SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

STATUS OF THE SHORTNOSE STURGEON IN THE LOWER SALUDA AND UPPER CONGAREE RIVERS

2007 FINAL SUMMARY REPORT

OCTOBER 2007

Prepared by:

Kleinschmidt
Energy & Water Resource Consultants

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1.0 INTRODUCTION

The shortnose sturgeon is an anadromous species that inhabits estuaries and rivers along the eastern coast of North America (NMFS, 1998). Once adults reach sexual maturity, they migrate to upper reaches of rivers to spawn from late winter to early spring. The shortnose sturgeon was federally listed as endangered on March 11, 1967. Since that time, the National Marine Fisheries Service (NMFS) has recognized South Carolina as one of the 19 distinct population segments of shortnose sturgeon (NMFS, 1998). Much of the Santee River Basin is thought to be within the historic range of the shortnose sturgeon (Welch 2000, Newcomb and Fuller 2001). Within the basin, shortnose sturgeon have been documented downstream of the dams associated with the Santee-Cooper Lakes (Marion and Moultrie) and in the lower reaches of both the Santee and Cooper Rivers (Collins et al. 2003; Cooke et al. 2002, 2004).

There are many reasons that shortnose sturgeon are at risk. From the early colonial times, both shortnose and Atlantic sturgeon populations were extensively overharvested; further pollution and the construction of dams over time have also played a role in depleting populations, with declines attributed primarily to degradation of habitat. Currently, the Cooper River shortnose sturgeon population is believed to be one of the most significant, with population estimates over a three-year period yielding an average of approximately 200 fish migrating upstream to the base of the Pinopolis Dam annually (Cooke et al. *in press*). In addition to this river population, a "dam-locked" population of shortnose sturgeon has also been documented within and upstream of the Santee-Cooper Lakes (Collins et al. 2003). While research to date suggests that Lake Marion and its tributaries harbor the most significant population (Collins et al. 2003), no population estimates are currently available for the Santee-Cooper Lakes and their tributaries.

As noted above, the shortnose sturgeon is federally listed as endangered under the Endangered Species Act (ESA) and falls under jurisdiction of the National Oceanographic and Atmospheric Administration – National Marine Fisheries Service (NMFS). Under Section 18 of the Federal Power Act, the NMFS also has mandatory conditioning authority for fishway prescription at all FERC licensed hydro projects when diadromous species, such as shortnose sturgeon, are involved. In addition, the shortnose sturgeon is among the species identified by the NMFS, South Carolina Department of Natural Resources (SCDNR), and U.S. Fish and Wildlife Service (USFWS) as a target species in the "Santee Cooper Basin Diadromous Fish Passage Restoration Plan" (USFWS et al. 2001), which was submitted to and accepted by FERC as a Comprehensive Plan under Section 10 (a)(2)(a) of the Federal Power Act. In response to comments and study requests provided by NMFS and the SCDNR during the initial stages of the Saluda Relicensing Project, SCE&G conducted sampling in the Saluda-Upper Congaree Sub-basin. Specific study objectives include:

- To document whether or not shortnose sturgeon are utilizing areas of the Saluda and Congaree rivers downstream of the Saluda Hydro Project;
- If sturgeon are found to be present, to document their relative abundance and spatial and temporal patterns;
- If shortnose sturgeon are present, determine whether or not spawning is taking place downstream of the Saluda Hydro Project;
- If possible, characterize usage of this reach of the Saluda and Congaree relative to water quality and habitat data; and
- Cooperate, to the extent feasible, with population genetics and other studies being conducted by the SCDNR to determine the status of shortnose sturgeon in the Santee River Basin.

2.0 METHODS

Upstream spawning migrations of shortnose sturgeon are triggered when water temperatures increase to 8-9°C. Sampling was conducted during late-winter and spring of 2007 (approximately the first week of February through the end of April) when shortnose sturgeon would be expected to migrate into the Piedmont rivers to spawn.

Typical spawning habitat includes gravel, rubble, large rock, sand, logs and cobble with moderate river flow (Duncan et al. 2004). Shortnose sturgeon primarily feed on mollusks, crustaceans, insect larvae and worms (NMFS, 1998). Based on this information and consultation with NMFS and SCDNR, it was determined that sampling would focus on the Saluda-Upper Congaree Sub-basin, from the vicinity of the Rosewood Boat Landing adjacent to downtown Columbia, upstream to the Saluda Hydro Project Dam on the Saluda River and the Columbia Canal Diversion Dam on the lower Broad River. Specifically, the following sites were sampled:

- Downstream of the Saluda Hydro Dam in the vicinity of the USGS gage;
- The vicinity of SCE&G's Gardendale canoe landing on the lower Saluda River;
- Upstream of the old Granby Lock and Dam on the Congaree River; and
- The vicinity of the Rosewood Boat Landing on the Congaree River.

2.1 Sampling for Adult/Juvenile Shortnose Sturgeon

The four sites were sampled weekly (one day per week) for adult and juvenile shortnose sturgeon from the first week of February through the end of April using standard gillnetting techniques. Specifically, 100 ft-long monofilament nets, with alternating 25 foot-long panels of 5-inch and 7-inch stretch mesh. Gillnets were set beginning at daybreak of each sampling day and were fished for approximately eight hours. To meet necessary precautions to ensure that sturgeon were not harmed, gillnets were checked every two hours. To keep sampling consistent, gillnets were set in the same location at each site during the three month sample period.

2.2 Sampling for Shortnose Sturgeon Larvae and Eggs

Ichthyoplankton nets were fished in conjunction with the gillnets to sample for the presence of shortnose sturgeon larvae and eggs. Specifically, one 2mm "D-shaped" drift net fitted with a General Oceanic flowmeter, was fished in the general vicinity of each gillnet location. Revolution counter data from the flow meter was recorded before and after each net set to determine the volume of water sampled through each net at each location. Nets were anchored upstream in sufficient flow to sample effectively. Samples from egg nets were preserved in ethyl alcohol and were returned to the laboratory for identification. Water temperature, dissolved oxygen, and specific conductivity levels were recorded after each egg net was pulled. Bycatch was identified, measured and released upon catch.

3.0 RESULTS

Gillnets were fished (on average) eight hours a day with a total of 344 net hours. No adult shortnose sturgeon were captured during the three month study period from February through April 2007 in the lower Saluda and Congaree Rivers. A total of 29 fish representing nine different species were collected during netting (Table 1) which yielded a 0.08 fish/hour catch per unit of effort. Bycatch species (including total length) are also presented in Table 1 by date and location.

No eggs or juvenile shortnose sturgeon were captured while sampling with the ichthyoplankton nets. A total of 37,054 m^3 of water was sampled during the three month study period. Total volume of water sampled for each net set by location is presented in Table 2. Water quality measurements for each sampling period are presented in Table 3.

Table 1: Fish Collected During the Saluda – Shortnose Sturgeon Study Presented by Date and Location

DATE	LOCATION	SPECIES	COMMON NAME	TOTAL LENGTH (MM)
2/20/2007	Rosewood Boat Landing	*Dorosoma cepedianum*	Gizzard Shad	46.7
2/20/2007	Rosewood Boat Landing	*Dorosoma cepedianum*	Gizzard Shad	48.8
2/27/2007	Saluda Hydro Dam	*Micropterus salmoides*	Largemouth Bass	55
2/27/2007	Saluda Hydro Dam	*Hypentelium nigricans*	Northern Hogsucker	43
3/1/2007	Rosewood Boat Landing	*Morone saxatilis*	Striped Bass	44.5
3/8/2007	Saluda Hydro Dam	*Hypentelium nigricans*	Northern Hogsucker	44.4
3/8/2007	Gardendale	*Moxostoma collapsum*	Notchlip Redhorse	49.8
3/8/2007	Gardendale	*Minytrema melanops*	Spotted Sucker	58.8
3/14/2007	Rosewood Boat Landing	*Morone saxatilis*	Striped Bass	62.3
3/21/2007	Granby Lock and Dam	*Cyprinus carpio*	Common Carp	71
3/21/2007	Granby Lock and Dam	*Minytrema melanops*	Spotted Sucker	53.7
3/22/2007	Saluda Hydro Dam	*Dorosoma cepedianum*	Gizzard Shad	38.4
3/26/2007	Granby Lock and Dam	*Ictalurus furcatus*	Blue Catfish	65.4
3/26/2007	Granby Lock and Dam	*Micropterus salmoides*	Largemouth Bass	46.5
3/26/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	45.1
4/11/2007	Saluda Hydro Dam	*Minytrema melanops*	Spotted Sucker	52.9
4/17/2007	Granby Lock and Dam	*Cyprinus carpio*	Common Carp	67.9
4/17/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	44.4
4/17/2007	Rosewood Boat Landing	*Morone saxatilis*	Striped Bass	68
4/17/2007	Rosewood Boat Landing	*Morone saxatilis*	Striped Bass	50.7
4/17/2007	Rosewood Boat Landing	*Morone saxatilis*	Striped Bass	57.5
4/25/2007	Rosewood Boat Landing	*Carpiodes cyprinus*	Quillback	44.6
4/25/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	34.9
4/25/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	34.5
4/25/2007	Granby Lock and Dam	*Ictalurus punctatus*	Channel Catfish	54.5
4/25/2007	Granby Lock and Dam	*Cyprinus carpio*	Common Carp	67
4/25/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	42.5
4/25/2007	Granby Lock and Dam	*Carpiodes cyprinus*	Quillback	39.5
4/26/2007	Saluda Hydro Dam	*Micropterus salmoides*	Largemouth Bass	84.2

Table 2: Total Volume of Water Sampled Through Each Ichthyoplankton Nets by Location

DATE	LOCATION	TOTAL VOLUME (M^3)
2/6/2007	Granby Lock and Dam	99.5
2/6/2007	Rosewood Boat Landing	5.4
2/7/2007	Gardendale	0.2
2/7/2007	Saluda Hydro Dam	0.4
2/14/2007	Gardendale	6.8
2/14/2007	Saluda Hydro Dam	0.1
2/15/2007	Rosewood Boat Landing	793.8
2/15/2007	Granby Lock and Dam	30.2
2/20/2007	Rosewood Boat Landing	17749.9
2/20/2007	Granby Lock and Dam	223.5
2/22/2007	Gardendale	0.09
2/22/2007	Saluda Hydro Dam	0.7
2/27/2007	Saluda Hydro Dam	90.2
2/27/2007	Gardendale	0.6
3/1/2007	Rosewood Boat Landing	2347.8
3/1/2007	Granby Lock and Dam	258.8
3/8/2007	Saluda Hydro Dam	14.8
3/8/2007	Gardendale	3601.6
3/14/2007	Granby Lock and Dam	0.4
3/14/2007	Rosewood Boat Landing	775.3
3/15/2007	Saluda Hydro Dam	0.6
3/21/2007	Rosewood Boat Landing	1217.7
3/21/2007	Granby Lock and Dam	1539.9
3/22/2007	Saluda Hydro Dam	1.3
3/22/2007	Gardendale	10.2
3/26/2007	Granby Lock and Dam	1875.4
3/26/2007	Rosewood Boat Landing	701.1
3/29/2007	Saluda Hydro Dam	19.4
3/29/2007	Gardendale	0.6
4/5/2007	Saluda Hydro Dam	0.9
4/5/2007	Gardendale	1.0
4/6/2007	Rosewood Boat Landing	728.9
4/10/2007	Rosewood Boat Landing	1570.2
4/10/2007	Granby Lock and Dam	255.2
4/11/2007	Saluda Hydro Dam	311.1
4/11/2007	Gardendale	1.7
4/17/2007	Granby Lock and Dam	78.6
4/17/2007	Rosewood Boat Landing	105.2
4/18/2007	Gardendale	11.2
4/18/2007	Saluda Hydro Dam	27.5
4/25/2007	Rosewood Boat Landing	652.5
4/25/2007	Granby Lock and Dam	1489.8
4/26/2007	Gardendale	1.0
4/26/2007	Saluda Hydro Dam	450.5

Table 3: Water Quality Measurements by Date and Location

DATE	LOCATION	TIME	WATER TEMPERATURE (˚C)	DISSOLVED OXYGEN (mg/L)	SPECIFIC CONDUCTIVITY (µS)	MEAN DAILY FLOW (cfs)
2/6/2007	Granby Lock and Dam	9:15 AM	6.7	12.3	80.3	9,080
2/6/2007	Rosewood Boat Landing	9:50 AM	6.7	12.3	80.3	9,080
2/7/2007	Gardendale	1:30 PM	10.2	9.8		805
2/7/2007	Saluda Hydro Dam	2:00 PM	11.1	10.5		805
2/14/2007	Gardendale	3:10 PM	11.4	8.0	63.7	973
2/14/2007	Saluda Hydro Dam	4:45 PM	11	8.7	62.9	973
2/15/2007	Rosewood Boat Landing	3:20 PM	9.2	10.1	53	10,200
2/15/2007	Granby Lock and Dam	3:50 PM	10.1	10.1	53	10,200
2/20/2007	Rosewood Boat Landing	12:45 PM	9.7	10.3	59.7	5,390
2/20/2007	Granby Lock and Dam	12:45 PM	9.7	10.3	59.7	5,390
2/22/2007	Gardendale	3:05 PM	11.9	9.8	63	596
2/22/2007	Saluda Hydro Dam	4:25 PM	10.8	9.4	84	596
2/27/2007	Saluda Hydro Dam	3:10 PM	11	10.6	84	601
2/27/2007	Gardendale	4:00 PM	11.3	10.8	86	601
3/1/2007	Rosewood Boat Landing	3:30 PM	12	7.1	86.6	8,650
3/1/2007	Granby Lock and Dam	11:35 AM	11.9	7.5	84	8,650
3/8/2007	Saluda Hydro Dam	3:24 PM	11.2	10.4	82.6	4,120
3/8/2007	Gardendale	4:30 PM	12.9	10.2	86.4	4,120
3/14/2007	Granby Lock and Dam	5:20 PM	11.3	9.1	84.1	6,360
3/14/2007	Rosewood Boat Landing	4:35 PM	14	9.1	83	6,360
3/15/2007	Saluda Hydro Dam	2:40 PM	11.7	6.3	84.3	550
3/15/2007	Gardendale	4:36 PM	12.8	9.2	84.8	550
3/21/2007	Rosewood Boat Landing	3:14 PM	16.4	17.7	-	4,460
3/21/2007	Granby Lock and Dam	3:14 PM	16.4	17.7	-	4,460
3/22/2007	Saluda Hydro Dam	3:15 PM	11.5	9.6	87.5	551
3/22/2007	Gardendale	3:54 PM	13	9.5	86.7	551
3/26/2007	Granby Lock and Dam	4:00 PM	17.8	9.4	88	6,960
3/26/2007	Rosewood Boat Landing	2:45 PM	17.6	9.2	88	6,960
3/29/2007	Saluda Hydro Dam	2:40 PM	11.2	8.4	87	523
3/29/2007	Gardendale	4:00 PM	9.8	11.6	88.2	523
4/5/2007	Saluda Hydro Dam	3:10 PM	12	11.2		566
4/5/2007	Gardendale	5:15 PM	13.6	10.7	88.4	566
4/6/2007	Rosewood Boat Landing	1:29 PM	19.4	10.8	-	4,390
4/6/2007	Granby Lock and Dam	2:26 PM	16.6	11.9	-	4,390
4/10/2007	Rosewood Boat Landing	3:45 PM	15.6	9.9	92.1	4,210
4/10/2007	Granby Lock and Dam	3:05 PM	15.5	11.6	91	4,210
4/11/2007	Saluda Hydro Dam	3:05 PM	11.4	10.1	84.5	473
4/11/2007	Gardendale	4:15 PM	11.7	9.9	-	473
4/17/2007	Granby Lock and Dam	1:30 PM	17.3	10	-	4,800
4/17/2007	Rosewood Boat Landing	1:15 PM	17.3	10.3	-	4,800
4/18/2007	Gardendale	3:00 PM	12.6	11.0	-	660
4/18/2007	Saluda Hydro Dam	1:56 PM	12	10.8	-	660
4/25/2007	Rosewood Boat Landing	1:40 PM	21.8	9.4	84	3,890
4/25/2007	Granby Lock and Dam	12:59 PM	20.8	10.7	88.4	3,890
4/26/2007	Gardendale	2:35 PM	14.2	11.1	85.2	495
4/26/2007	Saluda Hydro Dam	7:33 PM	12.4	11.8	85.4	495

4.0 DISCUSSION

Adult shortnose sturgeon are known to occur in the Santee River Basin. However, to date no shortnose sturgeon have been documented in the Lower Saluda River (LSR). Gillnet collections indicate that shortnose sturgeon likely did not use the LSR for spawning during the 2007 sampling period. Radio-telemetry studies conducted by the SCDNR have provided significant insight into the movements and habitat use of the Santee-Cooper Lakes shortnose sturgeon. Collins et al. (2003) documented migration of Lake Marion shortnose sturgeon to a spawning site on the Congaree River just south of the city of Columbia (approximately 15 miles downstream of the Saluda Hydro Project). Other telemetry studies, in which Cooper River sturgeon were captured, radio-tagged, and released upstream in the Santee-Cooper Lakes, documented migration as far upstream as the old Granby Lock and Dam on the Congaree River and near the town of Wateree, SC on the Wateree River (Isely 2002; Doug Cooke, SCDNR, Pers. Comm.).

The two locations sampled on the Congaree River for this study were located above and below the old Granby Lock and Dam, which is four miles upstream of the most recent upstream migration documented by Collins et al. (2003). Presence of shortnose sturgeon in the vicinity of Granby Lock and Dam was also confirmed by collection of a single specimen during sampling related to relicensing of Duke Power's Catawba-Wateree Project in March 2004 (Duke Power, 2004). These studies suggest that shortnose sturgeon have the ability to migrate into Piedmont reaches of the Santee Basin downstream of the Saluda Project; however, no shortnose sturgeon were captured in the lower Saluda and Congaree Rivers during the 2007 study.

Lack of presence of shortnose sturgeon in the LSR seems to be consistent with their spawning requirements. Adult shortnose sturgeon are known to commence spawning when temperatures increase to 15˚C. The maximum water temperature recorded during the course of this study was 14˚C and this occurred during late April near the end of the sampling period and near the end of when sturgeon would be expected to spawn. These data suggest that water temperature conditions in the LSR are likely not suitable for shortnose sturgeon spawning.

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APPENDIX A

STUDY PLAN: STATUS OF THE SHORTNOSE STURGEON IN THE LOWER SALUDA RIVER AND UPPER CONGAREE RIVER

SALUDA HYDRO PROJECT (FERC NO. 516)
STUDY PLAN

Study Plan Name: Status of the Shortnose Sturgeon in the Lower Saluda and Upper Congaree Rivers

Applicable Hydro Projects: Saluda Hydro FERC No. 516

I. Study Objective

The purpose of this study will be to document shortnose sturgeon (*Acipenser brevirostrum*) usage downstream of the Saluda Hydroelectric Project as part of efforts by SCE&G to acquire a new Federal Energy Regulatory Commission (FERC) operating license for the project. This study responds directly to comments and study requests provided by National Oceanographic and Atmospheric Administration - National Marine Fisheries Service (NMFS) and the South Carolina Department of Natural Resources (SCDNR) during the initial stages of the Saluda Project relicensing.

The objectives of this proposed study are as follows:

- To document whether or not shortnose sturgeon are utilizing areas of the Saluda and Congaree rivers downstream of the Saluda Hydroelectric Project;
- If sturgeon are found to be present, to document their relative abundance and spatial and temporal patterns (i.e., how many there are, where they are located, and at what times of the year);
- If shortnose sturgeon are present, determine whether or not spawning is taking place downstream of the Saluda Hydroelectric Project;
- If possible, to characterize usage of this reach of the Saluda and Congaree relative to water quality and habitat data; and
- Cooperate, to the extent feasible, with population genetics and other studies being conducted by the SCDNR to determine the status of shortnose sturgeon in the Santee River Basin.

II. Basis

The shortnose sturgeon is federally listed as endangered under the Endangered Species Act (ESA) and falls under the jurisdiction of the National Oceanographic and Atmospheric Administration - National Marine Fisheries Service (NMFS). Under Section 18 of the Federal Power Act, the NMFS also has mandatory conditioning authority for fishway prescription at all FERC licensed hydro projects when diadromous species, such as shortnose sturgeon, are involved. In addition, the shortnose sturgeon is among the target species identified by the NMFS, SCDNR, and U.S. Fish and Wildlife Service (USFWS) as target species in the Santee Cooper Basin Diadromous Fish Passage Restoration Plan (USFWS et al. 2001), which has been

submitted to and accepted by FERC as a Comprehensive Plan under Section 10(a)(2)(a) of the Federal Power Act. In addition to providing the baseline information needed to address such regulatory requirements, this study will likely provide valuable information regarding the status of the shortnose sturgeon in a portion of its historic range that has not been sampled in recent history. Sampling directed towards "areas where shortnose sturgeon historically occurred but have not been recorded in recent time" has been cited as an important recovery goal for the species (NMFS 1998).

III. Geographic and Temporal Scope

Temporal Scope: The study is scheduled to begin in February 2006 and continue through 2007 (2 years of study). Based on the findings of the initial 2 years of study and consultation with NMFS and the SCDNR, additional work may be scheduled.

On an annual basis, sampling will be conducted during late-winter and spring (Approximately February 1 through the end of April) when shortnose sturgeon would be expected to migrate into Piedmont rivers to spawn.

Geographic Scope: In consultation with NMFS and SCNDR, it has been determined that sampling likely should focus on the Saluda-Upper Congaree Sub-basin, from the vicinity of the Rosewood Boat Landing (also known as Barney Jordan Landing) adjacent to downtown Columbia, upstream to the Saluda Project Dam on the Saluda River and the Columbia Canal Diversion Dam on the lower Broad River. Within this area, the following potential sampling sites have been identified (Figure1):

1. Downstream and in the vicinity of the Saluda Project dam;
2. The vicinity of SCE&G's Gardendale canoe landing on the Saluda River;
3. Upstream of the old Granby Lock and Dam on the Congaree River; and
4. The vicinity of the Rosewood Boat Landing on the Congaree River.

IV. Summary of Existing Data

Much of the Santee Basin, including the portion of the Saluda Basin encompassed by the Saluda Project, is thought to be within the historic range of the shortnose sturgeon (Welch 2000, Newcomb and Fuller 2001). Within the basin, shortnose sturgeon have been documented downstream of the dams associated with the Santee-Cooper Lakes (Marion and Moultrie) in the lower reaches of both the Santee and Cooper rivers (Collins et al. 2003; Cooke et al. 2002, 2004). The Cooper River population is believed to be the most significant, with population estimates over a three-year period yielding an average of approximately 200 fish migrating upstream to the base of the Pinopolis Dam annually (Cooke et al. *in press*). An additional dam-locked population of shortnose sturgeon has been documented within and upstream of the Santee-Cooper Lakes (Collins et al. 2003). While research to date suggests that Lake Marion and its tributaries harbor the most significant population (Collins et al. 2003), no population estimates are currently available for the Santee-Cooper Lakes and its tributaries.

Radio-telemetry studies conducted by the SCDNR have provided significant insight into the movements and habitat use of Santee-Cooper Lakes shortnose sturgeon. Collins et al. (2003) documented migration of Lake Marion shortnose sturgeon to a spawning site on the Congaree River just south of the city of Columbia (approximately 15 miles downstream of the Saluda Project). Further telemetry studies, in which Cooper River sturgeon were captured, radio-tagged, and released upstream in the Santee-Cooper Lakes, documented migration as far upstream as upstream of the old Granby Lock and Dam on the Congaree River and near the town of Wateree, SC on the Wateree River (Isely 2002; Doug Cooke, SCDNR, Pers. Comm.). The old Granby Lock and Dam is located adjacent to downtown Columbia, approximately 11 miles downstream of the Saluda Project and an additional 4 miles upstream of the most upstream migration documented by Collins et al. (2003). Presence of shortnose sturgeon in the vicinity of Granby Lock and Dam was also confirmed by collection of a single specimen during sampling related to relicensing of Duke Power's Catawba-Wateree Project in March 2004 (Duke Power 2004). These studies suggest that shortnose sturgeon have the ability to migrate into Piedmont reaches of the Santee Basin downstream of the Saluda Project; however, no directed sampling effort has been undertaken within recent history to document the species.

The SCDNR has and continues to conduct population genetics studies aimed at delineating distinct population segments and estimated emigration and colonization rates. Collins et al. (2003) found significant genetic differences between Santee-Cooper lakes shortnose sturgeon and samples from three nearby rivers (Ogeechee, Savannah, and Edisto). Although not statistically significant, the study also observed appreciable differences in haplotype frequency between samples collected from reservoir shortnose sturgeon and those collected below the dam in the Cooper River. The authors noted that these results suggest that there may be some degree of genetic isolation between the shortnose sturgeon residing above and below the Santee-Cooper dams, but additional samples are needed from upstream areas.

V. Methodology

Sampling for Adult/Juvenile Shortnose Sturgeon

Adult and juvenile shortnose sturgeon will be sampled weekly (one day per week) during the sampling period using standard gillnetting techniques. Gillnetting will utilize one approximately 100 ft-long monofilament net at each sampling location (Figure 1), with alternating 25 foot-long panels of 5 inch (12.7 cm) and 7-inch (17.8 cm) stretch mesh. Nets will be set beginning at daybreak of each sampling day and fished for approximately 8 hours. During the initial phase of the study, gillnets will be checked every 2 hours. Gillnet soak times may be adjusted based on field experience, but will always fall within the guidelines described by in 'A Protocol for Use of Shortnose and Atlantic Sturgeons' (Protocol, Moser et al. 2000). Individual sturgeon will not be targeted for recapture on an annual basis. As such, gillnets may be repositioned within the general area of each sampling location (i.e. moved 100 to 150 yards) to minimize risk of exposure to the gear.

All captured sturgeon will be examined, measured for total length (mm), weighed (0.1 kg), and scanned for presence of a Passive Integrated Transponder (PIT) tag. If untagged, each fish will be tagged with a PIT tag as recommended in the Protocol. The PIT tags will be injected just under the skin on the left side of the fish, posterior to the dorsal fin, using a syringe equipped

with a 12 to 8-gauge needle. PIT tags will not exceed 32 mm x 3.1 mm, and generally will be smaller (e.g., Biomark model TX1405L, 14 mm x 2.1 mm). In addition, external streamer dart tags (e.g. Floy Tag model FT-1-94) may be attached in the dorsal musculature by puncturing the skin and muscle with an 8-gauge needle. In some instances, a small (1 cm^2 or less) non-deleterious tissue sample, clipped with surgical scissors from the pelvic fin, may be taken from captured sturgeon to contribute to the SCDNR's population genetics studies (i.e. to determine population of origin). Tissue collection will follow the Protocol, with all samples stored in ethyl alcohol. Any tissue collections will be closely coordinated with the SCDNR, with all tissues archived by:

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All adult and juvenile sturgeon captured will be placed in a live car (or equivalent device as recommended in the Protocol) and processed one at a time before making additional capture attempts. The live car will be constructed as specified in the Protocol, with bilge pumps used for water exchange and an external oxygen supply. The water supply to fill the live car will be taken from the ambient river system and all water quality criteria for the live car will follow NMFS guidelines, as established in the Protocol. Fish will be handled as little as possible and will always be supported in at least two places while out of the water to avoid stress to the vertebral column (as recommended in the Protocol). Processing time for each fish is expected to be 10 minutes or less. Maximum holding time for captured shortnose sturgeon will follow the Protocol, and will not exceed 30 minutes when water temperatures exceed 27ºC and 2 hours when water temperatures are 27ºC or less. After processing, all captured shortnose sturgeon will be released at the point of capture. A measurement of water temperature (ºC) and dissolved oxygen (mg/L) will also be taken at each location.

Results of gillnet sampling, including estimates of relative abundance and Catch per Unit Effort (number of fish/net hours fished), will be compared by date and location and presented in the final report. In addition, a species list will be compiled of all species encountered during the study.

Sampling for Shortnose Sturgeon Larvae and Eggs

Ichthyoplankton nets will be fished in conjunction with gillnets, whenever possible, to sample for the presence of shortnose sturgeon eggs and larvae. Specifically, one D-shaped or rectangular drift net (maximum mesh size 2mm), equipped with flowmeter, will be fished in the general vicinity of each gillnetting location (Figure 1). Nets will be anchored facing upstream in sufficient flow to sample effectively and will be deployed for a maximum of 24 hours (as recommended in the Protocol).

Samples from egg nets will be preserved in ethyl alcohol and returned to the laboratory for identification. All eggs collected will be examined to determine stage and all larval specimens will be measured for standard length (0.1 mm). Larval densities (number / cm^3) will be calculated, compared by date and location, and presented in the final report.

VI. Schedule and Required Conditions

Sampling for adult, juvenile, and larval shortnose sturgeon will begin in February 2006. A brief report summarizing the 2006 sampling results will be issued by November 1, 2006, with a more comprehensive final report issued by December 31, 2006. The final report will include all sampling results and conclusions regarding presence and population status of shortnose sturgeon.

VII. Use of Study Results

Results of the shortnose sturgeon sampling will be used as an information resource during discussion of relicensing issues with the SCDNR, NMFS, USFWS, relicensing issue working groups, and other relicensing stakeholders.

VIII. Study Participants

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IX. List of Attachments

ATTACHMENT A: Map of Shortnose Sturgeon Sampling Locations on the Lower Saluda and Upper Congaree Rivers

X. List of References

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Attachment A: Preliminary Shortnose Sturgeon Sampling Area