SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA RIVER AND UPPER CONGAREE RIVER DIADROMOUS FISH SAMPLING

2005 SUMMARY REPORT

JANUARY 2006

J. Jeffery Isely
South Carolina Cooperative Fish and Wildlife Research Unit
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Submitted to:
Kleinschmidt and Associates
Energy & Water Resource Consultants
101 Trade Zone Drive Suite 21
West Columbia, SC 29170

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SOUTH CAROLINA ELECTRIC & GAS COMPANY
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2005 SUMMARY REPORT

EXECUTIVE SUMMARY

A survey of the fish population of the lower Saluda River below Murray Dam and the Congaree River near the Rosewood Boat Ramp was conducted by South Carolina Cooperative Fish and Wildlife Research Unit staff in the spring of 2005 between February 1 and June 1. Fish were collected using 50 foot by 6 foot sinking gill nets of 2 and 5 inch stretch mesh. Nets were fished weekly during the month of February and twice per week for the remainder of the study. A single net of each mesh size was fished at each of four locations. Nets were fished an average of 4 hours during daylight hours for a total sampling effort of 165 net sets for a total of 660 net hours. A total of 78 fish representing 14 species was collected for an average catch per unit effort of 0.19 fish per net hour. No American shad, blueback herring, shortnose sturgeon, or American eel were collected. Two striped bass were collected during sampling.

An attempt was made to collect ichthyoplankton using a 0.5 m plankton net fitted with 0.505 mm mesh. The net was deployed midway between the surface and the bottom at each station for 5 minutes during daylight hours while gillnets were fished. A total of 72 net sets representing 14,900 m^3 of filtered water produced only one fish larva. Nets routinely clogged with filamentous algae and particulate organic matter.

1.0 INTRODUCTION

Restoration of anadromous clupeids to South Carolina waters has become an important objective of resource agencies. Each spring, efforts to pass migrating American shad and blueback herring are undertaken at the first barriers to migration in the Santee - Cooper system. Once passed, these fish have several migration pathways from which to choose. One such pathway results in these fish entering the Saluda River near Columbia. The relative abundance and potential spawning of this segment of the population is of particular interest to managers. The objective of this study is to determine the relative abundance of adult American shad, hickory shad and blueback herring during the spring migratory period, and to document spawning by these species in the Saluda River relative to the Congaree River. See Study Plan in Appendix A for additional detail.

2.0 METHODS

A survey of the fish population of the lower Saluda River below Murray Dam and the Congaree River near the Rosewood Boat Ramp was conducted by South Carolina Cooperative Fish and Wildlife Research Unit staff in the spring of 2005 between February 1 and June 1. Fish were collected using 50 foot by 6 foot sinking gill nets of 2 and 5 inch stretch mesh. Nets were fished weekly during the month of February and twice per week for the remainder of the study. A single net of each mesh size was fished at each of four locations; the 2 inch mesh net was always fished upstream of the 5 inch mesh net. Nets were deployed from shore to near the midpoint of the river perpendicular to the current. Nets were fished an average of 4 hours during daylight hours.

Sampling locations included sections of the Saluda River adjacent to Saluda Shoals Park, Radio Tower Fish Camp, Riverbanks Zoo, and a section of the Congaree River adjacent to Rosewood Boat Ramp (See map in Appendix A). All samples were collected from 10 to 200 m below natural shoal habitat in pool or run habitat. All fish were identified to species, measured (mm TL) and returned alive in the field.

Ichthyoplankton was sampled using a 0.5 m plankton net fitted with 0.505 mm mesh. The net was deployed from the boat midway between the surface and the bottom at each station for 5 minutes during daylight hours while gillnets were fished. After large debris was removed, samples were preserved in 90% ethanol and returned to the laboratory for processing. Larvae were removed, identified to the lowest taxon and stored in 90% ethanol.

River stage and temperature data were obtained from the USGS Saluda River Gauging station. Discharge ranged from 517 to 3,870 ft^3/sec. Temperature ranged from 9.2 to 17.1° C (Appendix B).

3.0 RESULTS

Gill nets were fished an average of 4 hours per set during daylight hours for a total sampling effort of 165 net sets for a total of 660 net hours. A total of 78 fish representing 14 species was collected for an average catch per unit effort of 0.19 fish per net hour. No American shad, blueback herring, shortnose sturgeon, or American eel were collected. Two striped bass were collected. Catches were dominated by stream-resident species (Table 1, Appendix C). Gizzard shad accounted for 38% of fish collected. Gizzard shad, spotted sucker, and yellow perch accounted for 67% of fish collected. Due to high discharge rates (Rosewood) or low discharge rates (Saluda Shoals); a total of 10 net sets of each mesh size could not be deployed during the sampling season.

A total of 72 net sets representing 14,900 m^3 of filtered water produced only one fish larva, a spotted sucker (Appendix D). A total of 20 ichthyoplankton samples were not collected. Ichthyoplankton samples were not collected prior to March 1 due to delays in equipment procurement, and an additional 10 samples were not collected when gill net sampling was forgone due to flow conditions.

4.0 DISCUSSION

Although total catch and catch per unit effort in gill net samples was relatively low, species diversity was high. No species are conspicuously absent; however, American shad are know to migrate past the Rosewood Boat Ramp site and were expected in those samples. The lack of American shad in the Congaree River samples, however; is not totally unexpected. River velocities combined with the high amount of debris in this section made sampling problematic for this gear. In many cases, the gear did not remain stationary during the sampling period. Nets often drifted down stream or the outer or upper end was swept until the net was repositioned parallel to the current. Also, the necessary shortness of the net, and deployment with one end attached to the shore resulted in a net that did not effectively sample to the thalweg. As American shad are know to migrate in the deepest portion of the river channel during daylight hours, the relatively shallow net placement may account for the lack of the species in Congaree River samples. This was not the case, however, with Saluda River samples. Nets effectively sampled at least 50% of the river channel during most sampling events. As with nets set in the Congaree River, fouling of nets by debris and vegetation resulted in a rapid reduction in net efficiency, even over the relatively short 4 hour set time. As gizzard shad are similar in body configuration and habitat preference, the lack of American shad in samples containing gizzard shad suggests that American shad are either absent or in such low densities as to result in a low probability of capture.

Although gill net sampling is routinely used to collect American shad and shortnose sturgeon, the method is primarily employed in low-gradient or low-velocity rivers during periods of slack or low flow. The efficiency of gill nets deployed in fast-flowing water is substantially reduced. First, the net itself disrupts the flow, resulting in turbulence that makes the net readily detectable, and therefore; avoidable. Second, the continuous fouling of the net by debris increases this effect. Although not ideal, few other options are available. American shad can be collected by electrofishing, but the method works best near barriers to migration and is relatively ineffective in open water. American shad are susceptible to angling, but are still caught in relatively low numbers by experienced anglers when in high density. The likelihood of capturing an American shad by angling is relatively low in the Saluda River where densities are low at best.

Results of this study suggest that American shad failed to migrate into the Saluda River or migrated in relatively low numbers during the spawning season of 2005. The lack of larval fish in samples suggests the Saluda River is not a primary spawning site for any species with semi-pelagic larvae.

Table 1: Numbers by Location of Fish Caught in 2 and 5 Inch Gillnets Combined in the Saluda and Congaree Rivers in Spring 2005

SPECIES	LOCATION				TOTAL
	SALUDA SHOALS	RADIO TOWER	ZOO	ROSEWOOD	
spotted sucker	15	2	9	3	29
gizzard shad	3	1	8	0	12
yellow perch	3	0	8	0	11
chain pickerel	7	0	0	0	7
rainbow trout	1	2	0	0	3
brown trout	3	0	0	0	3
northern hog sucker	0	0	3	0	3
striped bass	0	0	0	2	2
largemouth bass	1	0	1	0	2
white perch	0	0	0	1	1
channel catfish	0	0	0	1	1
bluegill sunfish	1	0	0	0	1
flat bullhead	0	0	1	0	1
pumpkinseed sunfish	0	0	1	0	1
longnose gar	0	0	1	0	1
Total	**34**	**5**	**32**	**7**	**78**

APPENDIX A

2005 SALUDA HYDROELECTRIC PROJECT DIADROMOUS FISH STUDY PLAN

Saluda Hydroelectric Project (FERC No. 516)
Study Plan

Study Plan Name: 2005 Diadromous Fish Studies
Applicable Hydro Projects: Saluda Hydro FERC No. 516

I. Study Objective

The objectives of this study are: (1) to document presence / absence of target diadromous fish species in the Lower Saluda River (LSR) and the upper Congaree River during the spring migratory period; (2) to determine the relative abundance and spatial and temporal distributions of species found to be present in the reach; and (3) to document spawning of these species in the Saluda River relative to the Congaree River. Target anadromous species for the study include American shad (*Alosa sappadissima*), hickory shad (*Alosa mediocris*), and blueback herring (*Alosa aestivalis*). One catadromous species, the American eel (*Anguila rostrata*), will also be targeted. The following tasks will be necessary to meet this objective:

a) Review and evaluation of historical records of target diadromous fish species occurrence in the Saluda-Congaree portion of the Santee - Cooper River Basin, and
b) Sampling of the LSR and upper Congaree River for target diadromous species during the spring spawning season.

II. Basis

Restoration of anadromous clupeids to South Carolina waters has become an important objective of resource agencies. Each spring, efforts to pass migrating American shad and blueback herring are undertaken at the first barriers to migration in the Santee - Cooper system. Once passed, these fish have several migration pathways from which to choose. One such pathway results in these fish entering the Saluda River near Columbia. The relative abundance and potential spawning of this segment of the population is of particular interest to managers.

The FERC licensing process requires an assessment of potential impacts to fish and wildlife resources by the project and its operations (18CFR4.51). The United States Fish and Wildlife Service (USFWS) has mandatory conditioning authority for fishway prescriptions at all FERC licensed hydro projects; and the National Oceanographic and Atmospheric Administration – National Marine Fisheries Service (NOAA Fisheries) has similar mandatory conditioning authority where anadromous and/or catadromous species are involved.

III. Geographic and Temporal Scope

Diadromous fish studies will focus on the Lower Saluda River (LSR), from downstream of Saluda Hydro Dam to its confluence with the Broad River, and the upper Congaree River, from its origin at the confluence of the Saluda and Broad rivers to Rosewood Boat Landing. Studies are scheduled to begin in February 2005, with a final report issued by December 31, 2005.

IV. Summary of Existing Data

The South Carolina Department of Natural Resources (SCDNR), USFWS, and NOAA Fisheries have collaborated to develop 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. The plan identifies the Saluda River as being less than optimal for diadromous fish restoration efforts for a variety of reasons including: the large number of dams in the basin (approximately 13); the limited number of river miles available to upstream migrating fish prior to reaching the Saluda Hydro Dam (approximately 10); and the cost and potential biological limitation (i.e., pressure-related impacts to outmigrating fish) of establishing fish passage at the Saluda Hydro Dam. In addition, cold hypolimnetic water released from the Saluda Hydro Dam may cause migrating fish to select the warmer water of the Broad River and not enter the Saluda (USFWS et al. 2001).

According to two recent reviews (Welch 2000, Newcomb and Fuller 2001), the target species noted above (American shad, hickory shad, blueback herring, and American eel) are among the diadromous fish species that occurred historically in Saluda-Congaree sub-basin. Shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus*) also occurred historically in the sub-basin; however, these species have not been recently documented in the study area upstream of old Granby Lock and Dam. While some limited fish passage above old Granby Lock and Dam may be possible through the abandoned lock or during high flows, passage may be hindered for bottom-oriented species (USFWS et al. 2001) such as sturgeons.

V. Methodology

a) Review of Historical Distributions of Target Species

Two reviews of historical occurrences of target species in the Santee-Cooper River Basin have been completed (Welch 2000, Newcomb and Fuller 2001). These two reports, along with any relevant supplemental information that can be acquired from study participants and resource agencies, will be reviewed and used to update historical distribution patterns in the Saluda-Congaree sub-basin.

b) Sampling of Target Species

Gillnetting

Adult American shad, hickory shad, and blueback herring will be sampled using gillnetting methods during the 2005 spawning season. Sampling for target species will occur at the following four locations (Figure 1):

1. The LSR at Hope Ferry Landing;
2. The LSR upstream of the Gardendale Canoe Landing;
3. The LSR adjacent to Riverbanks Zoo; and
4. The Congaree River in the vicinity of Rosewood Landing.

Beginning on or around February 1 of each sampling year, gillnets will be set once per week for one run. A typical run during this period will include setting nets at each site and then returning to the first site to retrieve the nets. Nets will be set during daylight hours and

fished for at least 4 hours. In addition to sampling for early run fish, this would allow for resolution of problems associated with access, site selection, and for various trip-based logistical problems to be addressed. This sampling schedule will continue through March 1, or until notification is received from the SCDNR that significant numbers of anadromous alosids have begun to move through the St. Stephens Fish Lift at Pineopolis Dam.

Following notification of significant movements of alosids at St. Stephens, sampling will increase to twice per week. During this period, sampling sites will be run at least twice in a day. Following deployment, nets will be checked without being removed from the water on the first run (if possible), and then retrieved on the second or third trip. Nets will be fished for as much of the daylight period as possible, with the number of trips dependent on the amount of time required to make one run of the nets, travel time, etc. Twice-per-week sampling will continue on this schedule through April of each sampling year.

Beginning on or around May 1, sampling will be reduced to once per week and will continue until approximately June 1. Sampling during this period will follow the once-per-week sampling regime as described above.

Gillnetting will utilize two 100 ft-long (30.5 m) monofilament gill nets at each sampling location: (1) one – 30 m x 2 m, 2.5 in (6.4 cm) stretch mesh; and (2) one – 30 m x 2 m, 5 in (12.7 cm) stretch mesh. Each net will be set perpendicular or at an angle to the shore, with the larger mesh net set downstream of the smaller. All fish collected in the gill nets will be identified to species, weighed (0.1 kg), measured for total length (mm), sexed (if possible without sacrificing), and released alive when possible. A measurement of water temperature (ºC) and dissolved oxygen (mg/L) will also be taken at each location.

Survey data will be evaluated for presence or absence of diadromous species known to have occurred historically in this reach of the Saluda/Congaree sub-basin. In addition, a species list will be compiled of all diadromous species encountered during the study. Catch per Unit Effort (number of fish/net hours fished) will be determined and presented in the final report. Data will be compared by date and location.

Ichthyoplankton Sampling

Ichthyoplankton nets will be fished in conjunction with gillnets, whenever possible. Specifically, one plankton net (0.5 m x 1 m, 1.0 mm mesh; surface and bottom), equipped with flowmeter, will be fished in the general vicinity of each gillnetting location. Nets will be anchored facing upstream in sufficient flow to sample effectively. Nets will be deployed after the first gillnet is set at each location and allowed to fish for four hours. If no ichthyoplankton are collected, or if clogging of the net proves to be problematic, the length of time that the nets are fished may need to be adjusted in consultation with the resource agencies.

Ichthyoplankton samples will be preserved in 90% ETOH and returned to the laboratory for identification. All alosid larvae and eggs will be measured for standard length (0.1 mm) and identified to the lowest possible taxon. Larval densities (number / cm^3) will be calculated, compared by date and location, and presented in the final report.

American Eel Sampling

Eel Traps will be baited and allowed to fish undisturbed for two days each week from February through May. Traps will also be deployed at the following locations to document presence/absence and relative abundance of adult and juvenile Amercan eels:

1. The LSR at the mouth of the Saluda Dam spillway;
2. The mouth of Rawls Creek adjacent to Saluda Shoals Park;
3. The mouth of Twelvemile Mile Creek or the base of Corley Mill Dam, depending on suitable access; and
4. The LSR downstream of Interstate 26 near the USGS gaging station.

All captured eels will be identified, measured for total length (0.1 mm), examined and released and the location of capture will be noted.

VI. Schedule and Required Conditions

a) The review of historical occurrences of target diadromous fish species in the Saluda/Congaree sub-basin will be completed by the end of February 2005.

b) Sampling for target diadromous species below the Saluda Hydro Dam will be conducted from February through May during 2005. A draft report summarizing the 2005 sampling results will be issued by November 1, 2005, with a final report issued by December 31, 2005. The final report will include all sampling results and conclusions regarding presence and population status of diadromous species, as well as a summary of historical distributions in the area.

VII. Use of Study Results

Results of the diadromous fish study will be used as an information resource during discussion of relicensing issues with the SCDNR, USFWS, relicensing issue working groups and other relicensing stakeholders. In addition, the study will provide baseline information for future studies and basin management decisions in the Santee –Cooper Basin.

VIII. Study Participants

	NAME	ORGANIZATION	PHONE	E-MAIL
Applicant Leads	Stephen E. Summer	SCANA Services	(803)217-7357	ssummer@scana.com
	Alan W. Stuart	Kleinschmidt	(803)822-3177	alan.stuart@kleinschmidtusa.com
	Shane Boring	Kleinschmidt	(803)822-3177	shane.boring@kleinschmidtusa.com
Agency Leads	Dick Christie	SCDNR	(803)289-7022	dchristie@infoave.net
	Amanda Hill	USFWS	(843)727-4707, x24	Amanda_hill@fws.gov
	Prescott Brownell	NOAA Fisheries	(843)762-8591	Prescott.brownell@noaa.gov
Other Participants	William Argentieri	SCE&G	(803)217-9162	bargentieri@scana.com
	Randy Mahan	SCANA Services	(803)217-9538	rmahan@scana.com

IX. List of Attachments

ATTACHMENT A: Map of Diadromous Fish Sampling Locations on the Lower Saluda and Upper Congaree Rivers

ATTACHMENT B: Meeting Notes from November 10, 2004, Diadromous Fish Study Meeting

ATTACHMENT C: Sampling Recommendations Provided by Resource Agencies (Received via e-mail December 8, 2004)

X. List of References

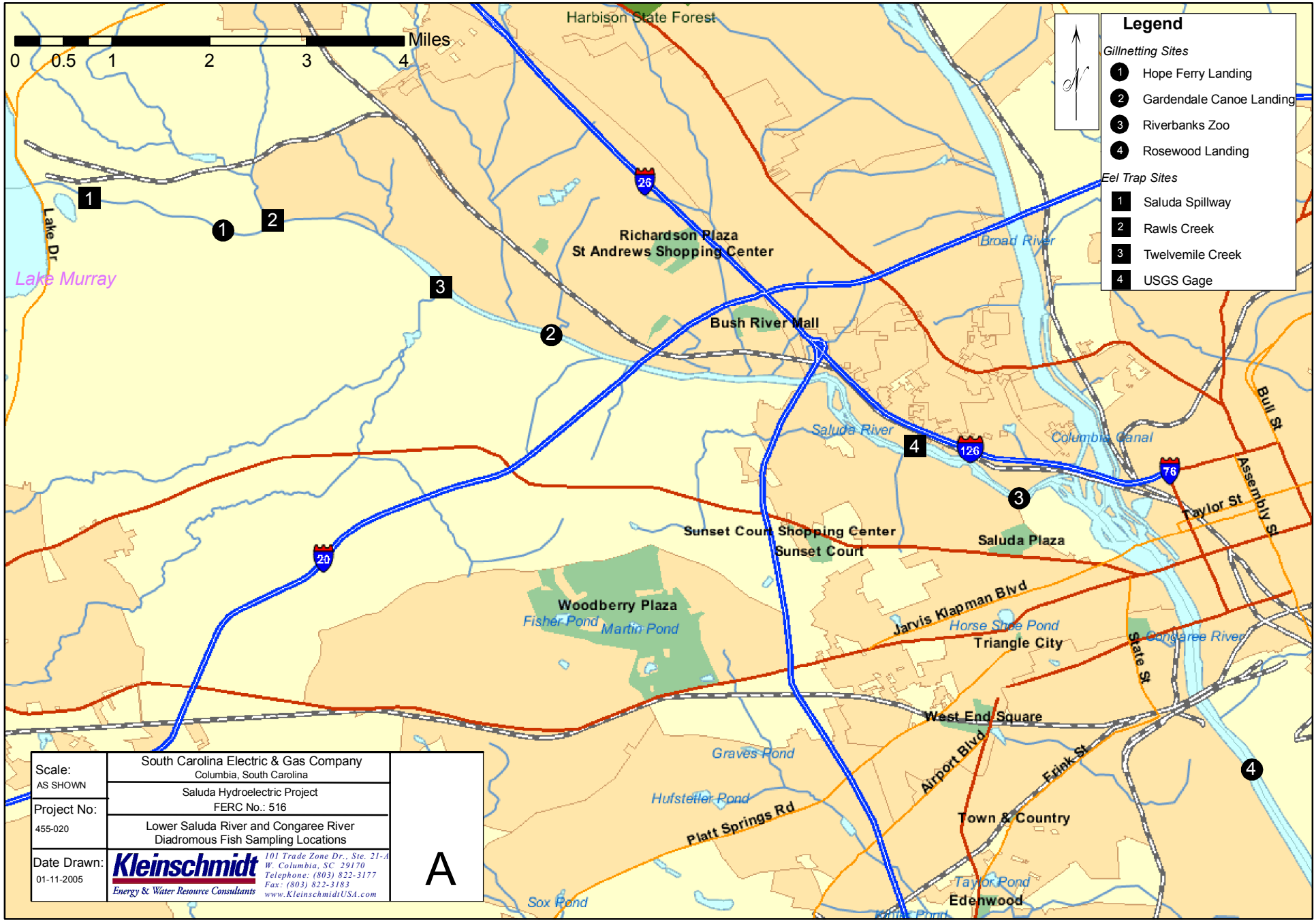
Newcomb, T.J. and J.S. Fuller. 2001. Anadromous and catadromous fish survey of Santee/Cooper Basin in North Carolina and South Carolina. Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA. Final Report, Prepared for Duke Power, June 25, 2001. 25 pp.

United States Fish and Wildlife Service, National Marine Fisheries Service, and South Carolina Department of Natural Resources. 2001. Santee-Cooper Basin diadromous fish passage restoration plan.

Welch, S.M. 2000. A report on the historical inland migrations of several diadromous fishes in South Carolina Rivers. Department of Aquaculture, Fisheries and Wildlife, Clemson University, Clemson, SC. Report prepared for Mr. Douglas W. Cook, South Carolina Department of Natural Resources. December 4, 2000. 19 pp.

ATTACHMENT A

Map of Diadromous Fish Sampling Locations on the Lower Saluda and Upper Congaree Rivers


Miles
0
0.5
1
2
3
4
Legend
Gillnetting Sites
1 Hope Ferry Landing
2 Gardendale Canoe Landing
3 Riverbanks Zoo
4 Rosewood Landing
Eel Trap Sites
1 Saluda Spillway
2 Rawls Creek
3 Twelvemile Creek
4 USGS Gage
Harbison State Forest
Lake Murray
Lake Dr
Richardson Plaza
St Andrews Shopping Center
Broad River
Bush River Mall
Saluda River
Columbia Canal
Bull St
Assembly St
Taylor St
Sunset Court Shopping Center
Sunset Court
Saluda Plaza
Woodberry Plaza
Fisher Pond
Martin Pond
Jarvis Klapman Blvd
Horse Shoe Pond
Triangle City
Congaree River
State St
West End Square
Graves Pond
Airport Blvd
Frink St
Hufstetler Pond
Platt Springs Rd
Town & Country
Taylor Pond
Edenwood
Sox Pond
Scale: AS SHOWN
South Carolina Electric & Gas Company
Columbia, South Carolina
Saluda Hydroelectric Project
FERC No.: 516
Project No: 455-020
Lower Saluda River and Congaree River
Diadromous Fish Sampling Locations
Date Drawn: 01-11-2005
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ATTACHMENT B

Meeting Notes from November 10, 2004, Diadromous Fish Study Meeting

Saluda Hydro Relicensing – Diadromous Fish Study Meeting – November 10, 2004
Meeting Location – SCE&G Training Center – Columbia, SC

Revision 12-10-04

Attendees:

Steve Summer	SCE&G	Dick Christie	SCDNR
Bill Argentieri	SCE&G	Steve Leach	SCDNR
Kristina Massey	SCE&G	Hal Beard	SCDNR
Randy Mahan	SCE&G	Amanda Hill	USFWS
Alan Stuart	Kleinschmidt	Mark Cantrell	USFWS
Shane Boring	Kleinschmidt	Alison Guth	Kleinschmidt

Action Items:

- Prepare a study plan for sampling diadromous fish on the Lower Saluda River and distribute to the resource agencies for review and comment.
- Obtain and distribute D.O. and flow data to the agencies. SCE&G will obtain data from the USGS.
- Organize canoes, transportation, etc. that is needed for a low flow float trip on the lower Saluda on the 29th of November (to be taken care of by Alison).
- Set up meeting with Prescott Brownell of NOAA fisheries about sturgeon issues.
- Check on permitting for studies, who needs to be there?
- Steve Leach and Mark Cantrell said that they could provide an electronic copy of the Santee Cooper Basin Diadromous Fish Passage Restoration Plan to anyone who needs it.

Meeting Notes:

These notes summarize the major items discussed during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan Stuart opened the meeting at 10:00 AM and noted that the focus of the meeting would be to discuss: (1) Target Species and Restoration Plans for the Lower Saluda River (LSR), (2) Historical data needs, (3) NOAA shortnose sturgeon sampling permit, (4) Lower Saluda River Sampling logistics, (5) Sampling in Lake Murray tributaries and, (6) Establish a date for low flow float trip on the Lower Saluda River & above Lake Murray.

Target Species and Restoration Plans:

The agencies began this discussion by briefly stating the target species that they would like to see included in the diadromous fish study. The fish mentioned include: blueback herring, hickory and American shad, American eel, Atlantic and shortnose sturgeon, and striped bass. Dick Christie noted that the Broad River Basin is considered number one (most promising) for fish restoration in the Santee Cooper Diadromous Fish Passage Restoration Plan. He also mentioned that the restoration plan is considered a general, wide-reaching plan.

The group decided that more studies need to be performed in order for the agencies to more fully develop their restoration plan, which is considered a living document.

Historical Data Needs:

Mark Cantrell mentioned that the flows into Lake Murray vs. the flows out of Lake Murray would provide great comparison data from which to figure out a fish's response to flow. Amanda Hill mentioned that she would like to look at temperature distributions as requested by Doug Cooke. Simple temperature data comparing the Broad River and LSR may rule out the presence of sturgeon.

Amanda Hill stated that it would be helpful to know the temperature data above and below the dam. This would allow the agencies to determine how far downstream the project influences. Steve Leach brought up the possibility of using USGS as a source for temperature data, possibly from the last 10-15 years. Dick Christie concurred that January through August would be good months to look at in regards to temperatures, flows, etc.

Amanda Hill asked if there were temperature and D.O. monitors on the Congaree itself. In response, it was stated that there was only stage data on Gervais Street. Also that there is possible data for city at sewer plant, which needs to be checked into. Moreover, around October of '88 through the present there should be data available at the dam. The agencies asked SCE&G to investigate locations for additional monitors, and the agencies will provide what data they already have. It was pointed out that SCDHEC may have some data prior to 1988.

Mark Cantrell of the USFWS asked how the project operations have changed since they first began. In response, Kristina Massey stated that since there is no flood storage pool, the project has always operated to pass large inflows so the dam won't be overtopped. Up to the late 1950s the project was operated as a base-load facility, and the lake fluctuated much more than it does at the present. From the 1960s to 1990s, the project moved into a load-following and peaking mode, generating when power was most needed on the system and reducing the amount of annual lake fluctuation. The annual flow of water through the system has remained relatively unchanged. Currently the project is used primarily to meet system reserve needs.

Alan inquired as to where the striped bass fit into the study plan. Hal Beard replied that the striped bass use the river for refuge and then they leave and no one is sure when they arrive, what the environmental demands are and where they go. It is possible that over-exploitation could occur. Although inconclusive, work conducted by Gene Hayes suggests that, to some degree, landlocked striped bass may utilize the Upper Saluda River as spawning area. Generally, the LSR is a two-tiered fishery, trout in the winter and striped bass in the summer. Hal continued to mention that there is also concern that the striped bass could become genetically depressed due to the over fishing of the best individuals.

Mark Cantrell would like to know how stripers have been sampled historically. The group stated that the sampling performed by Hal Beard is the first sampling that has been done on a regular basis. Hal indicated he usually samples in May/October. Dick suggested that IFIM study work has been done by Isley and Jobsis.

NOAA Shortnose Sturgeon sampling permit:

- Will be discussed in a meeting with Prescott Brownell

Saluda River Sampling Logistics:
Gill Netting:

When: Start in the beginning of March (1x a week) then increase to 3x's a week from the third week in March through April
4am to 10am or 2pm to 8pm.

Where: One gillnet near the mouth of the Saluda River near the Congaree River and one towards the dam.

Supplies: 2 ½" to 7" stretch mesh nets. One net should be constructed of 2.5-inch stretched mesh, the other of 5-inch stretched mesh.

How: Possibly set at an angle to the bank. Fish two nets (one net of each mesh size) at each site, to cover approximately one half of the river's width if possible.

The group began to discuss gillnetting and its caveats. Hal Beard mentioned that he will be interested in how the gill netting is going to be performed; he has not had much luck with it in the past. However, he has achieved the most luck with it when the nets were set at an angle to the bank, rather than perpendicular. When considering a site for the net, one must consider both access and velocity. (i.e., Is velocity going to increase fish catch?)

According to Dick, in order to target American shad and blueback herring, the smallest mesh size needs to be 2 ½ " for smaller fish and as much as 7" for larger adults. Moreover, net panels need to be made to the right length and height in order to cover the channel. The group mentioned that SCE&G may want to test the feasibility of gillnetting in 2004.

Mark Cantrell clarified that the goals of this early study were as follows: to determine the presence or absence of target species, what their distribution is in the habitat, and where along the river they are located.

Kristina brought up the fact that flows may be a serious setback when gillnetting, all depending on how wet of a winter and spring we have.

The group decided that sampling should occur in 6 hour time periods. The time period for setting and monitoring gill nets should be during either 2:00 pm -8:00 pm, or possibly 4:00 am to 10:00 am. According to Dick Christie there should be a gill net set up at least at one site around the mouth of the Saluda River at the Congaree River and one in the upper reaches, near the dam (Saluda Shoals). Hal Beard suggested that one of the nets should be located about 100m below the zoo bridge.

Alan suggested using the passage rates at St Stephens as a catalyst to increase sampling efforts in the LSR. Coordination with SCDNR, as was done during the relicensing of Columbia Hydro, was proposed. There needs to be coordination with Doug Cooke and Steve Leach to find out when the fish are being passed. Steve Leach responded that the peak at Pinopolis Dam occurs around March 7th and at St. Stevens around the 20th of March.

The discussion turned to possible sampling times and dates. It was mentioned that SCE&G may only need to sample using gill nets once a week until end of March, beginning of April, and then increase up to around 3x's a week. Hal cautioned against sampling too far into April because of the large amount of stripers.

The agencies indicated that it may be acceptable to electrofish while gill nets were soaking.

Note: *The following comments and clarifications were made by the resource agencies following the meeting*: Starting in February, set nets once a week for one run. A run will include setting nets at each site and then returning to the first site to retrieve the nets. The nets should be allowed to fish for at least 4 hours. In addition to sampling for early run fish, this would allow for resolution of problems associated with access, site selection, and various trip-based logistical problems to be addressed.

After notification of "significant" alosine passage at the Santee Cooper dams, increase sampling dates to twice per week (The agencies suggested shooting for Monday and Thursdays, to allow for some variation due to hazardous weather conditions).

The sites should be run at least twice in a day, so that nets are checked without removing from the water, if possible, on the first run, and then retrieved on the second or third trip. The goal is to fish the nets for as much of the daylight period as possible. The number of trips will be dependent on the amount of time required to make one run of the nets, travel time, etc. and can be adjusted accordingly. Nets should be fished in this mode through April and then reduced to one run (on one day) per week through May if alosine catch has decreased significantly.

The sites should be determined by locating adequate fishing habitat in close proximity to a private, public or improvised launching facility. Ideally, three sampling locations should be sampled. These locations should roughly correspond to upper, middle and lower sections of the river. A potential upper-river site should be near the SCE&G ramp at Saluda Shoals. The middle river should be generally between Fourteen Mile Creek and the Interstate 20 Bridge; the lower-river site suggested is in the vicinity of Riverbanks Zoo. Actual locations may have to be adjusted at the time of sampling due to varying flow conditions.

One additional site in the Congaree River near the confluence of the Broad and Saluda Rivers would provide information on relative abundance of fish in the river and provide indications as to whether they are selecting for the Saluda or Congaree. Sampling with the same techniques and timing as in the Saluda River would also provide insight to the effectiveness of gear and techniques, and was strongly encouraged by the agencies. Fishing near the Rosewood landing on Congaree River may prove suitable for this site.

If the catch of non-target species is high at any of the sampling sites, the length of time nets are fished can be shortened to reduce by-catch.

Eel Traps:

When: February to April

Where: At the mouths of rivers, channels and islands

Supplies: Eel pots can possibly be ordered from Wildco

Amanda Hill of FWS mentioned that they would like eel pots to be set at the mouths of rivers, channels and islands and that they were looking for potential elvers. She also stated that these would not be as laborious as gillnetting, the eel traps only needed to be checked every couple of days. Hal Beard indicated that in the past he has caught about three eels in a 10 day sampling season on average, and also that he had 5 yrs of data. Amanda replied that she would like to get that data from him if at all possible. The group mentioned that the first step was to compile as much historical data as possible.

The discussion turned to time periods in which to sample. Mark Cantrell said that February to April would be the best time to deploy eel pots.

The USFWS will provide info on equipment suppliers such as Wildco.

Note: *The following comments and clarifications were made by the resource agencies following the meeting*: Efforts should be made to determine whether eel traps can be fished on a corresponding schedule with gill nets sets. If locations as previously described (e.g. creek entrances) can be located near gill net sites, they should be utilized. Eel traps should be set there upon first deployment of the day, and checked at the end of

the day. They could also be left set until the next trip (once twice a weekly sampling starts), when they should be checked and re-baited.

Plankton Nets:

When: While gill netting

Where: DNR would prefer that plankton nets be set to fish off the bottom

Supplies ½ meter, 220/500 micron single nets, possibly with flow meter attached

Amanda Hill mentioned that they would like SCE&G to put up fixed plankton nets to gather eggs and larvae. In response, Alan mentioned that if gillnetting and electrofishing provide no results, plankton nets may be unnecessary. Amanda said that plankton nets are just another way of determining presence or absence, and they are definitely needed during the spring of 2005, if nothing else.

In regards to the nets themselves, Mark Cantrell mentioned that they would prefer tows but it may be difficult to do in the river, so maybe stationary nets would be better for a given period of time. Moreover, in regards to catching herring, shad and stripers, Mark pointed out that ½ meter, 220 micron would perform the best. He also stated that a flow meter would provide volume measurements, but you would need a meter attached to each net unless they are paired closely together. The group decided that single nets, not bongo nets, should be used. DNR would prefer that the river was fished off the bottom.

It was concluded that plankton nets can be sampled while electrofishing and gillnetting are taking place.

Note: *The following comments and clarifications were made by the resource agencies following the meeting*: Efforts should be made to fish plankton nets in conjunction with gillnets. Plankton nets may be anchored after the first gill net set at each site and retrieved upon the last gillnet retrieval of the day. This will allow for filtering the maximum volume of water during low flow periods, increasing the likelihood of sampling alosine eggs and larvae. However, if clogging with vegetation, detritus, etc. becomes problematic, plankton nets may be retrieved at the retrieval stage of the first run for gillnets each day. If clogging is still problematic, then shorter sampling times should be investigated.

Telemetry Study:

FWS expressed the desire to have a telemetry study preformed with some sentinel fish for American shad. This study will help the agencies determine if the shad utilize the Broad and LSR or just the Broad River. Also if they have thermal preferences and selection based upon the water temperature. Dick Christie believes it would be a good idea to do this because we do not know where they go. Dick Christie also mentioned that it would benefit SCE&G if the American Shad went up the Broad River.

Kristina made the point that if we were going to do this it needed to be done right, and it may be too late to put it together properly by the springtime.

It was discussed that the fish would probably be tagged in Pinopolis. However, SCE&G does not want to study the whole basin just to determine presence in the LSR. Alan suggested that it could possibly be combined with the Columbia fish passage project effectiveness testing and yield more information and better results.
It was suggested that fish needed for the effectiveness tracking effort could be obtained from the Congaree River.

In the end, it was decided that telemetry will be performed as a second phase, along with studies associated with the Columbia Hydro Fish Passage Testing.

Temperature Monitoring:

The influence of the project, water temperature wise, downstream was again brought up. Mark Cantrell mentioned the possible need for temperature monitoring downstream, to the Congaree. Moreover, the most likely time that water temperature is affected is in the summer and fall. Amanda Hill stated that describing the thermal environment of the LSR would help determine if a possible temperature difference influences a fish's choice of sub-basin.

In regards to location, it was stated that there should be temperature sensors 1 mile downstream of dam and 1 mile upstream from zoo. Steve Summer mentioned that SCE&G could put some tidbits (temperature recorders) near the confluence on the left and right banks. Mark Cantrell suggested that they do a transect across the river and decide where equilibrium is reached in mixing of both rivers. However SCE&G mentioned that quite a few transects would be needed to determine this, which may be difficult. Steve Summer suggested that one tidbit should be placed in the Saluda and one in the Broad River near the confluence just to track the differences for now. Mark Cantrell stated that the tidbit needs to be positioned towards the bottom but still in the water column. SCE&G mentioned that there are continuous temperature monitors in the Saluda River about 1,000 feet downstream of the hydro plant, and upstream of the zoo that are operated by USGS. It was also mentioned that there is a continuous temperature monitor in the Broad River immediately downstream of Parr Hydro, also operated by the USGS. Data from all three of these gages is available on the USGS website.

Steve Leach stated that the preferred spawning water temperature range for sturgeon is 7-18 degrees C. He also pointed out that the divergence of water temperatures between the Broad and LSR begins earlier in year then previously thought, begins around April, and is also more of an obvious difference what was once thought.

Hal Beard pointed out that it is possible that fish orient themselves toward flow instead of temperature.

It was decided that this study would be "tabled" as well.

Sampling in Lake Murray tributaries:

The agencies indicated that they would like an evaluation of potential spawning areas in the Lake and in tributaries. Amanda Hill stated that a characterization of the physical habitat below the dam and above the Lake would be helpful. This can possibly be submitted in GIS format, and would be used to determine if there is potential diadromous fish spawning habitat.

Hal Beard pointed out that Gene Hayes did some cursory work to determine if stripers could possibly be reproducing in middle Saluda, and his determination concluded that numbers were insignificant.

"Tabled" Studies

- Telemetry Study
- Temperature Monitoring in LSR and Congaree.
- Will possibly do a future Habitat Evaluation if it is in conjunction with a required flow study.
- Will determine need of habitat study after video fly-over and float trip.

Low Flow Float Trip on the Lower Saluda River:

The meeting concluded with a discussion of the canoe trip that was going to be taking place on the Lower Saluda River during low flows (400-500 cfs). It was determined that the 29th of November was the best date for everyone.

Amanda and Alan will both ask Prescott Brownell to attend.

The meeting adjourned at approximately 3:00 pm.

ATTACHMENT C

Sampling Recommendations Provided by Resource Agencies
(Received via e-mail from SCDNR on December 8, 2004, with concurrence from USFWS on December 7, 2004)

Sampling Recommendations Provided by Resource Agencies

RE: *Saluda River Sampling Logistics*
Gill netting:

After discussion with various biologists in the area we suggest the following changes to the gillnetting sampling regime that was originally discussed on November 10, 2004. These changes are designed to most effectively sample for determination of spatial and temporal distributions of alosine fishes in the system and to begin to generate an index of quantity. The general concept is to set nets near sites with boat access, so that after nets are set at one site, the boat can be trailered to the next site. For these first year studies, it is assumed that changes will need to be occur to compensate for unforeseen or as of yet poorly understood issues of manpower, river levels, site selection, gear applicability and other factors.

When: Starting in February, set nets once a week for one run. A run will include setting nets at each site and then returning to the first site to retrieve the nets. The nets should be allowed to fish for at least 4 hours. In addition to sampling for early run fish, this would allow for resolution of problems associated with access, site selection, and various trip-based logistical problems to be addressed.

After notification of "significant" alosine passage at the Santee Cooper dams, increase sampling dates to twice per week (We'd suggest shooting for Monday and Thursdays, to allow for some variation due to hazardous weather conditions).

The sites should be run at least twice in a day, so that nets are checked without removing from the water, if possible, on the first run, and then retrieved on the second or third trip. The goal is to fish the nets for as much of the daylight period as possible. The number of trips will be dependent on the amount of time required to make one run of the nets, travel time, etc. and can be adjusted accordingly. Nets should be fished in this mode through April and then reduced to one run (on one day) per week through May if alosine catch has decreased significantly.

NOTE: length of sets, etc. should be adjusted if impacts to other species are discovered.

Where: The sites should be determined by locating adequate fishing habitat in close proximity to a private, public or improvised launching facility. Three locations spread out along the river should be sampled, allowing managers to determine if fish are ascending rapids and are present at the dam. The locations should roughly correspond to upper, middle and lower sections of the river. A probable upper-river site should be near the SCE&G ramp at Saluda Dam. The actual gill netting site may have to be adjusted in varying flow conditions. The middle river should be generally between Fourteen Mile Creek and the Interstate 20 Bridge; the lower-river site suggested is in the vicinity of Riverbanks Zoo. As noted; actual locations may have to be adjusted due to varying flow conditions.

One additional site in the Congaree River near the confluence of the Broad and Saluda Rivers would provide information on relative abundance of fish available to use the Saluda River, and is strongly encouraged. Sampling with the same techniques and timing as in the Saluda River would provide insight to the effectiveness of gear and techniques. Fishing near the Rosewood landing on Congaree River may prove suitable for this site.

Supplies: Fish two nets at each site, approximately one half of the river's width. One net should be constructed of 2.5-inch stretched mesh, the other of 5-inch stretched mesh.

How: Nets should be "set" from the riverbank out perpendicular or angled to the shoreline, depending on flow conditions. Larger mesh nets should be fished downstream of the smaller mesh nets.

Eel Traps

Efforts should be made to determine whether eel traps can be fished on a corresponding schedule with gill nets sets. If locations as previously described (e.g. creek entrances) can be located near gill net sites, they should be utilized. Eel traps should be set their upon first deployment of the day, and checked at the end of the day, but probably may be left set until the next trip (once twice a weekly sampling starts). On the next trip, eel traps should be checked and re-baited.

Plankton nets

Efforts should be made to fish plankton nets in conjunction with gillnets. Plankton nets may be anchored after the first gill net set at each site and retrieved upon the last gillnet retrieval of the day. This will allow for filtering the maximum volume of water during low flow periods, increasing the likelihood of sampling alosine eggs and larvae. However, if clogging with vegetation, detritus, etc. becomes problematic, plankton nets may be retrieved at the retrieval stage of the first run for gillnets each day. If clogging is still problematic, then shorter sampling times should be investigated.

APPENDIX B

SALUDA RIVER DAILY MEAN DISCHARGE AND TEMPERATURE DURING 2005 DIADROMOUS FISH SAMPLING

DATE (MDDYY)	LOCATION	MEAN DISCHARGE (FEET/SECOND)	TEMPERATURE (ºC)
20505	Saluda	3,820	9.2
21005	Saluda	1,660	9.5
21705	Saluda	1,410	10.1
22305	Saluda	652	11.3
30805	Saluda	3,280	10.6
31005	Saluda	2,820	10.2
31505	Saluda	1,160	10.9
31705	Saluda	1,460	9.7
32105	Saluda	1,050	11.2
32505	Saluda	1,060	12.3
40605	Saluda	3,440	12.1
40705	Saluda	3,870	11.8
41805	Saluda	1,060	13.3
42005	Saluda	1,420	13.5
42605	Saluda	2,570	12.5
42805	Saluda	2,560	12.9
50305	Saluda	607	14.3
50405	Saluda	546	15.3
50905	Saluda	603	16.5
51105	Saluda	590	16.3
51805	Saluda	517	17.1
52505	Saluda	767	16.7
52605	Saluda	399	16

http://waterdata.usgs.gov/sc/nwis/dv?dd_cd=04_00010_00003&format=html&period=200&site_no=02169000

APPENDIX C

DAILY GILLNET CATCH DATA BY LOCATION FOR SPRING 2005 SALUDA AND CONGAREE RIVER SAMPLES

DATE (MDDYY)	LOCATION	GEAR (MESH SIZE (IN))	TIME IN	TIME OUT	SOAK TIME	SPECIES[1]	LENGTH
20505	sal	2	930	1230	300		
20505	sal	5	930	1230	300		
20505	rad	2	1045	1320	235		
20505	rad	5	1045	1320	235	spsuc	36
20505	zoo	2	1130	1400	230		
20505	zoo	5	1130	1400	230		
20505	rose	2	1500	1605	105		
20505	rose	5	1500	1605	105	chcat	44
21005	sal	2	1310	1610	300	chpic	20
21005	sal	5	1310	1610	300	spsuc	34
21005	rad	2	1340	1640	300		
21005	rad	5	1340	1640	300		
21005	zoo	2	1415	1720	305		
21005	zoo	5	1415	1720	305		
21005	rose	2	1500	1600	100		
21005	rose	5	1500	1600	100		
21705	sal	2	945	1345	400	chpic	39
21705	sal	2	945	1345	400	chpic	35
21705	sal	5	945	1345	400		
21705	rad	2	1025	1450	425		
21705	rad	5	1025	1450	425		
21705	zoo	2	1130	1535	405		
21705	zoo	5	1130	1535	405		
21705	rose	2	1140	1635	455		
21705	rose	5	1140	1635	455		
22305	sal	2	1050	1450	400		
22305	sal	5	1050	1450	400		
22305	rad	2	1120	1545	425	rbtr	34
22305	rad	2	1120	1545	425	rbtr	22
22305	rad	5	1120	1545	425	gzsh	39
22305	zoo	2	1115	1530	415		
22305	zoo	5	1115	1530	415		
22305	rose	2	1020	1600	540		
22305	rose	5	1020	1600	540		
30805	sal	2	910	1320	410		
30805	sal	5	910	1320	410		
30805	rad	2	935	1355	420		
30805	rad	5	935	1355	420		
30805	zoo	2	1015	1435	420		
30805	zoo	5	1015	1435	420		
30805	rose	2					
30805	rose	5					
31005	sal	2	1020	1435	415	chpic	34
31005	sal	2	1020	1435	415	chpic	38

[1] rbtr, rainbow trout
chpc, chain pickerel
pump, pumpkinseed
lngar, longnose gar
spsuc, spotted sucker
stba, striped bass
yper, yellow perch
whper, white perch
gzsh, gizzard shad
blgl, bluegill
ftbh, flat bullhead
brtr, brown trout
lmb, largemouth
hgsu, hogsucker

DATE (MDDYY)	LOCATION	GEAR (MESH SIZE (IN))	TIME IN	TIME OUT	SOAK TIME	SPECIES[1]	LENGTH
31005	sal	2	1020	1435	415	chpic	33
31005	sal	5	1020	1435	415		
31005	rad	2	1050	1525	435		
31005	rad	5	1050	1525	435		
31005	zoo	2	1120	1550	430		
31005	zoo	5	1120	1550	430		
31005	rose	2	1210	1325	115		
31005	rose	5	1210	1325	115		
31505	sal	2	945	1355	410		
31505	sal	5	945	1355	410		
31505	rad	2	1015	1420	405		
31505	rad	5	1015	1420	405		
31505	zoo	2	1050	1500	410		
31505	zoo	5	1050	1500	410		
31505	rose	2	1150	1300	110		
31505	rose	5	1150	1300	110		
31705	sal	2	1025	1430	405	rbtr	32
31705	sal	5	1025	1430	405	spsuc	52
31705	sal	5	1025	1430	405	spsuc	42
31705	rad	2	1105	1500	355		
31705	rad	5	1105	1500	355		
31705	zoo	2	1135	1540	405		
31705	zoo	5	1135	1540	405		
31705	rose	2					
31705	rose	5					
32105	sal	2	1015	1425	410	spsuc	58
32105	sal	5	1015	1425	410		
32105	rad	2	1040	1455	415		
32105	rad	5	1040	1455	415		
32105	zoo	2	1120	1530	410		
32105	zoo	5	1120	1530	410	spsuc	48
32105	rose	2	1200	1310	110		
32105	rose	5	1200	1310	110		
32505	sal	2	1000	1400	400		
32505	sal	5	1000	1400	400		
32505	rad	2	1040	1500	420		
32505	rad	5	1040	1500	420		
32505	zoo	2	1115	1530	415		
32505	zoo	5	1115	1530	415		
32505	rose	2	1215	1320	105		
32505	rose	5	1215	1320	105		
40605	sal	2	950	1400	410		
40605	sal	5	950	1400	410		
40605	rad	2	1030	1435	405		
40605	rad	5	1030	1435	405		
40605	zoo	2	1110	1510	400		
40605	zoo	5	1110	1510	400	spsuc	51
40605	rose[2]	2					

[2] rosewood had high discharge rates. Nets were floating away, so we abandoned sampling for days with discharge >12000 cfs.

DATE (MDDYY)	LOCATION	GEAR (MESH SIZE (IN))	TIME IN	TIME OUT	SOAK TIME	SPECIES[1]	LENGTH
40605	rose	5					
40705	sal	2	1020	1300	240	.	.
40705	sal	5	1020	1300	240		
40705	rad	2	1045	1330	245		
40705	rad	5	1045	1330	245		
40705	zoo	2	1115	1400	245		
40705	zoo	5	1115	1400	245		
40705	rose	2					
40705	rose	5					
41805	sal	2	940	1440	500	brtr	21
41805	sal	5	940	1440	500		
41805	rad	2	1020	1505	445		
41805	rad	5	1020	1505	445		
41805	zoo	2	1100	1530	430	gzsh	12
41805	zoo	2	1100	1530	430	gzsh	14
41805	zoo	2	1100	1530	430	gzsh	14
41805	zoo	2	1100	1530	430	gzsh	12
41805	zoo	5	1100	1530	430		
41805	rose	2	1200	1300	100		
41805	rose	5	1200	1300	100	stba	60
42005	sal	2	1010	1440	430	blgl	15
42005	sal	5	1010	1440	430		
42005	rad	2	1045	1515	430		
42005	rad	5	1045	1515	430		
42005	zoo	2	1130	1615	445	gzsh	13
42005	zoo	2	1130	1615	445	gzsh	13
42005	zoo	2	1130	1615	445	gzsh	13
42005	zoo	5	1130	1615	445	spsuc	48
42005	zoo	5	1130	1615	445	pump	30
42005	zoo	5	1130	1615	445	gzsh	42
42005	zoo	5	1130	1615	445	spsuc	52
42005	zoo	5	1130	1615	445	lmb	52
42005	rose	2	1215	1315	100		
42005	rose	5	1215	1315	100	stba	55
42605	sal	2	1000	1400	400		
42605	sal	5	1000	1400	400		
42605	rad	2	1035	1445	410		
42605	rad	5	1035	1445	410		
42605	zoo	2	1125	1525	400		
42605	zoo	5	1125	1525	400		
42605	rose	2					
42605	rose	5					
42805	sal	2	1045	1515	430	brtr	22
42805	sal	5	1045	1515	430	spsuc	45
42805	sal	5	1045	1515	430	spsuc	42
42805	sal	5	1045	1515	430	spsuc	43
42805	sal	5	1045	1515	430	spsuc	41
42805	rad	2	1115	1550	435		
42805	rad	5	1115	1550	435		
42805	zoo	2	1210	1620	410	yper	20
42805	zoo	5	1210	1620	410		

DATE (MDDYY)	LOCATION	GEAR (MESH SIZE (IN))	TIME IN	TIME OUT	SOAK TIME	SPECIES[1]	LENGTH
42805	rose	2	1255	1355	100		
42805	rose	5	1255	1355	100		
50305	sal	2	1015	1445	430	yper	18
50305	sal	5	1015	1445	430	spsuc	44
50305	rad	2	1050	1520	430		
50305	rad	5	1050	1520	430		
50305	zoo	2	1130	1555	425	yper	19
50305	zoo	2	1130	1555	425	yper	19
50305	zoo	2	1130	1555	425	yper	19
50305	zoo	2	1130	1555	425	yper	19
50305	zoo	5	1130	1555	425	ftbh	48
50305	rose	2	1240	1350	110		
50305	rose	5	1240	1350	110	spsuc	40
50305	rose	5	1240	1350	110	spsuc	48
50305	rose	5	1240	1350	110	spsuc	52
50405	sal	2	1020	1440	420	yper	14
50405	sal	5	1020	1440	420	spsuc	43
50405	sal	5	1020	1440	420	spsuc	43
50405	sal	5	1020	1440	420	spsuc	45
50405	rad[3]	2					
50405	rad	5					
50405	zoo	2	1120	1520	400	yper	15
50405	zoo	5	1120	1520	400	spsuc	55
50405	zoo	5	1120	1520	400	spsuc	42
50405	zoo	5	1120	1520	400	spsuc	54
50405	zoo	5	1120	1520	400	spsuc	57
50405	rose	2					
50405	rose	5					
50905	sal	2	1020	1420	400	brtr	22
50905	sal	2	1020	1420	400	gzsh	14
50905	sal	2	1020	1420	400	gzsh	14
50905	sal	2	1020	1420	400	gzsh	15
50905	sal	5	1020	1420	400		
50905	rad	2					
50905	rad	5					
50905	zoo	2	1115	1525	410	hgsu	29
50905	zoo	2	1115	1525	410	yper	19
50905	zoo	2	1115	1525	410	yper	22
50905	zoo	2	1115	1525	410	hgsu	24
50905	zoo	2	1115	1525	410	hgsu	28
50905	zoo	5	1115	1525	410		
50905	rose	2	1150	1250	100		
50905	rose	5	1150	1250	100		
51105	sal	2	1010	1405	355	chpic	24
51105	sal	5	1010	1405	355		
51105	rad	2					
51105	rad	5					
51105	zoo	2	1050	1500	410		

[3] Radio towers had very low water events and we could not access the river.

DATE (MDDYY)	LOCATION	GEAR (MESH SIZE (IN))	TIME IN	TIME OUT	SOAK TIME	SPECIES[1]	LENGTH
51105	zoo	5	1050	1500	410	lngar	85
51105	rose	2	1135	1240	105		
51105	rose	5	1135	1240	105		
51805	sal	2	945	1345	400	yper	25
51805	sal	5	945	1345	400	spsuc	48
51805	rad	2	1020	1430	410		
51805	rad	5	1020	1430	410		
51805	zoo	2	1115	1515	400		
51805	zoo	5	1115	1515	400		
51805	rose	2	1200	1300	100		
51805	rose	5	1200	1300	100		
52505	sal	2	945	1415	430		
52505	sal	5	945	1415	430		
52505	rad	2	1025	1450	425		
52505	rad	5	1025	1450	425		
52505	zoo	2	1115	1530	415		
52505	zoo	5	1115	1530	415		
52505	rose	2	1155	1255	100	whper	18
52505	rose	5	1155	1255	100		
52605	sal	2	1005	1405	400		
52605	sal	5	1005	1405	400	lmb	53
52605	sal	5	1005	1405	400	spsuc	48
52605	sal	5	1005	1405	400	spsuc	47
52605	rad	2	1040	1440	400		
52605	rad	5	1040	1440	400	spsuc	46
52605	zoo	2	1130	1530	400		
52605	zoo	5	1130	1530	400	spsuc	49
52605	rose	2					
52605	rose	5					

APPENDIX D

DAILY ICHTHYOPLANKTON SET TIME, DURATION, & FLOW METER READINGS
FOR SPRING 2005 SALUDA RIVER SAMPLES

DATE (MDDYY)	LOCATION	PLANKTON[4]	TIME (MIN)	START	STOP	TOTAL	COMMENT
20505	sal	505					hadn't started taking plankton
20505	rad	505					
20505	zoo	505					
20505	rose	505					
21005	sal	505					
21005	rad	505					
21005	zoo	505					
21005	rose	505					
21705	sal	505	5	5772	10030	4258	
21705	rad	505	5	10030	17655	7625	
21705	zoo	505	5	17655	20857	3202	
21705	rose	505	5	20869	26047	5178	
22305	sal	505	5	26070	27857	1787	
22305	rad	505	5	27859	31459	3600	
22305	zoo	505	5	31497	34957	3460	
22305	rose	505	5	31497	34957	3460	
30805	sal	505	5	49829	54410	4581	
30805	rad	505	5	54413	56902	2489	
30805	zoo	505	5	56895	59747	2852	
30805	rose	505	.				
31005	sal	505	5	63023	66680	3657	
31005	rad	505	5	66689	71101	4412	
31005	zoo	505	5	71108	76179	5071	
31005	rose	505	5	59828	63020	3192	
31505	sal	505	5	79392	81493	2101	
31505	rad	505	5	81493	86358	4865	
31505	zoo	505	5	86354	90647	4293	
31505	rose	505	5	76188	79402	3214	
31705	sal	505	5	90655	94083	3428	
31705	rad	505	5	94077	97954	3877	
31705	zoo	505	5	97956	102423	4467	
31705	rose	505	.				
32105	sal	505	5	102448	105762	3314	
32105	rad	505	5	105762	107915	2193	
32105	zoo	505	5	107919	110462	2543	
32105	rose	505	5	110480	113687	3207	
32505	sal	505	5	113725	116208	2483	
32505	rad	505	5	116206	118200	1994	
32505	zoo	505	5	118217	120424	2207	
32505	rose	505	5	120421	124397	3976	
40605	sal	505	5	124423	126636	2213	
40605	rad	505	5	126636	130694	4058	
40605	zoo	505	5	130703	134024	3321	
40605	rose	505	.				
40705	sal	505	5	134031	138628	4597	
40705	rad	505	5	138628	141335	2707	
40705	zoo	505	5	141350	143023	1673	

[4] One unit = 10 cm of flow; therefore 20 units for a 0.5 m^2 plankton net = 1 m^3.

DATE (MDDYY)	LOCATION	PLANKTON[4]	TIME (MIN)	START	STOP	TOTAL	COMMENT
40705	rose	505					
41805	sal	505	5	162480	168105	5623	
41805	rad	505	5	168107	173951	5844	
41805	zoo	505	5	173951	178690	4739	
41805	rose	505	5	178709	182965	4256	
42005	sal	505	5	182953	187097	4144	
42005	rad	505	5	187103	192081	4374	
42005	zoo	505	5	192078	196885	4807	
42005	rose	505	5	196876	201777	4901	
42605	sal	505	5	202621	207415	4794	
42605	rad	505	5	207411	210389	2978	
42605	zoo	505	5	210377	214631	4264	
42605	rose	505					
42805	sal	505	5	214633	216815	2182	
42805	rad	505	5	216814	221769	5155	
42805	zoo	505	5	221770	227433	5783	
42805	rose	505	5	227428	233347	5919	
50305	sal	505	5	233333	237715	4382	
50305	rad	505	5	237716	243454	5738	
50305	zoo	505	5	243459	247680	4221	
50305	rose	505	5	247670	252697	5027	
50405	sal	505					broken flow meter.
50405	rad	505					
50405	zoo	505					
50405	rose	505					
50905	sal	505	5	252708	258323	5815	
50905	rad	505					low water at this location
50905	zoo	505	5	258341	263705	5364	
50905	rose	505	5	263704	269563	5859	
51105	sal	505	5	269572	272524	2952	
51105	rad	505					low water
51105	zoo	505	5	272533	278819	6286	
51105	rose	505	5	278849	282380	3531	
51805	sal	505	5	282368	287317	4949	
51805	rad	505	5	287329	292750	5421	
51805	zoo	505	5	292756	296308	3752	
51805	rose	505	5	296510	303664	7164	
52505	sal	505	5	297648	302977	4329	
52505	rad	505	5	303260	307445	4185	
52505	zoo	505	5	307460	311879	4419	
52505	rose	505	5	311907	318178	6268	
52605	sal	505	5	318192	322995	4803	
52605	rad	505	5	322997	326824	3827	
52605	zoo	505	5	326839	331805	4966	
52605	rose	505					