MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
FISH AND WILDLIFE TECHNICAL WORKING COMMITTEE

SCE&G Environmental Offices
October 30, 2007

Final CSB 01-07-2008

ATTENDEES:

Bill Argentieri, SCE&G
Alan Stuart, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates
Brandon Stutts, SCANA Services
Tom Bowles, SCE&G
Milton Quattlebaum, SCANA Services
Scott Harder, SCDNR
Bob Perry, SCDNR
Brandon Kulik, Kleinschmidt Associates
Dick Christie, SCDNR
Jeni Hand, Kleinschmidt Associates
Malcolm Leaphart, Trout Unlimited
Steve Summer, SCANA Services
Hal Beard, SCDNR
Ron Ahle, SCDNR
Prescott Brownell, NMFS
Gerrit Jobsis, CCL/Amer. Rivers

DATE: October 30, 2007

DATE OF NEXT MEETING:

Date: December 13, 2007
Time: After IFIM Workshop
Location: Lake Murray Training Center

ACTION ITEMS:

- Send Scott Harder the raw and calibrated data files used in the Saluda IFIM study.

Brandon Kulik

- Contact Straud Armstrong about sending Kleinschmidt the pool ADCP data.

Dick Christie / Scott Harder/Bud Bader

- Develop potential framework for adaptive management plan for the LSR trout fishery.

Shane Boring

- Include info on other SE tailwater trout fisheries in Self-Sustaining Trout White Paper.

Shane Boring

- Provide comments on the Self-Sustaining Trout White Paper.

Gerrit Jobsis

- Add state listed species to the Rare, Threatened and Endangered Species (RT&E) Report.

Shane Boring

- Add column to Table 1 indicating species that occur in the project boundary/vicinity.

Shane Boring

- Include table of SCDNR "highest conservation concern" species for counties located within the project boundary.

Shane Boring

- Contact Fritz Rhode and Joe Quattro regarding the status of Saluda darter.

Shane Boring

- Refine the wording of the Rocky Shoals Spider Lilly summary in the RT&E report, stating that project operations may have an effect on populations located in the confluence area.

Dick Christie

- Confirm known locations of Carolina heelsplitter in L. Murray tribs with J. Alderman.

Shane Boring

- Provide Kleinschmidt with link to USDA-NRCS web-based soil data.

Brandon Stutts

- Incorporate Prescott Brownell's comments on shortnose sturgeon in the RT&E report.

Shane Boring

- Send Scott Harder the mesohabitat shapefiles for the Saluda IFIM.

Shane Boring

- Acquired Lake Murray contour from MaryAnn Taylor for calculating littoral habitat areas at varying lake levels.

Shane Boring

- Provide Amanda Hill and Prescott Brownell with Saluda mesohabitat coverages to determine if they satisfy GIS habitat mapping study request.

Shane Boring

- Provide additional clarification on what is needed to satisfy sediment transport study request.

Gerrit Jobsis

DISCUSSION

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

Shane Boring of Kleinschmidt Associates welcomed everyone and noted that the purpose of this meeting was to review and discuss: (1) the Saluda IFIM study status; (2) the Self-Sustaining Trout White paper; (3) the Rare, Threatened and Endangered Species Assessment; (4) the study requests for GIS-based habitat coverages for Lake Murray and the Lower Saluda River (LSR); (5) the Lake Murray waterfowl surveys; and (6) review the Fish and Wildlife Issue Matrix.

Review of the Lower Saluda River IFIM Study Status

Alan Stuart noted that there will be a three day IFIM workshop held on December 11th, 12th, and 13th to discuss the draft report. Specifically, he noted the first day of the workshop, the group will discuss the PHABSIM model; the following two days will be devoted to discussing goals for

minimum flows for the LSR. He informed the group that the draft IFIM study report is anticipated to be sent out to committee members on November 9th, and a conference call will be scheduled for the group to discuss the draft report before the three day workshop. Dick Christie requested that the IFIM data sets to be sent to Scott Harder so he can see how the data was analyzed. Brandon Kulik noted the data files were ready, and that he would send them to Scott today. Brandon informed Scott that he would also send him the raw data files, which will allow him to perform calibrations. Further, Brandon explained that when examining the data, Scott will have to decide which velocity calibrations he wants to use (low, medium, high velocities) for calibration. Brandon noted that the HSI curves will be provided digitally in the program. Dick asked if Kleinschmidt received the ADCP data for the pool transects from Straud Armstrong of SCDNR. Alan noted that they have not received the ADCP data yet, and he explained that it would be better if SCDNR organized the data set since they collect the information with their ADCP. Shane noted that Kleinschmidt will need the X and Y coordinates that were taken from that ADCP site in order to construct a bed profile. Dick noted that Bud Bader will talk to Straud about organizing the data files and to send them to Kleinschmidt as soon as possible.

Brandon informed the group that in the IFIM draft report, the data will be presented in both tabular and graphic form. The tabular data is broken down into flow increments (50-100 cfs). To visually gain a better understanding for gain and loss of habitat that may occur, the graphs are broken down into logical groups, such as wadeable usable area trends for the various guilds as well as stand alone species. Ron Ahle asked if a dual flow analysis was used with the PHABSIM model. Brandon explained that a dual flow analysis will be performed after the Technical Working Committee (TWC) has had a chance to review and discuss the draft report.

Review of the Self-Sustaining Trout White Paper

Shane noted that he would like to finalize the Self-Sustaining Trout White Paper (Attachment A) and opened the floor to any comments on the report. Alan Stuart noted that, in their comments on the Initial Consultation Document, Trout Unlimited (TU) had requested an analysis of the potential for a self-sustaining trout population for the LSR. He added that he felt the draft report accomplishes this and queried the group as to what else is needed to satisfy the study request. Malcolm reiterated the concerns expressed in his email of October 26, 2007 (Attachment B). Specifically, he noted that TU's original request of a "self-sustaining" trout population was likely a misunderstanding of what their group would like to see with respect to trout management in the LSR. Malcolm continued by saying that TU would like to potentially expand the current "put, grow and take" trout fishery to implementing changes in operations (i.e. in- stream flows, improved water quality etc) which may provide some level of trout reproduction. He noted that many factors can effect trout reproduction, such as temperature, dissolved oxygen, predators, and sedimentation which likely prohibited significant trout reproduction. He noted that the draft report focused

primarily on temperature and flow regimes for the LSR, but did not discuss potential physical habitat improvements. Alan noted that he did not see how enhancing potential trout spawning habitat would be priority mitigative measure for a non Project-related impact considering the fishery is a "put, grow and take".

Shane noted that, even if spawning were to take place, it is unlikely that natural reproduction would make a significant contribution to the fishery, as pool/riffle ratio in the LSR does not provide sufficient rearing habitat (< 5% riffle habitat). Hal pointed out that trout have been stocked on the LSR for the past 40 years and there is no sign of reproduction, so they probably have not been reproducing in these riffle/run habitats. He added that temperature and flow are obviously the influencing factors on trout reproduction for the LSR. Gerrit noted that back in the 1980's he caught one trout fingerling, so reproduction could be occurring. Alan noted that during the trout growth study on the LSR, they did not find any fingerlings and pointed out that SCDNR and SCANA have not found any fingerlings during their yearly sampling on the LSR.

Dick Christie inquired as to what could be done to move forward on the issue. Malcolm agreed that the white paper was generally sufficient for its intended purpose (to asses the potential for self-sustaining fishery), but added that he would like to have consideration given to the potential for some level of reproduction to supplement stocking. Several attendees noted that the effort currently underway to further improve DO conditions in the LSR (i.e. turbine venting, and alternate operating scenarios), as well the flow recommendations resulting from the upcoming IFIM process, will likely improve habitat for trout in the LSR. The group agreed that the effectiveness of the DO and flow enhancements likely need to be evaluated for some period of time before a decision can be made regarding the feasibility of a reproducing trout population as a management goal for the LSR. Shane suggested, and the group agreed, that this could be accomplished through an Adaptive Management approach. It was agreed that dissolved oxygen and flow regime effects on trout should be evaluated first; Hal noted that several years of data should be included to evaluate different situations, such as drought and wet years etc.. Alan noted that a plan will be drafted that will address these issues and will include a time schedule.

Ron Ahle and Gerrit noted that comparison of the LSR to other southeastern tailwater trout fisheries was also needed in the white paper. Gerrit agreed to provide reports regarding the reproducing trout population in the Bridgewater tailwater on the Catawba System. The group agreed that once these edits are incorporated, the report should be finalized. Gerrit noted that he would provide specific comments on the white paper in track changes.

Review of Draft Rare, Threatened and Endangered Species Assessment

Shane noted that the Rare, Threatened and Endangered Species Report (Attachment C) was distributed to the group in early October. He informed the group that he had received comments from Amanda Hill from USFWS indicating that she felt the report was adequate for federally listed species. Shane noted that Amanda had also requested that state-level threatened and endangered species be included. Shane added that most state listed species are also federally listed. He noted that he would add a column to the species table indicated that state status of each species and double check to make sure that no state listed species have been excluded. Shane opened the floor to comments on the report. Gerrit requested that the list be expanded to included rare species in the SCDNR Comprehensive Wildlife Conservation Strategy (CWCS) document. Dick Christie noted that this may prove difficult, as there are more than 1200 species in the CWCS. Shane proposes, and the group agreed, that including only those species that are considered in CWCS to be of "highest conservation concern" should be included. Because of the large number of species in the CWCW, it was agreed that this list could be added as an appendix. Alan noted that the goal of this report was to analyze potential impacts to the species and inquired why these species should be included if they're not analyzed for impacts. Ron replied that it would be good to know which CWCS species are likely to occur in surrounding counties for information purposes. Shane noted that he would construct a new table for highest conservation concern species. Gerrit inquired as to why freshwater mussels were not included in the report for the LSR. Shane replied that none of the species documented during the freshwater mussel surveys were state or federally listed.

Dick noted that the report should recognize that conservation management plans may be necessary for species that are found within the Project area or are found to be under Project influence during the life of the license. For example, Dick recommended a statement explaining that if a federally listed species, such as Carolina heelsplitter, is found within the project boundary, then SCE&G will develop a management plan for that species. Dick added that these management plans are usually attached in a shoreline management plan and in the Protection, Mitigation and Enhancement section of the license.

There was a brief discussion of the status of shortnose sturgeon downstream of the Project. Gerrit mentioned that telemetry work by SCDNR during 2002/2003 had documented shortnose sturgeon as far upstream as the confluence of the Broad and Saluda in the vicinity of Gervais Street Bridge. Prescott Brownell noted that there should be a management plan in place should sturgeon turn up in the LSR during the license period; Prescott added that he would assist with development of any such plan. Prescott mentioned that a draft recovery plan for the Santee basin has been prepared which includes documented sturgeon movement, as well as a genetics summary for shortnose sturgeon. He added that NMFS is in the process of identifying critical habitat for shortnose sturgeon in the Santee Basin and will likely designate critical habitat for this species at some point.

Prescott mentioned that the shortnose sturgeon comprehensive management plan should be available by May 2008. Shane noted that SCE&G is assisting SCDNR by putting out more receivers in the lower Saluda and Broad Rivers, as well as the confluence.

Ron noted that the wording of the Rocky Shoal Spider Lilly (RSSL) should be refined stating that the project could have an influence on the species, since it's located in the confluence of the lower Saluda and Broad Rivers. Dick noted that he would assist in rewording the summary of the RSSL in the RT&E report.

The group briefly discussed whether or not the Saluda darter and Carolina darter were the same species, and Shane noted that research has shown they are genetically the same species. Shane explained that he would contact Fritz Rohde to confirm that the Saluda and Carolina darter are the same species. The group agreed that if they are the same species then one name should been used in the report to describe this species.

In regards to the Saluda crayfish, Gerrit noted that the species has been documented in close proximity to Lake Murray and that further effort may be warranted to determine its presence in the Project area. Ron noted that this species utilizes certain soil types and recommended examining the USDA-National Resource Conservation Service (NRCS) soil database for the occurrence of suitable soil in the area. Brandon Stutts noted that he had access to the online database and would pass the link on to Shane.

Shane noted that he would incorporate the requested edits to the RT&E Report and distribute an updated draft to the group prior to the next meeting.

Request for GIS-Based Habitat Coverage for Lake Murray and the Lower Saluda River

Shane reviewed the GIS-based maps showing proportions of riffle/run/pool/glide habitat that were developed as part of the mesohabitat assessment for the IFIM study and inquired as to whether this data would satisfy the study request for the LSR. Dick Christie noted that the LSR had not been included in the SCDNR study request and recommended that we consult with USFWS (A. Hill) to determine whether the mesohabitat coverages were sufficient for the LSR. Shane noted he would send Amanda and Prescott the maps for their approval.

Dick noted that the SCDNR's original study request pertained to shallow-water habitats in Lake Murray. Specifically, he added that they would like to see calculations of the amount of littoral habitat (< 3ft) available at various reservoir levels. Dick further noted that this would be useful for establishing depth/stage relationships and for determining the impact of various reservoir drawdown scenarios on availability of littoral habitat in Lake Murray. Shane noted that the group had

previously discussed using LIDAR data collected by Orbis for this purpose. Dick recommended examining the contour maps from the 340-360 contours to determine how much shoreline is exposed in 10ft increments. Shane noted that he would work with MaryAnn Taylor from SCANA to obtain the needed data.

Lake Murray Waterfowl Surveys

Shane briefly discussed the results of the 2006-2007 waterfowl surveys conducted on Lake Murray; he noted that a total of seven species were found during the study period. Shane mentioned that the report was posted on the Saluda website. Shane handed out the 2007-2008 aerial survey schedule and noted that Cub Stephens from the Savannah River Ecology Lab will be conducting the aerial surveys again for the 2007-2008 surveys.

Review of Fish and Wildlife Issue Matrix

Shane handed out the fish and wildlife issue matrix and noted that most of the study requests listed have been satisfied or something is being done to satisfy the request (Attachment D). Shane briefly discussed the issues/request, description, and the status of the request. Specifically, Gerrit noted that he had requested a study to examine sediment regime and sediment transport for the Saluda Hydro Project. Gerrit noted that he would provide the group more detail on exactly what he would like to see.

Next Meeting

The group agreed that they would discuss follow-up items from this meeting on December 13th after the IFIM workshop at the Lake Murray Training Center.

ATTACHMENT A

DRAFT SELF-SUSTAINING TROUT PAPER

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

EVALUATION OF THE POTENTIAL FOR A SELF-SUSTAINING BROWN AND RAINBOW TROUT POPULATION IN THE LOWER SALUDA RIVER

DRAFT

Rev. 1

OCTOBER 2007

Prepared by:

Saluda Hydroelectric Project
Instream Flow/Aquatic Habitat Technical Working Committee

SOUTH CAROLINA
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COLUMBIA, SOUTH CAROLINA

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INSTREAM FLOW/AQUATIC HABITAT TECHNICAL WORKING COMMITTEE

DRAFT

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 REQUIREMENTS FOR A SELF-SUSTAINING TROUT POPULATION 3
- 2.1 Spawning Adults 3
- 2.2 Spawning and Spawning Habitat 4
- 2.3 Fry/Juvenile Nursery Habitat Requirements 6
- 2.4 Intra and Inter – Species Specific Competition 7

3.0 FEASIBILITY OF SUCCESSFUL SELF-SUSTAINING TROUT POPULATIONS IN THE LOWER SALUDA RIVER 8
- 3.1 Spawning Adults 8
- 3.2 Spawning Habitat 10
  - 3.2.1 Macrohabitat Considerations 10
  - 3.2.2 Mesohabitat Considerations 11
- 3.3 Intra and Inter – Species Specific Competition 13

4.0 CONCLUSIONS AND RECOMMENDATIONS 16

5.0 REFERENCES 18

LIST OF FIGURES

Figure 1: Average Water Temperature in the Lower Saluda River from the Period 08.01.2000 through 08.01.2006 as Measured at USGS Gages 2168504 (below Murray Lake) and 2169000 (Columbia).....10

LIST OF TABLES

Table 1: Average Maximum, Minimum, and Average Mean Dissolved Oxygen Levels in the Lower Saluda River from 2000 to 2006, as measured at USGS Gage # 02168504.....9

LIST OF PHOTOS

Photo 1: Example of Unimbedded Gravel Spawning Bar Substrates Used by Salmonids, Kennebec River, Maine.....14

Photo 2: Example of Embedded Substrate in Oh Brother Rapids Area, Saluda River, SC.....14

Photo 3: Remains of a 14-Inch Adult Brown Trout Expelled from Stomach of Adult Striped Bass, Lower Kennebec River, Maine, August 2002.....15

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1.0 INTRODUCTION

During the Saluda Hydroelectric Project relicensing consultation, interest was expressed by stakeholder groups in the potential for a "self-sustaining" trout fishery in the Lower Saluda River (LSR). According to the stakeholders, the primary benefits of establishing a self-sustaining trout fishery would be the reduction or elimination of annual stockings that are currently required to maintain a sport fishery and the establishment of a balanced trout population with cohorts of various age classes represented. The Relicensing Technical Working Committee agreed to discuss the potential to establish self-sustaining trout populations.

The purpose of this document is to:

1. discuss how overarching inherent macrohabitat characteristics of the LSR affect the biological requirements needed to support self-sustaining trout populations[1],
2. summarize the management expectations for trout in the LSR, and
3. identify any management goals that can be reasonably addressed in the relicensing of the Saluda Project.

The LSR is a Fall-Line river with a relatively cool annual water temperature regime, bedrock-dominated riffles with limited gravel and cobble, and a high percentage of pool habitat. The LSR currently supports a tailrace fishery for brown trout (*Salmo trutta*) and rainbow trout

[1] Macrohabitat considerations are watershed-scale factors such as water quality, water temperature, geology and ecology that may influence the biological resource independently of any management actions taken by man, such as flow modification, stocking, etc.

(*Oncorhynchus mykiss*) that is managed by the South Carolina Department of Natural Resources (SCDNR) as a Put, Grow and Take fishery.[2] This management approach, which has been employed since the mid-1960's, is considered by SCDNR to be appropriate where trout habitat is marginal but can at least provide sufficient growth and survival of enough sub-adult trout to support a recreational fishery (D. Christie, SCDNR, Pers. Comm.). Trout are not native to the LSR, and the fishery is maintained through annual stocking of sub-adult rainbow and brown trout. Presently, the SCDNR stocking program runs from early December until mid-April, with the total number of trout stocked annually averaging around 35,000. Approximately two-thirds of the trout stocked annually are rainbow trout (typically 9-10 inches in length), with the remainder being 7-8 inch brown trout (H. Beard, SCDNR, unpublished data). Angler creel surveys conducted in 1995-97 indicated a pronounced seasonal fishery that coincides with the stocking season (H. Beard, SCDNR, pers. Comm.).

[2] Trout Put, Grow and Take Waters, are defined by the South Carolina Department of Health and Environmental Control (SCDHEC) – Bureau of Water as freshwaters suitable for supporting the growth of stocked trout and a balanced, indigenous aquatic community of fauna and flora (SCDHEC 2004).

2.0 REQUIREMENTS FOR A SELF-SUSTAINING TROUT POPULATION

A self-sustaining population requires that recruitment from natural reproduction must exceed mortality from both natural and manmade sources (Everhart and Youngs, 1981; Moyle and Cech, 2004). Therefore, establishment of any self-sustaining population requires several basic components including spawning adults; spawning habitat (including macrohabitat considerations such as water temperature, water depth and flow, dissolved oxygen); fry/nursery habitat; and acceptable levels of intra- and inter- species-specific competition.

2.1 Spawning Adults

A self-sustaining population requires spawning adults. To obtain spawning age, trout must survive in the Lower Saluda for more than one year. Both rainbow and brown trout will spawn at age II, but fecundity is low (Raleigh et al, 1984; 1886); Age III and IV fish may be required to sustain a population because they produce much higher numbers of eggs.

The habitat requirements needed to provide recruitment into older age classes are well understood for brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). The preferred temperature range of brown trout is 12.4 – 17.6 C. Upper lethal limits are 25-29 C and above (Jenkins and Burkhead, 1993). At water temperatures greater than 10^{o}C, brown trout generally avoid water with dissolved oxygen levels of less than 5 mg/L. Rainbow trout prefer water temperatures of 12-19 C, and 15 C is considered most favorable for growth. The upper lethal temperature threshold is 25 C (Jenkins and Burkhead, 1993). Optimal dissolved oxygen conditions for adult rainbow trout (and embryos) are > 7.0 mg/L at water temperatures < 15^{o}C and > 9.0 mg/L at water temperatures > 15^{o}C. Rainbow trout can tolerate dissolved oxygen below those thresholds; however, growth and metabolic function may be inhibited. A level of 3.0 mg/L is considered to be the incipient lethal level for dissolved oxygen and can prevent spawning (Raleigh et al., 1984).

2.2 Spawning and Spawning Habitat

Brown trout spawning typically occurs in the fall, although spawning has been reported as late as February (Raleigh et al., 1986). Spawning behavior is triggered by decreasing day length, increased late fall flows, and by decreases in water temperature to between 6°C and 12°C (depending on latitude). Actual spawning typically takes place at water temperatures around 7°C to 9°C, with females digging an egg pit (*redd*) in clean, well-washed gravel deposits (Scott and Crossman, 1973). Optimal gravel size for brown trout redds is approximately 0.50 inches (1 cm) to 2.75 inches (7 cm), but they will spawn in gravel that ranges in size from 0.12 inches (0.30 cm) to 4 inches (10 cm). Gravels with high embeddedness restrict oxygen exchange, and cause entombment, resulting in mortality (Raleigh et al, 1986).

Brown trout spawning sites typically consist of areas influenced by upwelling of cold water and/or fast flow through spawning sized gravels, or by water currents that flow down into the gravel to allow for proper aeration of embryos (Raleigh et al, 1986). Following fertilization, the female covers the redd with unimbedded gravels that allow flow to freely aerate and cleanse the egg during incubation.

Optimal water velocity for spawning brown trout is reported as 1.3 to 2.3 feet per second (fps), with a full range of velocities ranging from 0.5 to 3 fps (Raleigh et al, 1986). Optimal water depth during spawning and for redd construction is reported as 0.8 to 1.5 feet, with a range of 0.4 to 3 feet (Raleigh et al, 1986). Optimal incubation temperatures for brown trout embryos are reported as ranging from 7°C to 13°C, although water temperatures as low as 0°C and as high as 15°C are reported as tolerable (Raleigh et al., 1986), though temperatures exceeding 13.3°C may result in hatching failure (Raleigh et al, 1986). Egg incubation may last from 34 to 148 days, depending on ambient temperature, and climatic conditions (Raleigh et al, 1986).

Rainbow trout typically spawn in the spring as water temperatures approach or exceed 6°C to 7°C (Behnke, 2002). However, spawning is theoretically possible with temperatures ranging up to 16°C (Raleigh et al., 1984). Spawning can begin as early as January in temperate western United States watersheds or as late as July in colder

climates. Hatchery strains may spawn at other times of the year (Behnke, 2002). Eggs are deposited by females in redds as with other salmonids. Redds are located in fast flowing, well-washed gravel-cobble bars that promote good aeration of the eggs during development; suitable substrate for redd construction and embryo development consists of clean gravels and cobbles ranging in size from 0.6 inches (1.5 cm) to 4 inches (10 cm), depending on the size of the adult fish. Substrates of larger sizes will be used if optimal gravel is not present (Raleigh et al. 1984). After fertilization, the female buries the redd with additional gravels that protect the redd from predation or dislocation during the incubation period (Scott and Crossman, 1973).

Optimum temperature for rainbow trout embryo incubation ranges from 7°C to 12°C. Highest egg survivability rates are reported at temperatures ranging from 7.5°C to 10°C. Suitable temperature for the growth of fry during the spring and early summer months (during the four month period after hatching) ranges from 10°C to 21°C (Raleigh et al., 1984). Egg incubation may last from four to seven weeks, depending on ambient temperature, and climatic conditions (Scott and Crossman, 1973).

Rainbow trout spawning can occur in depths of from 0.6 to 8.2 feet; suitable water depth for incubating eggs is generally assumed to be identical to that reported for spawning fish (Raleigh et al., 1984). Optimum water velocity for rainbow trout spawning and egg incubation is between 1.5 and 3.0 fps (Raleigh et al., 1984). Water velocity less than 1.0 or greater than 3.0 fps is considered unsuitable for spawning and incubating rainbow trout (Raleigh et al., 1984).

Due to the protracted egg incubation time, flow regime or water quality changes occurring between egg deposition and fry emergence may affect the productivity of a redd. For example if water temperature increases precipitously after egg deposition, eggs may be subject to mortality (Raleigh et al., 1986). Typically, a 1:1 ratio of pool and riffle habitat is considered optimal to support for both spawning and rearing life stages of rainbow trout (Raleigh et al., 1984).

2.3 Fry/Juvenile Nursery Habitat Requirements

Upon hatching, each brown and rainbow trout fry remains buried in the substrate until the yolk sac is absorbed. Transition to the swim-up fry (alevin) stage requires approximately three to seven days, depending on ambient water temperature (Scott and Crossman, 1973). Alevin emerge from the substrate and can swim weakly.

Brown trout fry are most often found in object cover at the edge of riffles or in river margins where water depth is 0.6 to 1.0 feet, where velocity, competition, and predation from larger fish is minimized and summer water temperature is moderate (Raleigh et al, 1986). Fry are rarely found in backwater or in areas with a small gravel substrate. Fry morph into young-of-year (YOY) juveniles during late spring to early summer in northern climates (Scott and Crossman, 1973).

During the winter months, brown trout juveniles seek refuge in the gravelly stream substrate, often at depths of 0.3 to 1.3 feet (Raleigh et al., 1986). Riverine habitat composition in productive brown trout streams is typically characterized by a 50% to 70% pool to 50% to 30% riffle-run combination of habitat types (Raleigh et al., 1986).

Rainbow trout fry generally inhabit run or stream margin habitat with slower water velocity. Competition with 1+ and older fish for pool habitat often limits young-of-year distribution to other habitats. As fry shift to the YOY juvenile phase they gravitate to somewhat deeper water with more complex cover (Raleigh et al, 1984). Over-wintering habitat for juveniles is comprised of gravels in runs; during the growing season juveniles typically inhabit runs, pools and riffles with gravel/cobble/boulder substrates. The accumulation of fines in riffle habitat can limit invertebrate production, as well as spawning, if gravels are too embedded with silts and sands (Raleigh et al, 1984).

2.4 Intra and Inter – Species Specific Competition

Self-sustaining trout populations typically occur in relatively oligotrophic cold-water ecosystems where population and ecosystem dynamics differ from those found in mesotrophic/eutrophic warmwater streams. Interactions between co-occurring warmwater competitors and predators often result in reduced abundance and viability of coldwater populations. For example, juvenile and adult trout are primarily insectivorous; a smallmouth bass introduction to a coldwater salmonid river ecosystem in Maine has impaired the abundance, growth and catch per unit effort of the natural trout population, because the more fecund adult bass are both insectivores and piscivores and therefore compete with, and prey on juvenile trout. Juvenile bass also compete for both microhabitat niches and food sources with adults and juvenile trout (Boucher and Bonney, 2004).

3.0 FEASIBILITY OF SUCCESSFUL SELF-SUSTAINING TROUT POPULATIONS IN THE LOWER SALUDA RIVER

3.1 Spawning Adults

A self-sustaining population of either rainbow or brown trout will require the presence of adequate numbers of spawning adults. The specific number of adult spawners required to sustain an exploitable population would depend on specific management objectives that would need to be established by SCDNR. The potential number of redds would be limited by the area of available spawning habitat, When spawning habitat is scarce, there may be insufficient space for enough redds to produce adequate catchable sized trout to measurably contribute to a fishery (Everhart and Youngs, 1981).

Available information suggests that adult spawning escapement may be variable or limited. Evidence from electrofishing and angling records indicate some trout do survive for longer than one-year in the river (Kleinschmidt et al., 2003; H. Beard, SCDNR, Pers. Comm.), and thus would be theoretically available as spawning stock. A 2003 growth study found a minimum of two distinct age classes of trout present during the study period (Kleinschmidt et al., 2003). Further, the study found that, of 441 brown and rainbow trout collected, 74 were greater than 16 inches in length. Data from an ongoing study begun by SCDNR to evaluate annual mortality of stocked trout in the LSR suggests that carryover of trout through the spring and summer may vary annually (H. Beard, SCDNR, Pers. Comm.).

Creel data and annual electrofishing by SCDNR generally indicates a significant decline in LSR adult trout abundance beginning in early summer (H. Beard, SCDNR, unpublished data). The reasons for the observed decline in trout abundance during late summer and the variability in yearly adult survival are not fully understood, but it is probable that the cumulative effects of heavy fishing effort and liberal creel limits, as well as predation and physical habitat degradation may limit the number of fish available to recruit to age II and older. As previously noted, creel surveys conducted in 1995-97 indicated a pronounced seasonal fishery that coincides with the stocking season (H. Beard, SCDNR, unpublished data). Although environmental conditions in the late

summer and early fall (particularly water temperature and dissolved oxygen (DO)) are factors with potential to limit survival, water temperatures in the LSR near the most downstream and presumably warmest extent of trout habitat in the river do not exceed the lethal limit for trout of 25°C (maximum of 23.9°C during the 2002 – 2006 period; USGS Gage # 02169000). Recent modifications made to the Saluda Project turbines have also resulted in improved DO levels (Table 1); the DO in the LSR provides suitable growing conditions during the growing season for sub-adult and adult trout, (average growth of 0.67 inches per month (Kleinschmidt et al, 2003)). In the past, low DO, combined with high water temperature, has been attributed to minimal survival of trout (D. Christie, SCDNR, Pers. Comm.).

Table 1: Average Maximum, Minimum, and Average Mean Dissolved Oxygen Levels in the Lower Saluda River from 2000 to 2006, as measured at USGS Gage # 02168504

MONTH	AVERAGE MAX	AVERAGE MIN	AVERAGE MEAN
September	8.0	4.3	6.2
October	8.0	5.6	6.5
November	9.3	7.2	8.3
December	10.8	9.8	10.2
January	11.5	10.4	10.8
February	11.7	10.5	11.0
March	10.6	9.4	10.0
April	9.7	7.9	8.7
May	9.5	6.8	8.1
June	8.9	6.0	7.6
July	8.6	5.6	7.3
August	8.0	5.0	6.7
Absolute Min Value	0.2	(9/25/2000)	-
Absolute Max Value	14.4	(2/25/2005)	-
Lowest Daily Mean	1.2	(9/29/2004)	-
Highest Daily Mean	13	(3/13/2005)	-

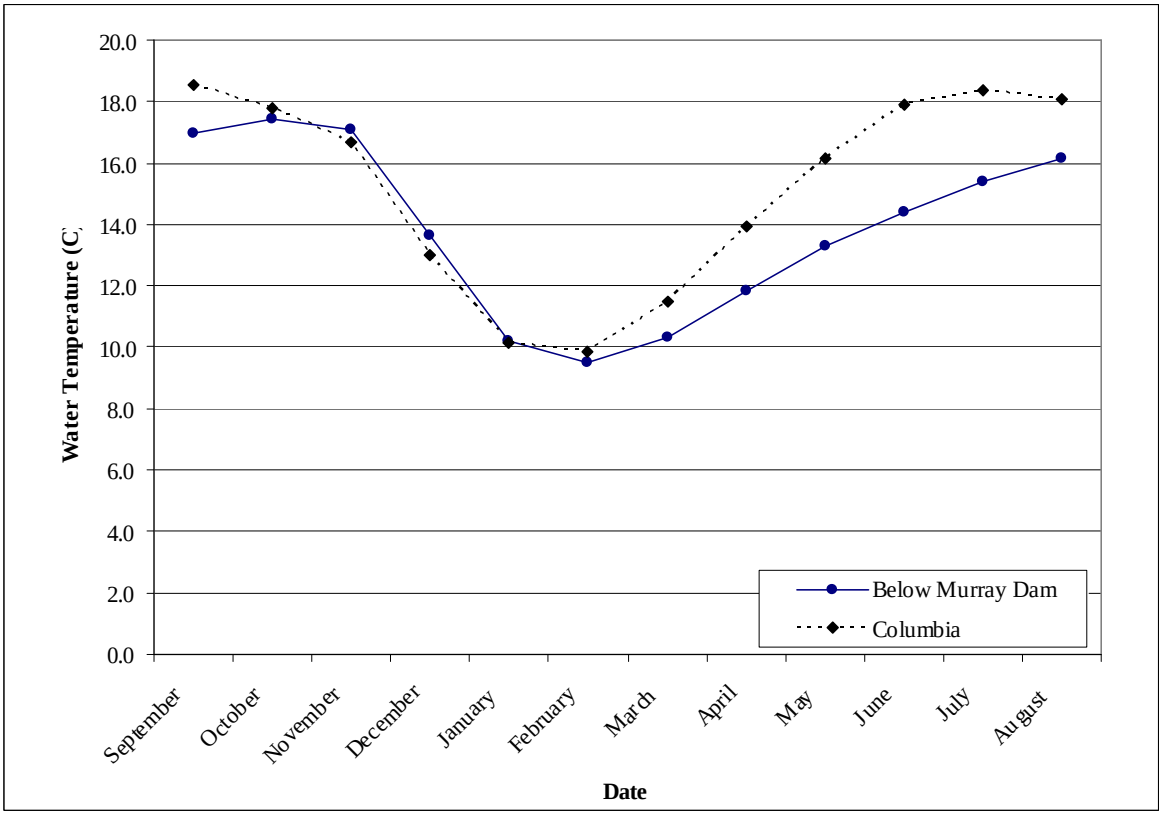

Figure 1: Average Water Temperature in the Lower Saluda River from the Period 08.01.2000 through 08.01.2006 as Measured at USGS Gages 2168504 (below Murray Lake) and 2169000 (Columbia)

3.2 Spawning Habitat

3.2.1 Macrohabitat Considerations

Average water temperature in the lower Saluda River ranges from approximately 17 to 10°C during the brown trout spawning and incubations season (Figure 1). Thus, the ambient temperatures are marginal for supporting brown trout spawning, and would most likely not provide suitable incubation conditions for eggs.

Average water temperature throughout the late winter, spring, and early summer months (February – July) in the lower Saluda River ranges from 9.5°C to 15.4°C and is within the tolerances for adult rainbow trout (Figure 1). Assuming that rainbow trout spawning occurred February or March, ambient water temperature in the lower Saluda River would likely support egg development.

Similarly, suitable water temperatures in the spring and early summer months (March – June) would likely exist for embryo development and rearing of post-emerged larval rainbow trout, as average water temperature typically remains between 10°C and 14°C. Suitable temperature conditions would likely be present for developing rainbow trout fry in the spring and early summer months (Figure 1).

3.2.2 Mesohabitat Considerations

Trout species are habitat specialists that require a series of spatially-linked mesohabitat types (*i.e.* riffles, runs, pools) that have specific parameters unique to each lifestage (Scott and Crossman, 1973, Raleigh, et al., 1986) including a pool/riffle ratio for optimal production. Barthelow et al. (2003) demonstrated that contiguous and sequential downstream linkage of spawning/rearing/nursery habitat was highly correlated to production of an abundance of sub-adult salmonids; conversely, discontinuous or isolated spawning habitats resulted in bioenergetic and predation mortality penalties to cohorts of fry emerging from isolated spawning sites and reduced recruitment success. Similarly, Shirvell and Dungey (1983) concluded that brown trout population size might be limited by the amount of the least abundant activity-specific habitat.

The LSR lacks the pool/riffle ratio and sequencing characteristic of most productive trout streams. Although some mesohabitat components can be found, Instream Flow Incremental Methodology studies performed on the LSR in the early 1990's (Isley et al.1995) and in 2007 (Kleinschmidt Associates, 2007), as well as aerial videography (DTA, 2005) all consistently document that most of the LSR below Lake Murray Dam consists of low-gradient, slow-moving, runs and pools intermittently separated by bedrock dominated shoal. Substrates are dominated by fines interspersed with boulder and gravel. Bedrock is the dominant substrate in the shallow shoal areas that separate pool and run/glide habitat.

According to Isley et al. (1995), there is approximately 0.8 river miles (8.5 percent) of riffle habitat in the lower Saluda River. Both rainbow and brown trout require riffle habitat featuring unimbedded clean gravel substrate (Photo 1) that ranges in size from 1/8 of an inch to 4 inches. The majority of riffle habitat in the LSR consists of bedrock-controlled shoals that have little value as spawning habitat. Ocean Boulevard/Oh Brother Rapids potentially provides the greatest concentration of suitable spawning substrate in an extensive gravel-cobble dominated riffle area. However, these substrates are marginal for spawning due to embedded fines and the lack of uniform gravels (Photo 2).

In addition to embeddedness, suitable LSR spawning substrates are scattered and occupy a relatively small area compared to the length of the LSR. For example in the nine miles of this river reach the spawning gravels in the Oh Brother Rapids area only occupy an area of approximately 100 ft long by 300 feet wide. As noted above, the gravels in this area are not optimal due to particle size and embeddedness. Thus only a relatively small portion of this area would likely provide suitable redd production potential. For the reasons discussed above, these redds would not necessarily generate viable juveniles. This one isolated area would not likely promote juvenile recruitment extensive enough to provide a fishery along a nine-mile segment of river. This would not likely support redd formation on a scale sufficient to support a self-sustaining trout population. Studies conducted in other Southeastern tailwaters have identified that the lack of suitable sized substrate was one of the limiting factors to trout reproduction (Banks and Bettoli, 2000). Furthermore, there is no contiguous connection between this spawning site and downstream fry-rearing habitat. Any fry produced in this area would drift downstream into deep slow moving pools and runs which are unsuitable for fry nursery habitat, and thus survivorship to older lifestages would be limited.

In some large river systems, significant trout spawning may occur in smaller tributaries. There are several tributaries that enter the LSR (*e.g.*, Rawls Creek and 12-mile Creek); however, these tributaries differ significantly from the

lower Saluda River in that they are low-gradient, warmwater reaches unsuitable for coldwater trout.

Isley et al. (1995), Kleinschmidt Associates (present IFIM study) and aerial videography all consistently document that the pool to riffle ratio in the lower Saluda River far exceeds that which is required for optimum productivity of fry and juveniles. Isley et al. (1995) classified the reach as containing approximately 58 percent pool habitat with 8.5 percent riffle habitat, a ratio of 6.8 to 1.

3.3 Intra and Inter – Species Specific Competition

Self-sustaining trout populations generally occur in cold-water habitats. In South Carolina, these cold-water habitats would be classified as trout natural streams. Here, fish species diversity is generally low and the highest level predator is typically the trout, or at least other top predators are unlikely to prey on trout. Such self-sustaining (or "wild") trout streams are limited to the extreme northwest portion of South Carolina and include the Chattooga River and other headwater streams of the Blue Ridge Escarpment (EBTJV, 2007). The fifty-seven or so species of fish documented in the LSR are warmwater species with the exception of the two trout species (SCE&G and SCDNR, unpublished data, as summarized in Kleinschmidt Associates, 2005). It is well documented that striped bass prey on the stocked trout, and that anglers fishing for striped bass often use trout as bait (H. Beard, SCDNR, Pers. Comm.). This is consistent with observations from other river systems in which brown trout have been stocked in waters containing striped bass populations that would normally not occupy the same ecosystem. For example, in the lower Kennebec River, adult striped bass have been documented consuming introduced adult brown trout (Photo 3).

Other species such as largemouth bass and chain pickerel prey on trout as well. Largemouth bass, smallmouth bass and chain pickerel are reported as predators on salmonids in other ecosystems (Keith and Barkley, 1971; Warner and Havey, 1985; Boucher and Bonney, 2004). Besides predation on the stocked trout, it is suspected that if

trout successfully reproduce, these other fish species would prey on the eggs, fry and juveniles as well.

Photo 1: Example of Unimbedded Gravel Spawning Bar Substrates Used by Salmonids, Kennebec River, Maine

Photo 2: Example of Embedded Substrate in Oh Brother Rapids Area, Saluda River, SC

Photo 3: Remains of a 14-Inch Adult Brown Trout Expelled from Stomach of Adult Striped Bass, Lower Kennebec River, Maine, August 2002 (from Yoder and Kulik, 2003)

4.0 CONCLUSIONS AND RECOMMENDATIONS

The existing habitat and water quality in the Saluda River generally provides suitable growing conditions for much of the year for adult brown and rainbow trout. However, self sustaining populations require specific spawning and nursery habitat conditions to allow for sufficient amounts of recruitment to compensate for mortality. These conditions are non-existent or marginal in the LSR.

Spawning Recruitment. Adult survivorship is likely limited during some years, potentially due to a variety of biotic and abiotic factors including predation, competition, angling exploitation and environmental conditions. As a result, few fish survive to reach age II and older.

Limited Spawning and nursery potential. Spawning potential is insufficient to support self-sustaining populations of either species. Factors identified that support this conclusion include marginal spawning and incubation water temperature (brown trout), limited amount and quality of gravel spawning beds for both species, and discontinuous and limited fry and juvenile nursery habitat. It should be noted that conditions for trout will improve with adherence to the new DO standard and with modified hydro-units operation that will lower temperatures during the late summer/early fall season. Not withstanding these improvements, it will still be unlikely that spawning will be sufficient to support self-sustaining populations of trout for other reasons stated.

Mortality in the present fishery is compensated for by annually stocking 35,000 sub-adult trout. Although it is theoretically possible that incidental natural reproduction may presently occur, at least for rainbow trout, the magnitude and frequency of production would not likely support the present level of the recreational fishery given the natural vagaries of reproduction in trout populations, and suboptimal conditions discussed above. The proximity to an urban area and the popularity of angling (where it is reasonable to expect pressure on this fishery to remain the same if not increase) was not assessed in this report but is also a mortality factor. Few if any urban trout fisheries located in native or at least more favorable cold water ecosystems are maintained by natural reproduction. Given the public expectations for this fishery, and the

marginal potential for self-sustaining coldwater salmonid populations, it is not clear what material benefit would be derived by altering LSR trout fishery management to rely on natural reproduction rather than the existing stocking strategy.

Focus should be placed on maximizing the potential for this river to maintain a Put-Grow and Take trout fishery in a manner that will ensure increased survival and growth of the river's trout population. If successful, this should lead to additional year to year survivorship and result in additional years classes contributing to the fishery. This can be accomplished, in part, by determining ways to modify project operations to provide more favorable water temperatures in July through September; to ensure that dissolved oxygen standards are being met and to implement instream flows that enhance habitat for adult trout. However, pursuing a goal of establishing a self-sustaining trout population in the LSR is not considered an appropriate management strategy. because of the limited potential for its success due to poor recruitment potential

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ATTACHMENT B

E-MAIL FROM M LEAPHART

Cheryl Balitz

From: Shane Boring
Sent: Monday, January 14, 2008 4:58 PM
To: Cheryl Balitz
Subject: Should be PDFed and included as Attachment B

-----Original Message-----
From: LEAPHART,JR., MALCOLML [mailto:MALCOLML@mailbox.sc.edu]
Sent: Friday, October 26, 2007 6:30 PM
To: Shane Boring; Theresa Thom; Alison Guth; Amanda Hill; BARGENTIERI@scana.com; Bud Badr; dchristie@comporium.net; Gerrit Jobsis (American Rivers); Hal Beard; Jennifer Hand; Jim Glover; Mike Waddell; mquattlebaum@scana.com; Prescott Brownell; RMAHAN@scana.com; Ron Ahle; Scott Harder; Steve Summer; Brandon Kulik; Alan Stuart; ahler@dnr.sc.gov; selfr@dnr.sc.gov; marshallb@dnr.sc.gov; tbebber@scprt.com; Amanda_Hill@fws.gov
Cc: rankind@dnr.sc.gov
Subject: RE: Saluda Hydro Relicense: Trout White Paper

Shane and others:

Thanks to SC DNR for suggesting, and to Kleinschmidt for preparing the white paper. The time and effort to scientifically measure, describe, and assess the lower Saluda River (LSR) is appreciative as such a study is the proper starting point for decision making, as long as the focus is accurate...

The first comment from Trout Unlimited (TU) however concerns the focus and scope of the white paper... I agreed at a past IFIM meeting and documented in writing that TU's main concern was for conditions needed for trout reproduction, not a 'self sustaining' trout fishery which is determined by too many factors outside of the utility company's operations. As I documented in my email to you for filing with the TWC minutes, I used the term 'self sustaining' synonomously with 'reproducing' in the TU ICD letter as is often done in the 'literature' and by fishery biologists all over the country. Clarifying that usage is important as it changes the scope of the white paper completely, certainly making the conclusions meaningless. If the 'self sustaining' response was necessary because of the TU ICD letter,,, fine; but, a further evaluation of reproduction potential as agreed on needs to be done too.

Even with the unwanted 'self sustaining' focus, much of the report however has value in that it establishes the needs of rainbow and brown trout and attempts to evaluate how the LSR fares in meeting those needs (ie, recruitment potential). Specific comments regarding the white paper follow.

-- We are not surprised that the temperature regime is satisfactory for trout reproduction and survival as that is consistent with the conclusions from the 1985 USGS study that TU funded for $5,250 for SC DNR. The note that the temperature range during brown trout spawning is marginal is somewhat surprising, but does provide a target for an important habitat improvement that should be closely evaluated for remedies.

-- According to Monte Seehorn, retired USFS Southeast Fisheries Biologist, experience has shown that pool to riffle ratios are not absolutes and that many trout streams with much less than ideal ratios have significant reproduction, often from relatively small areas suitable for spawning. The point is that many other factors come to bear besides the ratio, or the size of the spawning area, and trout are quite resilient. Much of the documented brown trout spawn in the White River in Arkansas for example has been found to occur in stretches relatively short for the length of the river. And their resiliency has been shown there too as they adapted to huge fluctuations in release levels, including for spawning site selection.

-- The implication that the LSR only has a 100' x 300' suitable for trout spawning is misleading. Most of the entire stretch of river on both sides of the islands below I26 where the 'Oh Brother Rapids' and 'Ocean Boulevard Rapids' are has the potential for trout spawning. Since the islands extend for nearly half a mile, that would mean

over a mile of potential spawning sites alone exists there, counting both sides. Plus, the riffles at the spillway channel juncture, the rapids above Hopes Ferry Landing, the rapids at Corley Islands, and those below the islands below I26 extending all the way to the to the confluence would all have some potential. The .8 mile of riffle habitat is certainly a conservative estimate, and to infer that trout spawning would not occur anywhere else is questionable. That's not even consistent with the cited Raleigh conclusions that trout can spawn in up to 8.2 feet of water with suitable velocity and substrate which could certainly fall out of the observed riffle areas. Again, an empirical study apparently beyond the scope of the white paper is needed to be more definite here.

-- There appears to be a lack of comparison with many southern trout rivers that have more in common with the LSR than many in Maine. Tailrace trout fisheries in Arkansas for example were previously pointed out as examples that were very analagous and whose management could be looked at for guidance giving the hundreds of miles of those rivers and their longer history of research and management by both that state and the Corps of Engineers that built most of the dams. What other state has an 'Aquatic Habitats Manager' as Arkansas has in Larry Rider? But, apparently Mr. Ryder was not consulted after I shared his expertise and contact information with you as to trout habitat for this white paper. The success of their revetments to deepen channels (while providing handicap and other angler access), of gravel beds developed from anchored tree tops, and from root wads installed to provide holding areas (as we have done on the Eastatoe and other upstate streams) are all examples of tailrace habitat improvements for trout that should be considered as the LSR potential is evaluated for trout.

In "The Future of Trout in South Carolina" (A Plan for the Management of South Carolina's Trout Resources" (Geddings, 1998), "Put, grow, and take" trout fisheries are described as having "various habitat deficiencies" that "do not permit successful reproduction" by trout. The LSR is essentially described as 'deficient habitat' in the white paper, though without any empirical studies or peer reviewed research to support that categorization, only observations and assumptions. However, it's difficult to question that description as the Lake Murray dam transformed a warm water piedmont river into a cold water fishery in the late 1920's. That the aquatic habitat that once was a 'self sustaining' warm water fishery is out of sync with the coldwater fishery created is not a surprise to no on. Indeed, that transformation is the crux of the 'habitat deficiency' problem for trout in the LSR and should be acknowledged, with remedies to get the two better in sync as part of the new license.

In summary: TU does not expect the utility company to develop a 'self sustaining' trout fishery as the white paper describes. TU does expect the utility to document steps in their plan to foster trout reproduction through habitat improvements, such as through annual projects developed in concert with TU, US Fish & Wildlife, and SC DNR. Those undertaken in upstate South Carolina in the SC DNR "Partners for Trout" program with the NRCS, and those in Arkansas as mentioned above would both be good starting points. While not totally replacing the need for trout stockings as the white paper indicates, the goal would be to improve the now coldwater habitat to the point where reproduction could at least occur, even if not in significant numbers to reduce stocking needs given the current fishing regs. To not do that while the dissolved oxygen and flow problems are being remedied would be short-sighted to say the least for a state 'wild and scenic' river that is the heart of the extensive rivere greenways of the Columbia area.

From: Shane Boring [mailto:Shane.Boring@KleinschmidtUSA.com]
Sent: Mon 10/15/2007 9:05 AM
To: Theresa Thom; Alison Guth; Amanda Hill; Bill Argentieri; Bud Badr; dchristie@comporium.net; Gerrit Jobsis (American Rivers); Hal Beard; Jennifer Summerlin; Jim Glover; LEAPHART,JR., MALCOLML; Mike Waddell; mquattlebaum@scana.com; Prescott Brownell; Randy Mahan; Ron Ahle; Scott Harder; Shane Boring; Steve Summer; Brandon Kulik; Alan Stuart
Subject: Saluda Hydro Relicense: Trout White Paper

Dear Instream Flow/Aquatic Habitat TWC Members:

Attached for your review is the updated draft of the white paper examining the potential for a self-sustaining trout

fishery on the Lower Saluda River. Many thanks to those who provided comments on the previous draft. Please provide us with your comments on the updated draft by Tuesday, October 31, 2007. Also, the paper will be an agenda item at our October 30th meeting of the Fish and Wildlife Technical Working Committees. Thanks again for your continued participation in the Saluda relicensing process.

Shane

C. Shane Boring
Environmental Scientist
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Lexington, SC 29072
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ATTACHMENT C

DRAFT RTE REPORT

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

RARE, THREATENED AND ENDANGERED SPECIES ASSESSMENT

SEPTEMBER 2007

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
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(FERC NO. 516)

RARE, THREATENED AND ENDANGERED SPECIES ASSESSMENT

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
- 1.1 Consultation History 1-1
- 1.2 Species Included in Assessment 1-2

2.0 SPECIES DESCRIPTIONS AND ANALYSES 2-1
- 2.1 Bald Eagle 2-1
- 2.2 Red-Cockaded Woodpecker 2-1
- 2.3 Wood Stork 2-2
- 2.4 Shortnose Sturgeon 2-5
- 2.5 Robust Redhorse Sucker 2-7
- 2.6 Saluda Crayfish 2-8
- 2.7 Carolina Heelsplitter 2-9
- 2.8 Saluda Darter 2-9
- 2.9 Canby's Dropwort 2-10
- 2.10 Georgia Aster 2-11
- 2.11 Little Amphianthus 2-12
- 2.12 Piedmont Bishop-Weed 2-13
- 2.13 Rough-Leaved Loosestrife 2-14
- 2.14 Schweinitz's Sunflower 2-14
- 2.15 Rocky Shoals Spider Lily 2-15
- 2.16 Smooth Coneflower 2-16

3.0 LITERATURE CITED 3-1

LIST OF TABLES

Table 1: Federally Listed Species, Candidate Species, and Selected Federal Species of Concern Occurring or Potentially Occurring in the Four County Region Surrounding the Saluda Hydroelectric Project (FERC No. 516) 1-3

Table 2: Summary of Saluda Hydro Relicensing Rare, Threatened and Endangered Species Technical Working Committee Meetings 1-4

LIST OF FIGURES

Figure 1: Location Map for the Saluda Hydroelectric Project (FERC No. 516)..... 1-5

LIST OF APPENDICES

Appendix A: Correspondence

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
(FERC NO. 516)

RARE, THREATENED AND ENDANGERED SPECIES ASSESSMENT

1.0 INTRODUCTION

The Saluda Hydro project is a 202.6 megawatt (MW) licensed hydroelectric facility located on the Saluda River in Lexington, Newberry, Richland, and Saluda counties of South Carolina and is owned and operated by South Carolina Electric & Gas (Figure 1). The project consists of Lake Murray, the Saluda Dam, the new back-up Saluda Berm, spillway, powerhouse, intakes, and penstocks. The project is currently licensed by the Federal Energy Regulatory Commission (FERC No. 516) and the present license is due to expire in the year 2010.

To initiate the Project relicensing process, SCE&G prepared and issued the Initial Consultation Document (ICD) on April 29, 2005. The Licensee submitted the document to a number of state and federal resource agencies for their review and comment. In response to the ICD, the United States Fish and Wildlife Service (USFWS), South Carolina Department of Natural Resources (SCDNR), National Marine Fisheries Service (NMFS), and several Non-governmental Organizations (NGO's) requested a number of studies to assess the potential impacts of Project operations on natural resources, including an assessment of potential impacts to rare, threatened and endangered species.

1.1 Consultation History

In comments issued in response to the ICD, the USFWS provided a list of all known rare, threatened and endangered (RT&E) species occurring in the four county region surrounding the Project (See letter dated August 1, 2005; Appendix A). This list included all known species that are currently listed as federally endangered or threatened, species that are candidates for federal listing, as well as federal species of concern. The USFWS suggested that the Licensee conduct a literature-based review to determine

habitat requirements for these species and compare these with available habitat types in the Project area. The USFWS indicated that field surveys for these species should be performed if suitable habitat is found to exist in the Project area.

As part of relicensing, SCE&G formed a Rare, Threatened and Endangered Species Technical Working Committee (RT&E TWC) to determine any impacts to rare, threatened and endangered species with respect to continued operation of the Project. The RT&E TWC is comprised of representatives from state and federal resource agencies (i.e., SCDNR, NMFS and USFWS), representatives from several NGO's, and other stakeholders. The TWC has met three times thus far during relicensing to discuss the status of RT&E species occurring in the Project vicinity and potential strategies for addressing issues related to RT&E species. A comprehensive listing of RT&E TWC meetings held to date is provided in Table 2.

1.2 Species Included in Assessment

This assessment includes the 12 species provided by the USFWS for the four counties surrounding the Saluda Hydro Project that are federally listed as threatened or endangered or are candidates for federal listing (Letter dated August 1, 2005). In addition, the assessment includes three federal species of concern for which state and federal agencies indicated have potential to occur in the Project area or are otherwise of conservation concern during the consultation process. Bald eagle, which was recently de-listed under the Endangered Species Act of 1973, is included in this assessment due to its protection under the Bald and Golden Eagle Protection Act of 1938. Species covered by this assessment are summarized in Table 1.

Table 1: Federally Listed Species, Candidate Species, and Selected Federal Species of Concern Occurring or Potentially Occurring in the Four County Region Surrounding the Saluda Hydroelectric Project (FERC No. 516) (Source: USFWS letter dated August 1, 2005, Charleston Field Office, Charleston, South Carolina, as modified by Kleinschmidt based on consultation with USFWS)

COMMON NAME	*SCIENTIFIC NAME*	FEDERAL STATUS[1]	COUNTIES
	Birds		
Bald eagle	*Haliaeetus leucocephalus*	P[2]	Lexington, Newberry, Richland, Saluda
Red-cockaded woodpecker	*Picoides borealis*	E	Lexington, Richland, Saluda
Wood stork	*Mycteria americana*	E	Newberry
	Fish		
Robust Redhorse Sucker	*Moxostoma robustum*	SC	Lexington (possible)
Saluda darter	*Etheostoma saludae*	SC	Lexington, Richland, Saluda, Newberry
Shortnose sturgeon	*Acipenser brevirostrum*	E	Lexington (possible), Richland
	Invertebrates		
Carolina heelsplitter	*Lasmigona decorata*	E	Lexington (possible), Newberry (possible), Richland (possible), Saluda (possible)
Saluda crayfish	*Distocambarus youngineri*	SC	Newberry
	Plants		
Canby's dropwort	*Oxypolis canbyi*	E	Richland
Georgia aster	*Aster georgianus*	C	Richland
Little amphianthus	*Amphianthus pusillus*	T	Saluda
Piedmont bishop-weed	*Ptilimnium nodosum*	E	Saluda
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Richland
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Lexington
Rocky Shoal's spider-lily	*Hymenocallis coronaria*	SC	Lexington, Richland
Smooth coneflower	*Echinacea laevigata*	E	Lexington (possible), 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 Bald eagle was removed from the list of federally threatened and endangered species on June 28, 2007; however, the species remains federally protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Table 2: Summary of Saluda Hydro Relicensing Rare, Threatened and Endangered Species Technical Working Committee Meetings

MEETING DATE	LOCATION	TOPICS DISCUSSED
July 26, 2006	SCE&G Offices at Carolina Research Park, Columbia, SC	Rocky Shoals Spider Lily, Species tracking
May 3, 2006	SCE&G Offices at Carolina Research Park, Columbia, SC	Wood Stork, Species tracking
March 8, 2006	SCE&G Lake Murray Training Center, Columbia, SC	Status of key species, strategies for addressing species in relicensing

Figure 1: Location Map for the Saluda Hydroelectric Project (FERC No. 516)

2.0 SPECIES DESCRIPTIONS AND ANALYSES

2.1 Bald Eagle

Bald eagles may be found throughout North America, typically around water where they feed primarily on fish and scavenge carrion. The species thrives around bodies of water where adequate food exists and human disturbance is limited. Eagles nest in large trees near water and typically use the same nest for several years, making repairs to it annually (Degraaf and Rudis, 1986).

Status in the Project Area

Foraging habitat for bald eagle is abundant in the Project area, and bald eagle sightings are common around both Lake Murray and the lower Saluda River. In addition, there are seven active documented bald eagle nests on Lake Murray as well as one active nest on the lower Saluda River (SCDNR, unpublished data).

Determination of Effect

Bald eagles inhabiting the Lake Murray and lower Saluda River are well habituated to and are tolerant of the presence of human activity; thus continued use of the reservoir and river for recreation are not expected to result in any negative effects to this species.

2.2 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 14,000 RCWs living in 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 Project Area

There are no known reports of red-cockaded woodpeckers from areas surrounding Lake Murray or the lower Saluda River. Further, there is no known longleaf pine savannah habitat in the Project vicinity.

Determination of Effect

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

2.3 Wood Stork

Wood storks are colonial waterbirds that typically nest in large rookeries and feed in flocks (USFWS, 1997). Typical foraging habitats include narrow tidal creeks, flooded tidal pools, and freshwater marshes and wetlands. Like most other wading birds, storks feed primarily on small fish. However, because wood storks feed by tactilocation, depressions where fish become concentrated during periods of falling water levels are particularly attractive sites (USFWS, 1997). Storks typically use tall cypresses or other trees near water for colonial nest sites. Nests are usually located in the upper branches of large trees and several nests are typically located in each tree. Trees utilized for nesting and roosting typically provide easy access from the air and an abundance of lateral limbs (USFWS, 1997). Currently, nesting of the species in the U.S. is thought to be limited to the coastal plain of South Carolina, Georgia, and Florida (USFWS 1997).

Status in the Project Area

Although they are primarily birds of freshwater and brackish wetlands along the coastal plain, wood storks were reported from several locations in the Lake Murray area in recent years. Specifically, a local resident reported observing wood storks feeding at several locations in the Bush River and Big Creek embayments of upper Lake Murray during the period from approximately 2000 through 2004. In addition, approximately 60 storks were observed feeding at various locations in the middle Saluda River and the upper portion of Lake Murray during an aerial survey for bald eagles performed by the SCDNR in early August 2004. In response to these sightings, SCE&G, in coordination with the USFWS and SCDNR, conducted an aerial reconnaissance survey in the upper portions of Lake Murray on August 27, 2004. During this survey, biologists from SCDNR and Kleinschmidt documented approximately 60 wood storks foraging within the Saluda Project Boundary, as well as two potential nesting sites along the floodplain of the middle Saluda River (Tosity Creek and Silverstreet).

Under the current FERC operating license, SCE&G is required to submit 5 year updates to the Lake Murray Shoreline Management Plan (FERC Order ¶ 61,332, June 1, 1984). In an order approving and amending SCE&G's most recent update, which was submitted on February 1, 2000, the FERC requested that SCE&G designate the two identified wood stork "roosting and foraging habitats" near Bush River as "conservation areas" (FERC Order No. 20040623-3015). Further, the order required that these areas, as well as all other wood stork roosting and foraging habitat identified within the project boundary, remain protected and undeveloped until new evidence is submitted to indicate that protection of these areas is not warranted. In response to the wood stork sightings on Lake Murray and the subsequent FERC order, SCE&G initiated consultation efforts with the SCDNR and USFWS and developed a study plan aimed at documenting where and under what conditions wood storks were utilizing habitats within the Saluda Hydro Project Boundary and in the project vicinity (Kleinschmidt, 2004).

In accordance with the Lake Murray Wood Stork Study Plan (Kleinschmidt 2004), aerial surveys were performed monthly during February through November of 2005 and 2006. No wood storks were observed during more than 13 hours of aerial

surveys during 2005 (Kleinschmidt, 2005). A limited number of storks were observed in the Project area during August and September of the 2006 survey season (Kleinschmidt, 2007). Specifically, a single juvenile wood stork was observed soaring above the Saluda River upstream of Lake Murray during the August survey, and an additional 10 – 12 were observed in the same general area during the September 15, 2006 survey - 6 foraging in a farm pond off of the Saluda mainstem just downstream of the Highway 121 bridge and 4 to 6 (4 confirmed, 2 suspected) soaring and feeding in wetlands adjacent to the wood chipping plant near Silverstreet.

The surveys likewise failed to document nesting of wood storks in the study area. Study results found the Tosity Creek or Silverstreet sites, which were identified as being potential wood stork nesting areas during reconnaissance surveys and associated agency consultation, to be great blue heron nests, with both nesting adults and pre-flight juveniles observed during both 2005 and 2006 (Kleinschmidt, 2005; 2007). The lack of nesting in the study area is consistent with the known life-history of wood storks as a coastal nesting species (USFWS, 1997). In South Carolina, all nesting colony sites currently known are located in the coastal plain, and primarily in the coastal counties (Murphy, 2005).

Timing of wood stork observations during 2006 (August and September), suggested that these were likely post-dispersal migrants from coastal nesting sites. During the late-summer/early-fall period, when chicks have fledged and adults are no longer tied to the nest site by chick rearing, adult and juvenile wood stork dispersing from nesting colonies often undertake extensive migrations to exploit ephemeral food resources prior to returning to coastal areas for the winter months. In South Carolina and Georgia, young-of-year storks typically fledge during July and August, but return to the nest for an additional 3 to 4 weeks to be fed before finally dispersing from the colony site in August and September (USFWS, 1996). Storks dispersing post-breeding from southern US colonies (Florida, Georgia, and South Carolina) have been documented as far north as North Carolina and as far west as Mississippi and Alabama (USFWS, 1996).

SCE&G met with representatives from the USFWS and SCDNR via conference call on February 8, 2007, to discuss the status of wood stork monitoring on Lake Murray.

Both SCDNR and USFWS concurred with the findings of the 2006 Wood Stork Monitoring Report (Kleinschmidt, 2007), agreeing that no nesting of wood stork in the Project area was evident based on study results. Due to the limited nature of stork activities observed in the Project vicinity, the agencies concurred with recommendations to discontinue further wood stork surveys on Lake Murray and that continued protection of the areas identified in the FERC order as wood stork "conservation areas" was no longer warranted or necessary.

Determination of Effect

Wood stork usage of the Saluda Project area appears sporadic and extremely limited in nature and thus is unlikely to be affected by operation of the Project.

2.4 Shortnose Sturgeon

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). In the Santee Basin, the shortnose sturgeon is believed to be estuarine anadromous, migrating to inland rivers on annual spawning runs (NMFS, 1998). Migratory spawning runs of this species usually occur in early February to mid-March when water temperatures approach 9 – 14° C. Shortnose sturgeon spawning habitat in the southeastern rivers is characterized as "curves with gravel/sand/log substrate" (Hall et al., 1991; Smith et al., 1993). Shortly after spawning, shortnose sturgeon leave spawning grounds and migrate downstream, with most leaving freshwater by May (Hall et al. 1991).

Status in the Project Area

Populations of shortnose sturgeon are known from downstream of the Santee-Cooper dams (lakes Marion and Moultrie) in the lower reaches of the Santee basin (Collins et al., 2003). An additional dam-locked population of shortnose sturgeon has been documented within and upstream of the Santee-Cooper Lakes, with Lake Marion and its tributaries harboring the most significant population. Radio-telemetry studies

conducted by the SCDNR have documented migration of Lake Marion shortnose sturgeon as far upstream as the old Granby Lock and Dam on the Congaree (J. Gibbons, SCDNR, Pers. Comm.). 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). The old Granby Lock and Dam is located adjacent to downtown Columbia, approximately 11 miles downstream of the Saluda powerhouse.

In response to anadromous fish studies requested by the NMFS and SCDNR during the initial stages of the Saluda Project relicensing, SCE&G developed and implemented a Shortnose Sturgeon Study Plan (Kleinschmidt, 2006). The primary objective of this study is to document whether or not shortnose sturgeon are utilizing areas of the lower Saluda and upper Congaree rivers immediately downstream of the Project. Implemented during the 2007 migratory season, the study includes gillnet sampling for adult and juvenile sturgeon, as well as D-net sample for eggs and larvae, at four downstream locations: two in the lower Saluda and two in the upper Congaree (immediately upstream and downstream of the Granby Lock and Dam). Approximately 400 hours of gillnetting during the 2007 season resulted in no captures of adult or juvenile sturgeon; likewise, no eggs or larval sturgeon were captured during the sampling period (Kleinschmidt, 2007). Although additional sampling may be warranted, these data suggest that shortnose sturgeon are absent from areas immediately downstream of the Saluda Hydro Project or are present in extremely low numbers. These findings are consistent with preliminary results of telemetry studies being conducted by the SCDNR, which found that none of the Lake Marion sturgeon implanted with sonic transmitter were detected in the LSR despite the presence of a receiver array (J. Gibbons, SCDNR, Pers. Comm.).

Determination of Effect

Due to the lack of occurrence of shortnose sturgeon in the lower Saluda River Downstream of Saluda Hydro, continued operation of the Project is likely to result in No Effect on this species.

2.5 Robust Redhorse Sucker

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 Endangered Species Act (ESA). Subsequent research has produced valuable information about 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 – 24° C, usually over gravel substrate in deep and shallow water (Hendricks, 1998).

Status in the Project Area

There are no known collections of robust redhorse from the lower Saluda River. Juvenile robust redhorse have been stocked by the SCDNR in the adjacent Broad River Basin below the Neal Shoals dam and below the Parr Shoals dam. In addition to stocking in the Broad River, juvenile robust redhorse have also been stocked by SCDNR in the Wateree River in the Santee Basin (SCDNR, 2005).

Determination of Effect

Due to lack of occurrence of this species in the Project area, continued operation of the Saluda Hydro Project is likely to result in No Effect on this species.

2.6 Saluda Crayfish

The Saluda crayfish is a terrestrial burrowing crayfish of the genus *Distocambarus* and is endemic to South Carolina (Eversole, 2007). Although knowledge of its habitat requirements is limited, the Saluda crayfish typically has been found in poorly drained areas where the ground is saturated during the rainy season (November – March) (Eversole, 2007, Hobbs and Carlson, 1985). Saluda crayfish have 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 Eversole (Welch and Eversole, 2002) found a close association between occurrence of Saluda Crayfish and the presence of a perched water-table. Soils found in association with Saluda crayfish burrows include Chewacla, Worsham, Toccoa-Cartecay, Enon, and Sedgefield (Eversole, 2007).

Status in the Project Area

Currently, the Saluda crayfish is known from only 14 sites, all of which are located in Newberry County (Eversole, 2007). The known range of the species encompasses portions of the Tyger, Enoree, Lower Broad and Saluda River Basins. The closest confirmed Saluda crayfish site to the Project area (Georges Loop) is approximately 1.2 miles from the Project boundary in a wooded site at the headwaters of a small tributary to Beaverdam Creek (approximately 0.3 miles south of the State Secondary Road 83 crossing at Beaverdam Creek) (Eversole, 2007). Recent surveys aimed at expanding the range further into the Saluda Basin were not successful (Eversole, 2007).

Determination of Effect

As previously noted, Saluda crayfish are generally found on moist, isolated sites and are not typically associated with floodplains or streams. This suggests that the

species is unlikely to occur in areas directly adjacent to Lake Murray and thus would not be affected by continued Project operations.

2.7 Carolina Heelsplitter

The Carolina heelsplitter is the only South Carolina freshwater mussel currently listed as federally endangered (Price, 2005). 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 (USFWS, 2002).

Status in the Project Area

A freshwater mussel survey of Lake Murray, its tributaries, and the lower Saluda and upper Congaree rivers was conducted during summer 2006 in support the Saluda Hydro Project relicensing (Alderman, 2006). The survey found 15 species of native freshwater mussels within the study area; however, Carolina heelsplitter was not among the species found. A separate survey conducted in fall 2006 in support of a South Carolina Department of Transportation project found Carolina heelsplitter in Clouds Creek, approximately five miles upstream of Lake Murray (J. Alderman, Pers. Comm.).

Determination of Effect

Since Carolina heelsplitter has not been documented in the Project area, continued operation of the Project is expected to result in No Effect on the species.

2.8 Saluda Darter

Saluda darter was first described as a separate species in 1935 (Hubbs and Cannon, as cited in Rankin and Bettinger, 2005). However, after considerable debate through the years regarding its taxonomic status, Saluda darter is currently considered conspecific with the Carolina darter (*Etheostoma collis*) (Jenkins and Burkhead, 1994;

Robins et al, 1991; Rohde et al., 1994; Nelson et al., 2004, as cited in Rankin and Bettinger 2005). The Carolina (Saluda) darter is generally thought to inhabit sluggish to calm areas in clear to slightly turbid small streams with a substrate of mud, sand, gravel and/or bedrock; however, in Wateree Creek, a large South Carolina stream, the Carolina (Saluda) darter has also been found in moderate gradient among coble and leaf packs (Rankin and Bettinger 2005).

Status in the Project Area

The Carolina (Saluda) darter has been collected from several Saluda River Basin tributaries upstream of Lake Murray, including Richland, Red Bank, Indian, Rocky and Mills creeks (H. Beard, SCDNR, unpublished data). However, due to this species' intolerance of impounded conditions, it would not be expected to occur within the influence of the Lake Murray pool. Sampling efforts by SCDNR in Kinley, Rawls, and Twelvemile Creek, tributaries to the lower Saluda River downstream of the Project, have failed to document this species (H. Beard, SCDNR, Pers. Comm.). Likewise, the species has not been collected from the lower Saluda River mainstem, although SCDNR staff have expressed that the gear used for period fish community sampling (boat electrofishing) may not be suitable for detecting darter species (H. Beard, SCDNR, Pers. Comm.).

Determination of Effect

Best available data suggest that the Saluda (Carolina) darter may not occur in the Saluda Project vicinity; therefore continued operation of the Project is expected to have No Effect on the species.

2.9 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, 1990a). 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 Project Area

Canby's dropwort is a coastal plain species and thus would not be expected to occur in the Project area.

Determination of Effect

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

2.10 Georgia Aster

Georgia aster is a relict species of post oak savanna/prairie communities that existed in the southeast prior to widespread fire suppression and extirpation of large native grazing animals (USFWS, 2001). Typical habitat consists of dry oak-pine flatwoods and uplands in the piedmont of North Carolina, South Carolina, Georgia, and Alabama. Georgia aster occupies a variety of dry, upland habitats. The primary controlling factor appears to be the availability of light. The species is a good competitor with other early successional species, but tends to decline when shaded by woody species. Populations can persist for some undetermined length of time in the shade, but these rarely flower, and reproduce only by rhizomatous expansion. Soils vary from sand to heavy clay, with pH ranging from 4.4 to 6.8 (USFWS, 2001).

Status in the Project Area

There are no populations of Georgia aster known from the Saluda Project area. However, consultation with SCDNR Heritage Staff revealed that some potential exists for this species to occur in frequently disturbed sites, such as transmission line rights-of-way and frequently mowed road shoulders (B. Pittman, SCDNR, Pers.Comm.).

Determination of Effect

Populations of Georgia aster potentially inhabiting the Saluda Project area could be affected by use of herbicides during roadside and transmission line right-of-way maintenance. Routine mowing of these areas would not be expected to result in negative effects, as mowing is generally thought to benefit this species by removing woody competitors (USFWS, 2001).

2.11 Little Amphianthus

Little amphianthus is a rooted aquatic plant restricted to eroded depressions on flat-to-doming granitic (either granite or granite-gneiss) outcrops (USFWS, 1993). These outcrops are similar in appearance, but may differ geologically as igneous, quartzitic, gneissic, or porphyritic granite. These endemics typically occur in shallow flat-bottomed pools found on the crest and flattened slopes of unquarried outcrops. These pools range in size from 0.3 square meters to 10 square meters; the vast majority of these pools range from 0.5 to 1 square meter. These pools retain water for several weeks following heavy rains and completely dry out with summer droughts. They are usually several meters in diameter and are circular or irregularly-shaped due to the coalescence of adjacent pools. This species is typically found in association with two other granite outcrop species: black-spored quillwort (*Isoetes melanospora*) and mat-forming quillwort (*Isoetes tegetiformans*), all of which are restricted to the Piedmont physiographic province of the southeastern U.S. (USFWS, 1993).

Status in the Project Area

There are no populations of this species known from the Saluda Project area. Further, consultation with SCDNR Heritage Program staff confirmed that occurrence of this species in the Piedmont of South Carolina is restricted to eroded pools on flat or domed granitic outcrops, and that suitable habitat for the species likely does not occur in the Project vicinity (B. Pittman, SCDNR, Pers. Comm.).

Determination of Effect

Continued operation of the Saluda Project is expected to result in No Effect on this species due to lack of occurrence in the Project area.

2.12 Piedmont Bishop-Weed

Piedmont bishop-weed (also know as harperella) is a slender, erect annual herb (to 47 in. in height) with hollow quill-shaped leaves and clusters of small white flowers that bloom in July and August (USFWS, 1990b). It typically occurs in two habitat types: (1) rocky or gravel shoals and margins of clear, swift-flowing stream sections; and (2) edges of intermittent pineland ponds in the coastal plain. In both habitats, occurrence is limited to a narrow range of water depths, as the species is intolerant of both dry conditions and deeper water. In addition, harperella appears to be particularly dependant on moderately intensive spring floods for germination, seed dispersal, and control of competing species. It is readily eliminated from its habitat by alterations of the water regime, which result from impoundments, water withdrawal, and drainage, or deepening of ponds. Other factors such as siltation, pollution, and shoreline development have also been cited as threats to harperella populations (USFWS, 1990b).

Status in the Project Area

Potential habitat for Piedmont bishop-weed is restricted to gravel shoal areas of the lower Saluda River; however, numerous aquatic vegetation surveys conducted on the lower Saluda in recent decades have failed to document the species. Although aimed at documenting the extent of invasive aquatic species in the river, these surveys would have documented Piedmont bishop-weed, if it were present (C. Aulbach, South Carolina Botanical Services, Pers. Comm.).

Determination of Effect

Continued operation of the Saluda Project is expected to result in No Effect on this species due to lack of occurrence in the Project area.

2.13 Rough-Leaved Loosestrife

This species 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 (USFWS, 1995). 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 Project Area

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

Determination of Effect

Continued operation of the Saluda Project is expected to result in No Effect on this species due to lack of occurrence in the Project area.

2.14 Schweinitz's Sunflower

It is believed that this species formerly occupied prairie like habitats or Post Oak - Blackjack Oak savannas that were maintained by fire (USFWS, 1994). Current habitats include roadsides, power line clearings, old pastures, woodland openings and other sunny or semi-sunny situations. Schweinitz's sunflower is known from a variety of soil types but is generally found growing on shallow, poor, clayey and/or rocky soils, especially those derived from mafic rocks. In the few sites where Schweinitz's sunflower occurs in

relatively natural vegetation, the natural community is considered a Xeric Hardpan Forest.

Status in the Project Area

There are no populations of Schweinitz's sunflower known from the Saluda Project area. Further, consultation with SCDNR Heritage Program staff revealed that suitable habitat for the species likely does not occur in the Project vicinity (B. Pittman, SCDNR, Pers. Comm.).

Determination of Effect

Continued operation of the Saluda Project is expected to result in No Effect on this species due to lack of occurrence in the Project area.

2.15 Rocky Shoals Spider Lily

Rocky shoals spider lily (RSSL), also referred to as Cahaba lily, is a perennial that typically inhabits large streams and rivers at or above the fall line. These areas usually consist of rocky shoals and bedrock outcrops, substrates which provide anchor points for the RSSL's roots and bulbs (Patrick et al., 1995). RSSL grows best in constantly flowing water with relatively low sediment loads and water depths (to bulb) of 4 – 12 inches (Aulbach-Smith, 1998).

Status in the Project Area

Personnel for the USFWS, SCDNR, and other member of the RT&E TWC surveyed the lower Saluda River downstream of the Project for presence of rocky shoals spider lily (RSSL) on May 30th, 2006 (Kleinschmidt, 2006). Two suspected RSSL plants were observed in the Ocean Boulevard Rapid area of the lower Saluda, but were not in bloom and appeared stunted compared to RSSL plants observed farther downstream in the confluence of the Saluda and Broad rivers.

Determination of Effect

No viable populations of RSSL were documented during the May 2006 survey; therefore continued operation of the Project is expected to have No Effect on the species.

2.16 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, 1995). 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 Project Area

There are no populations of smooth coneflower known from the Saluda Project area. Further, the diabase glade habitat required by this species is not known to occur in areas around Lake Murray or in the lower Saluda River. Consultation with SCDNR Heritage Program staff confirmed that suitable habitat for smooth coneflower is unlikely to occur in the areas around Lake Murray or the lower Saluda River (B. Pittman, SCDNR, Pers. Comm.).

Determination of Effect

Continued operation of the Saluda Project is expected to result in No Effect on this species due to lack of occurrence in the Project area.

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APPENDIX A

CORRESPONDENCE

United States Fish & Wildlife Service Letter Commenting on Initial Consultation Document and Requesting Rare, Threatened and Endangered Species Assessment

ATTACHMENT D

FISH AND WILDLIFE ISSUES MATRIX

Fish and Wildlife RCG
Issues Matrix

Issue/Request	*Requested by:*	*TWC Assignment/ Category Assignment**	*Description*	*Status*
Mussel Surveys	CCL/American Rivers, SCDNR, LSSRAC, USFWS	Mussels/Benthic Macroinverts TWC	The present status of mussels in the project area should be evaluated, their habitat needs assessed, and any project impacts on habitat be identified. CCL requests an evaluation of the cumulative impact analysis that the Project has on mussel stocks in the Santee Basin	**Mussel field work conducted summer 2006; final report issued 10/31/2006.**
Instream Flow Studies	CCL/American Rivers, City of Columbia Parks and Recreatioin, SCDNR, LSSRAC, NMFS, TU, USFWS	Instream Flows/Aquatic Habitat TWC	Requested for the Saluda River and the Confluence area. An assessment on how Project operations affect stream flows, and which flow regimens would best meeting biota needs. IFIM requested by SCDNR in lieu of implementing an instantaneous flow of at least 470 cfs for navigation, 590 July - Nov, 1170 Jan-April, and 880 May, June and Dec.	**Field work conducted summer 2007; draft report expected Nov 2007. Workshop scheduled Dec 2007.**
Diadromous Fish Studies	CCL/American Rivers, SCDNR, LSSRAC, National Marine Fisheries Service, USFWS	Diadromous Fish TWC	Study requests from the CCL/American Rivers focused on a more in depth analysis of habitat conditions, feasibility of hatchery operations for diadromous fish, impacts analysis of the Project on diad. fish stocks of the Santee-Cooper Basin, the feasibility and costs of fish passage at the Project. SCDNR requests that spawning and nursery habitat for diadromous fish species in the river and lake should be identified and quantified	**Shad and herring studies completed for 2005 and 2006 - final reports issued. Eel trapping conducted during 2005 and 2006. Eel ramps in place through Oct 2007. Shortnose sturgeon - final report issued Sept of 2007.**
Benthic Macroinvertebrate Study	SCDNR, LSSRAC, NMFS, TU, USFWS	Mussels/Benthic Macroinverts TWC	To determine if invertebrate fauna have increased in either number or species diversity as a result of turbine venting. As well as how far downstream they are impacted.	**Field work conducted fall 2006; final report 3/7/07.**
Fish Community Surveys	USFWS		It was requested that these surveys be performed and include small non-game species in the Saluda River above and below the reservoir as well as in Lake Murray, to supplement existing fish community data and/or replace dated information. Specific sampling focused on determining presence or absence of the rare robust redhorse sucker, Carolina sucker, and the highfin carpsucker should be conducted in the lower Saluda River	**Determined that sufficient information exists - see February 22, 2006 meeting notes.**
Migratory Bird Survey	USFWS	Terrestrial Resources TWC	This Survey would evaluate the effects of the Project on migratory bird use at Lake Murray and the Saluda River and riparian ecosystems. Surveys of migratory birds and their habitats to provide baseline information on populations. Aerial surveys for potential roosting, nesting, and foraging sites for the federally endangered woodsotrk should also continue	**Species list was compiled from existing data and distributed to TWC.**
Comprehensive Habitat Assessment	NMFS, USFWS, SCDNR	Instream Flows/Aquatic Habitat TWC	To provide quantitative and qualitative data in GIS format of available and potential spawning, rearing, and foraging habitats (i.e., riffles, shoals, open water, shallow coves, littoral zones) for diadromous and resident fishes in Lake Murray, the Saluda River and its major tributaries, and the Lower Saluda River below the Project. SCDNR requests a summary of water level fluctuations for the months of March, April and May to assess the possible enhancement of spawning habitat	**Draft maps being compiled based on existing mesohabitat (LSR) and ESA data (L. Murray).**
Fish Entrainment Desktop Study	SCDNR, NMFS, USFWS	Fish Entrainment TWC	This study would include conducting a desktop study of potential entrainment using previous studies conducted at other similar facilities. The objectives of the study should be to (1) quantify the numbers and sizes of fish entrained, by species, (2) estimate mortality rates associated by species, and (3) provide recommendations for project design and operation that can reasonably be made to prevent or minimize fish entrainment and associated injury/mortality	**Final report issued in March 2007.**

Fish and Wildlife RCG
Issues Matrix

Self Sustaining Trout Fishery Study	TU	Instream Flows/Aquatic Habitat TWC	The purpose of this study should be to determine the factors needed for a self sustaining trout fishery that can reproduce and thrive year round, and how the operation can be modified to meet the habitat needs. Dissolved oxygen, flows, spawning and rearing habitat, the aquatic food base, especially in the shallow, rocky foraging areas, and actual water chemistry should be key items in such an assessment	**Draft white paper issued and is currently being revised.**
Rare Threatened and Endangered Species Habitat Studies	CCL/American Rivers, SCDNR, LSSRAC, NMFS, USFWS	RT&E Species/Habitat Studies TWC	A study was requested to assess the condition of rare threatened and endangered species in the Project area, as well as how Project operations are affecting these species and how Project operations can be used to protect, restore, or enhance populations. Management plans be developed for species existing in the project area or under the influence of the project. Suggestions include Wood Stork and RSSL Surveys as well as SNS and American eel sampling	**Draft report issued, with final comments due Oct 31, 2007.**
Striped Bass Evaluations	USFWS	Water Quality TWC	This study would involve an evaluation of project operations on the reservoir striped bass population, particularly regarding: (1) the effectiveness of current turbine operations, (2) potential additional enhancements in association with the summer thermocline near the powerhouse; and (3) determine if striped bass migrate upstream of the project within the Saluda River during the spring spawning season, and if and where spawning activities occur.	**Being addressed in Water Quality TWC.**
Sediment Regimen and Sediment Transport Studies	CCL/American Rivers, USFWS	Moved to Instream Flow/Aquatic Habitat group in Fish and Wildlife Group	A request has been made that a study be performed on the sediment regimen in the Project area as well as the Project effects on the sediment regimen of the lower Saluda River. Should include such things as sediment composition, bedload movement, gravel deposition, sediment storage behind dams, and bedload changes below the dam; and project effects on downstream geomorphometry, sediment availability and streambank erosion, and the possible addition of gravel to mitigate for project impacts. Also, the effects of the Project operations on habitat requirements for spawning fishes.	**Major aspects being addressed in IFIM process**
Floodplain Flow Evaluations	CCL/Am Rivers, LSSRAC, NPS	Instream Flow/Aquatic Habitat	A study was requested in order to evaluate the flows necessary for incremental levels of floodplain inundation for the Lower Saluda, Congaree River, and Congaree National Park. It is requested that it include an inventory of floodplain vegetation as well, in order to classify and characterize the vegetative species composition and structure of the floodplain areas within the zone of operational influence of the river reaches.	**NPS is currently developing their own model outside of relicensing. Update is expected in Spring 2008.**
Ecologically Sustainable Water Management (ESWM)	CCL/Am Rivers, LSSRAC, NPS	Instream Flow/Aquatic Habitat	Described by the National Park Service as a "inclusive, collaborative, and consensus-based process to determine a scientifically based set of river flow prescriptions in order to protect downstream resources while balancing upstream benefits." The NPS notes that they believe this process can be readily adapted to the Saluda Project and have already began gathering information and developing an interactive GIS tool to provide information regarding the effect of various Saluda operational scenarios on the degree of inundation at the Congaree National Park. NPS seeks "partnership" with SCE&G as well as stakeholders in implementing this ESWM process.	**NPS is managing process.**