2015). The full range of the species is not completely known.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because no significant changes are proposed for Project operations. Wetland and stream areas will not negatively change under continued Project operations.

4.2.2 BROAD RIVER SPINY CRAYFISH

The Broad River spiny crayfish distribution is thought to be limited to lotic environments in the Broad River drainage (Eversole 1990). Although collections are limited, Broad River spiny crayfish have been found in association with leaf litter and other organic debris located along stream banks, primarily over unstable sandy substrates that lack rooted aquatic vegetation. In the Project Vicinity, this species has been collected in the Little River, a tributary to the Broad River, in Fairfield County (Eversole 1990).

4.2.3 AMERICAN EEL

The American eel, *Anguilla rostrata*, is a catadromous species known to occur within river systems in South Carolina. Mature American eels spawn in the ocean and the egg and pre-larval stages mature into the leptocephalus stage, where they drift with ocean currents for approximately a year before metamorphosing into the glass eel stage. Glass eels migrate across the continental shelf, eventually entering estuaries and tidal rivers, where they mature into elvers. Elvers migrate primarily at night and are able to overcome obstacles that often times prevent passage of other aquatic species. Vertical obstacles, such as a dam, can be traversed by small eels as long as the surface of the structure is textured and remains wet. As the small eels continue to mature into yellow eels, they may gradually move upstream over many years, with the greatest movement occurring during the moderate water temperatures of spring and fall (ASMFC 2000).

Although the American eel currently does not have special status under state or federal regulations, it has been identified by the South Carolina Department of Natural Resources (SCDNR) as a priority species (SCDNR 2005). The federal status of this species has been further reviewed by the U.S. Fish and Wildlife Service and National Marine Fisheries Service several times over the past decade and the species is considered “at risk”. American eel are also listed as

a target species in the Columbia Fishway Prescription. Currently, an area potentially conducive to eel passage exists along the west corner of the Columbia Dam.

4.2.4 BLUEBACK HERRING

The blueback herring is a diadromous fish that ranges along the Atlantic Coast from Nova Scotia to Florida. It can be found in the Atlantic Ocean as well as coastal rivers and streams (SCDNR 2013). As a diadromous fish, the blueback herring spends its adult life at sea and migrates up freshwater rivers and streams to spawn. Spawning area spans the tidal zone to as far upstream as 100 miles (SCDNR 2013).

During spawning the female releases as many as 250,000 eggs in shoreline areas of hard substrate (SCDNR 2013). The eggs are then fertilized by the male. After the spawning season of April and May, adult blueback herring return to the ocean. Freshly hatched blueback herring remain in the rivers for several months before moving to sea (SCDNR 2013).

Status in the Study Area

Blueback herring are known to occur in watersheds throughout South Carolina, including the Santee River Basin, where the Project is located. Currently, blueback herring do not occur in the Project Vicinity, however the construction of the Columbia Hydroelectric Project Fishway, completed in 2006, allows for the possibility of this species to occur in the Project Vicinity within the term of the new license.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area. If blueback herring begin to use the Columbia Fishway to move upstream during the new Project license, SCE&G and USFWS will likely consult to determine potential impacts to the species.

4.2.5 TRI-COLORED BAT

The tri-colored bat is very small and exhibits delayed fertilization. In the spring, the female fertilizes an egg with stored sperm and gives birth in the fall to twins (NatureServe 2015l). The pups are able to fly within a month and remain with the mother for another week for foraging. Once young tri-colored bats learn how to forage for insects they leave their mothers and are independent (NatureServe 2015l).

This bat ranges throughout most of the eastern United States, southeastern Canada, and into eastern Mexico and Central America (NatureServe 2015l). Most tri-colored bats roost in trees during the summer and hibernate in cave, mines, and rock crevices during the winter (NatureServe 2015l).

Status in the Study Area

The tri-colored bat is considered common in South Carolina, and is found statewide (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because SCE&G does not plan to significantly change the Project shoreline uses. There are no known hibernation caves located within the Study Area and SCE&G does not plan to alter the shoreline classifications to accommodate extensive development.

4.2.6 SAVANNAH LILLIPUT

The Savannah lilliput, a freshwater mussel, is a long-term brooder, brooding in August with hybrid bluegill suitable as fish hosts (NatureServe 2015o). The Savannah lilliput tends to inhabit shallow water, usually at the edges of very shallow streams, rivers and lakes, and backwaters. This mussel is rarely found in deeper lake waters and tends to be found in mud or silty sand (NatureServe 2015o). It will move up and down as water levels fluctuate.

Historical records show the species living in the Ocmulgee and Altamaha Rivers in Georgia, Savannah River in South Carolina, Catawba River and Beaver Creek in North Carolina, Wateree River in South Carolina, University Lake (Cape Fear River system) in North Carolina, and Neuse River in North Carolina (NatureServe 2015o). Savannah lilliput is known to occur in Allendale, Calhoun, Clarendon, Orangeburg, and Saluda counties, South Carolina (NatureServe 2015o).

Status in the Study Area

Savannah lilliput has been found in the Saluda River Basin, in Lake Greenwood and in Cloud's Creek, and in the Savannah River. It has also been documented in the lower Congaree River, the upper Santee River, and upper Lake Marion (SCDNR 2015). The species has not been documented as occurring in the Broad River, or in Parr and Monticello reservoirs.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.2.7 BOG SPICEBUSH

The bog spicebush is a recently described multi-stemmed deciduous shrub that can grow up to 4 meters tall (USFS 2015). Tiny yellow-green flowers are produced in clusters of three to four during mid-March and small bright red fruits mature during late summer. Plants are often clonal and spread by suckering (USFS 2015).

Bog spicebush occurs throughout the southeast Coastal Plain, from southeastern Virginia through the sandhills of the Carolinas; to Georgia, the Florida Panhandle, and south Alabama; and in south Mississippi and southeastern Louisiana (NatureServe 2015j). The plant inhabits permanently moist to wet, shrub-dominated seepage wetlands, open, quaking bogs in pinelands, shrub thickets of seepages, typically near the heads of streams and along the banks of small braided streams. It is usually not found outside of the wettest portions of rare sphagnous bog habitats, on very acidic soils that are high in organic matter and permanently saturated (NatureServe 2015j).

Status in the Study Area

Bog spicebush has been documented in Aiken, Barnwell, Lexington, and Richland counties, although it may currently be extirpated in Richland County (NatureServe 2015j).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because SCE&G does not plan to significantly change Project operations or the Project shoreline uses. Currently wetland areas would stay in their current condition and any individuals would continue to exist there.

4.2.8 CILIATE-LEAF TICKSEED

The ciliate-leaf tickseed is a perennial herb with bright yellow ray flowers surrounding a purple-red disk (NatureServe 2015e). Blooming typically occurs from August through November, but occasionally occurs as early as July. Habitat for ciliate-leaf tickseed is generally described as forested wetlands (NatureServe 2015e). This species can be found along streambanks and floodplains of blackwater streams; edges of swamp forests bordering longleaf pinelands or bordering brackish marshes; moist sand banks and low flat floodplains of rivers and creeks; low, heavily wooded bluffs above rivers; wooded edge of parking area for boat ramp and edge of creek, surrounded by floodplain forest; in wet loam of shaded, roadside depressions; in moist, semi-shaded sandy loam along edge of mesic woods; and along forestry road adjacent to bottomland (NatureServe 2015e). Ciliate-leaf tickseed occurs from southeastern South Carolina south to the Panhandle of Florida.

Status in the Study Area

Historically, ciliate-leaf tickseed has been reported in only three counties in southeastern South Carolina, including Berkeley, Charleston and Horry counties (NatureServe 2015e).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of habitat in the study area for this species. SCE&G does not plan to significantly change Project operations or the Project shoreline uses, so any current wetland areas would remain in their current condition and provide marginal habitat for this species.

4.2.9 GEORGIA ASTER

Georgia aster habitat consists of dry, rocky woodlands, woodland borders, roadbanks, and powerline rights-of-way (Weakley 2012). It is thought to be a relict species of the post oak-savanna communities that existed in the southeast prior to fire suppression.

Status in the Study Area

Although no site-specific occurrence data are available for the study area, Nelson (2006, 2007) found no Georgia aster on the adjacent V.C. Summer Nuclear Station but concluded that suitable habitat exists on the site. Georgia aster is also known from several locations on the nearby Sumter National Forest (USDA 2010).

Determination of Effect

Habitat for Georgia aster may exist within the Project study area; however, potential occurrences would be limited to terrestrial sites, which should not be affected by continued operation of the Project.

4.2.10 PURPLE BALDUINA

Purple balduina is an autumn-blooming perennial herb with yellow ray flowers surrounding a dark purple disk (NatureServe 2015c). Habitat for the species is classified as spring brook, forested wetland, herbaceous wetland, scrub/shrub wetland, forest/woodland, savanna, and woodland-conifer. The plant is often associated with longleaf pine or slash pine and is found in wet pine flatwoods, savannahs, peaty hillside seepage bogs, and pitcherplant bogs (NatureServe 2015c).

Purple balduina is distributed in southeastern and southcentral Georgia and northeast Florida. It has also historically been found in southeast North Carolina and northcentral South Carolina (NatureServe 2015c).

Status in the Study Area

Purple balduina is listed as occurring in Richland County, South Carolina.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area. Further, SCE&G does not plan to significantly change Project operations or the Project shoreline uses. Wetland areas would stay in their current condition and any individuals would continue to exist there.

4.2.11 SANDHILLS LILY

Sandhills lily is a perennial herb with showy, pendant flowers that range in color from yellow to orange to dusky red and spotted with magenta (NatureServe 2015i). This plant flowers late July through mid-August and capsules mature in October. Habitat is almost exclusively restricted to narrow transition zones between dry longleaf pine uplands and wet, wooded creeks and streamheads (NatureServe 2015i). It can also occur on herb and shrub-dominated side slopes and floodplains in streamhead and small depression pocosins, sandhill seeps, Coastal Plain small stream swamps, and wet, maintained rights-of-way (NatureServe 2015i).

Sandhills lily ranges in distribution from southeastern Virginia to southcentral South Carolina, with most populations occurring in the Sandhills region on the interior Coastal Plain of southeastern North Carolina (NatureServe 2015i).

Status in the Study Area

Sandhills lily is known to occur in Chesterfield County, and possibly Richland County, in South Carolina (NatureServe 2015i). This species has not been documented within the Study Area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because SCE&G does not plan to significantly change Project operations or the Project shoreline uses.

4.2.12 SPATHULATE SEEDBOX

Spathulate seedbox is a perennial herb with soft-hairy herbage and prostrate, creeping stems that often intermingle, forming extensive mats (NatureServe 2015k). Small flowers, which lack true petals, emerge and last from June through October. This species is most likely self-pollinating and spreads vegetatively by rooting from the nodes of stems. Habitat includes bogs, forested wetlands, herbaceous wetlands, and riparian areas (NatureServe 2015k). Spathulate seedbox is often found along exposed shores and bottoms of sinkhole ponds, bogs and depression meadows. This species occurs in Georgia, Florida, Alabama, and South Carolina (NatureServe 2015k).

Status in the Study Area

Within South Carolina, this species is known to occur within Aiken, Barnwell, Lexington, Richland, and Saluda counties (NatureServe 2015k). There is a possibility this plant could occur downstream of Parr Shoals Dam, in Richland county.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because SCE&G does not plan to significantly change Project operations or the Project shoreline uses. Wetland areas would stay in their current condition and any individuals would continue to exist there.

4.2.13 WIRE-LEAVED DROPSEED

The wire-leaved dropseed is a densely tufted perennial grass that flowers from July through September (NatureServe 2015n). Habitat types include bog, forested wetland, herbaceous wetland, forest-conifer, forest/woodland, and savanna. Wire-leaved dropseed occurs in

southeastern North Carolina and northeastern South Carolina, south to southern Georgia, and west to extreme southeastern Alabama (NatureServe 2015n).

Status in the Study Area

The species occurs in six counties in South Carolina, including Horry, Georgetown, Lexington, Kershaw, Richland and Chesterfield (NatureServe 2015n).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because SCE&G does not plan to significantly change Project operations or the Project shoreline uses.

4.2.14 SOUTHERN HOGNOSE SNAKE

Southern hognose snake is stocky with dark blotches and a sharply upturned snout (NatureServe 2015g). Females mature at two-three years and lay clutches of six-ten eggs. Some individuals have been known to live well into their second decade, and generation length is approximately five to ten years. Southern hognose snake inhabits open, dry habitats, with well-drained, sandy, or sandy-loam soils, such as those occurring at sand ridges, stabilized coastal sand dunes, pine flatwoods, mixed oak-pine woodlands and forests, scrub oak woods, old fields and river floodplains (NatureServe 2015g). This snake spends a majority of its time burrowed in the soil.

Southern hognose snake occurs on the Coastal Plain from eastern North Carolina to southern Florida, west to southeastern Mississippi (NatureServe 2015g).

Status in the Study Area

The southern hognose snake occurs in many counties throughout South Carolina, including Richland County, downstream of the Project (NatureServe 2015g).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species even though it likely occurs in the study area. SCE&G does not plan to significantly change Project operations or the Project shoreline uses, therefore the current habitats of the Project should not change significantly.

4.3 STATE LISTED SPECIES

Three species that are state-listed as threatened or endangered are included on the SCDNR county-level listings for the three counties of interest (Table 4-3). Life history information and habitat requirements for these species, as well as their status within the study area and potential to be affected by continued operation of the Project, are summarized below.

TABLE 4-3 STATE-LISTED SPECIES OCCURRING IN RICHLAND, FAIRFIELD, AND NEWBERRY COUNTIES, SOUTH CAROLINA

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS¹	STATE STATUS²	COUNTIES
Amphibians				
Pine Barrens tree frog	<i>Hyla andersonii</i>		T	Richland
Mammals				
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	ARS	E	Richland
Fish				
Carolina darter	<i>Etheostoma collis</i>	SC	T	Fairfield, Richland

¹ Federal Status – E (listed as Endangered under ESA); T (listed as Threatened under ESA); C (Candidate for Federal listing); SC (Federal Species of Concern); P (Federally protected); ARS (At-risk species).

² State Status – E (state listed as endangered); T (state listed as threatened).

4.3.1 PINE BARRENS TREE FROG

The pine barrens tree frog inhabits the swamps, bogs, and acidic brownwater streams of the New Jersey Pine Barrens, as well as the pocosins (shrub bogs) of the Carolinas (Conant and Collins 1991). This species is intolerant of closed-canopy conditions and is restricted to localized

wetlands such as hillside seepage bogs within dry uplands, pine barrens, and headwater swamps and disperses along drainages within these areas (NatureServe 2013). Non-breeding habitat generally is in pine-oak areas adjacent to breeding habitat. Important egg-laying and larval habitats include open cedar swamps and sphagnaceous, shrubby, acidic, seepage bogs on hillsides below pine-oak ridges.

For southeastern populations, typical habitats are characterized by the topography, soils, and vegetation of the Carolina Sandhills, with pocosin or evergreen shrub swamps established along seeps and small streams within the surrounding longleaf pine-oak forest. Breeding habitat in South Carolina has been described as low vegetation with dense growth of Sphagnum mosses. Cely and Sorrow (1983) found that occurrences in South Carolina appeared to be restricted to the Fall Line Sandhills at elevations ranging between 61 and 122 m.

Status in Study Area

The area surrounding the Project lacks the Carolina sandhills habitat and associated bogs and pocosins required by this species; therefore it is extremely unlikely that Pine Barren tree frog would occur in the study area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.3.2 RAFINESQUE'S BIG-EARED BAT

Rafinesque's big-eared bat is a colonial bat species native to the southeastern U.S. Two subspecies are recognized in South Carolina, *Corynorhinus rafinesquii rafinesquii* in the mountains and *Corynorhinus rafinesquii macrotis* along the Coastal Plain (Bunch et al. 2006). Rafinesque's big-eared bat is nocturnal, feeding primarily on moths by echolocation. Coastal plain and sandhills populations of the species utilize I-beam and T-beam bridges for roosting. Roosting in mountainous regions of the state occurs in large hollow trees (typically large tulip poplars), abandoned buildings and mines, rock shelters, and caves. Habitat in the Blue Ridge Mountains includes rock outcrops, mesic and cove hardwood forests, forested bottomlands,

bottomland agricultural fields, dry deciduous forests, pine woodlands, and forested riparian areas. Coastal zone and sandhills habitats include black gum stands, bald cypress swap forests, maritime forests, and mature hardwood and mixed forests (Bunch et al. 2006).

Status in the Study Area

The range of Rafinesque's big-eared bat in South Carolina includes the coastal plain and sandhills regions and the extreme northwestern Blue Ridge, with the piedmont representing a gap in the species' distribution (Bunch et al. 2006). As such, it is extremely unlikely that this species would occur in the study area.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area and because it is a terrestrial species. SCE&G does not propose to make major changes to shoreline classifications or encourage development within the Project.

4.3.3 CAROLINA DARTER

The Carolina darter exists only in the Piedmont region from south-central Virginia through North Carolina into north-central South Carolina (Hayes and Bettinger 2006); it is state-listed as threatened and a federal species of concern. It occurs in small to moderately sized streams in areas of low current velocity, typically in backwaters among submerged tree roots or under leaves, where it feeds primarily on Chironomid larvae and micro-crustaceans. Preferred substrates are usually characterized by mud, sand, and sometimes bedrock (Rohde et al. 2009).

Status in the Study Area

The Carolina darter has been collected at several locations in the lower Broad River, including one that appears to be a tributary to Parr Reservoir (Rohde et al. 2009). However, extensive sampling by SCE&G and SCDNR in both Parr and Monticello reservoirs and in the downstream reach have failed to document this species (Kleinschmidt 2013a), suggesting that it may not occur in the study area or occurs in extremely low numbers not detected by previous sampling.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.4 SELECTED SOUTH CAROLINA CONSERVATION PRIORITY SPECIES

As previously noted, ten species that are considered state conservation priority species were also added to the analysis based on consultation with SCDNR and USFWS staff (Table 4-4). Life history information and habitat requirements for these species, as well as their status within the Project Vicinity and potential to be affected by continued operation of the Project, are summarized below.

TABLE 4-4 SELECTED STATE CONSERVATION PRIORITY SPECIES

COMMON NAME	SCIENTIFIC NAME	STATE PRIORITY LEVEL ¹	FEDERAL STATUS ²
Newberry burrowing crayfish	<i>Distocambarus youngineri</i>	Highest	ARS
Robust redhorse	<i>Moxostoma robustum</i>	Highest	ARS
Piedmont darter	<i>Percina crassa</i>	High	
Seagreen darter	<i>Etheostoma thalassinum</i>	High	
Highfin carpsucker	<i>Carpionodes velifer</i>	Highest	
Quillback	<i>Carpionodes cyprinus</i>	High	
Santee chub	<i>Hybopsis zanema</i>	High	
Striped bass	<i>Morone saxatilis</i>	Moderate	
Yellow lampmussel	<i>Lampsilis cariosa</i>	Highest	
Roakoke slabshell	<i>Elliptio roanokensis</i>	High	

¹ Refers to conservation priority level as listed in SCDNR's State Wildlife Action Plan (SCDNR 2015).

² ARS – At-Risk-Species. Refers to species that the USFWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted), yet no Federal protections currently exist.

4.4.1 NEWBERRY BURROWING CRAYFISH

The Newberry burrowing crayfish is a terrestrial crayfish of the genus *Distocambarus* and is endemic to South Carolina (Eversole and Welch 2006). Although knowledge of its habitat

requirements is limited, Newberry burrowing crayfish has typically been found in poorly drained areas where the ground is saturated during the rainy season (November – March) (Eversole and Welch 2006; Hobbs and Carlson 1985). The species has been documented from a range of site types including low, moist woodlands, a machine-maintained powerline, and a manicured lawn. Sites are generally isolated from floodplains and streams, although some have been found in low moist areas near the headwaters of streams (colluvial valleys). Analyses performed by Welch and Eversole (2002) found a close association between occurrence of Newberry burrowing crayfish and the presence of a perched water-table, as well as presence of Chewacla, Worsham, Toccoa-Cartecay, Enon, and Sedgefield soil types (Eversole and Welch 2006).

Status in the Study Area

Currently, the Newberry burrowing crayfish is known from only 14 sites, all of which are located in Newberry County (Eversole and Welch 2006). The known range of the species encompasses portions of the Tyger, Enoree, Lower Broad, and Saluda River basins. Because this species is generally isolated from floodplains and streams, it is not expected to occur in the Project Area or in the downstream reach of the Broad River influenced by the Project.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.4.2 ROBUST REDHORSE

The robust redhorse is a large, heavy-bodied sucker which was presumed extinct until being “rediscovered” during the initial stages of relicensing at Georgia Power’s Sinclair Hydroelectric Project (FERC No. 1951). Fisheries scientists knew little about its life history and habitat requirements. As a result, Georgia Power Company, along with state and federal resource agencies, other hydropower interests, and the Georgia Wildlife Federation, formed the Robust Redhorse Conservation Committee (RRCC) in 1995 to guide recovery efforts for the species in lieu of listing under the ESA. Subsequent research has produced valuable information about the robust redhorse and its habitat requirements. However, much research is still needed, as little is known about the habitat preferences of juvenile robust redhorse.

Based on recent studies, it appears that adult robust redhorse typically inhabit areas of the river where the current is moderately swift. Preferred habitat is riffle areas or in/near outside bends, where depths are greater and accumulations of logs and other woody debris are present (Evans 1997). Spawning typically occurs at water temperatures from 18 to 24° C, usually over gravel substrate in both deep and shallow water (Hendricks 1998).

Status in the Study Area

At this time, natural populations of robust redhorse are not known to exist in the Broad River (Lamprecht and Scott 2013). Stocking of fingerlings began in 2004 at sites both above and below the Parr Shoals Dam (Lamprecht and Scott 2013), and robust redhorse have since been documented in both Parr and Monticello reservoirs, as well as the reach of the Broad River downstream of Parr Shoals Dam (Table 4-5). In addition, robust redhorse use of the fishway at the Columbia Hydroelectric Project has been documented (Kleinschmidt 2009, 2010, 2012, 2013, 2014), suggested that robust redhorse from the Congaree and potentially other areas of the lower Santee Basin are utilizing habitat in the reach of the Broad downstream of Parr Shoals Dam during the spawning season.

Determination of Effect

Habitat for robust redhorse is potentially affected by Project flow releases and will be assessed as part of the proposed Instream Flow Incremental Methodology (IFIM) Study. Because it is listed as one of the key species for flow alterations, proposed changes to downstream flows should benefit the species.

4.4.3 PIEDMONT DARTER

The piedmont darter is one of two species in the genus *Percina* found in South Carolina (Hayes and Bettinger 2006). It is typically found in cool to warm moderately-sized streams and rivers, usually in riffles with gravel or rock substrates (Rohde et al. 2009). Though a riffle dweller, this darter does not seem to favor extremely strong currents.

Status in the Study Area

The piedmont darter has been documented in the reach of the Broad River downstream of Parr Shoals Dam within the study area (Table 4-5).

Determination of Effect

Habitat for piedmont darter is potentially affected by Project flow releases and will be assessed as part of the proposed IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species.

4.4.4 SEAGREEN DARTER

The seagreen darter is restricted to the Santee River drainage of the Carolinas (Hayes and Bettinger 2006). This species inhabits lower elevation tributaries in the mountain regions and is also found over a broad area of the upper piedmont in the Carolinas. It is less frequently found below the fall line in tributaries of the Congaree River. The seagreen darter favors a habitat of rock, rubble or gravel riffles in large creeks and rivers with moderate to swift currents, but has adapted to wide variations in temperature and water clarity.

Status in the Study Area

The seagreen darter has been documented in the reach of the Broad River downstream of Parr Shoals Dam within the study area (Table 4-5).

Determination of Effect

Habitat for seagreen darter is potentially affected by Project flow releases and will be assessed as part of the proposed IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species.

4.4.5 HIGHFIN CARPSUCKER

The highfin carpsucker is distributed throughout the Lake Michigan drainage and Mississippi River Basin from Pennsylvania south to Louisiana (Self and Bettinger 2006). It also occurs on the Atlantic Slope from the Cape Fear River to Savannah River drainages and Gulf Slope drainages from Choctawhatchee River, Alabama and Florida to the Pearl River, Louisiana and Mississippi. The Atlantic Slope and Gulf Slope populations likely differ at the species level from those of the Mississippi and Lake Michigan drainages. In South Carolina, the highfin carpsucker occurs in the Broad and Congaree rivers in the upper Santee River Basin and the Savannah River. Historically the highfin carpsucker also occurred in the Pee Dee River; however, that population may have since been extirpated. The highfin carpsucker inhabits rivers in areas with moderate or swift current over sand or a gravel substrate (Rohde et al. 2009).

Highfin carpsucker population size and trends are not well known (Self and Bettinger 2006). There appear to be healthy populations with recruitment in the Broad River, Congaree River, and Savannah River. Preservation of populations in the Santee River is extremely important to the global preservation of the species given declining populations in the Cape Fear River and Pee Dee River (Self and Bettinger 2006).

Status in the Study Area

This species has been documented in both Parr Reservoir and the reach of the Broad River downstream of the Project (Table 4-5).

Determination of Effect

Habitat for highfin carpsucker is potentially affected by Project flow releases and will be assessed as part of IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species.

4.4.6 QUILLBACK

The quillback is found in warm, low- to moderate-gradient reaches of most major rivers, including upper portions of associated reservoirs (Lamprecht and Bettinger 2006). Quillback

occur over varied substrates in rivers, but seldom over mud. They tend to occupy calm water; however, quillback may shift to swifter and deeper depths during low water. Quillback reportedly spawn in riffles, calm stream reaches and in floodplain bayous, laying eggs on gravel, sand, mud and organic matter. Quillback feed on insect larvae and other benthic organisms.

The quillback is distributed from the Great Lakes region in the St. Lawrence River, Hudson Bay and Mississippi River basins from Quebec to Alberta, Canada; south to Louisiana and west to Wyoming in the United States (Lamprecht and Bettinger 2006). It also occurs on the Atlantic slope from the Delaware River, New York, to the Altamaha River, Georgia. In gulf slope drainages, it occurs from the Apalachicola River in Florida and Georgia to the Pearl River in Louisiana. The southern Atlantic slope populations in South Carolina are reported in the upper portions of the three major South Carolina drainages: the Pee Dee, Santee, and Savannah. Fish from these populations are likely distinct from those of the interior basin and gulf slope drainages (Lamprecht and Bettinger 2006).

Status in the Study Area

Quillbacks have been documented in both Parr and Monticello reservoirs, as well as the downstream reach of the Broad River (Table 4-5).

Determination of Effect

Habitat for quillback is potentially affected by Project flow releases and will be assessed as part of the proposed IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species.

4.4.7 SANTEE CHUB

The Santee chub is restricted to the Santee River drainage within South Carolina, primarily in the piedmont and Blue Ridge foothills (Hayes and Bettinger 2006). A few populations of Santee chub found in the coastal plain represent an undescribed species known as the “thinlip” chub. Outside of South Carolina, “thinlip” chub is also found in the Cape Fear River drainage of North Carolina. The Santee chub inhabits small to medium sized streams with sand and rocky runs or

current-swept pools. This species seems to be able to tolerate more turbid and warm waters than its close relative, the big-eye chub, *Hybopsis amblops*.

Status in the Study Area

Santee chub has been documented in the reach of the Broad River downstream of Parr Shoals Dam within the study area (Table 4-5).

Determination of Effect

Habitat for Santee chub is potentially affected by Project flow releases and will be assessed as part of the proposed IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species.

4.4.8 STRIPED BASS

The striped bass is an anadromous species native to the Atlantic slope, with natural populations residing in saltwater and migrating to medium to large freshwater rivers annually to spawn. It has been widely introduced or has remnant populations in impounded river systems, with some systems, including the Santee River Basin, supporting naturally-reproducing, damlocked populations (Sessions et al. 2006). In freshwater, they prefer to occupy areas with clean sandy bottoms, fine gravel and rock. Adult striped bass have a thermal tolerance of six to 27° C, but seek temperatures between 18 to 25°C when available. During spawning, striped bass occupy shallow rocky and gravelly areas with strong turbulent water flow. Striped bass eggs are semibouyant; they drift and sink slowly requiring moderate current to keep the eggs from settling to the bottom and dying before they are hatched in one to three days. Optimum water temperatures for successful striped bass egg hatching and survival is 17 to 18°C (Sessions et al. 2006).

Status in the Study Area

Striped bass are regularly observed passing through the Columbia Hydroelectric Project fishway into the reach of the Broad downstream of Parr Shoals Dam (Kleinschmidt 2009, 2010, 2011, 2012, 2013) and have been documented from the study area during electrofishing (Table 4-5).

Determination of Effect

Habitat for striped bass is potentially affected by Project flow releases and will be assessed as part of the proposed IFIM Study. This species is included in the IFIM analysis and proposed changes to downstream flows may benefit the species. The effect of downstream peaking flows on spawning habitat for this species is also being addressed as part of a downstream flow study.

4.4.9 YELLOW LAMPMUSSEL

The yellow lampmussel is a freshwater species that is found primarily in medium to large rivers and streams. Preferred habitat includes a variety of substrates such as silt or sand, gravel bars, and in the bedrock cracks of both large and small rivers and streams (Price 2006b). The range of this species extends from the Ogeechee River in Georgia to Nova Scotia, with distribution in South Carolina spanning the Savannah, Broad, Wateree, Congaree, and Pee Dee River basins (Bogan and Alderman 2008, Price et al. 2009, Kleinschmidt 2013b).

Gravid yellow lampmussels observed in the Congaree River in 2007 were reported to release their glochidia between June and July (Price et al. 2009). These animals are long-term brooders that attract piscivorous hosts with mantle lure display. Broad River host trials indicate that Moronids like striped bass and white bass are likely natural hosts for yellow lampmussel, though Centrarchids may also be viable hosts (Price et al. 2009).

Status in the Study Area

In 2007, 60 sites were surveyed for mussels on the Broad and Congaree rivers from Cayce on the Congaree to five river miles south of the North Carolina border on the Broad. Six sites were surveyed between Parr Dam and Columbia Dam, and seven sites were sampled in the Parr Reservoir. However, only nine individuals were collected from three sites located two-three river miles downstream of the confluence of the Broad and Saluda rivers (Price *et al.* 2009). Alderman (2006) documented similar numbers of yellow lampmussels from the upper Congaree River, with 3 live individuals documented at five sites between the Broad/Saluda confluence and the Cayce Boat Landing.

In 2012, 13 sites just downstream from the Parr Shoals Dam were surveyed on the northeast side of Hampton Island (Alderman and Alderman 2012). This survey reported two sites where yellow lampmussel was present (CPUE ranging from 0.5-0.57 mussels/surveyor-hour). This location represents the uppermost extent of yellow lampmussel's known range in the Broad River (Table 4-5).

Determination of Effect

Alderman and Alderman (2012) reported that the mussel assemblage directly downstream of the Parr Shoals Dam represents the highest freshwater mussel diversity recorded in the Broad River Sub-basin in North and South Carolina upriver from the Columbia Hydroelectric Project. Further, the tailrace is the only location above the Columbia Hydroelectric Project where yellow lampmussel appears to have persisted. Although densities of yellow lampmussel were low, the overall abundance and diversity of mussels observed suggests that the tailrace may actually be serving as a sanctuary for freshwater mussels.

4.4.10 ROANOKE SLABSHELL

The Roanoke slabshell is found in large rivers, but can occasionally be found in small creeks. The Roanoke slabshell is able to tolerate large variations in flow levels and higher water temperatures, making it able to survive in some locations near dams and hydroelectric plants. It has experienced large die offs when the plants generate extremely low flows and cause levels of oxygen to drop (Price 2006).

The host fish for this species are still somewhat speculative, but it is thought that it parasitizes a diadromous fish host. Moreover, host studies conducted for Roanoke slabshell only showed successful transformation on blueback herring (most successful), gizzard shad, and white perch although a suite of taxa (ictalurids, cyprinids, centrarchids, catostomids, and anguillids) were considered (Price et al. 2009).

Status in the Study Area

In 2007, 60 sites were surveyed for mussels on the Broad and Congaree rivers from Cayce to five river miles south of the North Carolina border. Six sites were surveyed between Parr Shoals Dam

and Columbia Dam seven in Parr Reservoir, and 13 sites below the Columbia Dam near the confluence of the Broad and Saluda rivers. Of these 60 sites, Roanoke slabshell was restricted to 194 live individuals from eight sites below the Columbia Dam (CPUE ranging from 1-62 mussels/surveyor-hour) and one individual from one site in Cherokee County, SC (Price et al. 2009).

In 2012, 13 sites just downstream from the Parr Shoals Dam were surveyed on the northeast side of Hampton Island (Alderman and Alderman 2012). This survey reported nine sites where Roanoke slabshell were present (CPUE ranging from 4-18 mussels/surveyor-hour), representing the healthiest, upper-most, extent of its presently known range in the Broad River (Alderman 2009) (Table 4-5).

Determination of Effect

As previously noted, Alderman and Alderman (2012) reported that the mussel assemblage found in the Parr tailrace represents the highest freshwater mussel diversity recorded in the Broad River Sub-basin in North and South Carolina upriver from the Columbia Hydroelectric Project. Further, the tailrace was the only location upstream of Columbia Hydroelectric Project dam where Roanoke slabshell has been documented (Alderman and Alderman 2012, Price 2010). Finally, juvenile Roanoke slabshell were documented by Alderman and Alderman (2012), suggesting that reproduction and recruitment are occurring in the tailrace area. These data suggest that the Project is unlikely to be resulting in any negative effects to the Roanoke slabshell population in the tailrace, but rather may be serving as a refuge for this and other mussel species.

TABLE 4-5 DOCUMENTED OCCURRENCE OF SELECTED STATE CONSERVATION PRIORITY FISH SPECIES IN MONTICELLO RESERVOIR, PARR RESERVOIR AND THE DOWNSTREAM REACH OF THE BROAD RIVER (SOURCE: NORMANDEAU 2007, 2008, 2009; SCANA 2013; BETTINGER ET AL. 2003; KLEINSCHMIDT 2013A; ALDERMAN AND ALDERMAN 2012)

COMMON NAME	SCIENTIFIC NAME	PARR	MONTICELLO	BROAD RIVER
Robust redhorse	<i>Moxostoma robustum</i>	x	x	x
Piedmont darter	<i>Percina crassa</i>			x
Seagreen darter	<i>Etheostoma thalassinum</i>			x
Highfin carpsucker	<i>Carpiodes velifer</i>	x		
Quillback	<i>Carpiodes cyprinus</i>	x	x	x

COMMON NAME	SCIENTIFIC NAME	PARR	MONTICELLO	BROAD RIVER
Santee chub	<i>Hybopsis zanema</i>			X
Striped bass	<i>Morone saxatilis</i>			X
Yellow lampmussel	<i>Lampsilis cariosa</i>			X
Roanoke slabshell	<i>Elliptio roanokensis</i>			X

4.5 BIRDS OF CONSERVATION CONCERN

In 2008, the USFWS published a report entitled *Birds of Conservation Concern 2008*, with the goal of accurately identifying the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the USFWS' highest conservation priorities. The USFWS requested that birds from the Piedmont Bird Conservation Region (BCR), (Table 4-6) be included in this assessment, as this is where the Project is located. Life history information and habitat requirements for these species, as well as their status within the Project Vicinity and potential to be affected by continued operation of the Project, are summarized below. Table 4-6 also includes the state priority level (SCDNR 2015) for the species presented.

TABLE 4-6 BIRDS OF CONSERVATION CONCERN IN THE PIEDMONT BIRD CONSERVATION REGION

COMMON NAME	SCIENTIFIC NAME	STATE PRIORITY LEVEL
Peregrine falcon	<i>Falco peregrinus</i>	Moderate
Black rail	<i>Laterallus jamaicensis</i>	Highest
Short-eared owl	<i>Asio flammeus</i>	Not listed
Whip-poor-will	<i>Caprimulgus vociferous</i>	High
Loggerhead shrike	<i>Lanius ludovicianus</i>	Highest
Brown-headed nuthatch	<i>Sitta pusilla</i>	Moderate
Bewick's wren	<i>Thryomanes bewickii</i>	Moderate
Sedge wren	<i>Cistothorus platensis</i>	Highest
Wood thrush	<i>Hylocichla mustelina</i>	High
Blue-winged warbler	<i>Vermivora cyanoptera</i>	Moderate
Prairie warbler	<i>Setophaga discolor</i>	High
Cerulean warbler	<i>Setophaga cerulean</i>	Highest
Swainson's warbler	<i>Limnithlypis swainsonii</i>	Highest
Kentucky warbler	<i>Geothlypis formosa</i>	High
Bachman's sparrow	<i>Aimophila aestivalis</i>	Highest
Henslow's sparrow	<i>Ammodramus henslowii</i>	Highest
Rusty blackbird	<i>Euphagus carolinus</i>	Highest

4.5.1 PEREGRINE FALCON

Peregrine falcon, a medium-sized bird of prey, is slate-grey on the head and back, barred and spotted on the chest and belly, with distinctive black “sideburns” (USFWS 2015c). Birds acquire adult plumage in their second year, but do not reproduce until age three. Nesting starts in late March, when females lay three to five eggs, which are identified by a pale rose color with brown blotches (USFWS 2015c). Incubation lasts approximately 33-34 days. If the first clutch of eggs is destroyed, a second clutch may be laid. Chicks remain in the nest six to seven weeks after hatching and are cared for by both parents (USFWS 2015c).

Historically the peregrine falcon ranged throughout the eastern United States from the Great Lakes and eastern Maine, south to Georgia and Alabama (USFWS 2015c). Peregrines usually nest on high, remote cliff ledges, with the nest site, or “eyrie” consisting of a shallow depression in the rocks and soil, sometimes surrounded with twigs and grass.

Status in the Study Area

The peregrine falcon is only known to occur within Greenville and Pickens counties, South Carolina (SCDNR 2015). Typically, peregrines are only seen in South Carolina during the winter season or during their migration.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.2 BLACK RAIL

The black rail is a small, blackish marshbird with a black bill, red eyes and a distinct white-speckled back (Cornell 2015c). The black rail nests in high portions of salt marshes, shallow freshwater marshes, wet meadows, and flooded grassy vegetation. Eggs are usually laid in clutches of six to ten and are a creamy white with brown spots. Incubation lasts approximately 16 to 20 days (Cornell 2015c).

Black rails range from southern New England to the Gulf States, and spend winters throughout the southern Atlantic coast states to Central America (Cornell 2015c).

Status in the Study Area

In South Carolina, there is only one confirmed nesting record, from 1903 (SCDNR 2015). Calling locations are spotty, with Bear Island WMA in Colleton County supporting the most significant population to date. SCDNR counted a total of 38 black rails in 1991-1992 along the coast of South Carolina, during an extensive marsh bird survey (SCDNR 2015). Black rails have also been reported in isolated wetlands in the Upstate (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because the species and its preferred habitats are not present within the Project Area.

4.5.3 SHORT-EARED OWL

The short-eared owl is found throughout North America, South America, Europe and Asia, and on many oceanic islands (Cornell 2015d). Preferred habitat includes open country, such as prairie, meadows, tundra, moorlands, marshes, savanna, and open woodland (Cornell 2015d). Nests are scratched out on the ground and surrounded by grass. Clutch size ranges from one to eleven eggs and incubation lasts from 26-29 days (Cornell 2015d).

Status in the Study Area

The short-eared owl resides within South Carolina during the winter months, and not during breeding season (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.4 WHIP-POOR-WILL

The whip-poor-will has a very distinctive call and is more commonly heard than seen. It is most active at dawn and dusk and spends the day roosting in trees. While roosting, the whip-poor-will prefers lower limbs of trees so as to be better camouflaged and sits with its body parallel to the limbs, unlike most birds (NatureServe 2015b).

The whip-poor-will's clutch size is 2 eggs on a nest of leaf litter directly on the ground. Eggs incubate for 19 to 21 days and chicks leave the nest at 17 to 20 days of age (NatureServe 2015b). Whip-poor-will chicks are downy and capable of feeding themselves at hatching. Females typically leave the nest at 7 to 9 days to start a second nest (NatureServe 2015b). The range of the whip-poor-will spans Central Canada to the Atlantic Coast and south to Oklahoma and Georgia; wintering in the Southeast United States and Central America (NatureServe 2015b).

Status in the Study Area

The whip-poor-will is a winter resident along the South Carolina coast and migrates northward to the middle and eastern sections of the state in April (SCDNR 2015). The bird has also been documented in Spartanburg, Union, Chesterfield, Lee, Dorchester, and Richland counties, South Carolina (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.5 LOGGERHEAD SHRIKE

The loggerhead shrike averages 23 cm long with a coloring similar to mocking birds; upper side gray with a white underside (NatureServe 2015h). In late April to early May, the bird begins building its nest made of thick twigs woven together and padded by feathers, hair, or cotton. A typical clutch consists of 4 to 6 eggs and incubation usually lasts 16-18 days. The young fledge in about 17-20 days and are independent in 36 days (NatureServe 2015h).

The loggerhead shrike is a fairly common bird throughout most of North America ranging from southern Canada to Mexico and from the Pacific to Atlantic coast (NatureServe 2015h). It typically winters from Virginia to Florida, but is common in these areas year-round as well.

Status in the Study Area

The loggerhead shrike is a permanent resident throughout South Carolina, except at higher elevations (SCDNR 2015). It is most abundant in the Coastal Plain, especially within the “farm belt” area of the Inner Coast Plain (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.6 BROWN-HEADED NUTHATCH

The brown-headed nuthatch has a brown crown with blue-gray wings and back. The average size is 10 to 11 cm in length (NatureServe 2015m). During nesting season, the brown-headed nuthatch uses holes or snags in trees, usually dead, but rely on nesting boxes when dead trees are unavailable. The brown-headed nuthatch is monogamous for the breeding season, and sometimes for several consecutive seasons. The female typically lays three to nine eggs and the male protects the nest (NatureServe 2015m).

Brown-headed nuthatch is a non-migratory species and primarily exist in the southeast region of the United States and the Bahamas (NatureServe 2015m). The brown-headed nuthatch’s habitat consists of mature forests and are pine specialists. Currently, the brown-headed nuthatch is not federally listed, but populations are declining due to habitat loss from logging and fire prevention (NatureServe 2015m).

Status in the Study Area

The brown-headed nuthatch commonly breeds in western South Carolina, utilizing the loblolly-shortleaf pine forests of the Upper Coastal Plain and the longleaf-slash pine forests of the Lower Coastal Plain (SCDNR 2015). This species spends a majority of its time in open, mature old-growth forest, especially where natural fire patterns have been maintained (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.7 BEWICK'S WREN

Bewick's wren is a medium sized wren with a long tail and long, slender bills (Cornell 2015a). Nests are usually built in cavities in trees or on ledges. Females usually lay three to eight eggs per brood sometimes producing as many as three broods in a breeding season (Cornell 2015a).

Bewick's wren prefers brushy and scrub type habitat and are often found in thickets in open country or open woodlands near streams (Cornell 2015a). This species is flourishing in western North America, but its populations have steadily declined in the east. A possible cause for population decline is the increase in the house wren, which typically remove eggs from existing nests (Cornell 2015a).

Status in the Study Area

Bewick's wren was historically found in central South Carolina, although it is likely extirpated from the state (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species due to a likely lack of occurrence in the study area.

4.5.8 SEDGE WREN

The sedge wren is a small wren measuring 10 to 12 cm with a short, thin bill. Male sedge wrens are very territorial and build multiple nests within their territory for females (NatureServe 2015d). Nests consist of round balls of grasses and sedges with an entrance on the side. After selecting her nest, the female sedge wren pads the nest with feathers and fur (NatureServe 2015d). A female sedge wren typically lays four to eight eggs per brood. Females incubate the eggs alone for approximately 14 days and continues to care for young alone. Young typically leave the nest after 12 to 14 days (NatureServe 2015d).

As the name suggests, the sedge wren prefers wet fields and marshes with tall grasses and sedges (NatureServe 2015d). The sedge wren typically breeds in central northern United States and central Canada and winters in the southeast region of the United States (NatureServe 2015d).

Status in the Study Area

The sedge wren is a common winter resident of the Coastal Plain region (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because its preferred wintering habitats are not present within the Project Area.

4.5.9 WOOD THRUSH

The wood thrush has brown upper parts with a spotted white breast and are typically 19 to 21 cm in length with a short tail and straight bill. During nesting season, the female initiates the nest building by developing a platform of grass will walls of woven grass, leaves, or stems (Cornell 2015e). Nests are usually located in shrubs for support from branches as well as coverage from foliage. A female wood thrush typically lays three to four eggs per brood and will usually have two broods in a breeding season (Cornell 2015e). A new nest will be made for the second brood, and wood thrush pairs generally remain monogamous throughout the season (Cornell 2015e).

The wood thrush prefers mature deciduous forests with large trees and a moderate understory and is a fairly common bird throughout the eastern region of the United States (Cornell 2015e). However, its populations have been steadily declining for several years, possibly due to nest parasitism from the brown-headed cowbird (Cornell 2015e).

Status in the Study Area

The wood thrush is distributed statewide with higher concentrations of breeding in the Piedmont and Mountain regions of the state (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.10 BLUE-WINGED WARBLER

The Blue-winged warbler is a small songbird commonly found in the eastern United States. Nests are generally built on the ground and well concealed by tall grasses and vines (NAS 2015). A usual clutch for the blue-winged warbler is four to seven eggs. The female incubates the eggs for 10 to 11 days and then both male and female feed the young (NAS 2015). Chicks remain in the nest for eight to 11 days. The blue-winged warbler often cross breeds with the golden-winged warbler resulting in fertile offspring (NAS 2015).

Blue-winged warblers spend their breeding season in the northeast and occupy the southeast during the winter (NAS 2015). They prefer the overgrown pastures of abandoned farmlands and forest clearings. Currently, they are suffering parasitism from brown-headed cowbirds, but populations appear stable (NAS 2015).

Status in the Study Area

The blue-winged warbler occurs in low densities as a breeding bird in South Carolina's Appalachian Mountains (SCDNR 2015). It is migratory along the coastal areas, and overwinters in Central America and the Caribbean (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.11 PRAIRIE WARBLER

The prairie warbler is a medium sized warbler commonly found throughout the eastern United States (USFS 2001). Nests are an open cup shape of woven plants located between 1 and 10 feet from the ground (USFS 2001). Birds are monogamous for the breeding season, but typically select new mates each year. Females incubate three to five eggs for 11 to 15 days. The hatchlings fledge after 8 to 10 days, but remain dependent upon both parents for another month. Prairie warblers produce one brood per year (USFS 2001).

Preferred habitat includes open, brushy areas, fields, and Christmas tree farms (USFS 2001). Prairie warblers are also found in disturbed areas which are deemed suitable five years after the disturbance of fire or clearing. An absence of a high canopy is important for this species of warbler (USFS 2001).

Status in the Study Area

The prairie warbler is found throughout the state of South Carolina (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because the species and its preferred habitats are not present within the Project Area.

4.5.12 CERULEAN WARBLER

The cerulean warbler is a small bird that prefers the tall trees of deciduous hardwood forests of the eastern United States (USFWS 2006). Female cerulean warblers will typically lay three to four eggs per brood and incubate for 11 to 13 days (USFWS 2006). Once hatched, both parents assist in feeding and care of the young until they leave the nest after nine to 11 days. Cerulean warblers generally produce only one brood per year, however if the original nest is destroyed, a second attempt may be made (USFWS 2006).

Cerulean warblers breed in the northeast and then migrate southeast for the winters (USFWS 2006). Populations are in a steady decline due to habitat loss. Much of the historical forest habitat has been cleared for human development (USFWS 2006).

Status in the Study Area

The cerulean warbler's breeding distribution includes the northwest corner of the South Carolina Mountain Ecoregion. Otherwise, it is only found throughout South Carolina as a passage migrant (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because its preferred breeding habitats are not located in the Project Area. Also, SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.13 SWAINSON'S WARBLER

Female Swainson's warblers build bulky nests at an average height of six feet in various vegetation, typically near dense vines or shrubs (Meyer 2006). Females lay an average of three eggs per brood. One brood per year is typical, though renesting in the event of a failed first attempt is common. The female Swainson's warbler incubates the eggs for 13 to 15 days and chicks leave the nest after 10 to 12 days (Meyer 2006).

Swainson's warbler is commonly found in bottomland hardwood forests. In the breeding season, they prefer the southeastern United States and migrate south to the Caribbean for the winter. Preferred habitat includes forests near rivers, swamps, or floodplains (Meyer 2006). Coniferous and deciduous forests with canebreaks are also desirable locations.

Status in the Study Area

Swainson's warbler is an uncommon breeder in South Carolina, inhabiting bottomlands in the Coastal Plain and rhododendron thickets in the mountains (SCDNR 2015). It is known to occur in Abbeville, Beaufort, Berkeley, Charleston, Chesterfield, Dorchester, Greenville and Pickens counties (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because its preferred habitats are not present in the study area.

4.5.14 KENTUCKY WARBLER

During nesting season, the female Kentucky warbler builds her nest on or near the ground hidden and supported by shrubs or fallen branches (Cornell 2015b). A typical clutch size consists of three to six eggs which are incubated solely by the female for 12 to 13 days. Once hatched, the young are cared for by both parents for the eight to ten days before they fledge as well as another week after leaving the nest (Cornell 2015b).

The Kentucky warbler's range spans from the Great Plains to the Atlantic Coast, wintering in Central America (Cornell 2015b). Preferred habitat for this species of warbler include woods with dense, humid thickets, areas near rivers and edges of swamps (Cornell 2015b). Currently suffering from habitat loss, the Kentucky warbler is also prone to parasitism by the brown-headed cowbird.

Status in the Study Area

The Kentucky warbler is a common breeder found throughout South Carolina, with breeding activity confirmed in all but a few counties of the state (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.15 BACHMAN'S SPARROW

Bachman's sparrow, distinguished by "buffy" brownish-gray under plumage that is tinged with reddish streaks, is monogamous throughout the year, typically yielding two broods each breeding season (USFWS 2015a). A female sparrow build a nest of grasses at, or just above, ground level and lays a clutch of three to four eggs and incubates for 12 to 14 days. After hatching, both parents care for the young until they leave the nest after nine to ten days (USFWS 2015a).

Bachman's sparrow spans the Coastal Plain and Piedmont of the southeastern United States. This species historically preferred mature pine forests, the majority of which have been logged (USFWS 2015a). Today, pine forests with a more open understory are the usual habitat for this sparrow. Populations have been seen to increase in the year immediately after a fire and decline after three years post-fire. The Bachman's sparrow southern populations are non-migratory while the northern populations have a short migration in the winter (USFWS 2015a).

Status in the Study Area

Bachman's sparrow can be found throughout the Piedmont and Coastal Plain regions of the state, specifically Charleston, Georgetown and Jasper counties (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

4.5.16 HENSLOW'S SPARROW

Henslow's sparrow is believed to be monogamous for the breeding season and produces two broods each year (NatureServe 2015a). The male sparrow suggests several different locations in areas of dense, tall grass in open fields and meadows. The female selects the site she prefers and begins building a nest on or near the ground and well hidden in the dense grasses and weeds (NatureServe 2015a). Typical clutch size is three to five eggs per brood and is incubated by the female for nine to 11 days. Once hatched, both male and female parents care for the young. The Henslow's sparrow remains in the nest for nine to ten days after hatching (NatureServe 2015a).

Henslow's sparrow is a rare bird whose populations are in decline. Historically, the habitat preferred by this species included open, moist meadows, coastal plains, and salt marshes, but in recent years they have been less frequently observed in coastal areas (NatureServe 2015a). The Henslow's sparrow breeds in the Central and Northeast United States and migrates to the Southeast, primarily the Gulf Coast, for winter (NatureServe 2015a).

Status in the Study Area

Henslow's sparrows winter throughout the Coastal Plain, extending inland from the coast through the Sandhills (SCDNR 2015). This species is unlikely to be found within the study area, as it is generally limited to areas below the fall line in South Carolina.

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because its preferred habitats are not present in the study area.

4.5.17 RUSTY BLACKBIRD

The female rusty blackbird is in charge of building the nest. Nests are typically a bulky cup shape of sticks and coarse grasses (NatureServe 2015f). They are placed in the mid to upper sections of small conifer trees. Rusty blackbird nests are often in or near wetlands. The female lays three to five eggs and she alone incubates the eggs for roughly two weeks (NatureServe 2015f). While the female incubates the eggs, the male will often feed her in the nest or on a nearby branch. Both parents care for and feed the hatchlings. Rusty blackbird chicks remain in the nest for 10 to 12 days (NatureServe 2015f).

Rusty blackbirds winter in the southeastern United States in flooded forests, wooded wetlands, and swamps (NatureServe 2015f). Breeding occurs in the boreal forests of Canada, specifically in patchy wetland areas with small coniferous trees (NatureServe 2015f).

Status in the Study Area

The rusty blackbird is a fairly common winter visitor to the Piedmont and Coastal Plain, with lesser numbers occurring in the Mountain region of South Carolina (SCDNR 2015).

Determination of Effect

Continued operation of the Project is expected to result in no effect on this species because SCE&G does not propose to significantly change the shoreline classification or encourage development in the Project Area.

5.0 SUMMARY

The original approved Study Plan for this Rare, Threatened, and Endangered Species Desktop Assessment (October 2014) was expanded based on an August 24, 2015 USFWS request to include several bird species considered to be of conservation concern for Piedmont Bird Conservation Region, as well as several Federal At-Risk Species. We addressed the potential project effects on each of those species in the report. Some of the species could occur in the Project boundary, but none of those species should be impacted by Project operations and are not protected by state or federal law.

Of the 13 state- and federally-listed and candidate species originally identified by the USFWS, habitat requirements and known occurrence data suggest that only the bald eagle likely occurs in the study area with any regularity. Wood storks may periodically utilize portions of the study area of seasonal foraging (primarily by post-dispersal migrants during the summer months); however, this usage is expected to be sporadic and ephemeral. Habitat for Georgia aster has been noted on the adjacent V.C. Summer Nuclear Station site and on nearby U.S. Forest Service lands, suggesting that habitat may also exist within the Project study area. Potential occurrences of Georgia aster would be limited to terrestrial sites, which would not be affected by continued operation of the Project. Finally, several fish species that are not state- or federally-listed, but are classified as priority conservation species have been documented from the study area. Habitat requirements for these species will be assessed as part of the proposed IFIM study. Information from this study will be considered in developing Protection, Mitigation, and Enhancement measures.

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APPENDIX A
RT&E SPECIES STUDY PLAN

PARR HYDROELECTRIC PROJECT

(FERC No. 1894)

RARE, THREATENED AND ENDANGERED SPECIES STUDY PLAN

Prepared for:

**South Carolina Electric & Gas Company
Cayce, South Carolina**

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

PARR HYDROELECTRIC PROJECT
(FERC No. 1894)

RARE, THREATENED AND ENDANGERED SPECIES
STUDY PLAN

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

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Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

RARE, THREATENED AND ENDANGERED SPECIES STUDY PLAN

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

RARE, THREATENED AND ENDANGERED SPECIES STUDY PLAN

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Fairfield Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1).

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as the licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGOs), and interested individuals. Collaboration and cooperation of stakeholders is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWCs), including members from among the interested stakeholders, with the objective of achieving consensus regarding the identification and proper treatment of these resource issues in the context of a new license.

In preparation for relicensing, SCE&G formed a Rare, Threatened and Endangered Species Technical Working Committee (“RT&E TWC” or “TWC”), which is comprised of interested stakeholders who are working with SCE&G to identify potential issues, make biological study recommendations, and provide technical and experience-based input related to rare, threatened and endangered (RT&E) species potentially residing in the Project area. SCE&G is planning to conduct a literature-based study to compile existing information on federally and state listed RT&E species in the immediate project area. SCE&G will use this information in developing their license application for Federal Energy Regulatory Commission (FERC).

2.0 STUDY OBJECTIVES

The objective of this study is to characterize the present status of RT&E species at the Parr Fairfield Hydroelectric Project by providing information regarding the availability of RT&E habitat and characterize the known status of RT&E species within the Project boundary and Project vicinity. The presence or absence of select species will be verified through targeted field studies, including the Rocky Shoals Spider Lily Study, the Spiny Crayfish Study, and the Monticello Mussel Study.

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

This study will focus on all areas within the FERC Project boundary, including Parr and Monticello reservoirs, the immediate vicinity of the Project in Fairfield and Newberry counties, and the area downstream of Parr Shoals Dam extending to and including Frost Shoals in Richland County. RT&E species that are deemed as potentially occurring within the Project Area and from Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island, along with the known presences of available RT&E habitat, will be evaluated. As this study is a desktop exercise, no field reconnaissance will be implemented. The study is scheduled to commence in 2015.

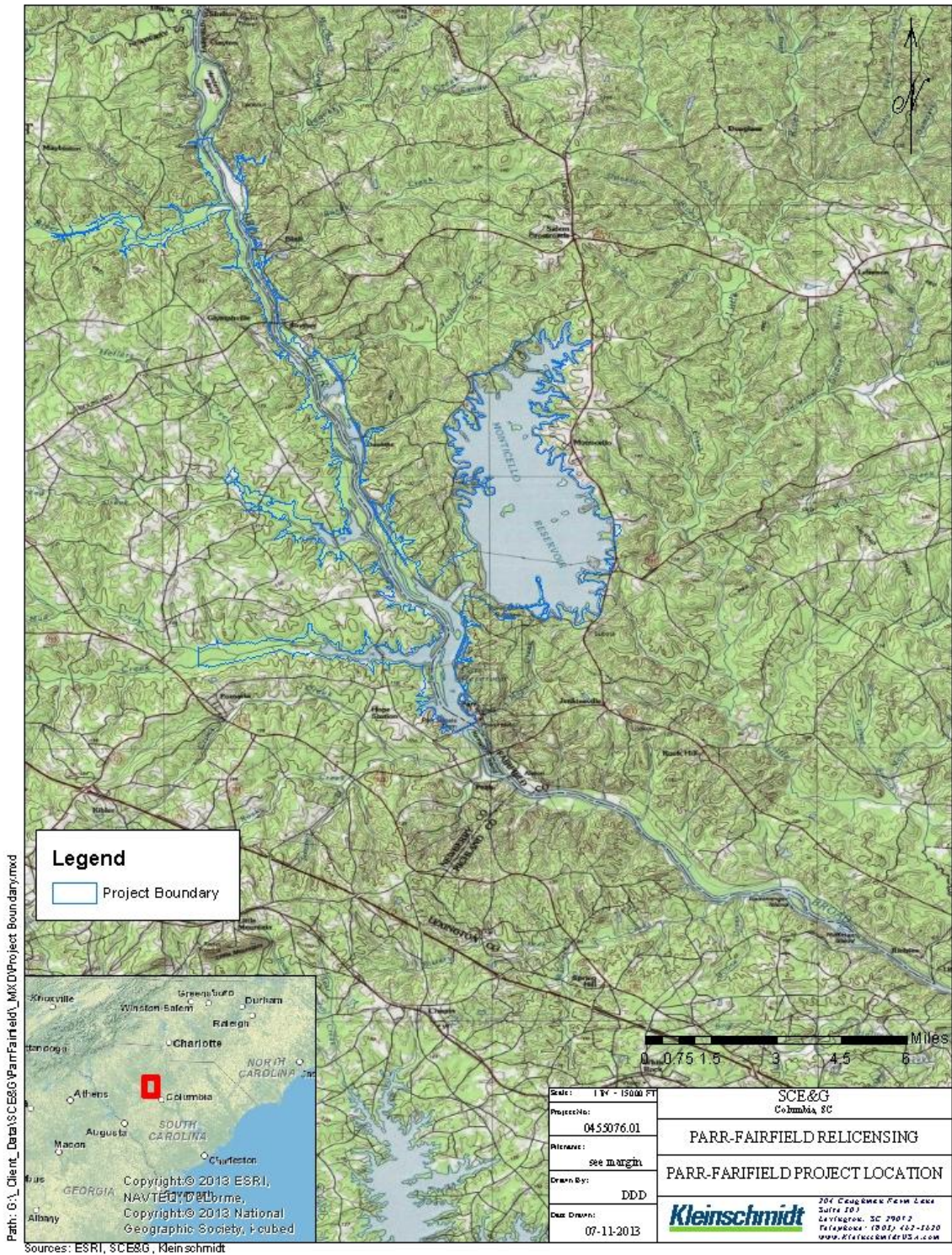


FIGURE 1 PARR-FAIRFIELD PROJECT LOCATION MAP

4.0 COLLECTION METHODS AND ANALYSIS

In order to appropriately characterize the present status of RT&E species in the Project vicinity, information will be collected from various sources, including the South Carolina Department of Natural Resources (SCDNR) and the U.S. Fish and Wildlife Service (USFWS) RT&E databases.

As an initial step, a list of RT&E species documented as occurring in the counties surrounding the Project and downstream (Newberry, Fairfield and Richland) will be compiled based on the USFWS and SCDNR county level listings. Additional key species may be added at the request of TWC members, if agreed to be appropriate. The federal, state and global status of each of these species will be summarized, along with counties of occurrence. As a second step, known ranges of these species, along with occurrence data from the SCDNR Natural Heritage Program and other survey data, will then be used to eliminate species occurring in the counties but not in the Broad River Basin. Habitat requirements of each of the remaining species will then be summarized and compared to available habitat within the Project boundary and the area downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island. This analysis will yield a list of species that potentially occur within the Broad River Basin, and that have suitable habitat within the Project Boundary and downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island.

5.0 SCHEDULE

Research and data collection efforts will begin no later than the spring of 2015. A final report summarizing the study findings including the compiled spreadsheets will be issued within 120 days of the completion of data collection. Study methodology and timing may be adjusted based on consultation with resource agencies and interested stakeholders.

6.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, USFWS, RT&E TWC and other relicensing stakeholders.

APPENDIX B
USFWS COUNTY LEVEL LISTING FOR FAIRFIELD,
NEWBERRY AND RICHLAND COUNTIES

South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species - Fairfield County

- * Contact National Marine Fisheries Service (NMFS) for more information on this species
- ** The U.S. Fish and Wildlife Service (FWS) and NMFS share jurisdiction of this species
- ARS At-Risk Species - Species that the FWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted); information is provided only for conservation actions as no Federal protections currently exist.
- BGEPA Federally protected under the Bald and Golden Eagle Protection Act
- C FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
- CH Critical Habitat
- E Federally Endangered
- P - CH Proposed critical habitat in the Federal Register
- S/A Federally protected due to similarity of appearance to a listed species
- T Federally Threatened

COUNTY	CATEGORY	COMMON NAME	SCIENTIFIC NAME	STATUS
Fairfield	Amphibian	None Found		
	Bird	Bald eagle	<i>Haliaeetus leucocephalus</i>	BGEPA
	Crustacean	Little River (Broad River spiny) crayfish	<i>Cambarus spicatus</i>	ARS
	Fish	Blueback herring	<i>Alosa aestivalis</i>	ARS
	Insect	None Found		
	Mammal	None Found		
	Mollusk	Carolina heelsplitter	<i>Lasmigona decorata</i>	E
	Plant	Georgia aster	<i>Symphotrichum georgianum</i>	C
Reptile	None Found			

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated as deemed necessary and may differ from earlier lists.

For a list of State endangered, threatened, and species of concern, please visit <https://www.dnr.sc.gov/species/index.html>.

South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species - Newberry County

- * Contact National Marine Fisheries Service (NMFS) for more information on this species
- ** The U.S. Fish and Wildlife Service (FWS) and NMFS share jurisdiction of this species
- ARS At-Risk Species - Species that the FWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted); information is provided only for conservation actions as no Federal protections currently exist.
- BGEPA Federally protected under the Bald and Golden Eagle Protection Act
- C FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
- CH Critical Habitat
- E Federally Endangered
- P - CH Proposed critical habitat in the Federal Register
- S/A Federally protected due to similarity of appearance to a listed species
- T Federally Threatened

COUNTY	CATEGORY	COMMON NAME	SCIENTIFIC NAME	STATUS
Newberry	Amphibian	None Found		
	Bird	Bald eagle	<i>Haliaeetus leucocephalus</i>	BGEPA
	Bird	Wood stork	<i>Mycteria americana</i>	E
	Crustacean	Newberry burrowing crayfish (Saluda)	<i>Distocambarus youngineri</i>	ARS
	Fish	None Found		
	Insect	None Found		
	Mammal	None Found		
	Mollusk	Savannah lilliput	<i>Toxolasma pullus</i>	ARS
	Mollusk	Yellow lance	<i>Elliptio lanceolata</i>	ARS
	Plant	None Found		
	Reptile	None Found		

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated as deemed necessary and may differ from earlier lists.

For a list of State endangered, threatened, and species of concern, please visit <https://www.dnr.sc.gov/species/index.html>.

South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species - Richland County

- * Contact National Marine Fisheries Service (NMFS) for more information on this species
- ** The U.S. Fish and Wildlife Service (FWS) and NMFS share jurisdiction of this species
- ARS At-Risk Species - Species that the FWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted); information is provided only for conservation actions as no Federal protections currently exist.
- BGEPA Federally protected under the Bald and Golden Eagle Protection Act
- C FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
- CH Critical Habitat
- E Federally Endangered
- P or P - CH Proposed for listing or critical habitat in the Federal Register
- S/A Federally protected due to similarity of appearance to a listed species
- T Federally Threatened

COUNTY	CATEGORY	COMMON NAME	SCIENTIFIC NAME	STATUS
Richland	Amphibian	Chamberlain's dwarf salamander	<i>Eurycea chamberlaini</i>	ARS
	Bird	Bald eagle	<i>Haliaeetus leucocephalus</i>	BGEPA
	Bird	Red-cockaded woodpecker	<i>Picoides borealis</i>	E
	Crustacean	Little River (Broad River spiny) crayfish	<i>Cambarus spicatus</i>	ARS
	Fish	American eel	<i>Anguilla rostrata</i>	ARS
	Fish	Atlantic Sturgeon*	<i>Acipenser oxyrinchus*</i>	E
	Fish	Blueback herring	<i>Alosa aestivalis</i>	ARS
	Fish	Robust redhorse	<i>Moxostoma robustum</i>	ARS
	Fish	Shortnose sturgeon*	<i>Acipenser brevirostrum*</i>	E
	Insect		None Found	
	Mammal		None Found	
	Mollusk	Savannah lilliput	<i>Toxolasma pullus</i>	ARS
	Plant	Bog spicebush	<i>Lindera subcoriacea</i>	ARS
	Plant	Canby's dropwort	<i>Oxypolis canbyi</i>	E
	Plant	Carolina-birds-in-a-nest	<i>Macbridea caroliniana</i>	ARS
	Plant	Ciliate-leaf tickseed	<i>Coreopsis integrifolia</i>	ARS
	Plant	Georgia aster	<i>Symphotrichum georgianum</i>	C
	Plant	Purple balduina	<i>Balduina atropurpurea</i>	ARS
	Plant	Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E
	Plant	Smooth coneflower	<i>Echinacea laevigata</i>	E
Plant	Spathulate seedbox	<i>Ludwigia spathulata</i>	ARS	
Reptile	Southern hognose snake	<i>Heterdon simus</i>	ARS	

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated as deemed necessary and may differ from earlier lists.

For a list of State endangered, threatened, and species of concern, please visit <https://www.dnr.sc.gov/species/index.html>.

APPENDIX C
STAKEHOLDER CONSULTATION

From: [Vivianne Vejdani](#)
To: [Kelly Miller](#)
Cc: [Bill Marshall](#); "[Richard Christie](#)"
Subject: RE: draft RT&E Species Desktop Assessment
Date: Wednesday, July 09, 2014 4:37:08 PM

Hi Kelly,

The plan looks good but I would offer perhaps one general suggestion...the phrase "does not occur within the study area/project area" be replaced by something like "is not likely to occur," in cases where on the ground surveys have not been conducted.

From: Kelly Miller [mailto:Kelly.Miller@KleinschmidtGroup.com]
Sent: Monday, June 23, 2014 4:34 PM
To: Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall; Bill Stangler (CRK@congariverkeeper.org); Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); David Eargle (eargleda@dhec.sc.gov); Gerrit Jobsis (gjobsis@americanrivers.org); Henry Mealing; Jay Maher; Jim Glover (gloverjb@dhec.sc.gov); Karla Reece (Karla.Reece@noaa.gov); Kelly Miller; QUATTLEBAUM, MILTON; rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); randy mahan (rmahan@sc.rr.com); Sam Stokes Jr.; Scott Castleberry (castlews@dhec.sc.gov); Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); Vivianne Vejdani
Subject: draft RT&E Species Desktop Assessment

All,

Attached is the draft Rare, Threatened and Endangered Species Desktop Assessment. Please review and submit any comments or edits to me by Wednesday, July 9th. Please note that the appendices will be included with the final report.

Thanks!
Kelly

Kelly Miller
Regulatory Coordinator

Office: 803.462.5633
www.KleinschmidtGroup.com

From: [Hamstead, Byron](#)
To: [Kelly Miller](#)
Cc: [Alison Jakupca](#); [BARGENTIERI@scana.com](#); [Bill Marshall \(marshallb@dnr.sc.gov\)](#); [Bill Stangler \(CRK@congariverkeeper.org\)](#); [Chad Altman \(altmankc@dhec.sc.gov\)](#); [David Eargle \(eargleda@dhec.sc.gov\)](#); [Gerrit Jobsis \(gjobsis@americanrivers.org\)](#); [Henry Mealing](#); [Jay Maher](#); [Jim Glover \(gloverjb@dhec.sc.gov\)](#); [Karla Reece \(Karla.Reece@noaa.gov\)](#); [QUATTLEBAUM, MILTON](#); [rammarell@scana.com](#); [Randy Mahan \(randolph.mahan@scana.com\)](#); [randy mahan \(rmahan@sc.rr.com\)](#); [Sam Stokes \(stokess@dnr.sc.gov\)](#); [Scott Castleberry \(castlews@dhec.sc.gov\)](#); [Shane Boring](#); [Steve Summer](#); [Tom McCoy \(thomas_mccoy@fws.gov\)](#); [Vivianne Vejdani](#)
Subject: Re: draft RT&E Species Desktop Assessment
Date: Wednesday, July 09, 2014 4:39:38 PM
Attachments: [20140709_Parr RTE TWC proposal to include two mussels for consideration.docx](#)

All,

The Service proposes that two additional species be included for consideration by the RT&E TWC, *Lampsilis cariosa* and *Elliptio roanokensis*. Attached is a document that aims to provide our basis for this proposal, and information relevant to the objectives of the desktop assessment. Please let me know if you have any questions regarding this information. Additionally, I can send along the 2007 mussel survey data (from Price *et al.* 2009) in GIS file format if you request it. The Service appreciates the opportunity to participate on this Committee.

Thanks,
Byron

Byron Hamstead
Fish and Wildlife Biologist
USFWS Charleston Field Office
176 Croghan Spur Rd., Suite 200
Charleston, SC, 29407

843-727-4707 ext. 205

On Mon, Jun 23, 2014 at 4:33 PM, Kelly Miller
<Kelly.Miller@kleinschmidtgroup.com> wrote:

All,

Attached is the draft Rare, Threatened and Endangered Species Desktop Assessment. Please review and submit any comments or edits to me by Wednesday, July 9th. Please note that the appendices will be included with the final report.

Thanks!

Kelly

From: [Hamstead, Byron](#)
To: [Kelly Miller](#)
Cc: [Alison Jakupca](#); [BARGENTIERI@scana.com](#); [Bill Marshall \(marshallb@dnr.sc.gov\)](#); [Bill Stangler \(CRK@congareriverkeeper.org\)](#); [Chad Altman \(altmankc@dhec.sc.gov\)](#); [David Eargle \(eargleda@dhec.sc.gov\)](#); [Gerrit Jobsis \(gjobsis@americanrivers.org\)](#); [Henry Mealing](#); [Jay Maher](#); [Jim Glover \(gloverjb@dhec.sc.gov\)](#); [Karla Reece \(Karla.Reece@noaa.gov\)](#); [QUATTLEBAUM, MILTON](#); [rammarell@scana.com](#); [Randy Mahan \(randolph.mahan@scana.com\)](#); [randy mahan \(rmahan@sc.rr.com\)](#); [Sam Stokes \(stokess@dnr.sc.gov\)](#); [Scott Castleberry \(castlews@dhec.sc.gov\)](#); [Shane Boring](#); [Steve Summer](#); [Tom McCoy \(thomas_mccoy@fws.gov\)](#); [Vivianne Vejdani](#)
Subject: Re: draft RT&E Assessment in track changes
Date: Sunday, August 24, 2014 1:36:04 PM
Attachments: [20140824_USFWS_Comments_Parr_RTE_Desktop_Assessment.docx](#)

Hi Kelly,

Please see comments from the USFWS on the RTE desktop assessment. Many thanks for your efforts to include the yellow lampmussel and Roanoke slabshell in your assessment. Please let me know if you have any questions regarding these comments. I will be away from the office for the next two weeks, but I am available via email or my cell: 919.946.0874.

Thanks,
Byron

Byron Hamstead
Fish and Wildlife Biologist
USFWS Charleston Field Office
176 Croghan Spur Rd., Suite 200
Charleston, SC, 29407

843-727-4707 ext. 205

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On Wed, Aug 13, 2014 at 10:01 AM, Kelly Miller
<Kelly.Miller@kleinschmidtgroup.com> wrote:

Good morning!

The draft Rare, Threatened and Endangered Species Desktop Assessment has been revised to address comments received by Byron Hamstead and Vivianne Vejdani. These revisions are included in track changes in the attached document. Please review the revised report and if everyone approves of the changes, I will attach the appendices and finalize the document.

Thanks!

Kelly

Kelly Miller

Regulatory Coordinator

Kleinschmidt

Office: 803.462.5633

www.KleinschmidtGroup.com

From: [Shane Boring](#)
To: [Hamstead, Byron](#)
Cc: [Henry Mealing](#); BARGENTIERI@scana.com; [Kelly Miller](#)
Subject: Final Parr/FF Rare, Threatened and Endangered Species Assessment
Date: Wednesday, September 24, 2014 4:15:20 PM
Attachments: [20140924_Parr RTE Desktop Assessment.docx](#)
[USFWS comment responses 9-18-2014- revised.doc](#)

Byron,

Thanks for your comments on the revised RT&E report; they were very constructive. We have addressed the majority of your comments, which you will find in track changes in the attached final version of the report. There were a few comments that we did not agree with for inclusion in the final report, but we believe needed further clarification with you specifically. For those items, we prepared and attached a separate document with our rationale on these items. When we file the RTE report in the Final License Application, we will include your official comments and correspondence as part of the report.

Thanks again for your continued commitment to the relicensing process.

C. Shane Boring
Environmental Scientist

Kleinschmidt

Office: 803.462.5625

www.KleinschmidtGroup.com

From: [Hamstead, Byron](#)
To: [Henry Mealing](#)
Cc: [ARGENTIERI, WILLIAM R](#); [Shane Boring](#); [Kelly Miller](#)
Subject: Re: Delivery delayed:County Species List
Date: Tuesday, September 01, 2015 7:19:27 AM
Attachments: [image001.png](#)

Apologies Henry. I included the Union County list b/c the PBL includes the confluence of the Broad and Enoree Rivers. I mistook the Union county line to extend down to the Enoree-Broad River confluence.

Byron

Byron Hamstead
Fish and Wildlife Biologist
USFWS Charleston Field Office
176 Croghan Spur Rd., Suite 200
Charleston, SC, 29407

843-727-4707 ext. 205

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On Mon, Aug 31, 2015 at 7:14 PM, Henry Mealing
<Henry.Mealing@kleinschmidtgroup.com> wrote:

Byron,

I took a closer look at all of the items you sent me and I noticed that you included Union County as one of the counties in the project influence. The project doesn't touch Union County and we will remove any species from the list that are associated with that specific county list. The major inclusions of species to evaluate are the At Risk Species (ARS). We will add an additional section to cover these species including a short write up – known presence within the PBL – if the project will affect the species.

Thanks again for the complete list. We will get started on this right away.

Henry

Henry Mealing

Fisheries Biologist / Project Manager

Kleinschmidt

204 Caughman Farm Lane

Suite 301

Lexington, SC 29072

706-339-3209

www.KleinschmidtGroup.com

From: Hamstead, Byron [mailto:byron_hamstead@fws.gov]
Sent: Monday, August 24, 2015 10:05 AM
To: ARGENTIERI, WILLIAM R <BARGENTIERI@scana.com>
Cc: Henry Mealing <Henry.Mealing@KleinschmidtGroup.com>
Subject: Re: Delivery delayed:County Species List

Hi Bill,

Per Henry's request, attached is a .xlsx list of federal priority species that may be impacted by the Parr Project. These species were pulled from the USFWS's county lists (Union, Fairfield, Newberry, and Richland Counties), Birds of Conservation Concern (2008) for Bird Conservation Region 29 (Table 27), and our July 9, 2014 proposal to include two mussels for consideration by the RT&E TWC. County lists and other reference documents are attached for your records. Please let me know if you have any questions.

Thanks,

Byron

Byron Hamstead

Fish and Wildlife Biologist

USFWS Charleston Field Office

176 Croghan Spur Rd., Suite 200

Charleston, SC, 29407

843-727-4707 ext. 205

This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act and may be disclosed to third parties.

On Mon, Jun 29, 2015 at 1:08 PM, ARGENTIERI, WILLIAM R
<BARGENTIERI@scana.com> wrote:

Done

His new email address is Henry.Mealing@KleinschmidtGroup.com.

From: Thomas McCoy [mailto:thomas_mccoy@fws.gov]

Sent: Friday, June 26, 2015 3:13 PM

To: ARGENTIERI, WILLIAM R

Subject: FW: Delivery delayed:County Species List

*****This is an EXTERNAL email. Please do not click on a link or open any attachments unless you are confident it is from a trusted source.**

Hi Bill,

??

Can you send to Henry the species list?

It bounced back.

Tom

??

NOTE: This email correspondence and any attachments to and from this sender are subject to the Freedom of Information Act and may be disclosed to third parties. ??

??

From: Microsoft Outlook [mailto:postmaster@doi.gov]

Sent: Friday, June 26, 2015 2:55 PM

To: thomas_mccoy@fws.gov

Subject: Delivery delayed:County Species List

??

Delivery is delayed to these recipients or groups:

[Henry Mealing \(HMealing@kassociates.com\)](mailto:HMealing@kassociates.com)

Subject: County Species List

This message hasn't been delivered yet. Delivery will continue to be attempted.

The server will keep trying to deliver this message for the next 1 days, 19 hours and 55 minutes. You'll be notified if the message can't be delivered by that time.

**Exhibit E-7 Rare, Threatened and Endangered
Species**

Rocky Shoals Spider Lily Study Plan

ROCKY SHOALS SPIDER LILY (*HYMENOCALLIS CORONARIA*) STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC No. 1894)

Prepared for:

**South Carolina Electric & Gas Company
Cayce, South Carolina**

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

ROCKY SHOALS SPIDER LILY
(*Hymenocallis coronaria*)
STUDY PLAN

PARR HYDROELECTRIC PROJECT
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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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**ROCKY SHOALS SPIDER LILY
(*HYMENOCALLIS CORONARIA*) STUDY PLAN**

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

The Parr Fairfield Hydroelectric Project (FERC No. 1894) (“Parr Fairfield Project” or “Project”), owned and operated by the South Carolina Electric & Gas Company (“SCE&G” or “Licensee”), is seeking a new license from the Federal Energy Regulatory Commission (“FERC”), as their current license is set to expire on June 30, 2020. The Parr Fairfield Project consists of two developments, including the Parr Hydro Development and the Fairfield Pumped Storage Development, located in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWCs) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license. A Rare, Threatened & Endangered Species TWC (“RT&E TWC” or “TWC”) was formed to address potential RT&E related issues associated with the Project. It is comprised of stakeholders including the U.S. Fish and Wildlife Service (“USFWS”), the National Marine Fisheries Service (“NMFS”), the South Carolina Department of Health and Environmental Control (“SCDHEC”) and the South Carolina Department of Natural Resources (“SCDNR”), among others. During issues scoping, the TWC identified a South Carolina state species of concern, the Rocky Shoals Spider Lily (*Hymenocallis coronaria*) as occurring in the Broad River, downstream of the Parr Shoals Dam (Parr Dam). TWC members requested a survey to document the presence of this species in reaches downstream of the Project Area.

2.0 RELEVANT LIFE HISTORY INFORMATION

The Rocky Shoals Spider Lily (*Hymenocallis coronaria*), a recognized species of concern for South Carolina, is an aquatic, perennial flowering plant easily identified by its large white flowers. The plant develops from a bulb and grows to be approximately 3 feet tall. *H. coronaria* requires a specialized habitat of swift, shallow flowing water over rocks and direct sunlight (Davenport, 2007). The Broad River downstream of the Parr Dam contains shoal areas which provide the necessary habitat for this species. During winter months, plant bulbs and seeds stay buried in the rocky riverbed until May, when leaves begin to emerge above the water surface. During this time, flower stalks begin to develop and the short blooming season occurs from mid-May through June (Davenport, 2007).

3.0 STUDY OBJECTIVES

The objective of this study is to assess the status of *H. coronaria* within the area of Project influence by identifying and documenting all populations in the portion of the Broad River from Parr Dam extending to and including Frost Shoals, near Boatwright Island.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

As the life history information indicates, *H. coronaria* populations may occur at various shoals along the Broad River downstream of the Parr Dam. For this reason, the survey area will include the stretch of the Broad River downstream of the Parr Dam extending to and including Frost Shoals, near Boatwright Island. The survey reach is depicted in yellow in Figure 1.

The study will occur during the flowering season over two to three days in May or June, depending on flows and weather.

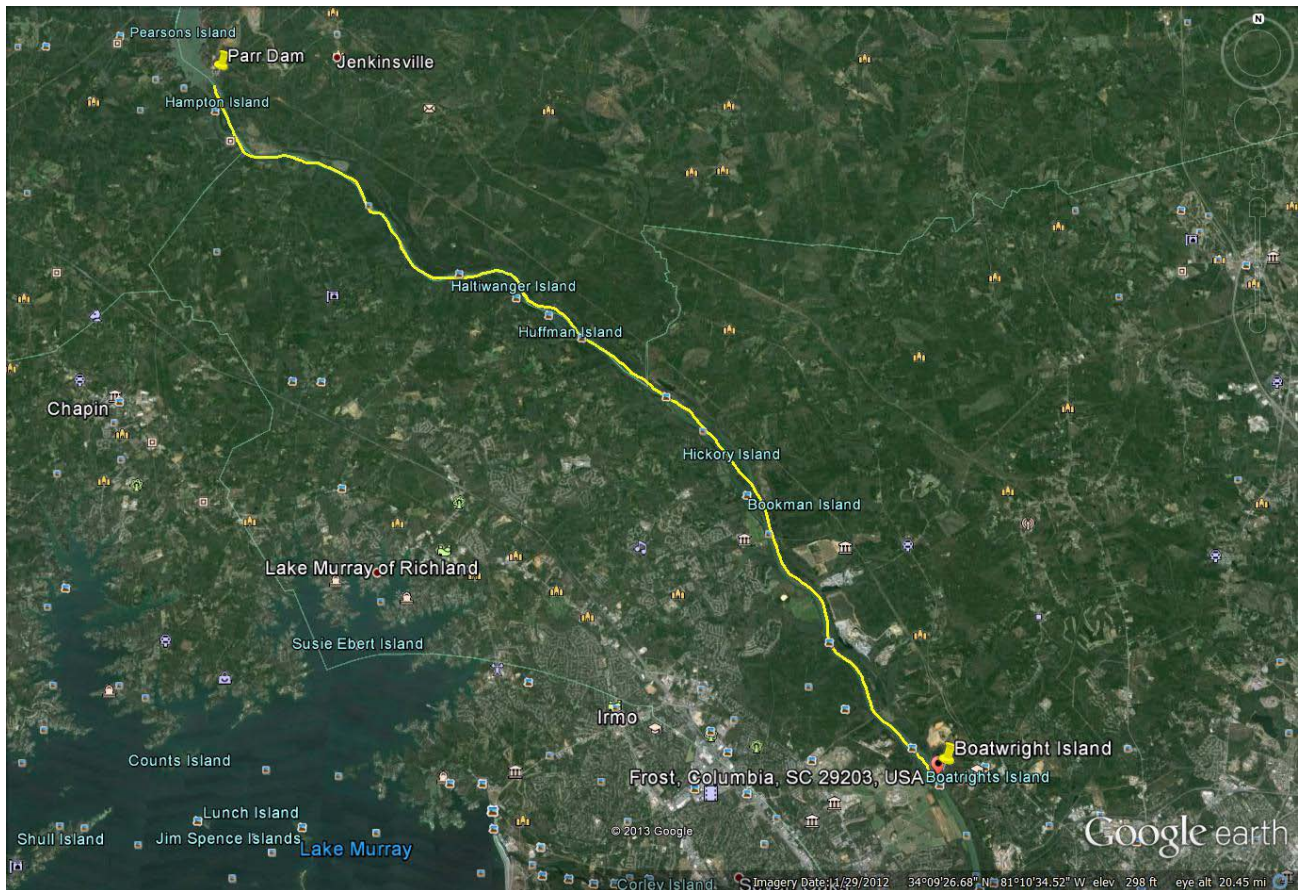


FIGURE 1 ROCKY SHOALS SPIDER LILY SURVEY REACH

5.0 COLLECTION METHODS AND ANALYSIS

The survey will take place during the flowering season of the *H. coronaria*, which occurs from late spring to early summer. A survey crew(s) will deploy in kayaks or canoes at the base of the Parr Dam and paddle downstream, observing the area for populations of *H. coronaria*. The main stem river channel, side channel areas and island complexes will be thoroughly surveyed. The crew(s) will paddle approximately halfway down the survey reach on Day 1. The group will then reconvene at the take-out location from Day 1 on Day 2 and paddle the remainder of the study area. When populations are sighted, the crew will document the exact location of the plants using GPS. The basal area of plants or clumps of plants will be measured and recorded. Elevation data for documented plants or clumps of plants will be obtained either during this survey or during the IFIM Survey.

6.0 SCHEDULE

It is anticipated that data collection will occur in the spring of 2015. Due to the variability in flows and meteorologic conditions, the exact survey dates will be determined at a later date and announced two weeks in advance to the TWC members. If 2015 has extensive high flow conditions that would not allow for an effective assessment, the study will be postponed until the spring of 2016.

Within 90 days of the close of field work, a final report summarizing the study findings will be issued. Study methodology, duration and timing may be adjusted based on consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Study results will be used as an information resource during the discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, SCDHEC, USFWS, RT&E TWC, and other relicensing stakeholders.

8.0 REFERENCES

Davenport, L. J. (2007). "Cahaba Lily." *The Encyclopedia of Alabama*. [Online] URL: <http://www.encyclopediaofalabama.org/face/Article.jsp?id=h-967>. Accessed August 7, 2013.

**Exhibit E-7 Rare, Threatened and Endangered
Species**

Rocky Shoals Spider Lily Report

ROCKY SHOALS SPIDER LILY REPORT

PARR HYDROELECTRIC PROJECT
FERC PROJECT NO. 1894

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
KleinschmidtGroup.com

November 2015

ROCKY SHOALS SPIDER LILY REPORT

PARR HYDROELECTRIC PROJECT
FERC PROJECT NO. 1894

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

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Lexington, South Carolina
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November 2015

ROCKY SHOALS SPIDER LILY REPORT

**PARR HYDROELECTRIC PROJECT
FERC PROJECT NO. 1894**

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ROCKY SHOALS SPIDER LILY REPORT

PARR HYDROELECTRIC PROJECT FERC PROJECT NO. 1894

1.0 INTRODUCTION

The Parr Hydroelectric Project (FERC No. 1894) (Project), owned and operated by South Carolina Electric & Gas Company (SCE&G), is seeking a new license from the Federal Energy Regulatory Commission (FERC), as their current license is set to expire on June 30, 2020. The Parr Hydroelectric Project consists of two developments, Parr Shoals and Fairfield Pumped Storage, and is located on the Broad River in Fairfield and Newberry counties, South Carolina.

As part of relicensing, SCE&G has established a Rare, Threatened & Endangered Species Technical Working Committee (TWC) to address potential Project-related issues involving species that are of conservation concern. The TWC includes representatives from the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), South Carolina Department of Health and Environmental Control (SCDHEC) and South Carolina Department of Natural Resources (SCDNR), among others. During issues scoping, the TWC identified the rocky shoals spider lily (*Hymenocallis coronaria*) as occurring in the Broad River downstream of the Parr Shoals Dam (Parr Dam) and requested a survey to document its occurrence in the area of Project influence. Accordingly, the objective of this study was to assess the number and spatial distribution of RSSL occurring in the study area of the Broad River extending from Parr Dam through Frost Shoals, near Boatwright Island (Figure 1-1).

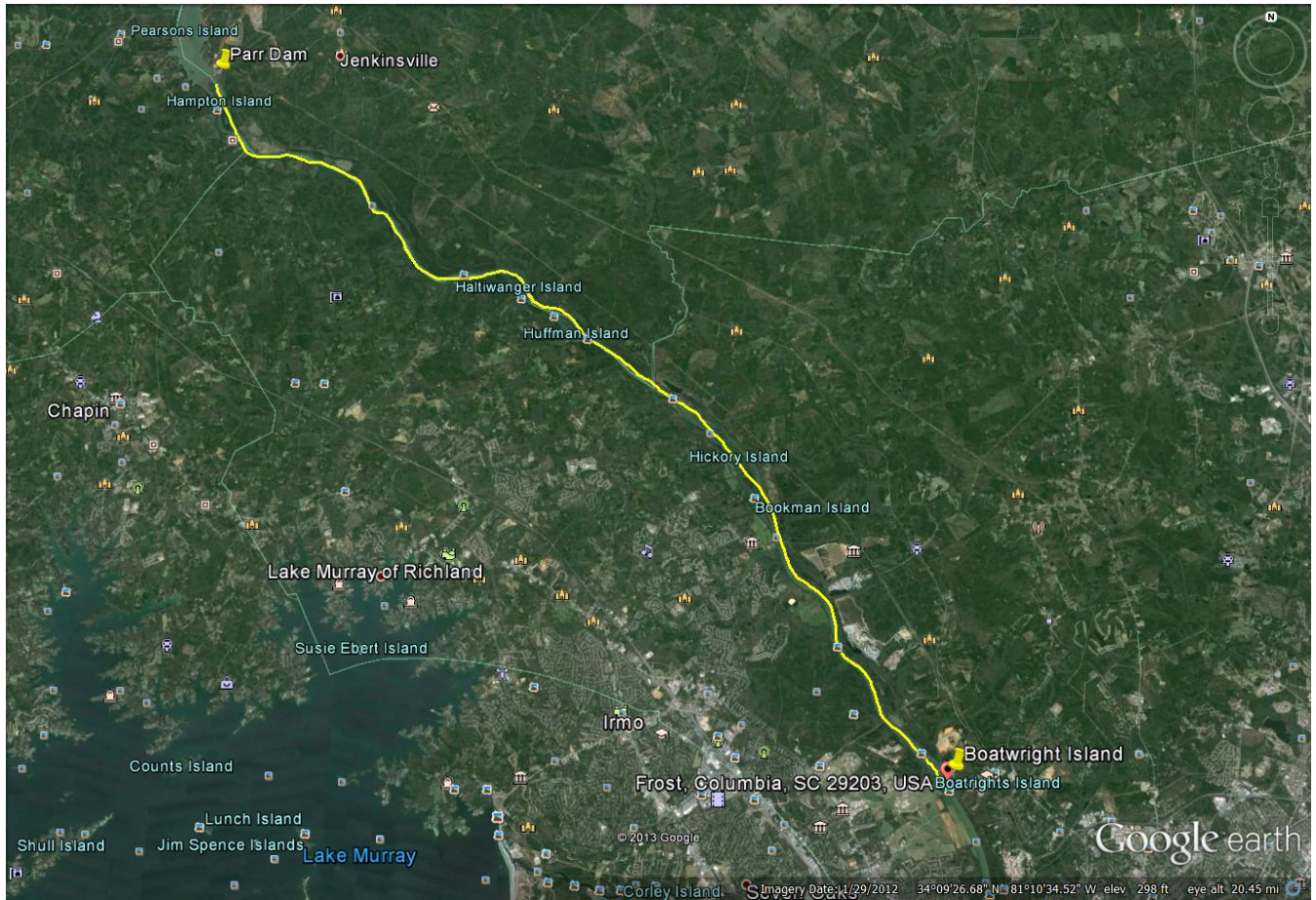


FIGURE 1-1 ROCKY SHOALS SPIDER LILY SURVEY REACH

1.1 RELEVANT LIFE HISTORY INFORMATION

Rocky shoals spider lily (RSSL), also referred to as Cahaba lily, is an aquatic perennial limited to large streams and rivers at or above the fall line in Georgia, South Carolina and Alabama (Davenport 1996). It is typically found on bedrock outcroppings or in large cobble or boulder substrates, which provide anchor points for the RSSL's roots and bulbs (Patrick et al. 1995). RSSL grows best in direct sunlight, with constantly flowing water, relatively low sediment loads, and water depths (to bulb) of 4 to 12 inches (Aulbach-Smith 1998). Blooming for this species occurs annually from late-April through mid-June, during which it is easily identified by its large white flowers (Photo 1-1). The decline of RSSL has historically been attributed to loss of shoals habitat due to construction of impoundments and other channel modifications (Davenport 1996).

While not state or federally listed as threatened or endangered, the RSSL is considered rare by the SCDNR and is among the species tracked by the agency's Heritage Trust Program (Julie Holling, SCDNR, Pers. Comm., April 14, 2014).



PHOTO 1-1 ROCKY SHOALS SPIDER LILY *HYMENOCALLIS CORONARIA* (A. CABE, 2004)

2.0 METHODS

The entirety of the study area was surveyed via boat by two to three crews during the peak flowering season in 2015 (May 26-27). Each team was led by a Kleinschmidt scientist with experience in conducting RSSL surveys. Each RSSL encountered was documented using a handheld Global Positioning System (GPS) and photographed. Surveyors also recorded length and width of each plant or cluster (to allow for calculation of basal area) and noted whether plants were blooming and if there were any visible signs of herbivory. Based on the length and width measurement collected in the field, basal area was calculated using the formula:

$$A = \pi (l/2 * w/2).$$

3.0 RESULTS AND DISCUSSION

A total of 81 RSSL plants or clumps of plants were documented during the survey. RSSL occurrences were limited to two primary areas: the Bookman Shoals complex and Frost Shoals, located just upstream of Boatwright Island (Figure 1-1). The majority of RSSL documented within the Bookman Shoals complex were located along a large bedrock ledge just upstream of Hickory Island, approximately 13 miles downstream of Parr Shoals Dam (Figure 3-1; Photo 3-1). Scattered additional RSSL were located in the braided channels downstream of the primary ledge in the Bookman Shoals complex (Figure 3-2). At Frost Shoals, RSSL occurrence was limited to the bedrock ledge located approximately 300 ft upstream of Boatwright Island and approximately 20 miles downstream of Parr Shoals Dam (Figure 3-3; Photo 3-2). RSSL occurrences ranged from single plants to assemblages of several hundred plants, and accordingly, basal area ranged from 0.05 m² to more than 20,000 m² within the study area (Table 3-1 and Table 3-2). Herbivory was noted at only 2 clusters observed during the survey. Plants were documented at water depths ranging from zero to 30 inches. Essentially all of the plants observed were extremely vigorous, with 96% (78 of 81) in full bloom at the time of the survey.



PHOTO 3-1 ROCKY SHOALS SPIDER LILY ASSEMBLAGE AT BOOKMAN SHOALS



PHOTO 3-2 LARGE ROCKY SHOALS SPIDER LILY ASSEMBLAGE AT FROST SHOALS

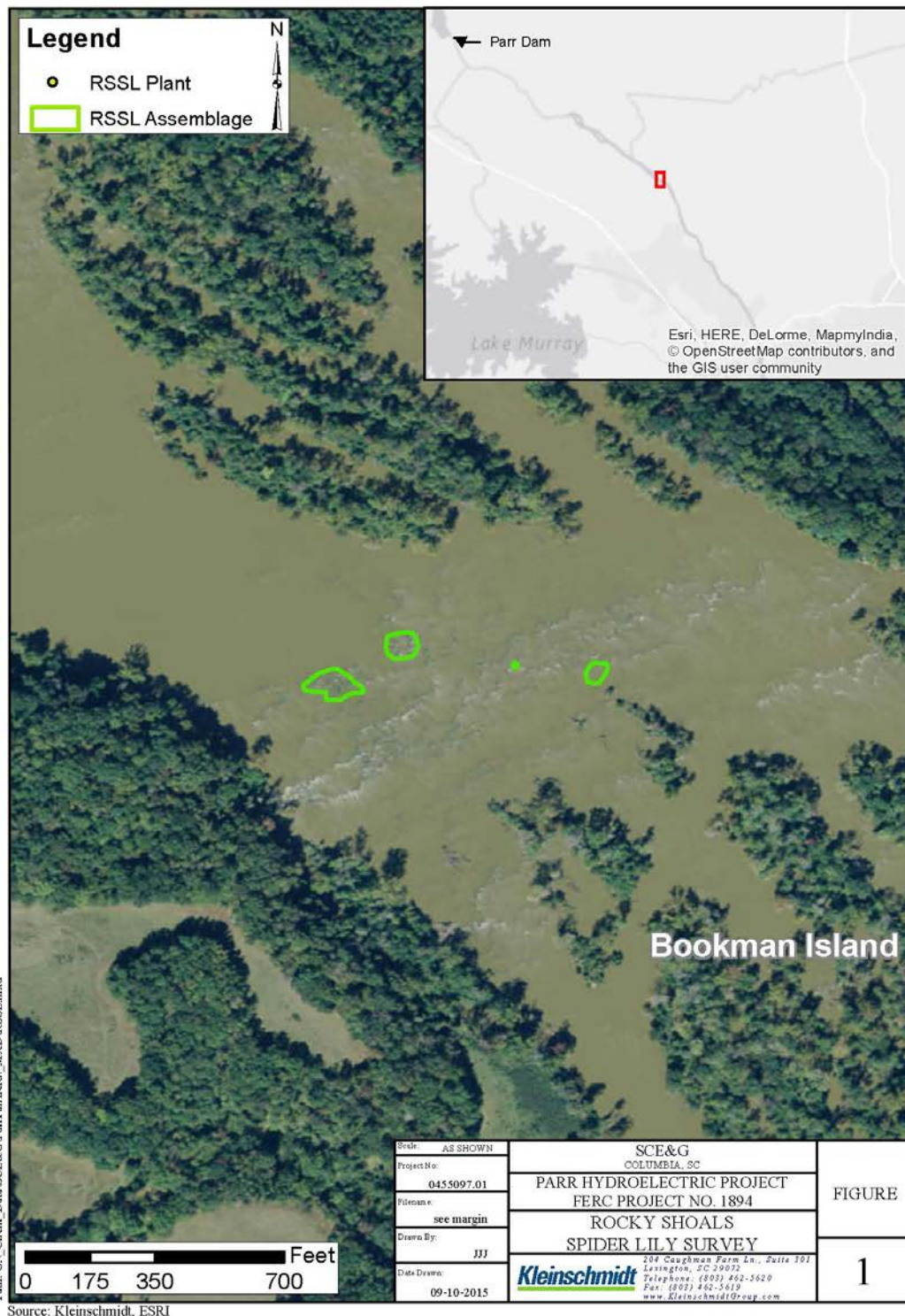


FIGURE 3-1 ROCKY SHOALS SPIDER LILIES – UPPER BOOKMAN SHOALS

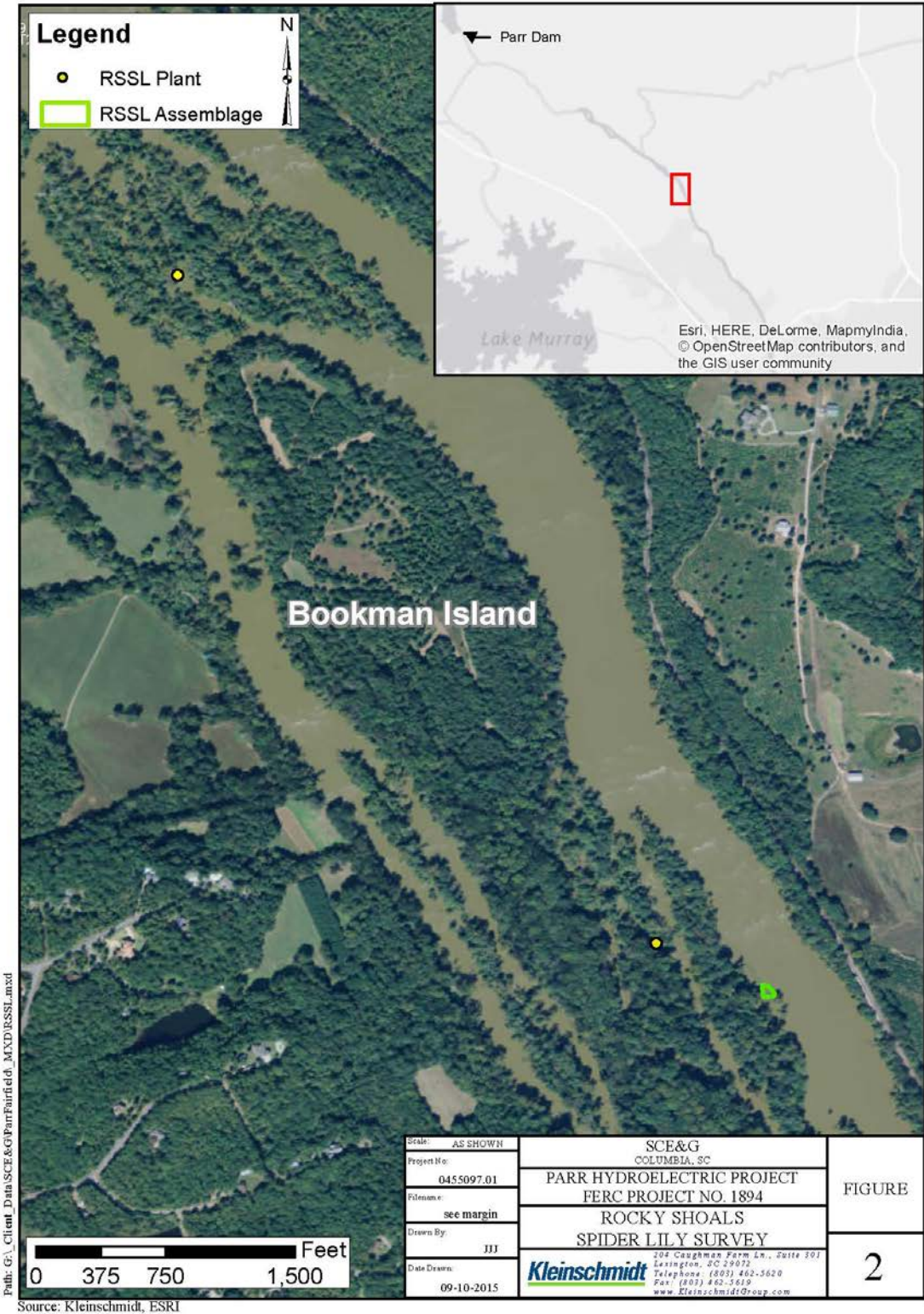


FIGURE 3-2 ROCKY SHOALS SPIDER LILIES – LOWER BOOKMAN SHOALS



FIGURE 3-1 ROCKY SHOALS SPIDER LILIES – BOATWRIGHT ISLAND

TABLE 3-1 ROCKY SHOALS SPIDER LILY DATA – BOOKMAN SHOALS

ID	Length (cm)	Width (cm)	Basal Area (m²)	Blooming (y/n)	Herbivory (y/n)	Water Depth (cm)
T1-1	68.58	27.94	15.05	y	y	5.1
T1-2	162.56	119.38	15.24	y	n	25.4
T1-3	81.28	81.28	51.88	y	n	30.5
T1-4	129.54	129.54	131.79	y	n	17.8
T1-5	121.92	96.52	92.42	y	n	27.9
T1-6	15.24	22.86	2.73	y	n	15.2
T1-7	111.76	45.72	40.13	y	n	22.9
T1-8	205.74	114.30	184.69	y	n	7.6
T1-9	68.58	66.04	35.57	y	n	5.1
T1-10	205.74	91.44	147.75	y	n	12.7
T1-11	83.82	55.88	36.78	y	n	5.1
T1-12	165.10	111.76	144.91	y	n	12.7
T1-13	368.30	271.78	786.15	y	n	33.0
T1-14	33.02	33.02	8.56	y	n	33.0
T1-15	27.94	30.48	6.68	y	n	22.9
T1-16	304.80	129.54	310.10	y	n	35.6
T1-17	58.42	35.56	16.31	y	n	33.0
T1-18	30.48	38.10	9.12	y	n	27.9
T1-19	35.56	33.02	9.22	y	n	17.8
T1-20	200.66	144.78	228.17	y	n	15.2
T1-21	312.42	360.68	885.01	y	n	15.2
T1-22	114.30	121.92	109.44	y	n	22.9
T2-1	33.02	60.96	15.80	y	n	0.0
T2-2	58.42	15.24	6.99	y	n	0.0
T2-3	86.36	60.96	41.34	y	n	3.8
T2-4	96.52	66.04	50.06	y	n	12.7
T2-5	25.40	20.32	4.05	y	n	20.3
T2-6	78.74	66.04	40.84	y	n	10.2
T2-7	45.72	30.48	10.94	y	n	10.2
T2-8	10.16	7.62	60.80	n	n	2.5
T2-9	2.54	2.54	0.05	n	n	2.5
T2-10	53.34	38.10	15.96	y	n	76.2
T2-11	10.16	15.24	1.22	y	n	0.0
T2-12	43.18	38.10	12.92	y	n	0.0
T3-1	172.72	401.32	544.41	y	n	10.2
T3-2	157.48	350.52	433.54	y	n	20.3
T3-3	281.94	127.00	281.22	y	n	10.2
T3-3b	261.62	106.68	219.20	y	n	10.2
T3-4	116.84	109.22	100.23	y	n	15.2
T3-5	50.80	93.98	37.50	y	n	25.4
T3-6	284.48	264.16	590.21	y	n	35.6
T3-7	914.40	350.52	2517.32	y	n	0.0
T3-8	574.04	396.24	1786.45	y	n	0.0
T3-9	25.40	10.16	2.03	y	n	7.6
T3-9b	15.24	5.08	0.61	y	n	10.2
T3-10	35.56	10.16	2.84	y	n	2.5
T3-11	60.96	335.28	160.52	y	n	2.5
T3-12	213.36	662.94	1110.91	y	n	7.6

TABLE 3-2 ROCKY SHOALS SPIDER LILY DATA – BOATWRIGHT ISLAND

ID	Length (cm)	Width (cm)	Basal Area (m²)	Blooming (y/n)	Herbivory (y/n)	Water Depth (cm)
T1-23	81.28	73.66	47.02	y	n	43.2
T1-24	93.98	91.44	67.49	y	n	17.8
T1-25	27.94	25.40	5.57	y	n	27.9
T1-26	149.86	421.64	496.27	y	n	15.2
T1-27	292.10	279.40	640.98	y	n	30.5
T1-28	35.56	22.86	6.38	y	n	35.6
T1-29	99.06	111.76	86.95	y	n	35.6
T1-30	269.24	167.64	354.49	y	n	30.5
T1-31	2377.44	1082.04	20204.25	y	n	22.9
T2-20	22.86	20.32	3.65	y	n	3.8
T2-21	48.26	17.78	6.74	y	n	5.1
T2-22	25.40	27.94	5.57	y	n	15.2
T2-23	81.28	81.28	51.89	y	n	25.4
T2-24	109.22	111.76	95.87	y	n	22.9
T2-25	586.74	215.90	994.92	y	n	15.2
T2-26	104.14	66.04	54.02	y	n	5.1
T2-27	104.14	86.36	70.64	y	n	25.4
T2-29	299.72	151.13	22624.89	y	n	12.7
T2-30	114.30	101.60	355.76	y	n	45.7
T2-31	63.50	53.34	91.21	y	n	30.5
T2-32	20.32	17.78	26.60	n	n	40.6
T2-33	55.88	60.96	2.84	y	n	12.7
T3-14	731.52	271.78	26.75	y	n	38.1
T3-15	1097.28	762.00	1561.47	y	n	25.4
T3-16	50.80	38.10	6566.93	y	n	33.0
T3-17	187.96	116.84	15.20	y	n	30.5
T3-18	121.92	101.60	172.48	y	n	43.2
T3-19	304.80	200.66	97.29	y	n	25.4
T3-20	1371.60	967.74	480.36	y	n	22.9
T3-21	53.34	60.96	10425.00	y	n	15.2
T3-22	325.12	127.00	25.54	y	n	10.2
T3-23	213.36	40.64	324.29	y	n	0.0
T3-24	86.36	50.80	68.10	y	n	7.6

4.0 REFERENCES

- Aulbach-Smith, Cynthia. 1998. *Hymenocallis coronaria*, The rocky shoals spider lily Broad River at Lockhart, SC. Botanical Services of South Carolina, Lexington, South Carolina. 99 pp.
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- Patrick, Thomas S., J. R. Allison, and G. A. Krakow. 1995. Protected plants of Georgia. Georgia Department of Natural Resources, Social Circle, GA. 246 pp.

**Exhibit E-7 Rare, Threatened and Endangered
Species**

Broad River Spiny Crayfish Study Plan

BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS
STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC No. 1894)

Prepared for:

South Carolina Electric & Gas Company
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January 2014

BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS
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January 2014

**BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS STUDY PLAN**

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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**BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS STUDY PLAN**

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894)(Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

During issues scoping, the TWC identified the potential need for a crayfish survey dependent upon discussions with U.S. Fish and Wildlife Service ("USFWS"). Based upon communications with the USFWS on June 6, 2013, the Broad River Spiny Crayfish (*Cambarus spicatus*), a South Carolina species of special concern, may be located within the Project area. As such, crayfish surveys were recommended to document the presence of this species within the Project area and downstream of the Parr Shoals Dam.

2.0 RELEVANT LIFE HISTORY INFORMATION

As noted, the Broad River Spiny Crayfish (*Cambarus spicatus*) is a species of concern in South Carolina. Eversole (1990) identified *C. spicatus* as having a distribution limited to lotic environments in the Broad River drainage basin. *C. spicatus* collections in the vicinity of the Project occurred within the Little River, a tributary to the Broad River, in Fairfield County. Although *C. spicatus* collections are limited, individuals were primarily associated with leaf litter and other organic debris located along the banks of streams. Preferred substrates have been found to be comprised primarily of sand and tend to be unstable in nature with a lack of rooted aquatic vegetation. Current information indicates that *C. spicatus* reproduces during the summer months (Eversole, 1990). *C. spicatus* was described by Hobbs (1956) as gray-green with cream, pink, purple and brown highlights. The chelae (the "claw" or "pincer") are green with orange tips and a double row of tubercles. Individuals range from about 60 mm (2.4 inches) to 78 mm (3.1 inches) in length.

3.0 STUDY OBJECTIVES

The objective of this survey is to assess the status of *C. spicatus* in the portion of the Broad River located within the Project boundary and an accessible area downstream of the Parr Shoals Dam.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

Based upon the life history information identified above, sampling sites will be located along the margins of the Broad River and associated tributaries, in areas of leaf litter/detritus, if possible. At least three sampling areas are proposed to be included as a part of this survey. General locations are listed in Table 1 and in Figure 1, below. These locations are approximate and actual sampling sites will be determined in consultation with USFWS prior to start of survey.

TABLE 1 BROAD RIVER CRAYFISH SAMPLING LOCATIONS

SAMPLING AREAS	
1.	Main Reservoir
2.	Broad River Downstream of Parr Shoals Dam
3.	Hwy 34 Boat Ramp

The study season will extend from September 1 through November 1, 2015.

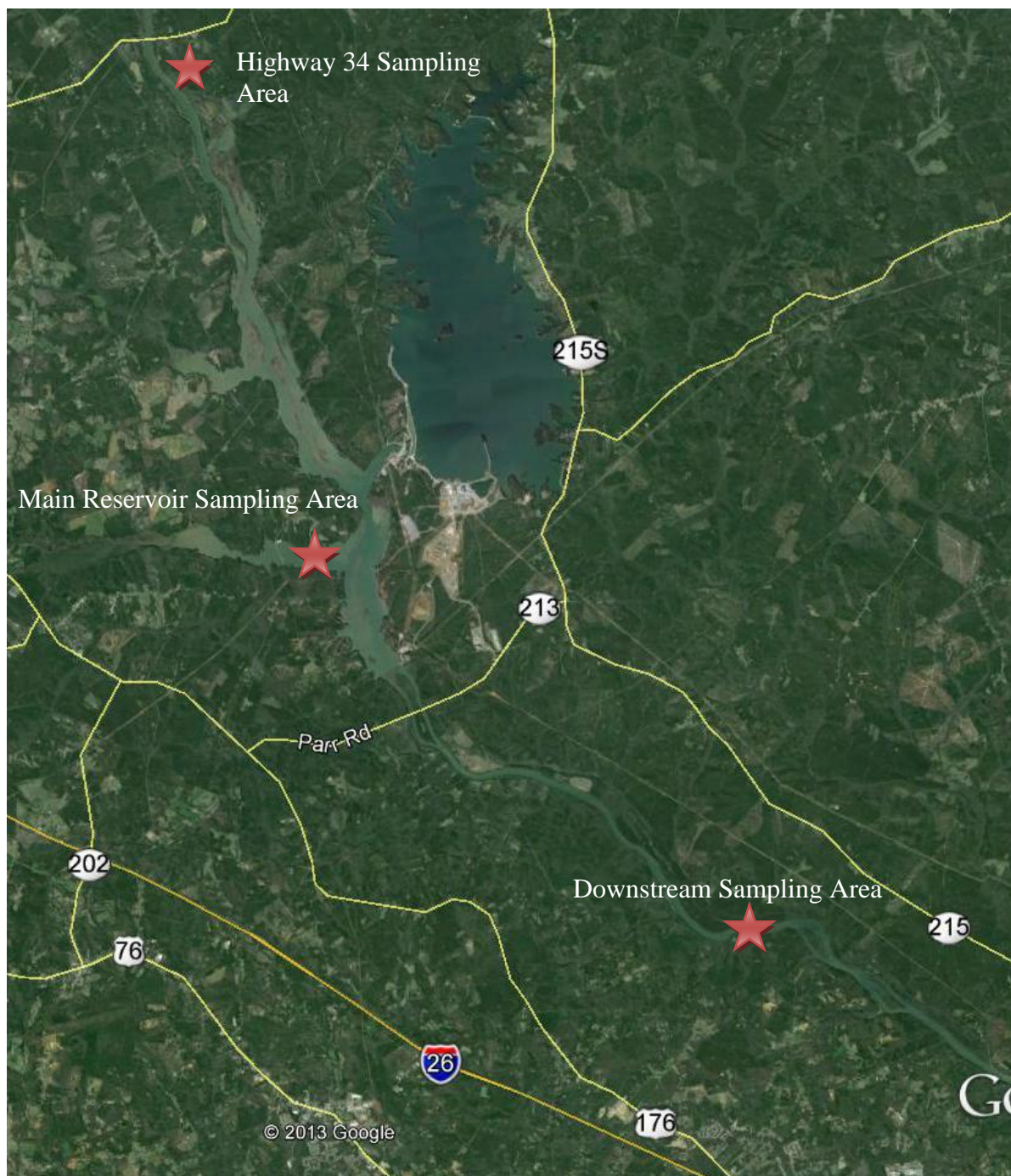


FIGURE 1 CRAYFISH SAMPLING AREAS

5.0 COLLECTION METHODS AND ANALYSIS

Passive trap methods will be utilized for this study. Traps will consist of double-entry, galvanized wire mesh minnow traps with 1" opercula. Traps will be baited with canned fish and will be re-baited when the traps are checked. A one-pound weight will be placed in the traps to ensure that they remain submerged. Traps will be deployed along shoreline, in areas of detritus and/or leaf litter, if possible. The number of traps per area will be determined during sample location reconnaissance. Traps will also be placed in locations where water depth is sufficient to ensure that they remain inundated. They will also be positioned such that they are not readily noticeable in an effort to decrease disturbance and vandalism. In the event of vandalism or theft, the trap will be replaced as soon as possible and the collection site location may be adjusted to prevent future vandalism.

The traps will be checked every 3 to 4 days beginning September 1. Based on collection results in September, the sampling days may be adjusted in October, as appropriate. Data recorded for each collection event will include: location (including site description and GPS coordinates), date, name of water body, basic water quality parameters (temperature, DO and conductivity), trap retrieval and deployment times, the total number of crayfish collected, the number of males and females. For the purposes of identification, only Form I males will be collected from the sample; other individuals will be released. Collected materials will be fixed in 5% neutral formalin, washed in tap water and preserved in 70% ethyl alcohol. Samples will be transported to a qualified astacologist for species identification.

6.0 SCHEDULE

Site location reconnaissance will be conducted in consultation with USFWS prior to start of survey. Crayfish traps will be deployed at the sampling locations on or around September 1, 2015 and will be allowed to sample for approximately eight weeks. The traps will be checked every 3 to 4 days in September and adjusted as appropriate in October.

A final report summarizing the study findings will be issued within 120 days of completion of field work. Study methodology, timing and duration may be adjusted based on consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the South Carolina Department of Natural Resources, USFWS, RT&E TWC, and other relicensing stakeholders.

8.0 REFERENCES

- Eversole, Arnold G. 1990. Status Report on *Cambarus (Puncticambarus) spicatus* Hobbs, *Distocambarus (Fitzcambarus) youngineri* Hobbs, and *Procambarus (Pennides) echinatus* Hobbs. Completion Report. 21 pp.
- Hobbs, H. H., Jr. 1956a. A new crayfish of the genus *Procambarus* from South Carolina (Decapoda: Astacidae). J. Wash. Acad. Sci. 46(1):117-121.
- NatureServe. 2013. *Cambarus spicatus* Hobbs, Broad River Spiney Crayfish. (Available Online)[URL]: <http://www.natureserve.org/>
- Price, Jennifer. Undated. Broad River Spiny Crayfish *Cambarus spicatus*. 2pp.

APPENDIX A

BROAD RIVER SPINY CRAYFISH STUDY – STUDY SITE SELECTION NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Parr Hydroelectric Project (FERC No.1894)

MEETING NOTES

Rare, Threatened and Endangered Species TWC
Broad River Spiny Crayfish Study – Study Site Selection Notes

July 23, 2014

Final CSB 092214

ATTENDEES:

Shane Boring – Kleinschmidt

Byron Hamstead – USFWS

Milton Quattlebaum – SCANA Environmental Services

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The group met with the purpose of selecting collection spots for the Broad River spiny crayfish (BRSC) as part of one of the proposed relicensing studies for the Parr Hydroelectric Project. The group launched from the Cannon's Creek ramp on Parr Reservoir and examined habitats from Cannon's Creek upstream to approximately 1 mile above the Highway 34 Bridge by boat. The group also examined habitat along Haltiwanger Island downstream of Parr Dam on foot. Prime collection areas included backwater areas with the presence of course woody debris and reasonable access for sampling.

Byron indicated that he was less impressed with habitats observed in Parr Reservoir, although some level of sampling was warranted in that area. The group determined that habitat in the vicinity of Haltiwanger Island in general lack the course woody debris and had higher velocities than are likely suitable for BRSC. Byron expressed an interest in exploring the area in the vicinity of the mouth of Little River for potential access since that is the area closest to where BRSC has been documented. The group made several attempts to examine Little River in that area, but were unable to find an access point. Shane and Milton noted that they would contact local landowners and attempt to facilitate an access point. Byron reiterated his desire to focus on the Little River mouth area.

Based on the field examinations and identifying a local landowner that would allow access to the Little River area, five sampling sites were identified, which are shown below in Figure 1 and Table 1. Two of the selected sites will be established at the Bookman Station Property to accommodate the USFWS request for additional sampling in the Vicinity of the Little River site located downstream of Parr Dam. A minimum of 3 traps will be deployed at each collection site.

Figure 1. Broad River Spiny Crayfish Sampling Sites

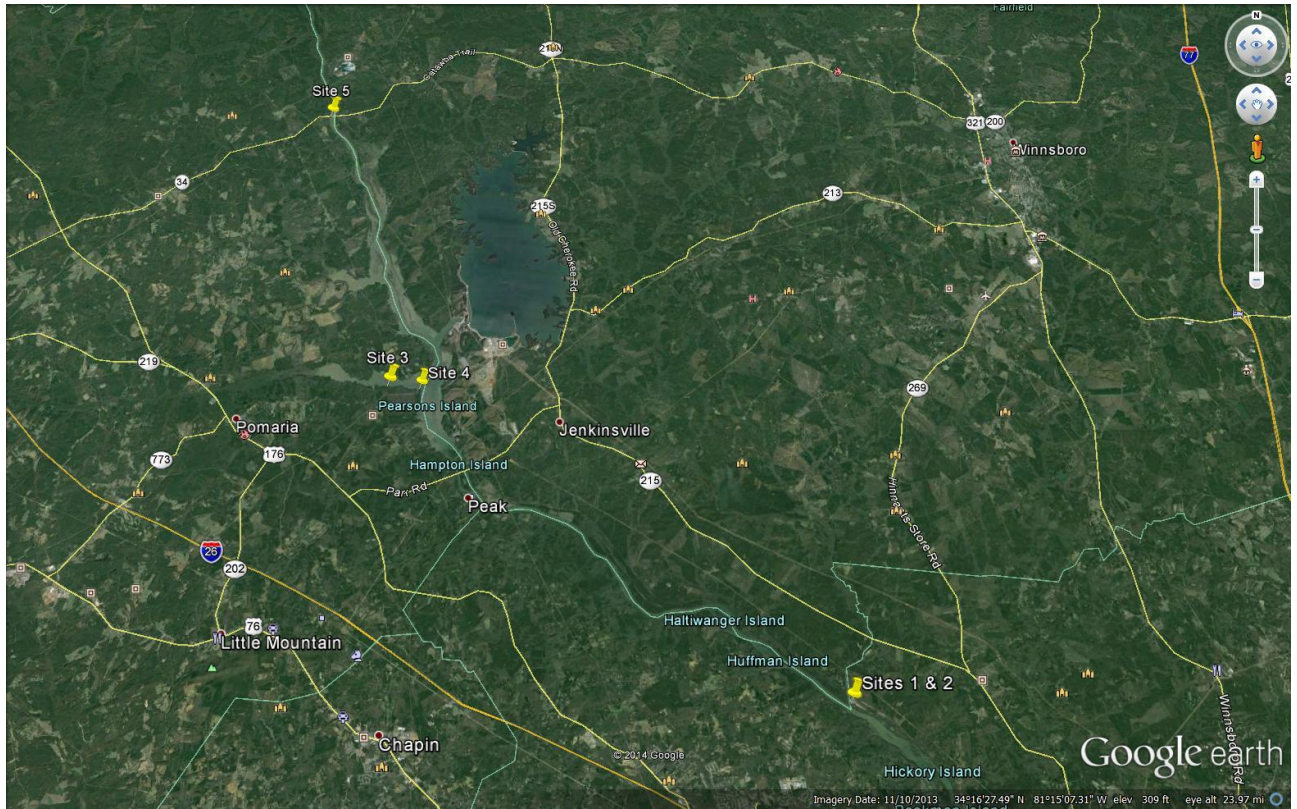


Table 1. Broad River Spiny Crayfish Sites

Site No.	Latitude/Longitude	Description/Notes
1	34°10'33.79"N, 81°10'41.48"W	Sites downstream of Parr Dam at mouth of Little River. Will be accessed from Bookman Station, LLC property. Two set of 3 traps will be positioned sufficiently apart in appropriate habitat to represent 2 sites.
2		
3	34°16'53.04"N, 81°21'35.93"W	Cove directly across from Cannon's Creek launch.
4	34°16'49.39"N, 81°20'48.05"W	Noted by USFWS as a shallow area with more overhead forest cover than other habitat in reservoir.
5	34°23'37.73"N, 81°23'55.93"W	Vicinity of Highway 34 Bridge.

ACTION ITEMS:

- Include these notes in the Final BRSC sampling plan and revise the Plan to note the listed sampling locations and number of sampling traps to be used.

**Exhibit E-7 Rare, Threatened and Endangered
Species**

Broad River Spiny Crayfish Study Report

BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS
STUDY REPORT

PARR HYDROELECTRIC PROJECT
(FERC No. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

January 2016

BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS
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**BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS STUDY REPORT**

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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**BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS STUDY REPORT**

**PARR HYDROELECTRIC PROJECT
(FERC No. 1894)**

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee for the Parr Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Shoals Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. SCE&G has established several Technical Working Committees (TWC's) comprised of members from the interested stakeholders. The TWC's objectives include the evaluation of relicensing issues and achieving consensus for addressing these issues in the new license.

The TWC identified the potential need for a crayfish survey based upon recommendations from the U.S. Fish and Wildlife Service ("USFWS"). On June 6, 2013, the USFWS noted that the Broad River Spiny Crayfish (*Cambarus spicatus*) may be located within the Project area and recommended that crayfish surveys for this species be performed in the Parr Shoals Reservoir and in the Broad River downstream of the Parr Shoals Dam. The South Carolina Department of Natural Resources currently designates this species with "special concern" status and is considering upgrading its priority rank from S3 to S2 (SC SWAP 2015). Additionally, the USFWS has been petitioned to list the Broad River Spiny Crayfish (BRSC) under the Endangered Species Act (USFWS 2011).

2.0 RELEVANT LIFE HISTORY INFORMATION

As noted, the BRSC (*Cambarus spicatus*) is a species of concern in South Carolina. Eversole (1990) identified BRSC as having a distribution limited to lotic environments in the Broad River Basin. BRSC collections in the vicinity of the Project are known from the upper portion of the Little River, a tributary to the Broad River, in Fairfield County (Figure 2-1; Eversole 2014). Although BRSC collections are limited, individuals are primarily associated with leaf litter and other organic debris located along the banks of streams. Preferred substrates are comprised primarily of sand and tend to be unstable in nature with a lack of rooted aquatic vegetation. Current information indicates that BRSC reproduce during the summer months (Eversole, 1990). BRSC was described by Hobbs (1956) as gray-green with cream, pink, purple and brown highlights. The chelae (the "claw" or "pincer") are green with orange tips and a double row of tubercles on the mesial margin of the palm. Individuals range from about 60 mm (2.4 inches) to 78 mm (3.1 inches) in length.

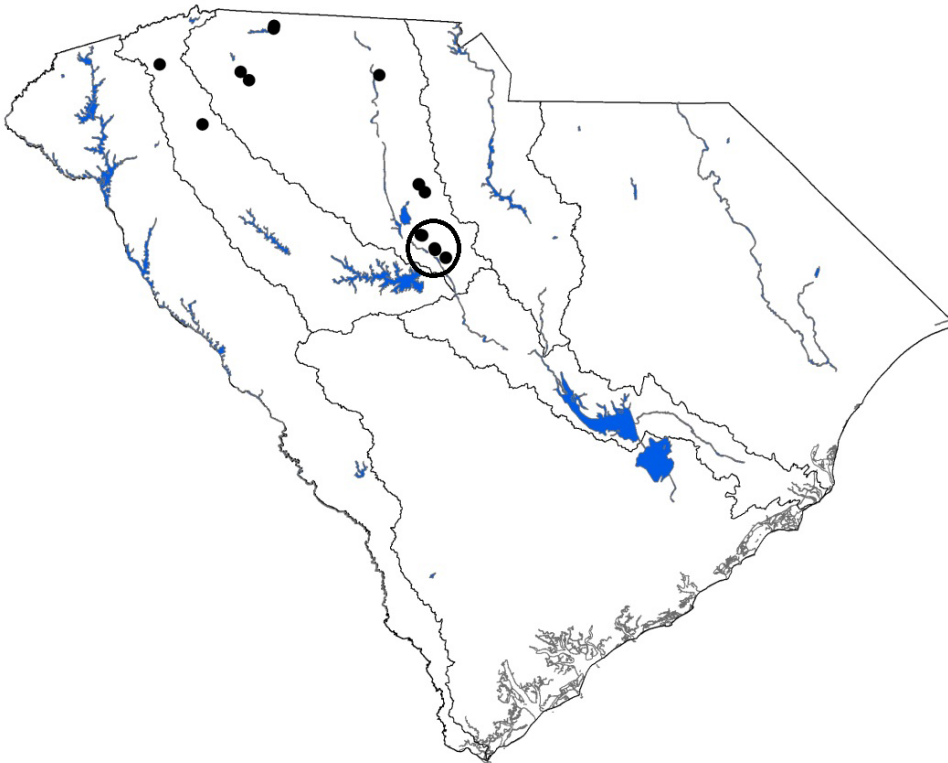


FIGURE 2-1 SPATIAL DISTRIBUTION OF *CAMBARUS SPICATUS* (EVERSOLE 2014): CIRCLE DELINEATES OCCURRENCES OF *C. SPICATUS* THAT OCCURRED IN THE LITTLE RIVER

3.0 STUDY OBJECTIVES

The objective of this survey was to assess the presence of BRSC in the Parr Shoals Reservoir and in the Broad River downstream of the Parr Shoals Dam.

Based upon the life history information for BRSC and input from the USFWS (Appendix A) sampling sites were selected along the margins of the Broad River and associated tributaries, in areas of leaf litter/detritus. Collection areas included the Broad River at the Highway 34 Bridge (Figure 3-1) (Photo 3-1, and Photo 3-2), the Cannon's Creek arm of Parr Reservoir (Figure 3-1) (Photo 3-3), and downstream of Parr Shoals Dam at the confluence of the Broad River and Little River (Figure 3-2).



PHOTO 3-1 TRAP LOCATION ON THE BROAD RIVER NEAR THE HIGHWAY 34 BRIDGE



PHOTO 3-2 TRAP LOCATION ON THE BROAD RIVER NEAR THE HIGHWAY 34 BRIDGE



PHOTO 3-3 TRAP LOCATION ON THE CANNON'S CREEK ARM OF PARR RESERVOIR



FIGURE 3-1 CRAYFISH SAMPLING AREAS AT HIGHWAY 34 AND CANNON'S CREEK

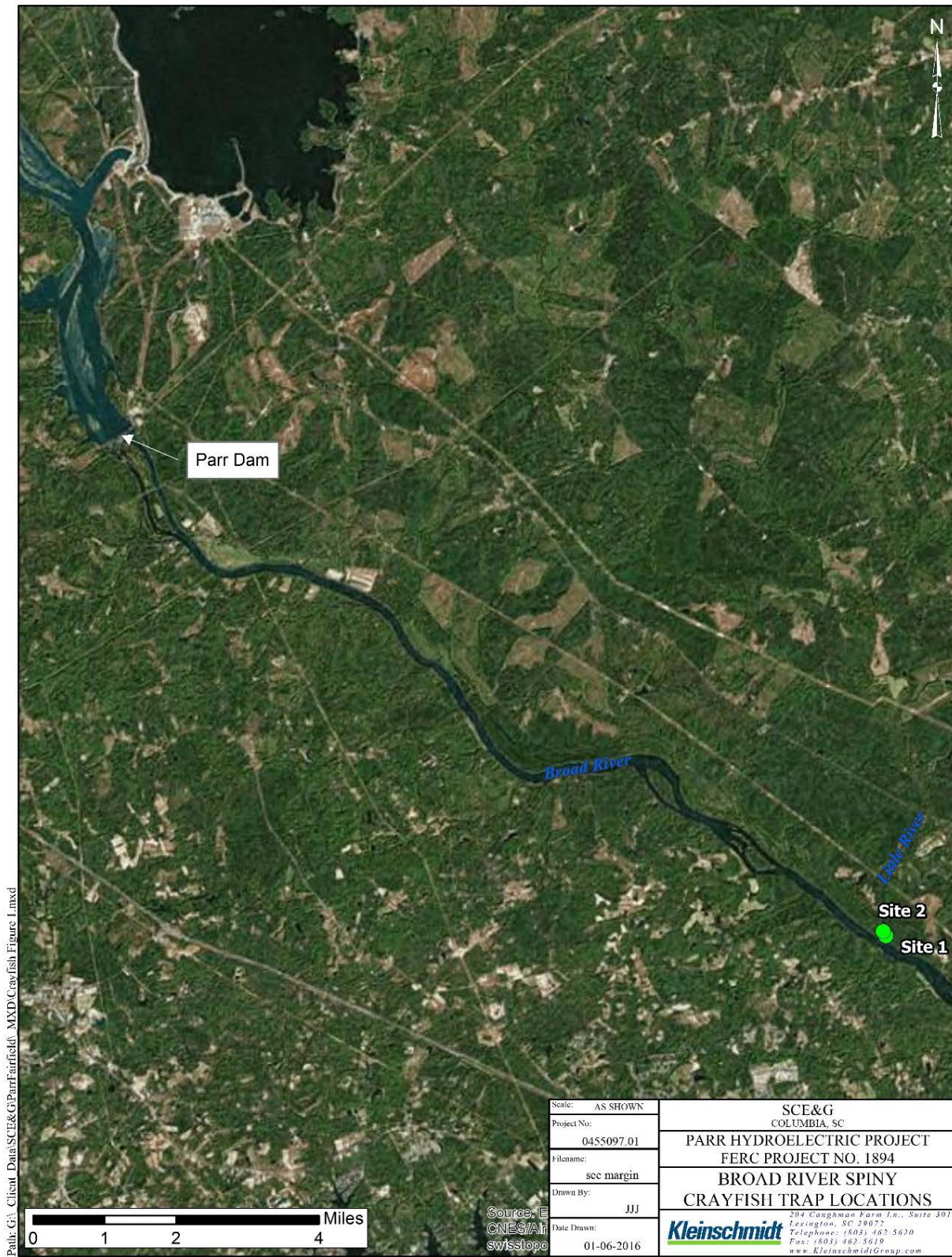


FIGURE 3-2 CRAYFISH SAMPLING AREAS DOWNSTREAM OF PARR DAM

4.0 COLLECTION METHODS

Sampling at all locations occurred from early September to late October, 2015 (Table 1). Passive trap methods were utilized for this study. Traps consisted of double-entry, galvanized wire mesh crayfish traps with 1.5 inch opercula (Photo 4-1). Traps were baited with canned fish and canned cat food, and were re-baited during biweekly (every 3 to 4 days) trap checks. A one-pound weight was originally placed in the traps to ensure that they remained submerged. However, after loss of gear due to flooding, traps were anchored to structures along the shoreline. Traps were deployed along shoreline habitats, in areas of detritus and/or leaf litter at all sampling sites. Traps were also placed in locations where water depth was sufficient to ensure that they remained inundated. Water quality parameters (temperature, DO, and conductivity) were periodically collected when traps were checked for crayfish.



PHOTO 4-1 EXAMPLE OF CRAYFISH TRAP USED IN THE STUDY

5.0 RESULTS

Traps at sites 1 and 2 fished for a total of 5,136 hours during this study (Table 1). Over the study period, water temperatures at the confluence of the Broad River and Little River ranged from 12-26°C, dissolved oxygen ranged from 8.5-10.6 mg/L, and conductivity ranged from 80-151 µS. No crayfish were collected, although traps at this site did collect several small sunfish throughout the study.

Traps at sites 3 and 4 were fished for a total of 4,860 hours during this study (Table 5-1). Over the study period, water temperatures at Cannon's Creek ranged from 19-28°C, dissolved oxygen ranged from 6.6-7.9 mg/L, and conductivity ranged from 60-117 µS. No crayfish were collected.

Traps at site 5 were fished for a total of 2,760 hours during this study (Table 1). Over the study period, water temperatures at the Highway 34 Bridge ranged from 16-25°C, dissolved oxygen ranged from 7.1-8.9 mg/L, and conductivity ranged from 65-159 µS. No crayfish were collected, although traps at this site did collect numerous small sunfish throughout the study.

TABLE 5-1 LOCATIONS AND DATES OF SAMPLING EFFORTS

LOCATION		NUMBER OF TRAPS AND DATES SAMPLED			NOTES
Confluence of Little River and Broad River	Site 1 (34°10'32.73"N, 81°10'41.80"W)	3 – traps 9/3/2015- 10/4/2015	2 – traps 10/20/2015- 10/27/2015		Traps were replaced due to 10/4/2015 flood event
	Site 2 (34°10'35.45"N, 81°10'43.74"W)	3 – traps 9/3/2015- 10/4/2015	2 – traps 10/20/2015- 10/27/2015		
Cannon's Creek Arm of Parr Reservoir	Site 3 (34°16'56.08"N, 81°21'35.26"W)	3 – traps 9/3/2015- 10/4/2015	2 – traps 10/13/2015- 11/2/2015		Traps were replaced due to 10/4/2015 flood event
	Site 4 (34°16'54.56"N, 81°21'12.86"W)	2 – traps 9/3/2015- 10/4/2015	1 – trap 10/13/2015- 11/2/2015		
Highway 34 Bridge	Site 5 (34°23'37.39"N, 81°23'46.53"W)	3 – traps 9/3/2015- 9/28/2015	2 – traps 9/29/2015- 10/4/2015	2 – traps 10/13/2015- 10/28/2015	Traps were replaced during study due to flooding and theft

6.0 DISCUSSION

No crayfish were collected during the BRSC study. During the American eel study performed in the Parr Shoals Dam tailrace area, approximately thirteen crayfish were collected in a large fyke net that sampled the west channel area during springtime collections. Through consultation with USFWS (Byron Hamstead), we identified these crayfish as either acuminate crayfish *Cambarus acuminatus* or Carolina needlenose crayfish *Cambarus aldermanorum* and a reference sample was kept in 70% ethanol. No BRSC were collected in the fyke net.

7.0 REFERENCES

- Eversole, A. G. 1990. Status Report on *Cambarus (Puncticambarus) spicatus* Hobbs, *Distocambarus (Fitzcambarus) youngineri* Hobbs, and *Procambarus (Pennides) echinatus* Hobbs. Completion Report. 21 pp.
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- South Carolina Department of Natural Resources (SCDNR). 2015. South Carolina's state wildlife action plan (SWAP) 2015. Final Report October 14, 2014.
- United States Fish and Wildlife Service (USFWS). 2011. Endangered and threatened wildlife and plants; partial 90-day finding on a petition to list 404 species in the southeastern United States as endangered or threatened with critical habitat. Federal Register 76: 59836–59862.

APPENDIX A
STUDY SITE COLLECTION NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Parr Hydroelectric Project (FERC No.1894)

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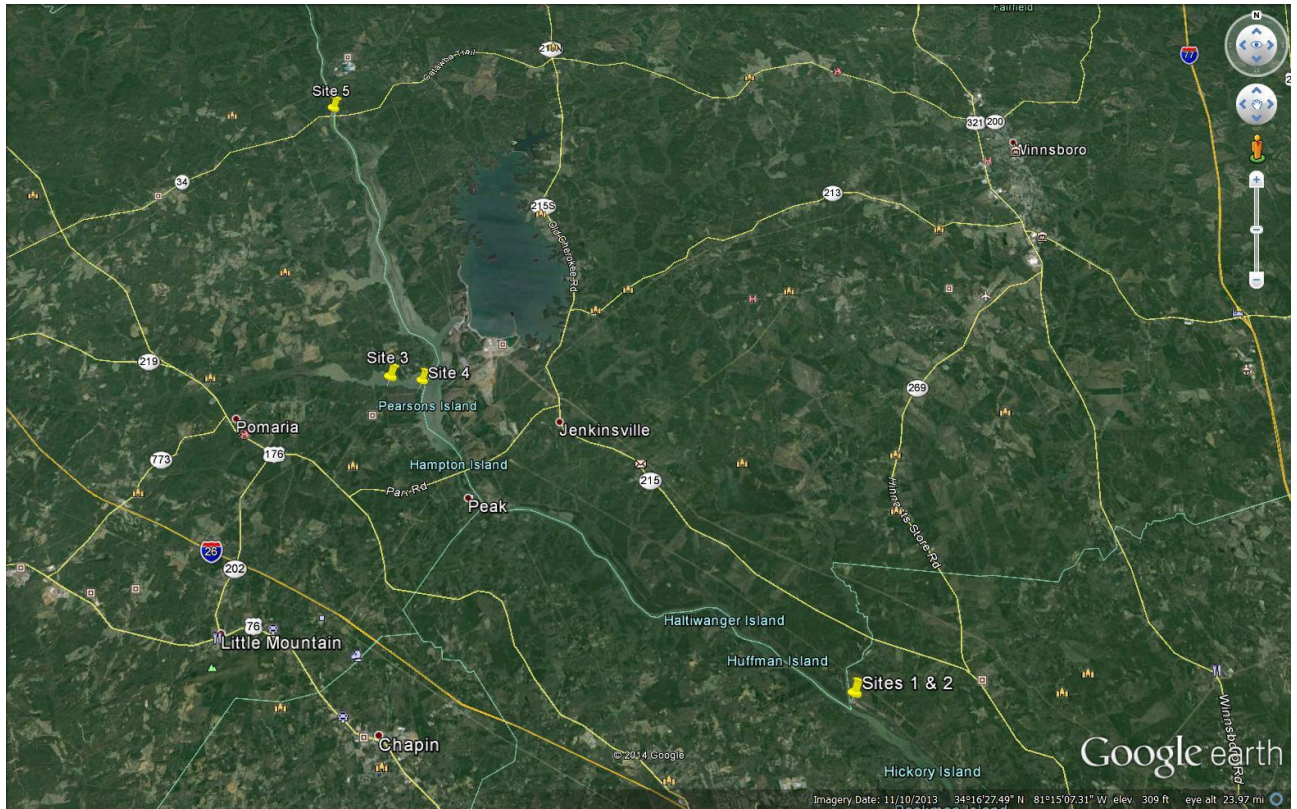


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