ATTACHMENT 1b

OUR SUBMITTAL TO THE CONSULTING AGENCIES AND TRIBES -

Appendices 1 through 15

Appendix 1

Whitepaper Regarding Increasing the Winter Minimum Pool Level for Normal Operations of Lake Murray

Whitepaper Regarding Increasing the Winter Minimum Pool Level for Normal Operations of Lake Murray

Drafted June 20, 2008

Introduction

SCE&G is considering whether to change the present pool level operating policy regarding the minimum pool elevation during the months December through March. Over the past 28 years the normal winter minimum pool elevation varied between 348 and 355, and in general it was near 350± about half the years and near 354± the other years.

This whitepaper addresses the probable effects of increasing the minimum pool elevation to 354 ft amsl or higher each year on inflow sediment deposition and water quality in the lake, especially originating in the upper areas of the lake that would likely be significantly impacted.

There are three main impacts that are addressed:

1. Effects of increased future sediment deposition and reduced current sediment scouring near the inflow areas of the lake on greater and more frequent inundation of property upstream from the lake
2. Effects of reduced current sediment scouring on water quality in the lake and anoxic products (including greenhouse gases) in the releases from Saluda Hydro
3. Effects of raised minimum pool elevation on increased aquatic plants around the shoreline

In the way of background, a comprehensive study on the effects of pool levels on issues like the one SCE&G is facing is not available. However, there are five pertinent observations that can be gleaned from actual, notable experiences:

1. In the TVA system there are two main types of reservoirs: those where winter pool elevations are lowered more than 20 feet and those where they are lowered about 5 feet. Those lowered 20 or more do not experience the kinds of issues that are a concern for Lake Murray. Those that are lowered about 5 feet do experience problems that are a concern for Lake Murray.
2. The most advanced study known to the author of sediment deposition problems was conducted at Smith Mountain Reservoir recently. Smith Mountain experiences significant problems expressed by stakeholders and it is lowered only 5 feet each year. One observation stated in their report was that the winter minimum pool elevation had a significant effect on the sediment deposition problems noted by stakeholders.
3. The pool level of Brownlee Reservoir (Snake River, ID and OR state line) is dropped about 90 feet about every five years. Sediment deposition that occurs for four years is partly scoured every fifth year when the pool level drops, but some remains causing constricted flow to the scoured channel. A similar phenomena occurs at the upper end of Parksville Lake (TN) that has experienced large

amounts of exposed sediment deposition over the past 100 years from erosion of the Copperhill basin but is only partly scoured by large inflows each year. These experiences show that once deposition occurs and it stays in place for a period of time like years, there is a limit to how much of it will be scoured and redeposited to deeper areas. Where sediment deposits in such areas, the original channel is constricted and hydraulic backwater curves increase in elevation.

4. Larger lakes in the southeast like Lake Murray experience similar levels of drawdowns: Hartwell, JST, Lanier. The large lakes on the TVA system experience drawdowns or 20-100 feet.
5. Other reservoirs in the southeast, i.e., Rhodhiss on the Catawba River and Claytor on the New River (VA), with low annual pool fluctuations like that proposed by LMA and sizeable uncontrolled drainage areas like Lake Murray experience notable sediment issues. Backwater effects are significant upstream from Rhodhiss, and water quality issues regarding eutrophication and sediment accumulation in the top few feet of Claytor have been reported.

These actual experiences are worthy of consideration for the decision SCE&G is facing regarding Lake Murray.

Deposition and Scour of Sediments at the Inflow Region of Reservoirs

Two distinctly different processes affect sediment deposition at the inflow regions to Lake Murray, especially the main inflow from the Saluda River.

The most obvious process is that of scour when the pool level is lowered each year starting in October. As the pool level drops the settled sediment in the inflow regions is scoured and redeposited to deeper regions of the inflow area. This process continues as long as the pool level is less than the summer pool elevation, and it is proportional to the amount of flow entering the lake as well as by the amount that the pool level is decreased in terms of elevation and duration of drawdown. This scouring process works best on newly deposited sediment, and older sediment from previous years is usually more resistant to scour and erosion (see Golterman, 1975).

The other major process is not so apparent, but has great significance based on available data: most new sediment entering Lake Murray enters the lake during January through April. When the lake level is at 350' amsl compared to a higher level, the inflowing sediment is carried down further into the reservoir before it settles. During relicensing studies in 1974-5, it was determined that 97% (adjusted for estimated bedload sediment in the Saluda River per Rosgen and Silvey, 1996) of the sediment entering Lake Murray from the Saluda River occurred over the months of January through April. Also, it should be noted that 86% of the sediment entering Lake Murray came from the Saluda River. The Saluda River sediment load to Lake Murray for January through April was estimated to be 161,000 tons while the sediment load in the remaining months was estimated to be 5100 tons. Sediment loads vary from year to year depending on the amount of runoff each year and the timing of the runoff; however, the sediment load

estimated from the 1974-1975 study is consistent with the observed seven foot difference in sediment elevation between 1975 and 2007 as shown in Figure 1.

It is important to note that no measurable deposition of sediments was observed by ERC (1976) downstream from the Rocky Creek area of Lake Murray, i.e., all deposition that occurred in Lake Murray over the ~ 50-year period prior to 1975 occurred upstream from the Rocky Creek area. This is consistent with the experience of Ruane, i.e., sediment deposits in reservoirs occur in the upper end of reservoir and progress towards the dam as the delta forms and moves toward the dam as more sediment continues to extend the length of the delta, and this process is significantly affected by the winter minimum pool elevation.

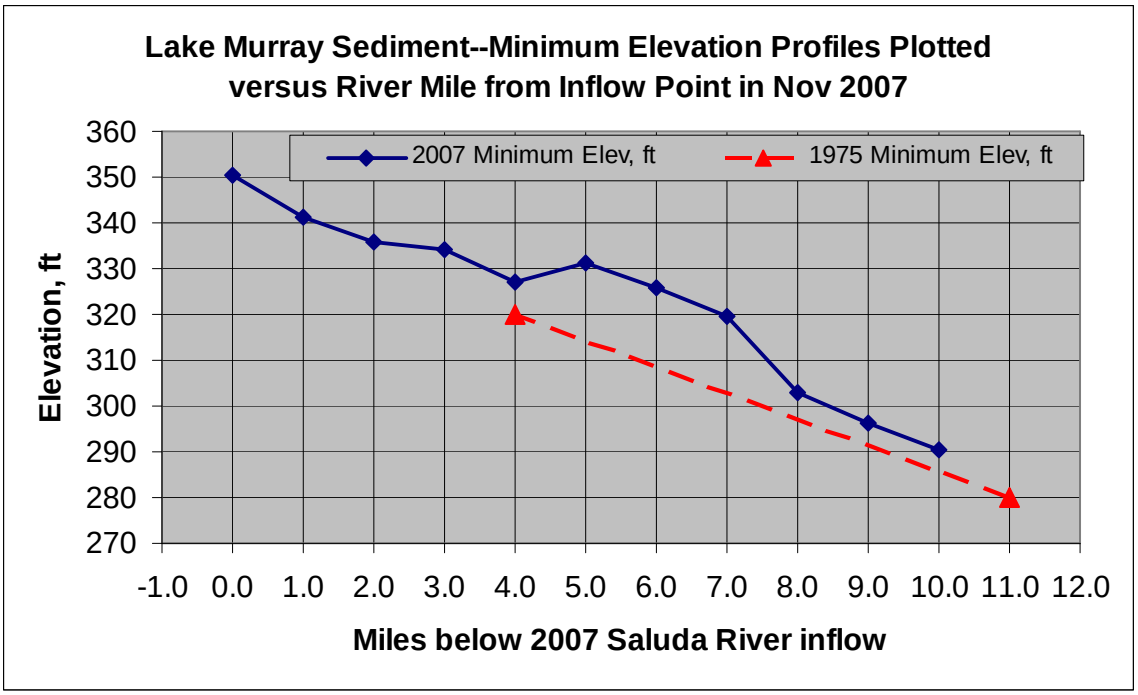

Figure 1. Elevation measurements in 1975 and 2007 in the upper 11-12 miles of the main channel of Lake Murray showing the amount of sediment accumulation over the 32 year period at a location four miles below the 2007 inflow point (this location is about one mile upstream from the confluence with LSR.) It appears that a delta of sediment has formed over the four mile reach between locations four and eight miles below the 2007 inflow point.

What about the region 350' to 354'amsl? What might happen in this region if the minimum pool elevation is raised to 354' amsl or higher? If minimum pool elevation is raised, more sediment will deposit in the first one-two miles at the upper end of the lake (and even some distance upstream from the lake) and the inflow region will be shallower than present conditions. The following fundamental processes would occur:

1. If the target operating policy for minimum winter lake pool level is increased from current levels, water velocities would decrease significantly in the upper 1-2 miles of the lake, especially near the inflow where currently water is shallowest and velocities are highest. This is best illustrated by viewing the 2007 sediment profile in Figure 1 where the profile intersects with elevation 350. In November 2007 the water depth at this inflow location was 1.6 ft deep. If the pool elevation had been 354 instead of 352.2 , the water velocity would have been about half the speed. If the pool elevation had been at 350 amsl, the sediment bottom at the start of the flat pool would have been at elevation 348 or 349 and water depth would have been 1 to 2 feet. Raising the pool level to 354 or 356 at the same location would cause a drop in water velocity to 14-33 % of that velocity that had occurred with the pool elevation at 350 amsl.
2. Key principles of sedimentation at the inflows to reservoirs: 1) when water velocity changes from river flow to pooled reservoir conditions, suspended sediment starts settling and inflowing bedload (sediment that moves along the riverbed) starts depositing at the first opportunity of lower water velocities; 2) when the minimum pool level is increased, settling starts closer to the reservoir inflow point when the lake is full; 3) scouring velocities in the inflow region of a reservoir decrease as the minimum pool level increases; 4) these principles add up to one coherent end-result: higher minimum pool levels result in more sediment accumulation at the inflow regions of the lake. Finally, this process causes constriction/restriction to flow entering the lake and this causes the backwater areas upstream from the reservoir to experience higher surface water elevations that in turn causes more flooding upstream from the reservoir, both in terms of water elevation and the frequency of inundation. This same process would occur at the inflow points of all the major tributaries to Lake Murray, except that the degree of sediment deposition would be proportional to the size of the watershed draining to Lake Murray.
3. Suspended solids in inflowing waters and associated bedload from watershed erosion would settle and accumulate as they enter the lake, with larger, heavier particles settling/accumulating first closer to the inflow area of the lake (within minutes, hours); and finer, smaller particles settling last further into the reservoir (within days and weeks). It should be noted that bedload is usually about the same as the suspended sediment load when inflows are high and when upstream Saluda River weeds “die back” over the winter. Also, bedload would be the first sediment to accumulate within the inflow areas, i.e., it would be the main cause for creating shallower water in the inflow regions of the lake.
4. At the lower water velocities associated with higher pool levels near the inflows to the lake, more settling and accumulation of solids would occur upstream of where it currently occurs. The sediment deposits/accumulation near the inflow would be noticeable. Tommy Boozer said he has observed some mounds of sediment already occurring in the inflow region of the lake—if minimum pool levels are raised, these would occur with more frequency and over larger areas of the inflows (including a reach of the Saluda River upstream from Lake Murray) due to the lower velocities that would occur with a raised minimum pool elevation.

5. Drainage area and therefore sediment sources are primarily from upstream of the main waterbodies feeding the reservoir, i.e., the Saluda River, Bush River, Little Saluda River, and Clouds Creek. SCE&G observations in 2007 at the creek inflow to Camping Creek embayment indicated that sediment accumulation and aquatic plants were present. This sediment deposition would increase if the winter minimum pool level was increased from 350 to 354 or higher. As for the main inflow from the Saluda River, backwater elevation would increase in Camping Creek when high flow events occur if the minimum pool level is increased.
6. The slopes of the reservoir channel (i.e., the thalweg) are lower in the upper part of the reservoir, mainly due to the nature of topography/bathymetry of reservoirs like Lake Murray and because more sediment has settled in this region of the lake than in deeper waters (for more information, see discussion in the ERC, 1975, report for gradation of sediment particle sizes).
7. When summer pool levels drop during drought conditions like those that occurred in 2007, the pool level in the September-November time frame would drop to about 353 feet above mean sea level. Unfortunately, the low river inflows would do little to scour the added sediment deposits that had accumulated in previous years, and these added sediment deposits would interfere with boating that otherwise occurs currently.

Considering that these two major processes (scour and deposition at different times depending on river flows and lake pool elevations) affect sediment deposition in the first one-two miles of the inflow region of Lake Murray and that they would be adversely affected (i.e., result in sediment deposition up-reservoir from where current deposition occurs) by raising the minimum winter pool elevation, it is evident that there is strong likelihood for sediment-related problems to occur if the minimum pool level is increased to 354 or 356. These problems could include the following:

1. Increased elevations for backwater curves upstream from Lake Murray as flood flows were restricted (compared to current conditions) as they passed through the entrance area to Lake Murray. The restricted flow would be caused by increased constrictions in the channel that would be caused by increased sediment deposition.
2. Considering that water would be shallower than current conditions and sediment would be more stable compared to the current “shifting sediment” conditions due to the current scouring conditions, aquatic plants could grow under these habitat conditions. If this were to occur, even more sediment deposition would occur in this same area since aquatic plants trap more sediment as sediment laden water passes through them. If aquatic plants develop in this area, additional pollutant loads of organic and nutrient levels would be added to the reservoir.
3. Boating in the inflow region would become more difficult due to the sediment build-up, especially in years like 2007 when the inflow is low and evaporation causes the pool to drop to 353 or even 352. In these cases, the later summer pool elevation would be lower than the winter minimum pool elevation and sediment deposition would be worse than current conditions at the inflow to the lake.

4. As will be discussed in the next section, water quality in the lake would be adversely affected due to the accumulation of organic matter in the sediments in the upper 1-2 miles of the inflow region.

Finally, the concerns expressed above would be even worse if the Greenwood pool is filled in February and the pool in Lake Murray is filled by March 1 instead of April 1. The combination of these two operational changes would postpone high inflows to Lake Murray from Lake Greenwood to later than currently occur and these postponed inflows would enter Lake Murray when pool levels would be higher than under current operations when the pool is filled by April 1. Hence, if the combination of these two lake operational changes were to be combined with the proposed minimum pool of Lake Murray being at elevation 354 or 356, the effects on sediment deposition in the first 1-2 miles of Lake Murray compounded significantly.

Bottom Line: raising minimum pool elevation (especially if combined with the proposed earlier full pool targets at Greenwood and Lake Murray) will result in shallower water in the upper 1-2 miles of the lake and its associated consequences—the only question is how much shallower, and addressing this question would take further study. Such studies can be expensive: upwards of $500,000. Unfortunately, testing an increased minimum pool level for a certain time period is not advisable since it would take a number of years to test just one scenario; and, within this time period adverse impacts would not likely be reversible unless dredging is considered. Also, it would be difficult for SCE&G to revert to current operating policy as SCE&G might deem needed based on the results of the proposed trial period because LMA pressure as well as concerns by Lexington County regarding potential (even if perceived) impacts property values would raise a steep barrier to overcome. If SCE&G were to proceed with raising the minimum pool level, even on a trial basis, they would experience costs due to damages upstream from the lake and possibly increased costs for aeration for the releases from Saluda Hydro (to be discussed in the next section.) In addition, water quality in the upper reaches of the lake would be adversely affected (to be discussed in the next section.)

It is also worthy to note that this issue is common to all man-made lakes, i.e., reservoirs, especially hydropower reservoirs since they typically have higher inflows and larger watersheds. There are two main variables that affect the sediment problems in reservoirs: the watershed characteristics and how the pool level is drawn down during the winter. SCE&G has control of only one of these variables.

Effects of Reduced Sediment Scouring on Water Quality in the Lake

Lake water quality is significantly affected by sediment transport—especially less than 30-40 feet deep, and these sediments are significantly affected by winter minimum pool levels.

The inflow regions of Lake Murray already experience poor water quality and SC DHEC has taken some action to start to improve water quality in the upper reaches of Lake

Murray. They have required TP reductions in the Bush River watershed and have considered establishing a TMDL on the LSR embayment. But much more is needed, especially for TP reductions in the Saluda River, LSR, and Clouds Creek. The LMA has strongly encouraged these efforts. However, raising the minimum pool level would adversely affect these efforts, i.e., they are at odds. Some members of LMA have expressed to me that they are not concerned about water quality and weeds and other sediment-related issues that would occur in the upper regions of Lake Murray.

The following summarizes the water quality conditions at the inflow region of Lake Murray.

Summary of Water Quality Issues Identified by SCDHEC and USGS

- The stations at Rocky Creek and in the Bush River arm of Lake Murray have been reported to be among the most eutrophic sites on large lakes in South Carolina, and both of these locations were designated as non-supporting for aquatic life uses. All the locations between Rocky Creek and the dam, including the embayment locations, were reported to be among the least eutrophic in South Carolina.
- Low pH in the tailrace was the cause for non-supporting and partially supporting ratings in the tailrace in the 303(d) listings in 2004 and 2006. *[note: low pH in the tailrace is caused by eutrophication in the inflow regions of the lake]*
- USGS monitors at Black's Bridge and the bridge over the LSR near its mouth have recorded DO levels less than DHEC standards…this is attributable to eutrophic conditions at these two locations.
- Watershed management has been recommended to reduce phosphorus loading to two areas of the lake: Bush River embayment and the Rocky Creek area of Lake Murray.
- Total phosphorus loads to Lake Murray still remain high due to nutrient loads from Ninety-Six Creek, Bush River, Little Saluda, and Clouds Creek. These tributaries to the upper end of Lake Murray contribute an estimated 71% of the TP load to Lake Murray while their streamflow contributions only total about 18%. DHEC has stated that they will not pursue TP reductions at Greenwood which is the largest source of known phosphorus loads to Lake Murray.
- Considerations for internal nutrient cycling—eutrophication at Rocky Creek and low DO in the metalimnion (and subsequently in the turbine releases) could be partly attributed to internal nutrient cycling. Also, the nutrients released from the sediments in the upper region of the lake could be subject to upwelling induced by power pulse inflows from Lake Greenwood being cooler than the surface water. This upwelling could contribute additional P and N (i.e., NH_3) into the surface layer.
- Water quality problems (algae, anoxics, low DO) in the Little Saluda River embayment are partly caused by internal nutrient cycling due to the small watershed feeding this embayment (i.e., it is a sizeable body of water with relatively low potential for sediments to be flushed out.) Nutrients accumulate

in a system like this and cycle over and over as they are taken up by algae, the algae die and settle, and then the nutrients are cycled up into the water column again. DHEC is considering designating the LSR embayment as a TMDL site. *[note: LSR water quality modeling indicates that internal nutrient cycling is occurring and raising the minimum pool elevation would increase this internal nutrient cycling.]*

- The Bush River arm of Lake Murray was reported in both the 1995 and 1998 reports to be among the most eutrophic sites on large lakes in South Carolina. The median TP was about 0.10 mg/L, indicative of eutrophic-hypereutrophic conditions.

SCE&G can't control sediment and pollutant loads from the watershed, but they can affect water quality by how they operate Lake Murray. Raising the winter minimum pool level would aggravate the current water quality problems making it more difficult to improve water quality.

What is the likely impact to sediments if the minimum pool elevation is increased to 354 or 356? Greater levels of nutrient and organic matter in shallower reaches of the lake; greater levels of SOD in these shallower reaches; greater levels of releases of nutrients (i.e., internal nutrient cycling) and anoxic products; lower DO in the inflow region and higher frequency of low DO in this region; higher levels of algae and possibly aquatic weeds. These near-field effects could result in far-field effects on striped bass habitat and water quality issues for the releases from Saluda Hydro. *[Note: internal nutrient cycling can be a significant source of phosphorus. Tufford and McKellar reported that internal "sediment flux accounted for … 50% … of the annual load" of phosphorus in Lake Marion.]*

What did the study conducted by SCE&G in November 2007 show? Sediment ooze is very sensitive to water velocity: none was found in shallow inflow water less than about 1 m deep; ooze contains dead organic matter like algae, bacteria are very active in this layer, and ooze releases ammonia, phosphorus, and methane to the overlying water. Ooze also causes sediment oxygen demand, i.e., SOD. The shallower the water, the more impact it has on the water above it. If minimum pool elevation is raised, more sediment area in the upper reaches of the reservoir will be covered with ooze. Ooze causes internal nutrient cycling, resulting in more algae growths and organic matter. With more sediment deposition in the upper 1-2 miles, the water depth will be less than current depths and organic matter is likely to be higher than current considering less scour in this reach than before (resulting in sediment with higher organic content, i.e., ooze) and weeds may take hold. The effects of sediment DO demands and releases of nutrients from the sediments would reduce DO in the water that enters the interflow through Lake Murray and impact striped bass habitat and water quality in the releases from Saluda Hydro.

The following table (developed using the results of the November 2007 sediment study) shows that lake sediments contained much higher levels of organic matter, nutrients, and SOD (as indicated by the ammonia levels) than the sediment samples at the five inflow

points. This simply means that if the minimum pool elevation is raised and full pool is targeted earlier, the resulting inflow points will be further upstream and the sediments will contain about 50% greater organic matter, 100% greater phosphorus releases, and almost 100% greater SOD. The increased length of reservoir containing such sediments would be about half of a mile, but the water depth over these sediments would be shallow resulting in a much greater effect on water above the sediments. Considering these two factors, the increase in nutrient contributions to the upper layer of Lake Murray would be about 15-20%.

Results of sediment sampling by SCE&G in November 2007	Volatile Solids (~organic matter)	Total Organic Carbon	Organic Nitrogen	Phosphorus	Ammonia
Percent increase between inflow sites and in-lake sites	51	77	46	103	84

Could algae blooms occur in the upper parts of Lake Murray? Algae blooms are usually caused by cyanobacteria (blue-green algae), i.e., nitrogen fixers like Anabaena and Aphanizomenon. As far as what triggers such blooms it is likely that inorganic nitrogen concentrations are low (if not zero) and phosphorus is relatively high. Nitrogen is already low in the inflows to Lake Murray, so that leads to better conditions for blue-green algae to thrive. ERC (1976) reported that blue-green algae reached bloom proportions in the upper reaches of Lake Murray in August 1975. Therefore their occurrence is likely dependent on phosphorus levels, and these would tend to increase if minimum pool elevations are increased.

How could striped bass habitat and releases from Saluda Hydro be impacted? Organic matter in the upper reaches of Lake Murray is a significant contributor to the low DO and production of anoxic products that is seen at the dam. Therefore, this organic matter impacts the striped bass habitat and the anoxic products that occur in the releases from Saluda Hydro. The anoxic products are not regulated at this time, but likely will be in the future especially considering the current concerns about greenhouse gases (i.e., methane and carbon dioxide are greenhouse gases.) Although these gases are directly affected by pollutants from the watershed, even more so than low DO, SCE&G may likely be responsible for "treating" these anoxic products. Reducing anoxic products would cost more than aerating the releases from Saluda Hydro—it would likely require in-lake aeration several miles upstream from the dam, costing $millions. About 20-50% of the cost of such a system could be attributed to increased organic matter caused by increasing the minimum winter pool level.

What is my response to the whitepaper prepared by LMA? Following is their whitepaper with my responses:

"There are a number of reasons The Lake Murray Association is opposed to any proposed operational policy for Lake Murray that calls for a periodic draw down to the 350 msl level for the purpose of sediment scouring.

- *Coves that have no stream inflows would not benefit from scouring, especially where the inflow terrain is fairly flat and the velocity of water movement would be insufficient for sediment scouring*. I agree with this. I informed them of this in my Nov 2007 and Jan 2008 presentations. But this applies primarily to the lower end of the lake where impounded tributaries are steep due to their location, i.e., they are closer to the dam
- *Unless there is torrential, high volume rainfall, any scouring will be confined to narrow stream beds and will be of insignificant benefit.* This would be true for tributaries to the lower end of the lake. But, it is not true for main inflows like the Saluda River, LSR, Bush R, and Clouds Creek. Also, their point would apply to cohesive sediments that have been settled for sometime, like occurs when the pool level is <u>not</u> dropped "frequently." However, as described above there can be significant impact to the lake if the minimum winter pool level is raised.
- *Scouring benefits occur at the interface of stream entry to the lake. This dynamic occurs whether the lake level is at 350 msl or at 354 msl. There is no available data that supports a greater benefit of scouring when lake levels are 350 msl versus when lake levels are at 354 msl.* No data are actually needed on Lake Murray to address the issue as to whether "a greater benefit of scouring (occurs) when lake levels are 350 msl versus when lake levels are at 354 msl" Fundamental principles of sediment settling and scouring would lead to rejection of this point. However, available data are presented in this whitepaper and the results of my analysis show that significant impact will occur.
- *There has been no data presented that show that the recent multi-year draw down associated with dam remediation provided any benefit that reduced the chances for fish kills. In fact, despite the recent extended drawdown, there was a fish kill in 2007.* Fish kills occurred before and after the drawdown, but this does not provide <u>any</u> evidence that raising the minimum pool to higher than current levels would not cause fish kills. All available data is based on the current operations policy. These data cannot be used to prove that fish kills will not occur if pool elevations are raised. To me, their thoughts along this line are nonsensical.

Effects of Increasing the Minimum Winter Pool Elevation on Aquatic Plants in the Lake

Aquatic weeds periodically occur around the shoreline of Lake Murray. Figures 2-4 provide illustrations of the water primrose problem that occurred in 2005. Although the weed condition in 2005 followed an extended drawdown period to 345' amsl, the same situation could occur when the lake is naturally at 352-353' amsl due to drought conditions. Considering that summer pool elevation can drop to < 358 ft even when May-June elevation starts at 358 ft due to low inflows, evaporation, and minimum flow provision, aquatic plants could take root at elevation ~ 352-353 when summer pools are low. Therefore, the minimum winter pool should be dropped to about elevation 350 periodically to freeze these plants.

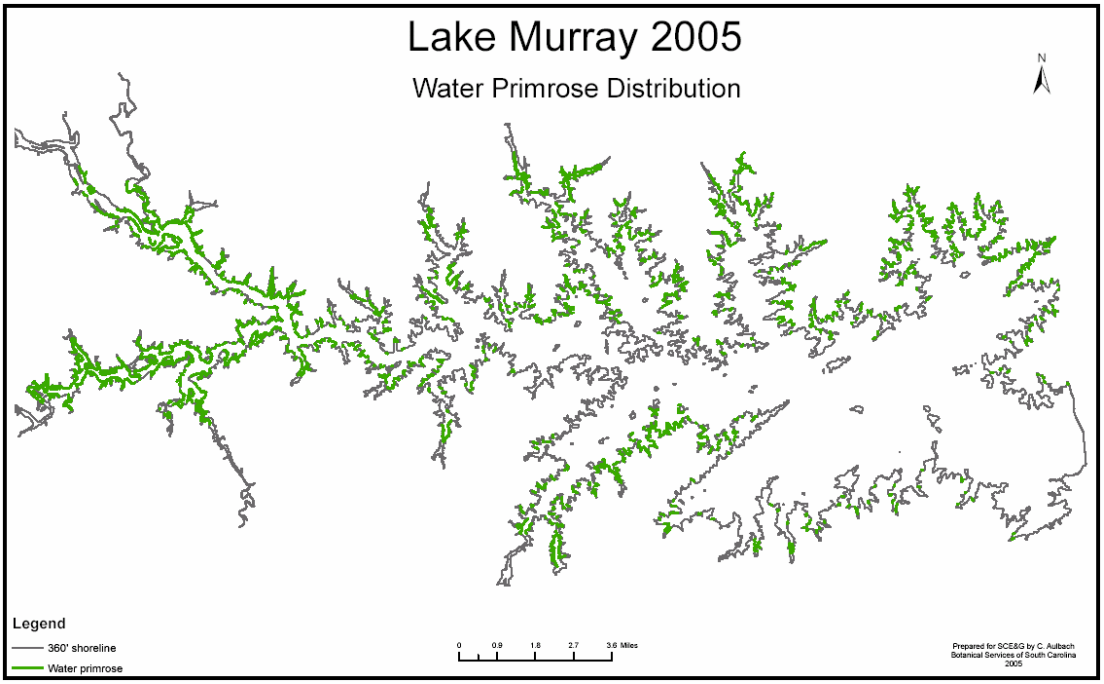

Figure 2. Water Primrose distribution in Lake Murray in 2005

Figure 3. Water Primrose reaching the surface of the lake in 2005. The roots were at elevation 346 and had started growing during the drawdown of 2003-2004. When the pool increased over the winter of 2004-2005, the weeds were not killed during freezing conditions because they were submerged.

Figure 4. Water Primrose in a cove of LSR embayment in 2005. The roots had started growing during the drawdown of 2003-2004. When the pool level increased the winter of 2005, the weeds were not killed during freezing conditions because they were submerged (the winter pool elevation was greater than 354' amsl).

Tommy Boozer has expressed concern about aquatic plants not being controlled if the minimum winter pool elevation is not dropped to 350 amsl periodically.

Closing Comments

There is considerable risk in changing the current operating policy for Lake Murray to raise the winter minimum pool elevation, especially in combination with changing the full pool level target to March 1 and considering that Lake Greenwood apparently will be filled in February instead of the current filling period. Although this whitepaper has relied generally on qualitative analyses instead of a thorough quantitative study, the risk analysis is based on sound, fundamental principles and information that solidly point to the conclusions derived.

The impacts that would occur are as follows:

1. Backwater problems will occur at the inflows to Lake Murray, especially the larger inflows to the upper parts of the lake. These are likely to be irreversible unless dredging is considered.

2. Water quality in the lake at the upper end of the reservoir would be adversely affected, and water quality in the lower part of the lake and in the releases from Saluda Hydro would likely be adversely affected.
3. Aquatic plants would cost more to manage

Regarding considerations for developing a policy for winter minimum pool levels, based on data for 1980 through 2007, the winter pool level was down to about 350 ± 2' about half the time. It would be best to maintain this frequency of drawing the lake down to this level each year or risk poorer water quality compared to current conditions.

A key point: sediment and water quality in Lake Murray is affected by the watershed as well as minimum winter pool levels, and SCE&G can control only the pool levels.

Appendix 2

Shortnose Sturgeon Monitoring and Adaptive Recovery Program- NMFS Proposal

Diadromous Fish Protection, Mitigation and Enhancement Measures
Saluda Hydroelectric Project

Shortnose Sturgeon Monitoring and Adaptive Recovery Program

- NMFS Proposal-
November 17, 2008

Background

This draft proposal was prepared by National Marine Fisheries Service (NMFS) in coordination with South Carolina Department of Natural Resources (DNR) for South Carolina Electric & Gas Company and the Saluda Relicensing Team. This proposal is intended to be included in development of a relicensing settlement agreement for the Saluda Project's aquatic resource protection, mitigation and enhancement measures (PM&E). Revisions may be considered during the settlement discussions to better integrate proposed studies into an overall plan for aquatic resource PM&E measures. NMFS intends to include the proposed measures in development of recommendations to FERC pursuant to Section 10(j), and in resolution of consultation pursuant to the Endangered Species Act.

The Saluda Project relicensing proceeding includes fishery and aquatic resource studies designed by S.C. Electric & Gas Company in consultation with state and federal fishery management and water quality agencies including National Marine Fisheries Service, U.S. Fish and Wildlife Service, South Carolina DNR, and South Carolina Department of Health and Environmental Control. Other stakeholders including American Rivers, South Carolina Coastal Conservation League, Trout Unlimited also participated in developing the relicensing study plans. The purpose of the relicensing studies is to identify continuing project effects on the environment, and to aid in development of protection, mitigation and enhancement measures for inclusion in the new hydropower license.

Project Effects on Sturgeon

Construction and operation of the Saluda Project since its construction in the 1930's has resulted in blockage of access to many river miles of former spawning and maturation habitats above the Lake Murray Dam, permanent loss of riverine habitat by reservoir inundation, and alteration of natural flows, temperature, and dissolved oxygen in the lower Saluda and Congaree Rivers (Columbia Shoals). Hypolimnetic flows from the Lake Murray Dam depressed seasonal ambient dissolved oxygen levels and temperatures in the lower Saluda River for decades, potentially playing a role in the observed absence of diadromous species including sturgeon, striped bass, American shad and other alosines, and American eel. In recent years dissolved oxygen levels in the Saluda have been substantially improved through installation of turbine runner hub baffles and other design features. Because of the lower ambient temperatures in the lake Murray Dam flow releases, trout were introduced in the 1960's to provide a "put and take" fishery which has become popular and of economic importance to the public and state fishery management objectives for the Saluda River. Active management of the Saluda River as a cold water fishery for trout reduces habitat suitability for potential restoration of natural resident aquatic species

and migratory diadromous fishes including sturgeon, striped bass, American shad and other alosines, and American eel.

Development of practical actions for mitigation of continuing project effects on availability of suitable habitat is limited by the size and depth of the Lake Murray Dam and reservoir, limited options for effective fish passage, hydropower generation operations, and established management of the lower Saluda River for a cold water trout fishery.

Recommended Sturgeon Monitoring and Recovery Program

To promote protection and recovery of sturgeon in remaining accessible habitats in the Broad, Saluda and Congaree Rivers, the following integrated studies and an adaptive management program are recommended:

I. Sturgeon behavior and movements.

Purpose: Monitor sturgeon behavior and movements to improve understanding of habitat use patterns in response to river flow regulation, short term and seasonal temperature and dissolved oxygen variations, and availability of suitable habitat in the Saluda, lower Broad, and Congaree Rivers. Improved understanding of factors limiting recovery of sturgeon and other diadromous species is expected to support practical adaptive management actions.

Methods: Conduct a long term telemetry study to monitor movements of sturgeon in the Congaree, lower Broad, and Saluda Rivers, in concert with other telemetry studies in the Santee River Basin. This objective will be achieved by using a receiver array system already in place and in use (figure 1). Study budget should include funding for the Biologist and Technician and supply monies to purchase transmitters (table 1). Recommendations would be for a 10-year study with annual review of study findings and assessment of factors affecting sturgeon recovery.

Figure 1. Receiver array system currently in use.

II. Temperature and Water Quality Monitoring Study.

Purpose: Establish a temperature and water quality monitoring program to help develop a better understanding of physical habitat factors potentially affecting movements, migrations, spawning, and recovery of sturgeon and other diadromous and resident species of special management interest. Study area should include the Saluda River, lower Broad River, and the Congaree River.

Methods: Establish an array of temperature and water chemistry monitoring stations located throughout the study area to allow for automated data collection and analysis. Data analysis should help identify annual and seasonal variations in temperature throughout the study area using GIS spatial analysis tools. Funding should include purchasing dataloggers and project personnel (table 1). An initial 10-year study should be planned for with annual review of study findings and assessment of environmental factors actually or potentially affecting sturgeon recovery.

III. Habitat Characterization Study.

Purpose: Integrate the findings of Studies I and II with a detailed physical habitat study to identify characterize, and map habitats in the Saluda, lower Broad, and Congaree Rivers to provide support for a long term sturgeon recovery program in the Santee River Basin. Identify potential critical habitats and limiting factors.

Approach/Methods: Conduct a field study to characterize, classify, and map important habitat components in the study area including substrate type, depth/velocity characteristics, location of point source discharges, seasonal temperature and dissolved oxygen distribution, etc. Plan for a one-year initial physical habitat characterization study, with provisions to adapt the habitat characterization based on findings of studies I and II.

IV. Adaptive Management Study for Sturgeon Recovery.

Purpose: Integrate the findings of studies I-III to identify Saluda Project-specific effects and limiting factors, and other limiting factors affecting sturgeon recovery in the study area. Identify practical beneficial actions that can be undertaken to contribute positively to recovery of sturgeon in the Santee River Basin.

Approach: Establish a sturgeon technical advisory team to collaboratively participate in design and conduct of the proposed sturgeon study program, and to develop practical management and recovery actions. The technical advisory team would seek to integrate studies conducted and/or funded by S.C. Electric & Gas Company with other studies in order to develop sound and practical actions.

Table 1. Estimated costs for 2010

Sturgeon Studies	
Personnel	
Biologist II-6 months	17,250
Technician II - 12.0 months	21,000
Fringe	11,475
Indirect	11,253
Travel	5,000
Supplies	38,000
Misc.	5,000

Total	**108,978**

Budget Justification, 2010:

Personnel – Biologist II and Tech. II employees including fringe and indirect for field sampling.

Travel -Vehicle mileage for field work.

Supplies -30 Vemco transmitters and shipping charges; 100 dataloggers plus associated software.

Misc -Equipment maintenance, long distance calls, and supplies.

Appendix 3

RT&E Educational Brochure

Rare Plant and Animal Species of Interest Around Lake Murray and the lower Saluda River

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is best known as the national bird of the United States of America. The bald eagle was listed as federally-endangered on March 11, 1967, due to population declines attributed to exposure to pesticides, loss of suitable habitat and illegal shooting. Today, the species has recovered to the degree that it was recently removed from the Federal Endangered Species List in July of 2007. The bald eagle continues to receive protection under the South Carolina Nongame and Endangered Species Conservation Act as a state endangered species, as well as through the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act.

The bald eagle is a bird of prey that may be found throughout North America, typically around water bodies, including Lake Murray and the lower Saluda River, where they feed and nest. Eagles forage on

Lake Murray year round, with peak usage likely occurring during the winter months. Nesting of bald eagles on Lake Murray was first documented in 1996, and since that time, the nesting population has increased significantly. The South Carolina Department of Natural Resources (SCDNR) has recently documented seven active bald eagle nests on Lake Murray as well as one active nest on the lower Saluda River. Active bald eagle nests occurring within Lake Murray and lower Saluda River are managed by South Carolina Electric & Gas (SCE&G) in accordance with the National Bald Eagle Management Guidelines. These guidelines generally prohibit potential "disturbance" within 660 ft of an active nest during the nesting season (September through May) and 330 ft during the non-nesting season.

Photo by Jennifer S. Hand

What You Can Do: Avoid disturbing eagles at nesting and feeding areas and provide habitat for eagles by maintaining mature trees on your property. If you find an injured eagle call the South Carolina Center for Birds of Prey at (843) 971-7474.

Wood Stork

The wood stork (*Mycteria americana*) is a large wading bird native to coastal areas of South Carolina, Georgia, Florida and is the only stork species native to North America. The wood stork was federally listed as endangered in 1984, with population declines attributed primarily to loss of wetlands suitable for nesting and foraging. Like most other wading birds, wood storks feed primarily on small fish in habitats such as narrow tidal creeks, flooded tidal pools, freshwater marshes and freshwater wetlands. Wood storks typically use tall cypresses or other trees near wetlands or marshes for colonial nest sites. Nests are usually located in the upper branches of large trees and there are typically several nests in each tree. Currently, nesting of the species in the U.S. is thought to be limited to the coastal plain of South Carolina, Georgia and Florida.

Wood storks were observed feeding at various locations in the upper portions of Lake Murray between the years of 2001 and 2004. A study conducted by SCE&G during 2005 and 2006, in cooperation with the SCDNR, found that a small number of wood storks periodically forage in the upper reaches of Lake Murray, the Saluda River upstream of the reservoir and nearby wetlands during the late-summer and early-fall of some years. Timing of these observations suggest that these wood storks are likely what is known by biologists as "post-dispersal migrations," meaning that they likely nested or were hatched in coastal areas during the summer months, dispersed from the

nest, and then migrating through the Lake Murray area to exploit temporary food sources (fish trapped in shallow pools) before returning to coastal areas for the winter. Although, there have been no wood stork observations recently, SCE&G and SCDNR will continue to monitor for wood storks on Lake Murray during routine bald eagle and waterfowl surveys on the reservoir.

Photos by Jennifer S. Hand

What You Can Do: If you happen to see a wood stork soaring above Lake Murray or wading along the shorelines call SCE&G's Environmental Services at (XXX) XXX-XXXX. Adult wood storks appear all white with long blackish-grey legs and pink feet. They have an unfeathered head and neck with a long, thick black bill. In flight, the wings underneath are edged in black.

Rocky Shoals Spider Lily

The rocky shoals spider lily (RSSL) (*Hymenocallis coronaria*), also referred to as Cahaba lily, is a flowering aquatic plan that typically inhabits large streams and rivers in South Carolina, Georgia and Alabama. As the name would suggest, these areas usually consist of rocky shoals hence and bedrock outcrops, which provide anchor points for the RSSL's roots and bulbs. RSSL grows best in constantly flowing, shallow water. The decline of RSSL has historically been attributed to loss of shoal habitat due to construction of impoundments and other channel modifications. Threats to current populations include modification of river flows and fluctuating water levels resulting from dam operations, water pollution and collection for use in gardens. The RSSL is considered a species of concern by the State of South Carolina.

A good vantage point from which to observe the RSSL is at the Columbia Riverfront Park. The lily's are in the island complex at the confluence of the Broad and Saluda rivers and just upstream of the confluence in the bypass reach of the Broad River downstream of the Columbia Diversion Dam. Each spring from mid-April to May in this section of the Broad River, one to three stalks will emerge from a RSSL bulb and each will produce a group of six to nine beautiful white flows. As many as xxxx RSSL plants have been estimated to occur in the area during some years.

Photo by Jennifer S. Hand

What You Can Do: Do not pick the lilies or remove the bulbs for transplant, as they will not grow in a typical garden setting. Rocky shoals spider lilies are most beautiful in it's natural habitat.

Shortnose Sturgeon

The Shortnose sturgeon (*Acipenser brevirostrum*) is one of the oldest living fish species, predating dinosaurs. They range from three to four feet in length and have primitive characteristics such as an elongated, slightly flattened body covered with bony plates (scutes). They have a toothless mouth that is positioned under the snout, which allows them to feed on bottom dwelling organisms. Shortnose sturgeon are spawned in freshwater rivers and migrate out to the ocean where they spend most of their life. Sturgeon will return to their natal rivers to spawn several times throughout their life. Shortnose sturgeon are restricted to the east coast of North America. The National Marine Fisheries Service has recognized South Carolina as one of the 19 distinct population segments of shortnose sturgeon. Shortnose sturgeon have been documented downstream of the dams associated with the Santee-Cooper Lakes (Marion and Moultrie) and as far up as the Congaree River in the vicinity of the Gervais Street Bridge.

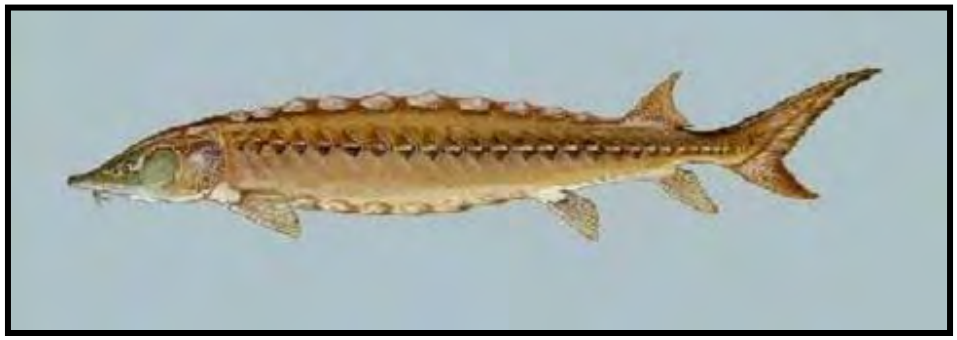

Photo by Duane Raver, USFWS

The shortnose sturgeon was federally listed as endangered on March 11, 1967, with population declines attributed to extensive overharvesting, loss of habitat, limited access to spawning grounds and polluted waters. Specific environmental conditions must be present for sturgeon to spawn such as specific water temperatures and available spawning habitat. Females will spawn every 3 to 5 years after reaching sexual maturity at age 8 to 12 years. With the combination of human threats along with the number of years it takes a female sturgeon to reach sexual maturity, it will take many years for the shortnose sturgeon populations to recover from its decline.

What You Can Do: Become familiar with the fish species native to your area before going fishing. If a live sturgeon is captured, return it safely to the water.

Appendix 4

Lower Saluda River Benthic Macroinvertebrate Monitoring and Enhancement Program

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

LOWER SALUDA RIVER BENTHIC MACROINVERTEBRATE MONITORING AND ENHANCEMENT PROGRAM

DECEMBER 2008

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

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COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
(FERC NO. 516)

LOWER SALUDA RIVER BENTHIC MACROINVERTEBRATE MONITORING AND ENHANCEMENT PROGRAM

1.0 INTRODUCTION

The Saluda Hydro Project (Project) is a 202.6 megawatt (MW) hydroelectric facility owned and operated by South Carolina Electric & Gas (SCE&G or Licensee) and located on the Saluda River in Lexington, Newberry, Richland, and Saluda counties of South Carolina (Figure 1-1). 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. SCE&G has been engaged with state and federal agencies, non-governmental organizations (NGO's), and other stakeholders in a cooperative relicensing process for the Project since early 2005. The final application to relicense the Project was filed with the FERC on August 27, 2008.

During the relicensing process, a number of stakeholders, representing primarily state and federal resource agencies and non-governmental organizations, requested that SCE&G study the macroinvertebrate community of the lower Saluda River (LSR) to evaluate the effectiveness of recent dissolved oxygen (DO) enhancements at the Project (i.e. turbine venting). SCE&G subsequently formed a Freshwater Mussels and Benthic Macroinvertebrate Technical Working Committee (TWC) to address issues related to these species, which included representatives from the U.S. Fish and Wildlife Service (USFWS), NOAA – National Marine Fisheries Service (NMFS), South Carolina Department of Natural Resources (SCDNR), South Carolina Department of Health and Environmental Control (SCDHEC), and American Rivers. With oversight from the TWC, a two-year relicensing study of the LSR macroinvertebrate community was developed and implemented during 2006 and 2007. As is typical of hydropower projects, the study found generally impaired conditions close to the dam, with conditions improving with increased downstream distance from the dam (additional detail provided below in Background Information). In comments issued on the Draft License Application for Saluda Hydro, state and federal resource agency staff requested that SCE&G develop a plan for mitigation and/or

continued monitoring of the LSR macroinvertebrate community under a new license term. The program described herein was prepared pursuant to their request.

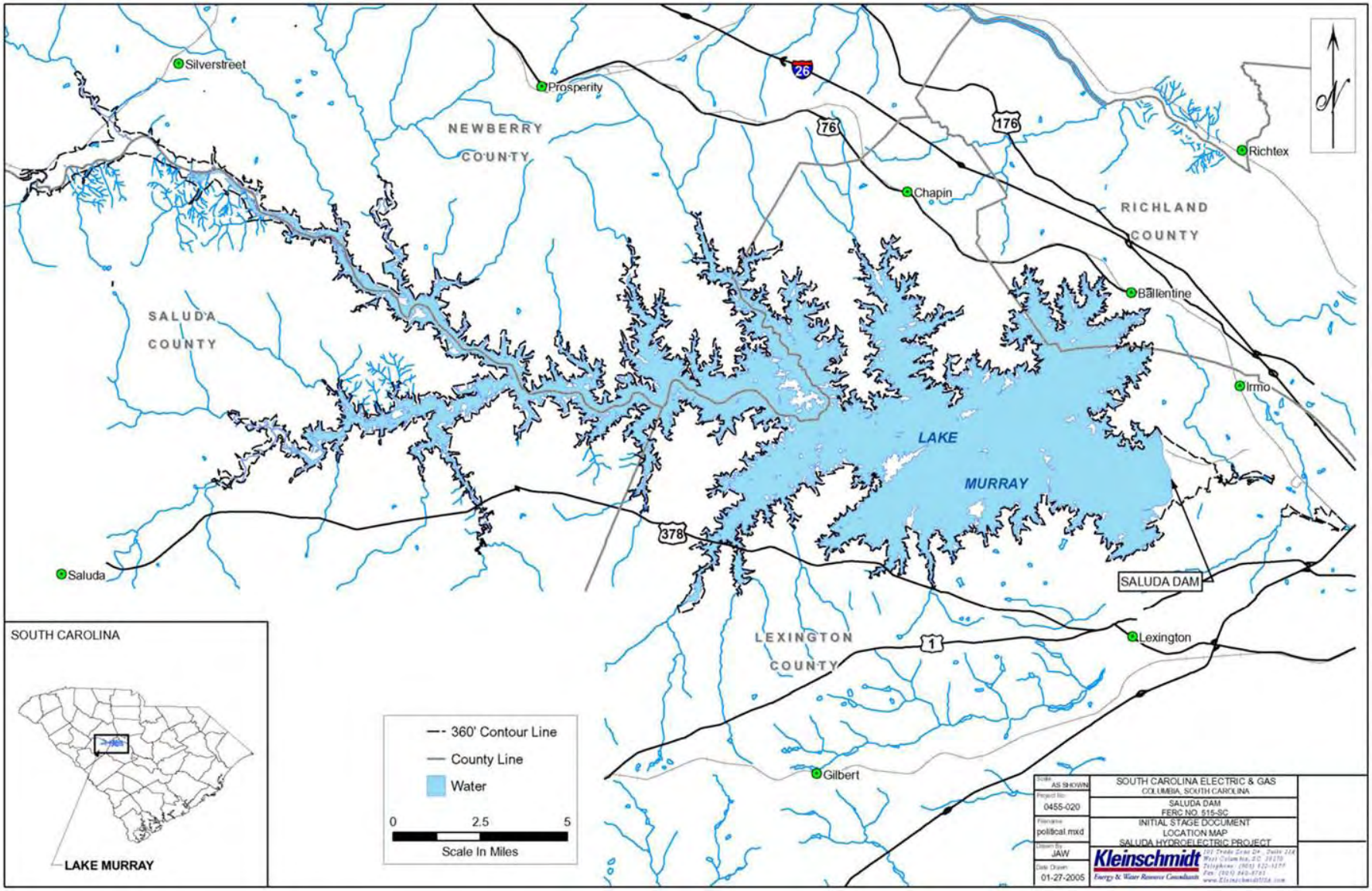

Figure 1-1: Location Map for the Saluda Hydroelectric Project (FERC No. 516)

2.0 BACKGROUND

The benthic macroinvertebrate community of the LSR downstream of Saluda Hydro has been assessed regularly by SCE&G over the past decade (Shealy, 1996a; 1996b; 2001; 2004; 2005; Carnagey Biological, 2006; 2007). Recent assessments have shown that biotic conditions (based on metrics such as taxa richness and abundance, EPT Index, EPT abundance, and dominant taxa) improved with increased distance from the Project dam (Shealy, 2004; 2005; Carnagey Biological, 2006; 2007). Similarly, North Carolina Biotic Index (NCBI) scores from these studies have generally ranged from "good" to "fair" for lower sites near the Riverbanks Zoo, to "poor" at sites directly below the dam (Shealy, 2004; 2005; Carnagey Biological, 2006).

The most recent assessment (Carnagey Biological, 2006; 2007), conducted in 2006 and 2007 as part of the current relicensing, sampled the LSR macroinvertebrate community at six locations downstream of Saluda Hydro (Figure 2-1). This study was conducted during the late-summer and early-fall months when DO levels were expected to be at their lowest levels and employed both the artificial substrate samplers used in previous assessments (Hester-Dendy multi-plate), as well as rapid bioassessment methods (Barbour et. al. 1999). As in previous studies, regression analysis of the Hester-Dendy data suggested improved biotic conditions as distance from the Saluda Hydro dam increased during both 2006 and 2007. NCBI scores during the study generally ranged from "poor" immediately downstream of Project dam (TR) to "fair" to "good-fair" at the Oh Brother Rapids (OB) downstream near the Interstate 26 crossing. These results were not surprising, as studies have shown that operation of hydroelectric dams often results in decreased benthic diversity immediately downstream due to habitat instability associated with water level fluctuations and scour associated with increased water velocity (Carnagey Biological, 2006; 2007).

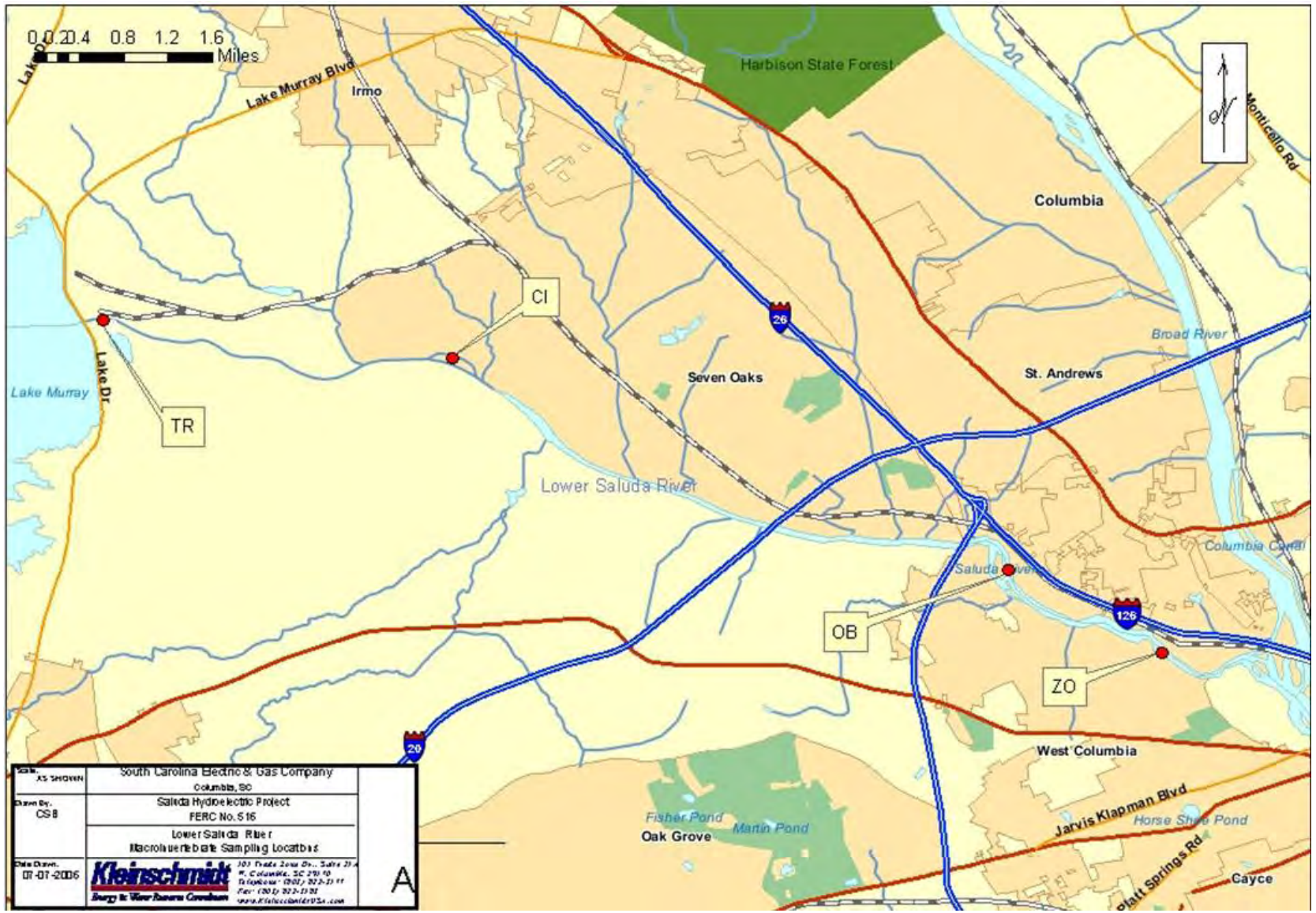

Figure 2-1: Proposed Macroinvertebrate Sampling Locations in the Lower Saluda River Downstream of the Saluda Hydroelectric Project Dam

3.0 ENHANCEMENT AND MONITORING

SCE&G proposed in its Final License Application for Saluda Hydro (filed with the FERC on August 27, 2008) to continue turbine aeration measures implemented since 1999 aimed at optimizing DO in Project releases. Specifically, these measures included installation of turbine venting and hub baffles on Project turbines (completed in 1999 and 2005, respectively), as well as implementation of operational modifications ("look-up tables") developed in recent years to provide guidance regarding unit and gate combinations that provide the greatest DO enhancement under various operating scenarios. These measures have resulted in significant DO improvements in the LSR, with median DO in Project releases increasing from 2.7 mg/L before 1999 to 7.2 mg/L after implementation (1999 to 2007). Likewise, this has resulted in less frequent occurrences of DO levels in the release below 5.0 mg/L, from 88% to about 12% of the time.

SCE&G has also proposed to implement minimum flow releases from Saluda Hydro to support target riverine species in the LSR, including benthic macroinvertebrates. In addition to improved DO conditions (through increased shoaling and turbulence), implementation of minimum flows will likely improve benthic macroinvertebrate habitat by ensuring more stable flows and maintenance of riverine wetted width. Physical Habitat Simulation (PHABSIM) modeling conducted in support of the current relicensing suggests that the 700 cfs minimum flow being proposed for the majority of months during a normal water year will provide between 71% and 97% of maximum Weighted Usable Area (an estimate of available habitat) for benthic macroinvertebrates, depending on the river reach being considered (Kleinschmidt 2008).

Because continuation of DO enhancement measures and implementation of minimum flows are likely to improve the aquatic habitats of the LSR, and because macroinvertebrates serve as an important bioindicator of aquatic health, SCE&G deems it necessary to implement a long-term aquatic macroinvertebrate monitoring program. Specifically, SCE&G will implement a monitoring program utilizing both the artificial substrate (Hester-Dendy) and USEPA Rapid Bioassessment sampling methods utilized in previous LSR studies. Details regarding timing, duration, methodology, and reporting/consultation requirements of the program are provided below.

3.1 Monitoring Program

The macroinvertebrate fauna of the LSR will be sampled for a period of six years following issuance of a new FERC license for the Project. Sampling will occur at four locations: the project tailrace (TR); Corley Island (CI); the Ocean Boulevard shoal area (OB); and in the vicinity of Riverbanks Zoo (ZO)[1] (Figure 2). Three of these sites (TR, OB & ZO) are consistent with previous investigations on the LSR[2]. Although not previously sampled, the Corley Island (CI) area represents a significant aquatic habitat in the LSR, with extensive gravel substrates and shoal/riffle habitats, and thus has been added to this monitoring program.

A multi-habitat assessment, following the USEPA *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers* (Barbour et al. 1999), will be performed bi-annually at each of the sample sites during the six-year monitoring period. Bi-annual sampling will consist of a spring sample coinciding with the period when DO levels are typically highest downstream of Project (March - April), as well as a late-Summer and early-Fall months (August – October) when downstream DO conditions are typically at their most critical. Multihabitat sampling will involve timed, quantitative sampling of the various habitat types available within the identified reaches (i.e. cobble, sand, snags, woody debris, etc.), using kicknets and/or D-shaped dipnets, with each habitat type sampled in approximate proportion to its availability.

Artificial substrate sampling will also be conducted at each site on alternate years. During these years, three replicate Hester-Dendy multi-plate samplers will be deployed at each location and allowed to colonize for 45–60 days. Similar to the multi-habitat assessment, Hester-Dendy sampling will be conducted during the spring when DO levels downstream of the project are typically highest (March – April) and again during the low DO period during late-summer and early fall (August – October).

[1] Site is in close proximity to the "old police club" (OPC) sampled in previous investigations (see Shealy 2005); sites may be used interchangeably depending on field conditions and access.
[2] Habitat is described in previous investigations at these sites (Shealy 2001; 2003; 2004; 2005).

Intact Hester Dendy samplers, as well as raw samples from the multihabitat assessment, will be preserved in the field with 95% ethanol and transported to a South Carolina Department of Health and Environmental Control (SCDHEC) – approved laboratory for processing. In the laboratory, macroinvertebrates will be separated from debris with the aid of a stereo microscope, identified to the lowest possible taxonomic level, and enumerated using appropriate techniques and taxonomic keys. Specimens will be maintained in a voucher collection for five years or placed permanently in a reference collection.

Differences in taxonomic composition between sampling sites will be examined using appropriate bioassessment metrics, as described in Barbour et al. (1999). These metrics will likely included taxa richness (diversity); EPT (Ephemeroptera, Plecoptera, Trichoptera) Index; Chironomidae taxa and abundance; ratio of EPT and Chironomid abundance; ratio of scraper/scraper and filtering collectors; shredder/total number of specimens collected; percent contribution of dominant taxa; and North Carolina Biotic Index (NCBI)[3]. Regression analyses may also be used to detect trends in community composition as a function of distance from the dam. Water Quality data (dissolved oxygen and temperature) will also be reported for the sampling period. Water quality data will be obtained either from the two USGS gages on the LSR (#02168504, Saluda River below Lake Murray Dam or #02169000, Saluda River near Columbia) or from field measurements collected during macroinvertebrate sampling.

3.1.1 Reporting and Consultation

Results of macroinvertebrate monitoring will be summarized in an annual report, which will be issued to state and federal resource agencies on or before January 31 of the year following the sampling period. Finally, SCE&G will meet annually with state and federal resource agency staff to review the status of aquatic macroinvertebrate monitoring and enhancement efforts. Timing, duration, methodology or other aspects of the program may be modified based on such

[3] Bioassessment metrics are described in greater detail in Barbour et al. (1999) and in reports summarizing previous macroinvertebrate investigations at the LSR sites (Shealy 2001; 2003; 2004; 2005).

consultation. This meeting may be combined with other resource agency consultation relative to water quality; fisheries; freshwater mussels; rare, threatened and endangered species; or other Saluda Hydro enhancement/monitoring programs.

3.1.2 Follow-up Monitoring

Tens years following completion of the six-year sampling regime described above, SCE&G will initiate a two-year-long follow-up assessment of the LSR macroinvertebrate community in order to assess long-term impacts of the aquatic enhancements being proposed as part of the current relicensing process (i.e., continued DO enhancements, implementation of minimum flows, etc.). SCE&G will consult with the appropriate state and federal resource agencies prior to initiating this study. Unless otherwise agreed upon in consultation with the agencies, this assessment will be conducted during two consecutive years and utilize the methodology described in this plan (bi-annual rapid bioassessment during the spring and fall, with Hester-Dendy sampling during at least one year).

4.0 LITERATURE CITED

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Appendix 5

FRESHWATER MUSSEL ADAPTIVE MANAGEMENT PROGRAM

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

FRESHWATER MUSSEL ADAPTIVE MANAGEMENT PROGRAM

DECEMBER 2008

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
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DECEMBER 2008

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Kleinschmidt
Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
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SALUDA HYDROELECTRIC PROJECT
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FRESHWATER MUSSEL ADAPTIVE MANAGEMENT PROGRAM

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COLUMBIA, SOUTH CAROLINA

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(FERC NO. 516)

FRESHWATER MUSSEL ADAPTIVE MANAGEMENT PROGRAM

1.0 INTRODUCTION

The Saluda Hydro Project (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 (Figure 1-1) that is owned and operated by South Carolina Electric & Gas Company (SCE&G or Licensee). 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 relicensing of the project, SCE&G prepared and issued the Initial Consultation Document (ICD) on April 29, 2005. In response to the ICD, the United States Fish and Wildlife Service (USFWS), South Carolina Department of Natural Resources (SCDNR), and several Non-governmental Organizations (NGO's) requested that SCE&G conduct studies characterizing the mussel fauna occurring in the Project vicinity and identify potential Project impacts to these species. SCE&G subsequently formed a Freshwater Mussels and Macroinvertebrate Technical Working Committee (TWC) to address relicensing requests related to these organisms, and with oversight from this TWC, contracted with a regional expert (John M. Alderman) to conduct mussel surveys of the Project vicinity.

These surveys, conducted during the summer of 2006, documented 15 native freshwater mussel species as occurring in Lake Murray, its tributaries, and the upper Congaree River (Alderman, 2006). .Further, the study found no mussels directly downstream of the Project in the lower Saluda River (LSR) and concluded that mussel assemblages were more diverse and abundant on the Broad River side of the Congaree River than on the LSR side. These findings prompted USFWS, SCDNR and other stakeholders to request mitigation for the lack of mussel fauna in their comments on the Saluda Draft License Application and in subsequent consultation. The program outlined herein was prepared pursuant to this request and is intended to serve as a guiding document for adaptive management of mussels in the Project vicinity.

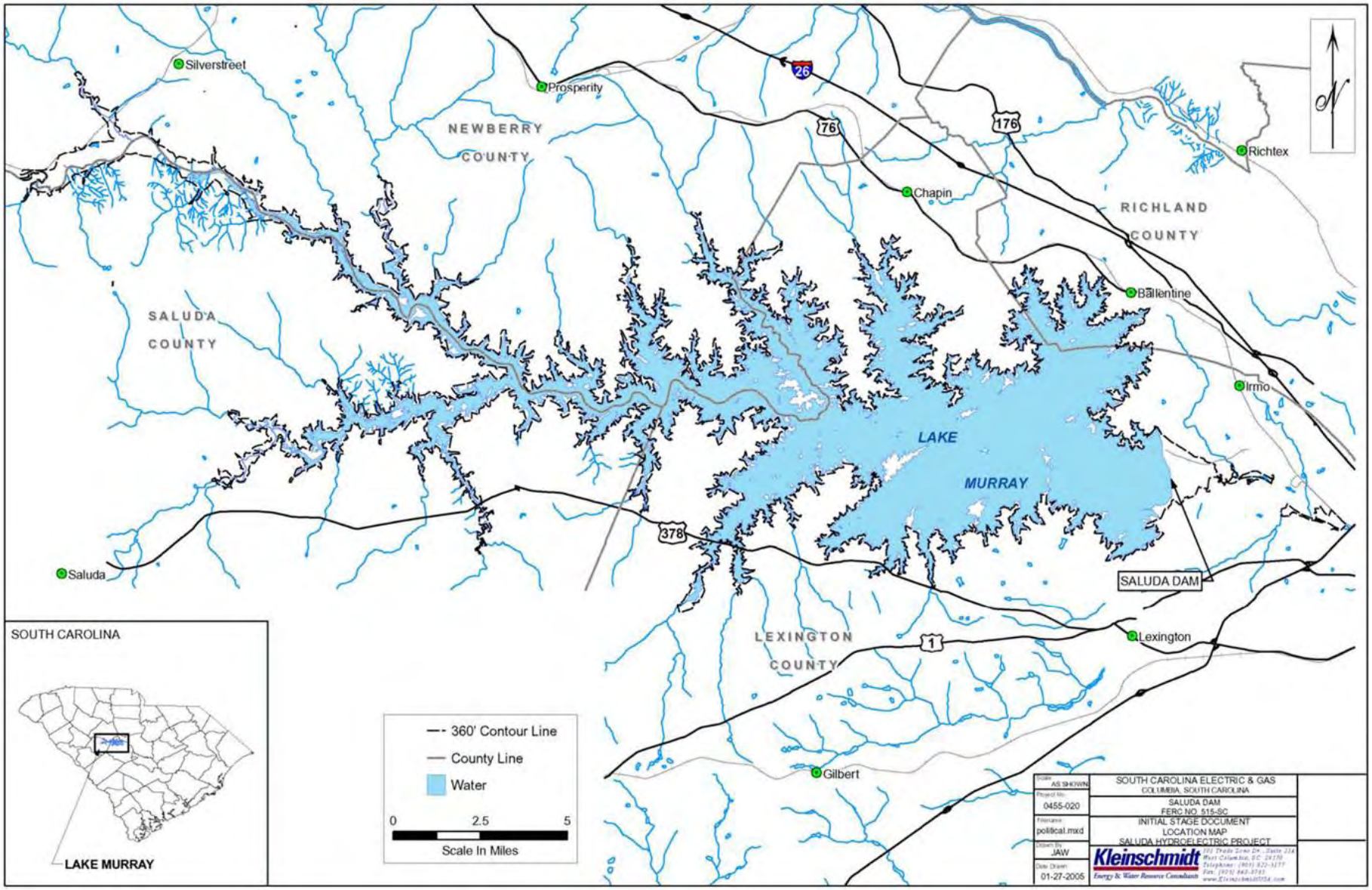

Figure 1-1: Location Map for the Saluda Hydroelectric Project (FERC No. 516)

2.0 BACKGROUND

The southeastern United States is considered the "epicenter" of North American freshwater mussel biodiversity, with approximately 90% of the 300 species known from the U.S. occurring in the region (USGS, 2000). However, the freshwater mussel fauna of most southeastern river systems has declined dramatically in the past 30 years. In the past, one of the largest impacts to mussels was the construction of large dams which converted large amounts of riverine habitat into impoundments. Subsequently, mussel populations that remained in unimpounded streams were impacted by habitat degradation caused by dredging, mining, point and non-point source pollution, and siltation. Presently, most remaining mussel populations are highly fragmented, occupying small reaches of their historic range where habitats have remained relatively unimpacted. It is estimated that 70% of our freshwater mussels are extinct, endangered, or in need of special protection (Williams, et. al. 1993).

Twenty-four species of native freshwater mussel are known to occur or are thought to have occurred historically in the Santee River Basin in South Carolina (Alderman and Bogan, 2004) (Table 2-1). However, prior to the current relicensing, little information was available regarding their distribution in Lake Murray, its tributaries, or the LSR. As previously noted, surveys conducted in support of relicensing found 15 native freshwater mussel species as occurring in Lake Murray, its tributaries, and the upper Congaree River (Alderman, 2006). While none of the species encountered are federally or state listed as threatened or endangered, a number are consider federal species of concern (Table 2-2). Alderman (2006) also noted differences in mussel assemblages between areas upstream and downstream of the Project dam. In Lake Murray and its tributaries, 11 native freshwater mussel species were identified, with the sample area dominated by backwater-adapted species such as Eastern floater and paper pondshell. No mussels were collected in the LSR downstream of the Saluda Dam. However, 9 native species were documented in the upper Congaree River and the confluence area of the Broad and Saluda rivers.

Riverine species such as Carolina slabshell and Roanoke slabshell were dominant in these two areas. Several of the species collected in the upper Congaree River and the confluence area were not collected upstream of the Saluda Dam, which could suggest the need for an anadromous

host and or the lack of species specific habitat. Also noted was the greater abundance of mussels on the Broad River side of the confluence area than on the Saluda River side, suggesting temperature may be a limiting factor. A similar pattern was observed in the Congaree River downstream of the confluence (Alderman, 2006).

Table 2-1: Native Freshwater Mussels of the Santee River Basin in South Carolina (Source: Alderman and Bogan, 2004, except where otherwise noted)

COMMON NAME	SPECIES	G RANK[1]	FEDERAL STATUS[2]	STATE STATUS[3]	OCCURRENCE IN BASIN[4]
Roanoke Slabshell	*Elliptio roanokensis*	G2G3	SOC		X
yellow lampmussel	*Lampsilis cariosa*	G3G4	SOC	SOC	X
Carolina slabshell	*Elliptio congaraea*	G4	SOC	SOC	X
Carolina Lance	*Elliptio angustata*	G4	SOC		X
Common Elliptio	*Elliptio complanata*	G5			X
Variable Spike	*Elliptio icterina*	G4			X
Atlantic Spike	*Elliptio producta*	G4			X
Savannah Lilliput	*Toxolasma pullus*	G3	SOC	SOC	X
Eastern floater	*Pyganodon cataracta*	G5		SOC	X
paper pondshell	*Utterbackia imbecillis*	G5		SOC	X
Rayed Pink Fatmucket	*Lampsilis splendida*	G3	SOC	SOC	X
Eastern Creekshell	*Villosa delumbis*	G4		SOC	X
Creeper	*Strophitus undulatus*	G5			X
Florida pondhorn	*Uniomerus carolinianus*	G4			X
northern lance	*Elliptio fisheriana*	G4			X
barrel floater	*Anodonta couperiana*	G4		SOC	H?
brook floater	*Alasmidonta varicosa*	G3		SOC	H,N
Triangle floater	*Alasmidonta undulata*	G4			H
Carolina heelsplitter	*Lasmigona decorata*	G1	E	E	X
Pod lance	*Elliptio folliculata*	G2G3Q			X
Eastern pondmussel	*Ligumia nasuta*	G4			X
Southern rainbow	*Villosa vibex*	G5Q		SOC	H
Notched rainbow	*Villosa constricta*	G3		SOC	N
Carolina creekshell	*Villosa vaughaniana*	G2			X
Eastern lampmussel	*Lampsilis radiata*	G5			X

[1] G1 = Critically Imperiled; G2 = Imperiled; G3 = Vulnerable; G4 = Apparently Secure; G5 = Secure

[2] Endangered; SOC = Species of Concern

[3] E = Endangered; SOC = Species of Concern (Source: SCDNR, 2008)

[4] X = extant; H = historical; N = just into N. Carolina

Table 2-2: Occurrence and Status of Freshwater Mussel Species Documented in the Vicinity of the Saluda Hydroelectric Project, including the Lower Saluda and Upper Congaree Rivers and Lake Murray and Selected Tributaries (Source: Alderman, 2006)

COMMON NAME	SPECIES	G RANK	FEDERAL STATUS	OCCURANCE[2]
Roanoke Slabshell	*Elliptio roanokensis*	G2G3	SOC	BR, CO
yellow lampmussel	*Lampsilis cariosa*	G3G4	SOC	BR, CO
Carolina slabshell	*Elliptio congaraea*	G4	SOC	CO
Carolina Lance	*Elliptio angustata*	G4	SOC	LM, LMT, BR, CO
Common Elliptio	*Elliptio complanata*	G5		LM, LMT, BR, CO, S*
Variable Spike	*Elliptio icterina*	G4		LMT, CO
Atlantic Spike	*Elliptio producta*	G4		LM, LMT
Savannah Lilliput	*Toxolasma pullus*	G3	SOC	LM, LMT
Eastern floater	*Pyganodon cataracta*	G5		LM, LMT
paper pondshell	*Utterbackia imbecillis*	G5		LM, LMT
Rayed Pink Fatmucket	*Lampsilis splendida*	G3	SOC	LM, CO
Eastern Creekshell	*Villosa delumbis*	G4		LM, LMT, BR, CO, S*
Creeper	*Strophitus undulatus*	G5		S*, CO
Florida pondhorn	*Uniomerus carolinianus*	G4		LM, LMT
northern lance	*Elliptio fisheriana*	G4		LM

[1] G1 - Critically Imperiled; G2 - Imperiled; G3 - Vulnerable; G4 - Apparently Secure; G5 - Secure
[2] BR = Broad; CO = Congaree; S = Saluda; LM = Lake Murray; LMT = Lake Murray Tributaries
* Refers to Saluda River side of confluence area.

3.0 CONSULTATION HISTORY

An earlier draft of this Adaptive Management Program document, which focused on reintroduction of native freshwater mussels to habitat downstream of the Project in the LSR, was reviewed with state and federal resource agencies, NGO staff, and other local experts during the Fall of 2008. During this consultation, USFWS and University of South Carolina biologists with expertise in freshwater mussels expressed concern regarding the feasibility of re-establishing mussel populations in the LSR due to a number of factors including, prevailing cool year-round water temperatures resulting from hypolymentic releases from the Project, scour from periodic Project operations, and the relatively short length of the reach (10 miles). It was subsequently determined that reintroduction of mussels to the LSR was likely to meet with little success and that mussel restoration efforts should focus on areas upstream of the Project dam (See Fish and Wildlife Meeting Notes, 17 October 2008). This consultation also resulted in formation of a Freshwater Mussel Working Group to provide technical expertise and guidance for mussel

monitoring, restoration, and management efforts in the Project vicinity (See Item 1 below for additional detail).

An initial meeting of the Freshwater Mussel Working Group identified the Savannah lilliput (*Toxolasma pullus*) as likely being the most imperiled species occurring in the Project Area upstream of the dam and identified further assessment of this population as an appropriate focus for the initial phase of this Program. Savannah lilliput is Federal Species of Concern that was detected at two locations in upper Lake Murray during the 2006 reconnaissance surveys (Alderman, 2006). The Working Group identified a greater understanding of the distribution, abundance, population ecology and reproductive status of this species as being an essential first step for restoration efforts in the basin.

4.0 PROGRAM ACTIVITIES

The mechanism governing mussel distributions in the Saluda Project vicinity remain unclear at this time. Potential factors influencing mussel distributions likely include biotic factors, such as presence and abundance of suitable host fish, and abiotic environmental factors such as water temperature and dissolved oxygen. Due to these uncertainties, SCE&G proposes to employ an adaptive management strategy for the Project Area. Specifically, SCE&G proposes implementation of the following after issuance of a new FERC license for the Saluda Project:

4.1 Freshwater Mussel Working Group

SCE&G will coordinate formation of a Freshwater Mussel Working Group to provide technical expertise and guidance for mussel restoration efforts in the Project Area. Potential participants will likely include SCE&G staff, representatives from state and federal resource agencies, such as USFWS and SCDNR, as well as academic and other regional mussel experts. The Working Group will meet at least annually to review relevant data, evaluate effectiveness of restoration efforts to date, and to establish goals and objectives for the coming year. Results of the monitoring program will be filed with the FERC as part of the annual report (See Section 5.0).

4.2 Phase I – Savannah Lilliput Distribution in Upper Lake Murray

An in-depth survey for Savannah lilliput (*Toxolasma pullus*) will be conducted in upper Lake Murray to further document distribution, abundance, and reproductive status of this species. This survey will focus on Lake Murray and its tributaries, beginning in the vicinity of the Buffalo Creek area of Lake Murray (near the easternmost junction of Saluda and Newberry counties) and extending upstream into the reservoir headwaters. Survey methodology will be consistent with the 2006 reconnaissance survey of the area (Alderman, 2006), and will consist of timed, qualitative searches utilizing tactile methods (probing into substrate) and visual methods (snorkeling and/or bathoscope inspections in shallow water and visual shoreline searches).

Specific sites within the survey area will be selected and prioritized based on appearance of best available habitat, with shallow shoreline areas preferred by this species given initial priority. As many sites as possible will be surveyed during a two week survey period (10 field days). The survey team will consist of at least three people, at least two of which will be biologists. All sites surveyed will be documented with a Global Positioning System (GPS). Approximately 1-2 person hours will be expended at each site to determine presence/absence and to maximize the number of sites examined. If presence of Savannah lilliput is confirmed at a site based on occurrence of live or dead specimens, an additional 6 – 12 person hours, or possibly more if needed, will be expended at each site in order to adequately assess the population. Specifically, the following parameters will be collected at each site where *T. pullus* is found.

- Abundance and Catch-Per-Unit-Effort, based on total number of live and dead individuals collected.
- Length measurements (cm) for all live and fresh-dead specimens to allow development of size-class estimates and aid in determining if reproduction is taking place.
- Determination of gravidity based on examination of a sub-set of female mussels from the site.
- Age of live specimens based on growth ring patterns.

- General habitat conditions, including dominant substrate, approximate slope of bank, extent of shoreline vegetative cover, depth range of population.

Microhabitat water quality data will be collected at each site surveyed and will include:

- Dissolved Oxygen (DO)
- Water Temperature
- pH
- Conductivity
- Water Hardness

4.2.1 Age Structure Determination

If available, fresh-dead shells (that have not eroded significantly) will be collected from sites where *T. pullus* presence is confirmed for age structure determination. Shells will be thin sectioned, polished and age estimated according to methods described in (Neves and Moyer, 1988). Thin section age data, combined with the field aging of live specimens and lengths measurements described above, will be used for development of age-length curves for the population.

4.3 Phase II - Host Fish Trials

Should the Phase I survey indicate sufficient availability of gravid *T. pullus* females in upper Lake Murray (12 or more gravid females at a given sample site), SCE&G will initiate laboratory trials aimed at identifying host fish species. Although specific details of the trials will need to be worked out in consultation with the Working Group, this effort will involve collection of subset of gravid female mussels during the reproductive season (likely May through June). Effort will be to made to avoid collecting more than 25-30% of gravid females from a site in order to preserve the viability of the local population (e.g., no more than 3-4 from a site with 12 confirmed

gravid females). Glochidia will be extracted from collected females in a laboratory setting, after which females will be returned alive to the source population. Lepomid fish species will be collected by electrofishing or other accepted methods, transported to laboratory aquaria, and inoculated with glochidia from the source mussels.

Feasibility and additional details associated with this task will be determined based on results of the Phase I *T. pullus* survey and subsequent consultation with the Working Group.

5.0 ADDITIONAL STUDIES

Additional phases will be contingent upon the findings of the Phase I and Phase II of this program. Potential additional phases identified by the Working Group include additional water quality data analyses in the vicinity of *T. pullus* sites (i.e., phosphorous, nitrogen concentrations); laboratory testing of sediment toxicity; and diet studies of native mussels. Scope and objectives of any additional phases will be developed in consultation with the Working Group.

6.0 REPORTING

SCE&G will file the final Phase I and Phase II reports detailing status of freshwater mussel studies conducted in the Project Area. A draft report will be distributed to the Working Group for review and comment by the end of February of the year following completion of each phase. The final report will be filed with the FERC and distributed to the above noted parties by April 30 the same year. The final report will contain recommendations from the Working Group on any changes to the Adaptive Management Program

7.0 FUNDING

SCE&G will provide funding for Phases I and II of this Mussel Adaptive Management Program. Any additional studies or tasks determined by the Working Group will be funded by other sources. While SCE&G is supportive of the Working Group's desire to find out as much about the Savannah lillput (*T. pullus*), it cannot guarantee that additional studies will be

conducted. However, SCE&G will consider providing in-kind services (consisting of manpower, boat, and/or monitoring equipment) in support of future studies or surveys within the Lake Murray Project boundary if the Working Group is interested in future research.

8.0 IMPLEMENTATION SCHEDULE

Implementation of this Program's Phase I survey will commence within two years after issuance of the new license. This time frame is necessary to assure adequate time for mobilization and securing contracts between license issuance and the next monitoring season, which usually is in the May to June time frame. Phase II will be implemented within 2 years of commission approval of the Phase I Final Report.

9.0 LITERATURE CITED

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Appendix 6

TROUT MANAGEMENT PLAN FOR THE LOWER SALUDA RIVER

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

TROUT MANAGEMENT PLAN FOR THE LOWER SALUDA RIVER

DRAFT

JANUARY 2009

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

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1.0 INTRODUCTION

The South Carolina Electric & Gas Company (SCE&G) filed an Application for New License on August 27, 2008, and as part, has developed a Comprehensive Settlement Agreement for Protection, Mitigation and Enhancement of environmental resources at the Saluda Hydro Project (FERC No. 516)(Project). The enhanced relicensing process implemented was a multi-year cooperative effort between SCE&G and interested stakeholders to address operational, recreational and ecological concerns associated with hydroelectric project operations.

As part of that relicensing process, SCE&G consulted with a wide variety of stakeholders including, state and federal resource agencies, non-governmental organizations and concerned citizens seeking their input on important relicensing issues. As a result of that consultation and subsequent stakeholder meetings, relicensing participants identified several issues that they believed needed to be addressed during the relicensing process. One of the identified issues included management of the Put, Grow and Take trout fishery located in the Saluda Hydro Tailrace.

The existing Put, Grow and Take fishery appears to be a thriving and successfully managed trout fishery that maintains healthy stocks of both brown and rainbow trout. Several efforts are currently underway by SCE&G to improve DO conditions in the lower Saluda River (LSR) that are likely to further improve habitat for trout. Enhancement measures consist of turbine venting, alternate operating scenarios, and implementation of IFIM flow recommendations.

During relicensing consultation, interest was expressed by stakeholder groups in the potential for a "self-sustaining" trout fishery in the LSR. Although existing habitat in the Saluda River may generally provide suitable growing conditions for much of the year for adults of both trout species, several conditional factors make establishment of a self-sustaining trout fishery a highly unlikely option. An evaluation on brown and rainbow trout populations in the LSR, which culminated in a white paper, further substantiated this. These factors, and the white paper, are summarized in Section 2.2 of this document. Although self-sustaining populations are not likely, it has been theorized that there is potential for some level of natural trout reproduction in the LSR.

The *Trout Management Program for the Lower Saluda River* (Program) was developed by the F&W TWC and initiated by SCE&G to monitor and assess the success of water quality enhancement measures on trout reproduction. It is a culmination of SCE&G's work with stakeholders to define resource goals and objectives for the lower Saluda trout fishery. Furthermore, the Program will determine a process for evaluating changes and making decisions for management of the fishery based on the best available information. This document explains the goals, objectives, management, and methods of the Program, and was developed to serve as a guidance document for future management of the tailrace trout fishery during the new license term of the Saluda Project.

This document is organized to describe the Program in the following manner:

- Section 2 – Background of Saluda Project and Tailrace
- Section 3 – Goals and Objectives for the Saluda Tailrace Trout Fishery
- Section 4 – Management of the Program and Formation of the Advisory Committee
- Section 5 –Methods for Monitoring Enhancement Measures
- Section 6 – Implementation Schedule
- Section 7 – Compliance

2.0 BACKGROUND OF SALUDA PROJECT AND TAILRACE FISHERY

2.1 Saluda Project

The Saluda Hydroelectric Project (Saluda Hydro or Project) is an existing licensed hydroelectric project, owned and operated by South Carolina Electric & Gas Company (SCE&G). The Project is located on the Saluda River, in the counties of Lexington, Richland, Newberry and Saluda, South Carolina. The Project consists of an earth fill embankment Dam (Saluda Dam) impounding a 48,000-acre reservoir (at elevation 356.5'[1]), a gated emergency spillway, a back-up Dam, a powerhouse, five concrete intake towers and associated penstocks. Construction of the Project was completed in 1930, and construction of the back-up dam was completed in 2005.

The lower Saluda River (LSR) is approximately 10 miles in length and is characterized by bedrock-dominated riffles, with limited gravel and cobble substrates, and a high percentage of pool habitat. The river receives hypolimnetic (i.e coldwater) flows from Lake Murray via the Saluda Hydro Project. This cold water has created the opportunity for the South Carolina Department of Natural Resources (SCDNR) to establish a successful Put, Grow and Take trout fishery for brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). The following sections summarize features of the fishery and water quality resources of the LSR, including results of applicable studies.

2.2 Fishery Resources

The LSR fishery community is unique in that it provides fishing opportunities for both resident warmwater species, as well as stocked coldwater species (trout). As mentioned previously, the LSR currently supports a tailrace trout fishery for rainbow and brown trout that is managed by the SCDNR as a Put, Grow and Take fishery. Trout are

[1] Unless otherwise noted, all elevation references in this document are given in North American Vertical Datum 1988 (NAVD 88); conversion to traditional plant datum (PD) requires the addition of 1.50 feet.

not native to the LSR, and the fishery is maintained through stocking of sub-adult rainbow and brown trout. Typically, the SCDNR stocking program runs from early December until mid-April. The total number of trout stocked annually typically averages around 35,000, but varies annually based primarily on availability of fish from the Walhalla State Fish Hatchery. This management approach, which has been employed since the 1960's, is appropriate where trout habitat is marginal but can provide the acceptable growth and survival of enough sub-adult trout to support a fishery (D. Christie, SCDNR, Pers. Comm.). Similarly, the LSR is classified by the SCDHEC for regulatory purposes as Put, Grow, and Take Trout Waters, which are defined as freshwaters suitable for supporting the growth of stocked trout populations and a balanced, indigenous aquatic community of fauna and flora (SCDHEC, 2004).

A trout growth study conducted in 2003 in support of establishment of a site-specific DO standard for the LSR found that growth of trout in the LSR exceeds many other southeastern tailwaters (0.7 percent weight gain per day, 0.67 inches per month) (Kleinschmidt et al., 2003). Further, the study found that 74 of 441 brown and rainbow trout collected during 2003 were greater than 16 inches in length, suggesting a significant number of carryovers from previous stocking years. The study concluded that the high growth rates and large number of carryovers observed in 2003 could potentially be attributed to higher DO levels since the inception of SCE&G's turbine venting program (Kleinschmidt et al. 2003). Conversely, a recent study begun by SCDNR to evaluate the annual mortality of the stocked trout in the LSR documented slightly less carryover of trout during the spring and summer of 2007 (H. Beard, SCDNR, Pers. Comm.). Disparity between study results suggests that there may be significant annual variability in carryover.

As described previously, an interest has been expressed by stakeholder groups in the potential for a self-sustaining trout fishery in the LSR. The issue was evaluated by the Instream Flow/Aquatic Habitat Technical Working Committee and the results were documented in a white paper [2]. Several factors were identified that suggest that

[2] Evaluation of the Potential for a Self-Sustaining Brown and Rainbow Trout Population in the Lower Saluda River Available on the Saluda Hydro Relicensing website at http://www.saludahydrorelicense.com/StudyReports.htm.

establishment of a self-sustaining populations of brown and rainbow trout is unlikely. They are summarized here but described more fully in the white paper produced on the subject.

Limited spawning recruitment. Available information suggests that adult survivorship is variable and likely limited during some years. Creel data and annual electrofishing by SCDNR generally indicates a significant decline in LSR adult trout abundance beginning in early summer and variability in yearly adult survival, for reasons not completely known (H. Beard, SCDNR, unpublished data). However, recruitment issues to age II and older likely arise through the cumulative effects of heavy fishing effort and liberal creel limits, as well as predation and physical habitat degradation.

Limited spawning and nursery potential. It is unlikely that spawning will be sufficient to support self sustaining populations of either species. Factors identified that support this conclusion include the small numbers of fish that survive to reach age II and older, marginal spawning and incubation water temperatures (brown trout), limited amount and quality of gravel spawning beds for both species, and discontinuous and limited fry and juvenile nursery habitat.

As mentioned, the fishery is supported by significant annual trout stocking. Although it is theoretically possible that some occasional natural reproduction may occur, at least for rainbow trout, the magnitude and frequency of the production would not likely support a recreational fishery, or measurably contribute to the existing fishery, given the natural vagaries of reproduction in trout populations, marginal water temperatures, abundance of warm water predators, 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). Few if any urban salmonid 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.

2.3 Water Resources

SCE&G began monitoring DO and temperature in the Saluda Project turbine releases in 1989 and continues the effort to the present day. Most recently, SCE&G conducted a study from 2000 to 2006 to characterize water resources by collecting baseline water quality data in the Saluda Tailrace extending downstream to the confluence with the Broad River. Results of this study and other water quality data are summarized below.

2.3.1 Dissolved Oxygen

The LSR occasionally suffers from periods of low DO during high flow or when the pool level of Lake Murray is drawn down for special purposes. Characteristics of the project reservoir, namely the relatively high water retention time and considerable depth of Lake Murray, coupled with regional climate conditions, results in seasonal thermal stratification of the lake and an associated decrease in DO in the lower water column. The problem is further exacerbated by watershed factors such as high nutrient loading, particularly from point discharges of phosphorus. High nutrient inputs to Lake Murray leads to an increase in the biological oxygen demand, especially during periods of high runoff (high flow), and consequent depletion of DO from the water column.

In 1999, to address issues associated with low DO of Project discharges, SCE&G installed an aeration system. This aeration system, which along with modified operational patterns, has since improved water quality of discharges. Currently, Project discharges of low DO waters to the LSR are infrequent, and are above the minimum DO level protective for trout survival (3.0 mg/L) 97 percent of the time. Results of 2000 to 2006 water quality monitoring showed average monthly DO levels to be above 6.2 mg/L throughout the year with the lowest levels observed in September (average minimum of 4.2 mg/L), and highest levels in February (monthly average 11.0 mg/L).

2.3.2 Temperature

According to the 2000-2006 water quality study, average water temperature throughout the late winter, spring, and early summer months (February – July) in the LSR ranges from 9.5 to 15.4º C. Specifically, during the spring and early summer months (March – June) average water temperature typically remains between 10º C and 14º C. As the summer progresses, water temperatures rise and are at their highest, about 17º C, between mid-September and early November. During the study, water temperatures never exceeded the lethal limit for trout of 25°C at any of the monitored trout habitat sites.

2.4 Technical Work Committees Meeting Notes

Note to readers: to be added once the consultation process within the TWC has been completed

3.0 GOALS AND OBJECTIVES

The goals and objectives of the Trout Management Program for the LSR were developed using a consensus-based approach during stakeholder discussions by the Fish and Wildlife Technical Working Committee. Specially, the goals and objectives are focused in two areas that are fundamental to effective management of the lower Saluda Tailrace Trout Fishery, namely water quality and fishery resources. For each goal identified in these two areas, there are several qualitative and quantitative objectives for measuring the progress made towards meeting the goals. The F&W TWC determined field collection methods appropriate for gathering the relevant data, which are described in more detail in Section 5.0. The Program goals for fishery resources and water quality, and their associated objectives, are described below.

3.1 Fishery Resources

Goal #1 To manage the Put, Grow, and Take trout fishery to maximize fishing opportunities for the public.

Objectives

- Measure changes in the fishery community by summarizing data in standard community-level metrics, such as species diversity, richness, relative abundance, trophic levels, presence and distribution of key species, and other summarizations that the Fish Team deems appropriate.
- Document and assess qualitative changes in trout habitat, including food resources (BMI) and water quality factors, resulting from flow modifications and DO enhancements.

Success Criteria

- **Note to readers : to be developed within the TWC**

Goal #2 To investigate reproductive successes of trout to augment stocked fishery.

Objectives

- Document recruitment of young-of-year within the LSR
- Document eggs or larval life-stages in the LSR

Success Criteria

- **Note to readers: to be developed within the TWC**

Goal #3 Determine feasibility of a naturally reproducing trout population as a management goal for the LSR.

Objectives

- Advisory Committee to conduct annual review and assessment of water quality, IFIM, and biological data. Committee to issue a report of findings and assessment of progress towards goals.

Success Criteria

- **Note to readers: to be developed within the TWC**

Goal #4 Determine growth rates of adult trout after implementing new instream flow regimes developed by the TWC.

Objectives

- SCE&G will conduct a trout growth study in year 7 of this program. The study will document trout growth and be similar to the study conducted in 2003 during the development of the LSR site specific DO standard.

SCE&G will coordinate the study with the SCDNR and their trout production facilities.

Success Criteria

- **Note to readers: to be developed within the TWC**

3.2 Water Quality

Goal #5 To release water from the Saluda Project that meets, to the extent possible, applicable State Water Quality Standards.

Objective

- Collect water quality data in the Saluda Tailrace year-round for 6 consecutive years to capture conditions during all seasons and for wet and dry years.

Success Criteria

- **Note to readers: to be developed within the TWC**

4.0 MANAGEMENT OF THE PROGRAM

The Fish & Wildlife TWC has developed this Trout Management Program for the LSR during the relicensing process for inclusion in the FERC license application and eventual incorporation into the new Saluda Project License. SCE&G is ultimately responsible for collection and analysis of Program data; however, a Advisory Committee will be been convened, as described below, and it is anticipated and desired that Committee members will actively participate in all facets of the Program.

4.1 Formation of Advisory Committee

To help develop and oversee implementation of the Program, a Advisory Committee (Committee) will be created. Member organizations and their responsibilities, as well as the approved dispute resolution procedures, are described below.

4.1.1 Committee Members and Responsibilities

The Committee will be comprised of representatives from SCE&G, SCDNR, the United States Fish and Wildlife Service (USFWS), Trout Unlimited (TU), and other interested Stakeholders. Each entity will have the opportunity to select its own representation to the Committee. SCE&G (or their designee) will serve as chairperson of the Committee and be responsible for organizing meetings and distributing documents to committee members.

The Committee will ultimately be responsible for guiding the decision making processes specified in the Program. It is anticipated that the Committee will be comprised of many members of the TWC responsible for development of this Program. The Committee's responsibilities may include, but are not limited to the following:

- Collection and evaluation of baseline information and evaluation of study plans;
- Providing overall guidance and decision making for the Program process;
- Evaluating other study (*i.e.*, existing) information or information which becomes available during the time period of evaluations;
- Establishing and documenting the goals and objectives of each modification and determine the appropriate metrics for evaluative purposes;
- Keeping other stakeholders aware of information relative to potential decisions and providing opportunities to comment prior to decisions on modifications and provide a notification system of Advisory Committee meetings;
- Determining and considering long term impacts of operational modifications on downstream projects and project economics when evaluating the feasibility of implementing flow modifications; and
- Reviewing the annual report that provides information on the prior year's activities which SCE&G will file with FERC.

The Committee acknowledges the importance of allowing interested stakeholders to review and comment on major documents, such as study results, that may impact the evaluation and potential modification to the Project. The Committee chairman (an SCE&G representative or designee) will distribute these study results and make annual reports available to interested stakeholders. Interested stakeholders can request documents in writing to the Committee chairman. The Committee chairman will ensure that interested stakeholders have adequate notice and review time prior to final decisions of the committee relative to modifications to test flows, etc. For all other documents on which stakeholders wish to comment, the Committee will review all timely comments and include these comments in the official record.

All information from the Committee relative to this Program, including notification of meetings, meeting summaries, study results and final study plans will be coordinated by SCE&G and shared with each committee member.

4.1.2 Advisory Committee Meetings

The Advisory Committee will establish a meeting schedule based on the activities and deliverables in any given year. To keep all committee members abreast of the schedule, the Advisory Committee will establish an annual calendar that will be distributed to members, along with any notes from previous meetings. The tentative Program schedule is provided in Section 6 of this plan. It should be noted that this schedule is based upon the issuance of a new license in 2010. A delayed issuance of the license will require that the schedule be revised accordingly.

4.2 Budget and Program Resources

Responsibility for implementing this Program will rest primarily with SCE&G, as licensee for the Saluda Project. Annual budgets will be developed by SCE&G relative to the monitoring and study costs as well as administrative costs and expenses. SCE&G will also rely on other resources outside of its establishment including, but not limited to, the following:

- federal, state and local grants
- donated services (federal and state agency involvement)
- equipment (purchases and loaners)
- expertise (governmental, non-governmental, private)

5.0 PROGRAM MONITORING METHODS

(Note to readers: Further refinement of Sampling Methodologies will be conducted within the TWC)

5.1 Sampling Techniques

5.1.1 Water Quality Monitoring

Water Quality monitoring in the Saluda Tailrace is necessary to establish an accurate baseline and to evaluate changes in water quality resulting from DO enhancements and changes to project operations. Further, it will be the basis from which to determine whether the Project is in compliance with applicable State Water Quality Standards (Goal #4).

Continuous water temperature and DO data will be sampled annually using installed USGS gages located below Saluda Hydro and near Riverbanks Zoo. Data will be collected at 15 minute intervals.

5.1.2 Flow Monitoring

Flow monitoring in the LSR is necessary to establish an accurate baseline and to evaluate changes in instream flows as they relate to TWC recommended flows, recreational flow releases and changes in project operations.

Continuous flow data will be collected annually using installed USGS gages located below Saluda Hydro and near Riverbanks Zoo. Data will be collected at 15 minute intervals.

5.1.3 Fish Sampling

Monitoring of the fish community in the Saluda Tailrace is necessary to establish an accurate baseline and to evaluate changes resulting from DO enhancements and changes to project operations. Fish sampling will be conducted using standard collection techniques that gather information on both community structure and document carryover of adults . Fishery collections may also assist in documenting active spawning. Methodologies for each are described below.

Fish Community Sampling

During each year of the Program (years 1 through 6), fish community data will be collected using daytime boat electrofishing during the April/May and September-October time periods.

Boat electrofishing will be used to sample the fish community at the deeper locations within each reach (generally, greater than 2 feet deep). Boat sampling will include 2-ten minute samples (pedal down) in each reach (total of 20 minutes of sampling time). Sampling will commence at the beginning of each reach with a shoreline (10 min.) and a mid-channel (10 min.) sample, if feasible. Each 10 minute sample will be processed as a separate sample. If habitat and channel width does not permit both a shoreline and mid-channel sample, mid-channel efforts will be shifted to shoreline sampling to obtain the required 20 minutes in the sample reach. Within each sampling station, all microhabitats (pools, riffles, runs, brush piles, stumps, boulders, etc.) will be sampled in an attempt to clearly describe the fishery community present.

All stunned fish will be collected during sampling, placed in a live well or collection container and identified to species. Weight (to nearest gram) and total length of collected individuals will be determined. Any individuals not identified in the field will be preserved and returned The sample will be returned for lab

identification, at which time the species will be added to the datasheet. All other fish will be returned downstream of the collection area.

Other pertinent information that will be collected during electrofishing efforts will include date, time, weather conditions, sample location, collection technique, sampling effort, water temperature, DO, and secchi disc, etc.

5.1.4 BMI Sampling

BMI Sampling will be conducted in accordance with the macroinvertebrate Program approved by the F&W TWC.

5.1.5 Ichthyoplankton Sampling

Sampling for fish at the egg and larval stages, or ichthyoplankton sampling, will be performed annually at Ocean Boulevard and Oh Brother Rapids 1 time a week during April and May. Duplicate samples will be collected at each location using standard drift net sampling techniques.

5.1.6 Trout Growth Study

SCE&G proposes to conduct an in-situ growth study in the LSR to determine growth rates of rainbow trout in the LSR. The trout growth study will be conducted during December – May and employ tag and recapture techniques utilized in the 2003 growth study conducted in LSR (Appendix A).

Annual Report Format and Summary Data Package

At the conclusion of the sampling season for each year of the Program, SCE&G will prepare reports for the various data collection components of the Program and consolidate them into a summary report that will be used by the Committee to track trends in the Saluda Tailrace.

The annual summary report package will include summaries of the following information:

- Water quality sampling data
- Saluda Tailrace flow data for the year
- Fish sampling data
- BMI sampling data
- Ichthyoplankton sampling data
- Trout stocking data
- Trout growth study results (following 7^{th} year only)

Water quality data will be summarized and displayed graphically by daily average and instantaneous temperature and DO value. Each annual report will include a discussion of any occurrences when water quality did not meet State standards as well as an analysis of the influence of generation on water quality in the Tailrace. Also, as the Program progresses, each report should include a discussion comparing the current years data to previous years data to identify any trends or anomalies.

Baseline fishery data will be compared to the Program goals to determine the potential and observed changes (positive or detrimental) to the aquatic biota associated with changes in project operations. Analysis of data may include, but not be limited to, a comparison of the following metrics:

- species richness/diversity
- species distribution
- species density
- trophic shifts
- young-of-year recruitment
- distribution of migratory species
- catch rate (average number / 300 FT^2 or 10 minutes of boat shocking)

- percentage of individuals with disease, tumors, fin damage or other anomalies
- Other sources of available fishery data may also be incorporated into this analysis

Benthic macroinvertebrate sampling data will be summarized to determine the potential and observed changes (positive or detrimental) to the food sources with changes in project operations. Analysis of data may include, but not be limited to, a comparison of the following metrics:

- species richness/diversity
- species distribution
- species density

Ichthyoplankton sampling data will be summarized to reflect successful reproduction of trout at the Oh Brother/Ocean Boulevard complexes. These two areas were identified by the TWC as high quality trout habitat containing the highest potential for successful reproduction. This data will be used to determine the reproductive potential and success within the LSR.

5.2 Implementation Schedule

The Program is designed to be implemented for a total of seven years. Annual data collection for water quality, flow monitoring, and biological sampling (fish, BMI, ichthyoplankton) will be conducted for six years. At the end of each year, an annual evaluation will be conducted by the Committee to assess the data. As the Program progresses, the Committee will be tasked with considering previous years data, as well as the current years data, to determine trends and to assess overall progress towards Program goals. On the seventh year of the Program, the Trout Growth Study will be implemented to assess changes in growth patterns of rainbow trout since implementation of the TWC recommended instream flow regimes.

5.3 Decision Process for Program Modifications

The AdvisoryCommittee will evaluate the annual data and make recommendations to SCE&G for any changes in the Program.

APPENDIX A

LOWER SALUDA RIVER TROUT GROWTH STUDY

SOUTH CAROLINA ELECTRIC & GAS CO.
COLUMBIA, SOUTH CAROLINA

SALUDA DO STANDARD PROJECT
LOWER SALUDA RIVER TROUT GROWTH STUDY

1.0 DISSOLVED OXYGEN CRITERIA

In 1986 the U.S. Environmental Protection Agency (EPA) produced the Ambient Water Quality Criteria for Dissolved Oxygen (freshwater). This document replaced all previously published EPA aquatic life criteria for dissolved oxygen (DO). State water quality criteria may have the same numerical values as those in the EPA document or States may want to adjust their criteria to reflect local environmental conditions.

Site-specific criteria are allowed by regulation and are subject to EPA review and approval. Although no specific procedures are in place for establishing site-specific criteria for DO in freshwater, existing guidance and practice are that EPA will approve site-specific criteria developed using appropriate procedures. Site-specific criteria must be based upon a sound scientific rationale in order to protect the designated use. A site-specific criterion is intended to come closer than the national criterion to providing the intended level of protection to the aquatic life at the site, usually by taking into account the biological and/or chemical conditions at the site. The LSR trout growth study was the initial step in the use of the bioenergetic model to predict a DO standard that provides a level of protection of trout growth consistent with the EPA DO criteria.

The LSR growth study and the resultant growth model predictions are used to establish a long-term average concentration that will adequately protect trout growth in the LSR. In addition to the long-term average, the DO criteria also contain a short-term DO concentration that will prevent mortality as a result of acute hypoxia. Even short-term exposure to DO levels in the range of 1 to 2 mg/L can kill trout in a short period of time if they are not able to find local refugia where DOs are higher. In one case, mortality of trout has been reported after 3-4 day exposure to 2.4 mg/L at 20 C. In general, low DO is better tolerated at cooler temperatures than at warmer temperatures. In order to avoid direct mortality due to low DO, the EPA criteria

document recommends a minimum DO of 3 mg/L, a DO concentration that is survived by salmonids, including trout, in long-term growth studies.

Although EPA cited, and agreed with, reviews that concluded that invertebrates are generally protected by DO levels that protect fish, there were potential exceptions that induced EPA to recommend a minimum DO of 4 mg/L to protect sensitive species of mayflies, caddisflies, and stoneflies that are present in some areas of the western U.S. There are no data available on the many insect species that inhabit other habitats and regions.

In order to protect trout growth, EPA concluded that the growth attained at a constant, or 30-day running mean, DO concentration of 6.5 mg/L was adequate. The assumed level of protection was estimated to be the threshold of effect of DO on growth. Lower mean concentrations are adequate to protect important fishery resources, but risk slight growth impairment (6 mg/L) or moderate growth impairment (5 mg/L). EPA concluded that reductions in growth rate sometimes seen above 6 mg/L are usually not significant and that DO concentrations below 4 mg/L can have severe effects on growth. Between 4 and 6 mg/L the effect on growth is moderate to slight if the exposure is sufficiently long. It must be noted that these findings are derived from laboratory studies in which food was surplus.

Because DO affects fish growth primarily by reducing appetite and food consumption, growth effects are greatest when food is not limited according to the EPA criteria document. For example, in tests with coho salmon and DOs of 3, 5 and 8 mg/L, growth effects were seen only at food availability greater than 70% of maximum consumption and a DO of 3 mg/L. No effects were seen at 5 mg/L. This 70% food availability is similar to that estimated from the LSR growth study.

The most “natural” DO study included in the EPA criteria document was a test conducted in laboratory streams in which coho salmon fed on insects produced in the streams (9.5-15.5 C). At high growth rates (0.04 to 0.05 g/g/d) dissolved oxygen levels below 5 mg/L reduced growth, but at lower growth rates (0 to 0.02 g/g/d) no effects were seen at concentrations down to 3 mg/L. These lower growth rates are similar to those observed in the LSR. Although these studies were not conducted with rainbow trout, there is a general similarity in growth response to

DO in all tested salmonid species and these results are probably representative of rainbow trout as well.

Perhaps the most critical issue identified in the EPA criteria document was the application of data from tests with constant DO exposure levels to natural situations in which DO may fluctuate significantly. They concluded that existing data allowed for a tentative theoretical dosing model for fluctuating DO as applied to fish growth if daily average DO was calculated using as a maximum value the threshold concentration below which growth effects are observed under constant exposure conditions.

The publication of several fish bioenergetic model papers occurred almost simultaneously with the publication of the EPA criteria document for DO (Cuenco et al., 1985 a, b, c). It was immediately evident that the fish growth analysis performed for the EPA DO criteria document (JRB Associates, 1984) provided the DO-food consumption link that would enable a similar modeling approach to be used for generating growth-effect predictions for natural conditions with cycling DO. Consequently, EPA and TVA entered into a cooperative agreement to develop and test a fish growth model using DO-growth effect data and the other bioenergetic parameters common to established fish growth models. The EPA-TVA model also utilized many physiological parameters from another bioenergetics model developed by the University of Wisconsin Sea Grant Program (Hewett and Johnson, 1991). The resultant model (Shiao et al., 1993) forms the basis for the LSR growth study and the LSR site-specific DO criteria proposal. The 1993 model has been updated with data of better precision for rainbow trout respiration and food consumption relationships with temperature (From and Rasmussen, 1984) and with additional analysis of the rainbow trout growth studies from the EPA criteria document (Spoor, 1981).

This modeling approach provides a tool to address what EPA termed a most critical and poorly documented aspect of the dissolved oxygen criterion which is the acceptable minimum DO under cycles of varying periodicity.

2.0 LOWER SALUDA RIVER TROUT GROWTH STUDY

Prediction of trout growth in the LSR requires adequate knowledge of three key parameters: temperature, DO concentration, and food availability to trout. In-stream monitoring of temperature and DO, coupled with turbine intake DO, a turbine aeration model, and a tailwater water quality model, provided very good data and estimates of the actual temperature and DO to which trout are exposed. Food availability can be estimated by measuring fish growth, determining the temperature and DO during the period that growth was measured, and using the FISH bioenergetics model to estimate food consumption (availability). During the period of this growth study DO was sufficiently high that there was no significant effect of DO. Therefore, food consumption and growth were determined almost exclusively by temperature and food availability.

The growth study was conducted to closely simulate the typical pattern of rainbow trout release into the put, grow, and take trout fishery in the LSR. This pattern is characterized by periodic releases of catchable trout (8-10 inches) at several locations along the LSR.

The growth study began with the tagging of approximately 15,000 rainbow trout obtained from the South Carolina Department of Natural Resources Walhalla Fish Hatchery. The tagging efforts were divided into four nearly equal monthly batches beginning in November and concluding in February. The November batch of rainbow trout contained 3000 individuals while the remaining 3 batches contained approximately 4000 individuals.

Each monthly batch of rainbow trout (201.4 ± 49.7 mm total length, 136 ± 36.7 g; mean ± SD) was tagged with sequentially numbered, large format, soft Alphanumeric Visible Implant Elastomer (VI-alpha) tags produced by Northwest Marine Technology Inc. To conduct the tagging exercise, fish were crowded in a raceway and 10 - 20 individuals were transferred to 50 – L aerated holding containers containing an anesthetic (~ 90 mg/L MS 222). Once fish were anesthetized, each rainbow trout received one visible implant tag, injected using a syringe-like tag applicator designed and supplied by the manufacturer just below the surface of the clear adipose postorbital eye tissue. The fish were then returned to a separate raceway and held for a minimum of 21 days as required by federal regulation for drug clearance as mandated by the

Food and Drug Administration. During the holding period, fish were maintained in a flow-through raceway system at 4 – 12 C.

After the 21 day waiting period, all fish tagged for that month were individually weighted and measured {Total length (mm) and wet weight (g)} and the tag code recorded for each fish. All fish were left unfed two days prior to weighing and measuring. Each monthly batch of tagged fish were divided up into 1000 fish sub-units, with each sub-group designated for release at one of the four release locations. The December plantings were divided into 4 lots, one 300 batch (Lake Murray Dam), one 700 fish grouping (Saluda Shoals) and 2 1000 fish batches (Allied Signal and Quail Hollow) All other monthly stockings contained relatively equal stockings of 1000 (less tag loss). Monthly tagging numbers and tag retention rates appear in Table B1.

Trout were planted in four discreet releases, one each in December 2002, and in January, February and March of 2003. Release sites were three that are routinely used for the fishery (Saluda Shoals Park, Allied Signal, and Quail Hollow) plus an additional upstream site just below Lake Murray dam (Figure B-1).

The tagged fish arrived in hatchery trucks each outfitted with multiple cells to keep fish separated. To accomplish this, fish were taken from numbered raceways at the hatchery with each raceway containing known tagged fish. Fish were then placed in each of the designated cells for transport and release to the LSR. For the helicopter stocking, the fish were placed in the helicopter bucket and the pilot was given specific directions where to place the fish in the LSR. The remaining stockings were conducted via truck with each driver having a designated stocking location to release fish based on a pre-arranged raceway numbered matrix. During the January stocking, the lock on the access gate to Quail Hollow had been changed which required the driver to stock the fish at Allied Signal. To compensate and provide an even distribution of fish at all stocking locations, two 1000 batches of fish were released in the Quail Hollow area during February stocking event.

To determine trout growth, recovery of tagged trout was carried out by obtaining trout from the LSR by electrofishing as well as by obtaining weight and length data of freshly caught trout in the LSR sports fishery. Fish were collected from the LSR from April thru June using

primarily boat electrofishing means. The sampling area extended from the base of Lake Murray Dam to the I -26 bridge (Figure B-1). While no sampling was conducted below the I-26 Bridge, there were anecdotal reports of tagged fish being caught near Riverbanks Zoo, approximately 1 mile downstream. Boat electrofishing was conducted using a 16 foot aluminum boat outfitted with a generator, Smith-Root model VII-A Electrofisher, and anode and cathode umbrella droppers. Pulsed DC current was placed in the water and output amperage was adjusted to maximize electric current in the water. Voltage was regulated in attempts to maintain approximately 5 amps. During electrofishing sampling, electric current was directed to all microhabitats (shoals, ruffle run complexes and rock outcroppings) throughout the LSR. Electrofishing effort was typically expended over a two and three day period. All trout captured were placed in 100 L aerated containers. Fish were then evaluated to determine if they were tagged. Those fish that were tagged individual length and weight, data was collected, along with the corresponding tag color and number and recorded on field data sheets. Fish were then released back to the LSR in the general location of capture. Additionally untagged trout were collected and those individuals were enumerated and length data obtained.

2.1 Growth Results

A total of 111 tagged trout were collected, weighed and measured during April, May and June. The growth data were analyzed to determine if the data were sufficiently homogeneous to allow use of the entire data set for estimation of food availability in the LSR. There were several factors that might have caused growth (and food availability estimates) to be significantly different for one or more subsets of fish in the growth study. These factors included:

- Release site
- Release date
- Recapture site
- Size at release
- Condition at release
- Condition at recapture
- Direction of movement after release
- Distance of movement after release

- Time between release and recapture

Because growth was primarily influenced by temperature and food availability during the study period (DO was always high), any difference in these factors related to tailwater location or date could have caused differences in growth rate. In addition, size and condition of the fish might be related to fitness to the tailwater environment, including adaptability to feeding, as well as finding and competing for most-suitable habitat. Obviously, any factors that might tend to selectively crop fish through predation, movement out of the study area, or susceptibility to angler harvest could influence the study result. However, as these factors are always present, their exclusion, even if possible, would make the study less representative of the actual conditions for the trout remaining in the system.

2.2 Initial Data Analysis

A summary of the data collected for each recaptured fish from the growth study is provided in Table 2. The weight at release and recapture of the 111 fish used for the growth analysis is shown in Figure B-2. It is immediately evident that there was a large range in fish weight both at release and recapture. The range of trout weight at release is typical, as trout will feed and grow at different rates even in a hatchery environment where feeding is regular. The same phenomenon occurs in nature, as individual fish become more-or-less adapted to the natural habitat and more-or-less dominant in retaining better habitat niches.

2.3 Release Site and Date

The initial analysis of growth rate by release site and release date indicated that differences in median growth raters were relatively small (Table B-3). Because of periodic access problems, only 14 of the 16 potential release combinations (4 sites x 4 dates) were possible. The number of fish recaptures represented in these 14 combinations ranged from 1 to 14, with several releases being represented by fewer than a half-dozen individuals.

Comparing individual trout growth rates as a function of release site and release date indicated that only two of fourteen release groups had growth rates that appeared to be lower than the norm for the other release groups (Figures B-2a and 2b). The two groups with lower growth rates were the December group released at Quail Hollow and the March group released at Allied Signal. However, these two groups were represented by only four and one fish, respectively. With the large range of growth rates represented within each of the other groups and the fact that most groups in the March release had fish which lost weight following release, there was no reason to remove these two groups (five fish) from the overall data set of 111 trout.

2.4 Recapture Site

It is not possible to determine where an individual fish resided between the time of release and the time of recapture. For those fish that were recaptured near the release site it might be concluded that there was not a significant movement upstream or downstream from the point of release. Other fish that were recaptured farther from the release site may or may not have moved rapidly to the vicinity of the point of recapture. Given the pool-like nature of much of the study area, it is possible that many of the released trout moved freely up and down long stretches of the LSR and established no small-scale area of residency. On the assumption that recapture site might indicate the primary area of residency following release, the growth rate data were analyzed to see if there was a relationship between growth rate and recapture site (Figure B-3).

Growth rates were highly variable regardless of recapture site. Almost twice as many fish were recaptured between Allied Signal and Saluda Shoals than in the upstream or downstream sections. Median growth rates were slightly higher in this intermediate stretch (0.75 percent per day) as compared with upstream (0.68 percent per day) and downstream (0.65 percent per day). Given the highly variable growth rates, these relatively small differences were not seen as significant to the modeling effort. Fish from the Saluda Shoals releases were the most common at all recapture sites below RM 8 (and below the Saluda Shoals release site, ca. RM 8.3), and fish from the release immediately below the dam were most common above RM 8 (Figure B-4). The effect of movement from the site of release was analyzed separately from the site of recapture.

2.5 Growth and Movement

All four release times were characterized by fish moving both up- and down-stream from the release sites. In general, more fish moved downstream than upstream, with median movement ranging from 0.3 to 1.2 miles downstream. Although the pattern of movement differed slightly among the four release dates (Figure B-5) only fish from the January releases appeared to differ in any noticeable way from the overall pattern. This exception is perhaps more noteworthy because no fish were released at Quail Hollow during January, and fish that moved downstream from Quail Hollow were outside of the recapture area. In fact, only trout that were released at the two intermediate sites, Saluda Shoals and Allied Signal, could be sampled both above and below the release site. The Quail Hollow released fish were not sampled below the site of release and the fish released just below the dam were obviously limited to the immediate area of the release or movement downstream.

Analysis of fish movement for the two intermediate release sites indicated that both the Saluda Shoals and Allied Signal fish from the December release tended to move downstream (Figure B-6). [Note that in this and other figures some data points are identical and are superimposed in the figures, thus, the number of points visible may not equal the number of data points represented (n).] Later releases at Saluda Shoals followed this pattern, but the indications are that the Allied Signal fish may have moved upstream more frequently following the January and March releases (there was no February release at that site). The release of fish immediately below the dam may have populated the upstream section to the extent that competitive pressure produced the net downstream movement of Saluda Shoals fish. Of course, this movement pattern may also be a direct response to physical habitat characteristics.

Although the movement of trout released at the dam was limited to essentially staying put or moving downstream, and the Quail Hollow releases were only sampled at and above the release site, the analysis of this data is of interest (Figure B-7). The Lake Murray dam releases routinely had a median movement of 0.8 miles downstream. Perhaps the most interesting aspect of all the movement data was the relatively rapid upstream migration of several fish from the March release at Quail Hollow. Although

median movement was still less than one mile upstream, at least four fish moved 3-5 miles upstream in the period between release and sampling.

Given the wide range of dispersal seen among the fish (up to 5 miles up and downstream from the release site) the potential effect of this movement on growth was considered potentially important. As shown in Figure B-8, there was essentially no pattern seen in the growth data when distance and direction of post-release movement was included as a variable. A similar analysis broken down by release site and release date showed no appreciable pattern (Figures B-9-12). Figure B-13 shows the analysis of the relationship between time in the LSR after release and distance traveled between release and recapture. In general, there was no relationship between distance traveled and the time between release and recapture.

2.6 Size at Release and Growth Rate

The maximum growth rate of fish is in part dependent upon fish size, with smaller fish capable of higher food consumption rates and higher growth rates than larger fish. Hatchery feeding practices have routinely used size as a determinant of how much feed to provide trout (e.g., Leitritz, 1972: 2-inch fish 4x and 5-inch fish 2x the food fed 9-inch fish). The growth rate observed for fish in the LSR study indicated a weak relationship to size at release, with most growth rates >1 percent per day occurring in trout that were <150 grams at release (Figure B-14). Given the wide range of growth rates for fish of any particular size and the growth model expression of food availability as a percent of maximum consumption potential rather than absolute amounts of food consumed, there was no compelling need to consider size in determining food availability for the growth model.

2.7 Condition Factor and Growth Rate

Trout of any length may be judged as to their general condition by overall appearance and described as skinny, solid, plump, fat, etc. A quantitative term that describes the length and weight relationship is the “condition factor.” The condition factor (c.f.) is expressed as:

$$c.f. = (W \times 100) / (L)^3$$

where: W = weight in grams and L = length in cm.

A condition factor of 1.0 may be used as a general guide with factors <1 representing less than optimal condition in trout and those >1 representing well-fed trout.

Trout with lower initial condition factors tended to grow at a faster rate than those with higher initial condition factors (Figure B-15). This is an expected finding under circumstances where hatchery conditions can cause a wide spread in condition factor and where field conditions allow dispersal of fish into areas of adequate food. The overall range in initial condition factors (ca. 0.8-1.8 in this study) is not unusual in crowded fish culture units without extensive and frequent grading and separation of fish sizes. Once released into the LSR the fish were able to disperse and feed more uniformly. This tends to allow the skinny fish to bulk up and the fatter fish to become more trim, resulting in the growth rate relationship seen in Figure B-15. This phenomenon is probably typical of the LSR put, grow, and take trout fishery and does not complicate the use of this growth study with the bioenergetic growth model.

The change in condition factor is illustrated in Figure B-16. In general, trout with initial condition factors >1.2 became more trim and those with initial condition factors <1.0 became more robust. The central tendency in the population was to develop a condition factor of about 1.1. This same trend was evident for trout recaptured from each of the release periods (Figures B-17a and b). This trend towards uniformity of condition factor is clearly evident in the decreasing variability in the length-weight relationships between release and recapture (Figure B-18) where r^2 values improved from 0.61 to 0.87 during residency in the LSR. The trend to greater uniformity in condition simplifies the application of the bioenergetic growth model.

Because growth was related to condition factor, the data were analyzed to see if there was any relationship between post-release movement in the LSR and the condition factor of the trout at time of release (Figure B-19). There was no effect of condition factor on the movement of trout following release.

A final analysis of the data was to determine if there was any relationship between growth rate and the time between release and recapture. Except for an apparently reduced growth rate for fish captured shortly after the March release, growth was essentially independent of residence time. The slightly reduced growth seen in the early recapture of the March release is probably attributable to a period of recovery from handling procedures inherent in capture, transport and release of fish in the planting process. Some period of time is also probably needed for the fish to adapt to feeding in nature as opposed to feeding under hatchery conditions. It is likely that all four release periods underwent the same handling stress and adaptation process, but the December-February releases experienced that pattern long before the initial recapture effort in April 2003.

2.8 LSR Trout Fishery Information

Additional information collected during the growth study revealed significant numbers of rainbow and brown trout that appear to be carryovers from previous stockings. A total of 441 tagged and untagged trout were collected from the LSR, with 253 rainbow and 188 brown trout comprising the total catch.

Of the 441 rainbow and brown trout collected, 74 exceeded 16 inches in length, or nearly one in every six fish. The largest rainbow and brown trout collected during these surveys were 22 and 24 inches, respectively, with all fish appearing robust and healthy. Further examination of the data indicates that trout do appear to carryover from annual stockings. Figure B-21 illustrates that at a minimum two distinct age classes of fish were collected in the LSR during the study. However, without otolith examination it is not readily possible to determine what year classes these individuals represent. One likely contributor to this observed carryover is likely is the higher DO levels maintained in the LSR since the inception of SCE&G's turbine venting program than those DO levels historically observed.

3.0 SUMMARY

A detailed analysis of growth patterns and relationships with potentially significant variables relating to the LSR sites, release dates, and fish size indicated that there were no factors requiring either data deletion or subdivision prior to the use of observed growth rates for calculating food availability. Consequently growth rate data from all 111 recaptured trout were used to calibrate the bioenergetics model for the LSR.

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SOUTH CAROLINA ELECTRIC & GAS CO.
COLUMBIA, SOUTH CAROLINA

SALUDA DO STANDARD PROJECT
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SALUDA DO STANDARD PROJECT

LOWER SALUDA RIVER TROUT GROWTH STUDY

AUGUST 2003

Prepared by:

Paladin Water Quality Consulting

Kleinschmidt Associates
Energy and Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS CO.

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Energy and Water Resource Consultants

Table B-1: Number tagged, number of survivors, survival (%), number retaining tags, and proportion (%) retaining tags of rainbow trout tagged with large format, soft VI-alpha tags and held for 25 days

TAG DATE	TAGGED (N)	SURVIVORS (N)	SURVIVAL (%)	NUMBER RELEASED (N)	RETENTION (%)
12/8/02	3000	2975	99.2	2405	80.8
1/6/03	4000	3780	94.5	2979	78.8
1/20/03	4400	4281	97.3	3331	77.8
2/13/03	4000	3251	81.3	3089	95.0
Total	15400	14287	92.8	11804	82.6

Table B-2: Data on rainbow trout recaptured and used in the Bioenergetics Model from the Lower Saluda River Growth Study April- June

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted)	Stock Date	Recaptured Date
1	yellow	C27	242	307	179	353	Sandy Beach, way point 106	3	Saluda Shoals Park	2	12/17/2002	4/2/2003
2	yellow	D55	217	230	157	171	Sandy Beach, way point 106	3	Saluda Shoals Park	2	12/17/2002	4/2/2003
3	yellow	22D	233	290	164	299	Corley Island shoal	7	Saluda Shoals Park	2	12/17/2002	4/3/2003
4	yellow	X26	253	298	216	302	downstream of I-20 at house	10	Quail Hollow	4	12/17/2002	4/3/2003
5	yellow	R73	261	324	221	438	tailrace, near spillway inflow	1	Lake Murray Dam	1	12/17/2002	4/28/2003
6	yellow	50E	245	315	197	347	above Sandy Beach (near shoal)	2	Saluda Shoals Park	2	12/17/2002	4/28/2003
7	yellow	D42	233	290	156	273	Sandy Beach	3	Saluda Shoals Park	2	12/17/2002	4/28/2003
8	yellow	L97	243	320	165	379	Upstream of Rawls Creek at shoal	5	Saluda Shoals Park	2	12/17/2002	4/28/2003
9	yellow	R72	245	325	156	350	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
10	yellow	K20	244	315	143	328	downstream of I-20 bridge	11	unknown	n/a	12/17/2002	5/1/2003
11	yellow	J59	265	348	234	501	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
12	yellow	L41	234	278	204	294	downstream of I-20 bridge	11	Saluda Shoals Park	2	12/17/2002	5/1/2003
13	yellow	G73	239	305	210	375	downstream of I-20 bridge	11	Quail Hollow	4	12/17/2002	5/1/2003
14	yellow	I38	208	275	117	211	downstream of I-20 bridge	11	Saluda Shoals Park	2	12/17/2002	5/1/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
15	yellow	09D	239	302	168	309	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
16	yellow	54E	250	335	194	461	Corley Island shoal	7	Allied Signal	3	12/17/2002	5/1/2003
17	yellow	35C	277	345	204	472	Corley Island shoal	7	Saluda Shoals Park	2	12/17/2002	5/1/2003
18	yellow	O7E	239	282	113	255	upstream of Quail Hollow, mile 4+	12	Saluda Shoals	2	12/17/2002	5/20/2003
19	yellow	X04	216	281	197	236.0	upstream of Quail Hollow, mile 4+	12	Quail Hollow	4	12/17/2002	5/20/2003
20	yellow	B97	245	311	209	283	upstream of Quail Hollow, mile 4+	12	Quail Hollow	4	12/17/2002	5/20/2003
21	yellow	56D	254	333	179	377	asphalt plant, mile 4+	11	Allied Signal	3	12/17/2002	5/20/2003
22	yellow	J22	245	336	166	361	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	12/17/2002	6/2/2003
23	yellow	L92	224	334	165	415	Corley Island shoal	7	Saluda Shoals	2	12/17/2002	6/2/2003
24	red	A96	240	295	185	307	Sandy Beach, way point 106	3	Lake Murray Dam	1	1/7/2003	4/2/2003
25	red	S22	220	266	145	222	Sandy Beach, way point 106	3	Lake Murray Dam	1	1/7/2003	4/2/2003
26	red	46B	212	271	102	223	Sandy Beach, way point 106	3	Saluda Shoals Park	2	1/8/2003	4/2/2003
27	red	B84	207	258	133	206	Sandy Beach, way point 106	3	Saluda Shoals Park	2	1/8/2003	4/2/2003
28	red	C59	260	308	238	313	downstream of Hope Ferry Landing	4	Saluda Shoals Park	2	1/8/2003	4/2/2003
29	red	64K	231	275	125	228	Corley Island shoal	7	Saluda Shoals Park	2	1/8/2003	4/3/2003
30	red	50G	226	290	162	227	Corley Island shoal	7	Saluda Shoals Park	2	1/8/2003	4/3/2003
31	red	P13	250	285	183	252	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003
32	red	88L	185	279	70	243	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
33	red	77D	236	275	168	227	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003
34	red	E36	237	280	166	227	above Sandy Beach (near shoal)	2	Allied Signal	3	1/9/2003	4/28/2003
35	red	E17	213	282	130	240	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	1/7/2003	4/28/2003
36	red	85E	220	304	130	319	Upstream of Rawls Creek at shoal	5	Saluda Shoals Park	2	1/8/2003	4/28/2003
37	red	A44	228	305	171	333	Upstream of Rawls Creek at shoal	5	Saluda Shoals Park	2	1/8/2003	4/28/2003
38	red	80M	219	271	124	230	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/28/2003
39	red	92I	264	315	223	339	downstream of I-20 bridge	11	Allied Signal	3	1/9/2003	5/1/2003
40	red	P97	230	283	146	232	downstream of I-20 bridge	11	Allied Signal	3	1/9/2003	5/1/2003
41	red	51D	217	280	125	242	Honeywell Intake	9	Saluda Shoals Park	2	1/8/2003	5/1/2003
42	red	P95	226	298	130	311	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/1/2003
43	red	52M	240	296	157	282	Corley Island shoal	7	Allied Signal	3	1/9/2003	5/1/2003
44	red	V97	217	284	150	272	Corley Island shoal	7	Allied Signal	3	1/9/2003	5/1/2003
45	red	63C	228	301	155	282	Honeywell Intake	9	Saluda Shoals Park	2	1/7/2003	5/20/2003
46	red	K51	223	278	112	206	Honeywell Intake	9	Lake Murray Dam	1	1/8/2003	5/20/2003
47	red	P72	228	289	126	222	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/20/2003
48	red	07I	255	317	235	326	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/20/2003
49	red	F67	224	313	168	339	asphalt plant, mile 4+	11	Allied Signal	3	1/9/2003	5/20/2003
50	red	H29	205	280	91	231	Corley Island shoal, mile 7+	7	Allied Signal	3	1/9/2003	5/20/2003
51	red	82H	221	329	141	434	Corley Island shoal, mile 7+	7	Saluda Shoals	3	1/8/2003	5/20/2003
52	red	23K	245	311	180	298	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	1/7/2003	6/2/2003
53	red	19B	232	320	102	343	downstream of Saluda Shoals	4	Lake Murray Dam	1	1/7/2003	6/2/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
54	red	50N	243	335	179	397	downstream of Saluda Shoals Park	4	Saluda Shoals	2	1/8/2003	6/2/2003
55	red	P41	203	289	149	264	downstream of Saluda Shoals Park, above "Logan's Point"	5	Saluda Shoals	2	1/8/2003	6/2/2003
56	orange	V09	224	258	119	194	Sandy Beach, way point 106	3	Lake Murray Dam	1	2/11/2003	4/2/2003
57	orange	I77	232	277	141	222	Sandy Beach, way point 106	3	Lake Murray Dam	1	2/11/2003	4/2/2003
58	orange	D20	247	273	165	244	downstream of Hope Ferry Landing	4	Lake Murray Dam	1	2/11/2003	4/2/2003
59	orange	Y10	233	244	153	161	Corley Island shoal	7	Saluda Shoals Park	2	2/12/2003	4/3/2003
60	orange	88J	217	247	112	168	Corley Island shoal	7	Quail Hollow	4	2/13/2003	4/3/2003
61	orange	N04	235	252	136	166	Corley Island shoal	7	Saluda Shoals Park	2	2/12/2003	4/3/2003
62	orange	47A	247	265	145	210	Corley Island shoal	7	Saluda Shoals Park	2	2/12/2003	4/3/2003
63	orange	46V	222	227	102	147	downstream of I-20 at house	10	Quail Hollow	4	2/13/2003	4/3/2003
64	orange	73V	218	254	113	185	tailrace, near spillway inflow	1	Lake Murray Dam	1	2/11/2003	4/28/2003
65	orange	G07	212	251	107	171	above Sandy Beach ("flat")	2	Lake Murray Dam	1	2/11/2003	4/28/2003
66	orange	U87	219	260	118	215	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	2/11/2003	4/28/2003
67	orange	26V	220	252	154	179	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	2/11/2003	4/28/2003
68	orange	90P	208	260	108	214	Upstream of Rawls Creek at shoal	5	Lake Murray Dam	1	2/11/2003	4/28/2003
69	orange	09Y	186	288	62	246	downstream of I-20 bridge	5	Lake Murray Dam	1	2/11/2003	5/1/2003
70	orange	Y79	249	295	146	266	downstream of I-20 bridge	10	Quail Hollow	4	2/13/2003	5/1/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
71	orange	13B	225	265	126	218	downstream of I-20 bridge	10	Saluda Shoals Park	2	2/12/2003	5/1/2003
72	orange	74A	232	270	124	186	downstream of I-20 bridge	10	Quail Hollow	4	2/13/2003	5/1/2003
73	orange	M37	249	264	131	208	Honeywell intake area	9	Saluda Shoals Park	2	2/12/2003	5/1/2003
74	orange	18A	236	257	143	165	Honeywell intake area	9	Saluda Shoals Park	2	2/12/2003	5/1/2003
75	orange	73B	224	274	131	211	Corley Island shoal	7	Lake Murray Dam	1	2/11/2003	5/1/2003
76	orange	R44	261	306	183	360	asphalt plant, mile 4+	11	Quail Hollow	4	2/13/2003	5/20/2003
77	orange	62P	203	264	112	193	BC Components intake	8	Saluda Shoals	2	2/12/2003	5/20/2003
78	orange	J45	230	273	148	216	BC Components intake	8	Saluda Shoals	2	2/12/2003	5/20/2003
79	orange	D60	203	241	106	130	Corley Island shoal, mile 7+	7	Quail Hollow	4	2/13/2003	5/20/2003
80	orange	R77	216	280	100	250	Corley Island shoal, mile 7+	7	Saluda Shoals	2	2/12/2003	5/20/2003
81	orange	17C	223	282	142	239	downstream of Saluda Shoals Park	4	Lake Murray Dam	1	2/11/2003	6/2/2003
82	green	R76	267	278	234	243	Sandy Beach, way point 106	3	Lake Murray Dam	1	3/11/2003	4/2/2003
83	green	R79	260	258	173	165	SCE&G boat landing - tailrace, way point 108	1 (red)	Lake Murray Dam	1	3/11/2003	4/2/2003
84	green	Z71	237	279	215	243	downstream of Hope Ferry Landing	4	Quail Hollow	4	3/14/2003	4/2/2003
85	green	22R	215	226	134	126	Corley Island shoal	7	Allied Signal	3	3/13/2003	4/3/2003
86	green	98G	220	230	140	155	Corley Island shoal	7	Saluda Shoals Park	2	3/12/2003	4/3/2003
87	green	L34	245	245	192	177	Corley Island shoal	7	Saluda Shoals Park	2	3/12/2003	4/3/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
88	green	O00	215	270	108	220	above Sandy Beach (near shoal)	2	Saluda Shoals Park	2	3/12/2003	4/28/2003
89	green	N24	242	266	176	225	Sandy Beach	3	Lake Murray Dam	1	3/11/2003	4/28/2003
90	green	47G	238	265	173	203	Sandy Beach	3	Lake Murray Dam	1	3/11/2003	4/28/2003
91	green	81L	236	265	148	191	Upstream of Rawls Creek at shoal	5	Lake Murray Dam	1	3/11/2003	4/28/2003
92	green	O57	244	280	154	219	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
95	green	S64	280	300	255	327	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
93	green	91Y	246	278	177	222	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
94	green	37G	235	269	152	238	Honeywell Intake	9	Lake Murray Dam	1	3/11/2003	5/1/2003
95	green	Z21	237	285	215	301	Corley Island shoal	7	Saluda Shoals Park	2	3/12/2003	5/1/2003
96	green	30T	238	280	138	204	Quail Hollow, mile 3 to mile 4	12	Quail Hollow	4	3/14/2003	5/20/2003
97	green	H42	252	305	178	213.0	Honeywell Intake	9	Quail Hollow	4	3/14/2003	5/20/2003
98	green	11C	230	272	178	204.0	Honeywell Intake	9	Saluda Shoals	2	3/12/2003	5/20/2003
100	green	P34	281	326	252	366	BC Components intake	8	Quail Hollow	4	3/14/2003	5/20/2003
101	green	82R	230	272	186	189	asphalt plant, mile 4+	11	Quail Hollow	4	3/14/2003	5/20/2003
102	green	T65	216	284	167	216	upstream of I-20, ~mile 4.5	13	Quail Hollow	4	3/14/2003	5/20/2003
103	green	G41	300	334	360	372	BC Components intake	8	Lake Murray Dam	1	3/11/2003	5/20/2003
104	green	P89	235	285	145	286	Corley Island shoal, mile 7+	7	Saluda Shoals	2	3/12/2003	5/20/2003
105	green	09Y	225	272	155	186	Corley Island shoal, mile 7+	7	Lake Murray Dam	1	3/11/2003	5/20/2003
106	green	08R	210	262	134	209	Corley Island shoal, mile 7+	7	Lake Murray Dam	1	3/11/2003	5/20/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
107	green	28B	193	213	88	74	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	3/11/2003	6/2/2003
108	green	G67	230	271	126	211.5	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	3/11/2003	6/2/2003
109	green	72Y	259	291	159	259.0	Sandy Beach (upstream of Saluda Shoals Park landing)	3	Lake Murray Dam	1	3/11/2003	6/2/2003
110	green	E35	250	284	157	213.0	Sandy Beach (upstream of Saluda Shoals Park landing)	3	Quail Hollow	4	3/14/2003	6/2/2003
111	green	N25	233	272	146	204.0	downstream of Saluda Shoals Park, above "Logan's Point"	5	Lake Murray Dam	1	3/11/2003	6/2/2003

Table B-3: Median growth rate (n) for each of the fourteen combinations of release site and release date. Overall median (n) growth rates are shown for each site, each date, and for all 111 recaptured trout. Growth rates are g/g/day and the overall rate of 0.0071 g/g/day is 0.71 percent weight gain per day.

	DEC.	**JAN.**	**FEB.**	**MAR.**	**ALL MONTHS**
Below Dam	0.0072 (2)	0.0070 (6)	0.0095 (11)	0.0048 (13)	**0.0075 (32)**
Saluda Shoals	0.0077 (11)	0.0083 (12)	0.0075 (9)	0.0063 (6)	**0.0076 (38)**
Allied Signal	0.0078 (6)	0.0065 (14)	No release	-0.0030 (1)	**0.0071 (21)**
Quail Hollow	0.0030 (4)	No release	0.0095 (6)	0.0055 (10)	**0.0056 (20)**
All Sites	**0.0071 (23)**	**0.0072 (32)**	**0.0083 (26)**	**0.0056 (30)**	**0.0071 (111)**

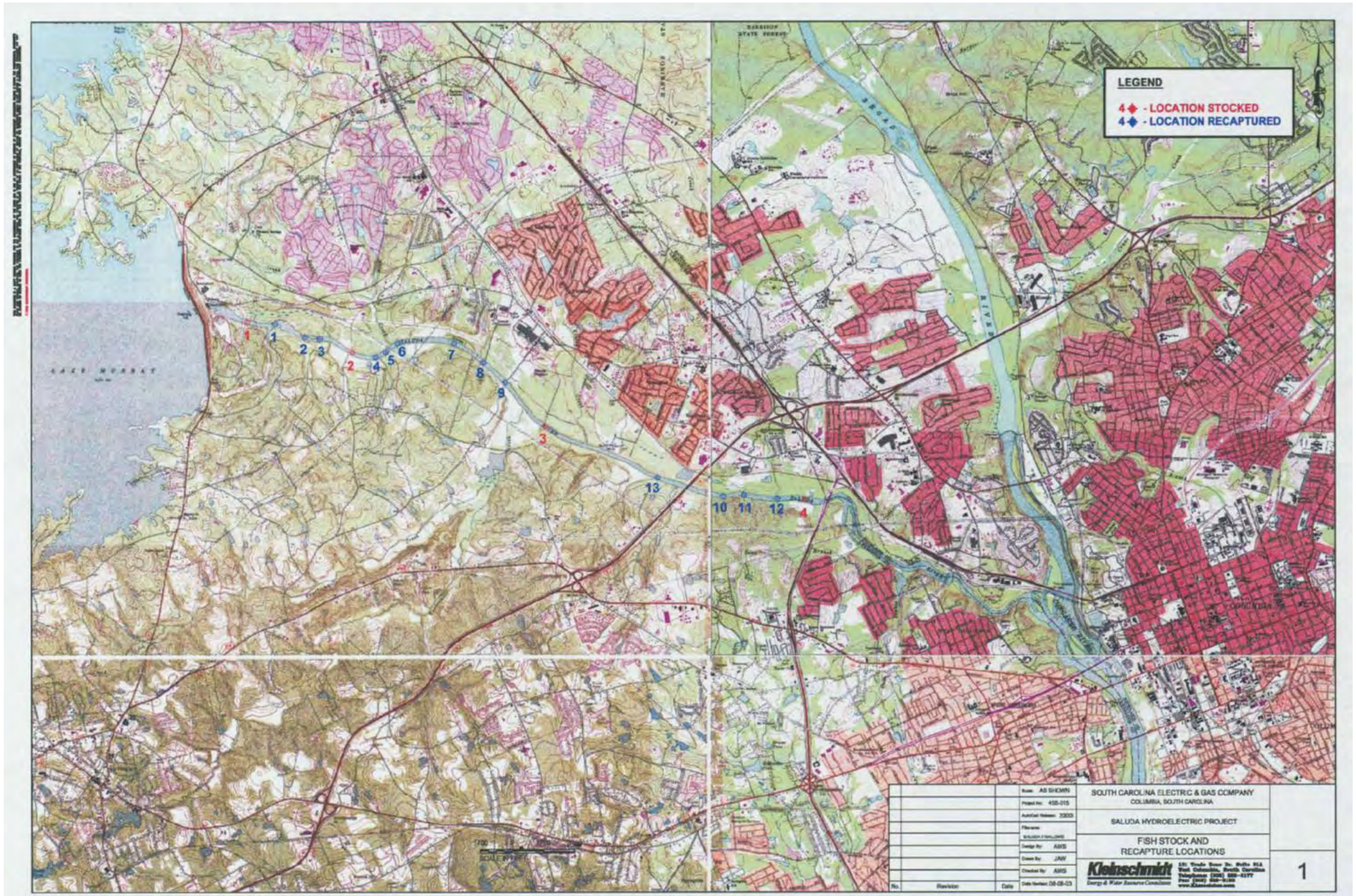


Figure B-1: Fish Stock and Recapture Locations

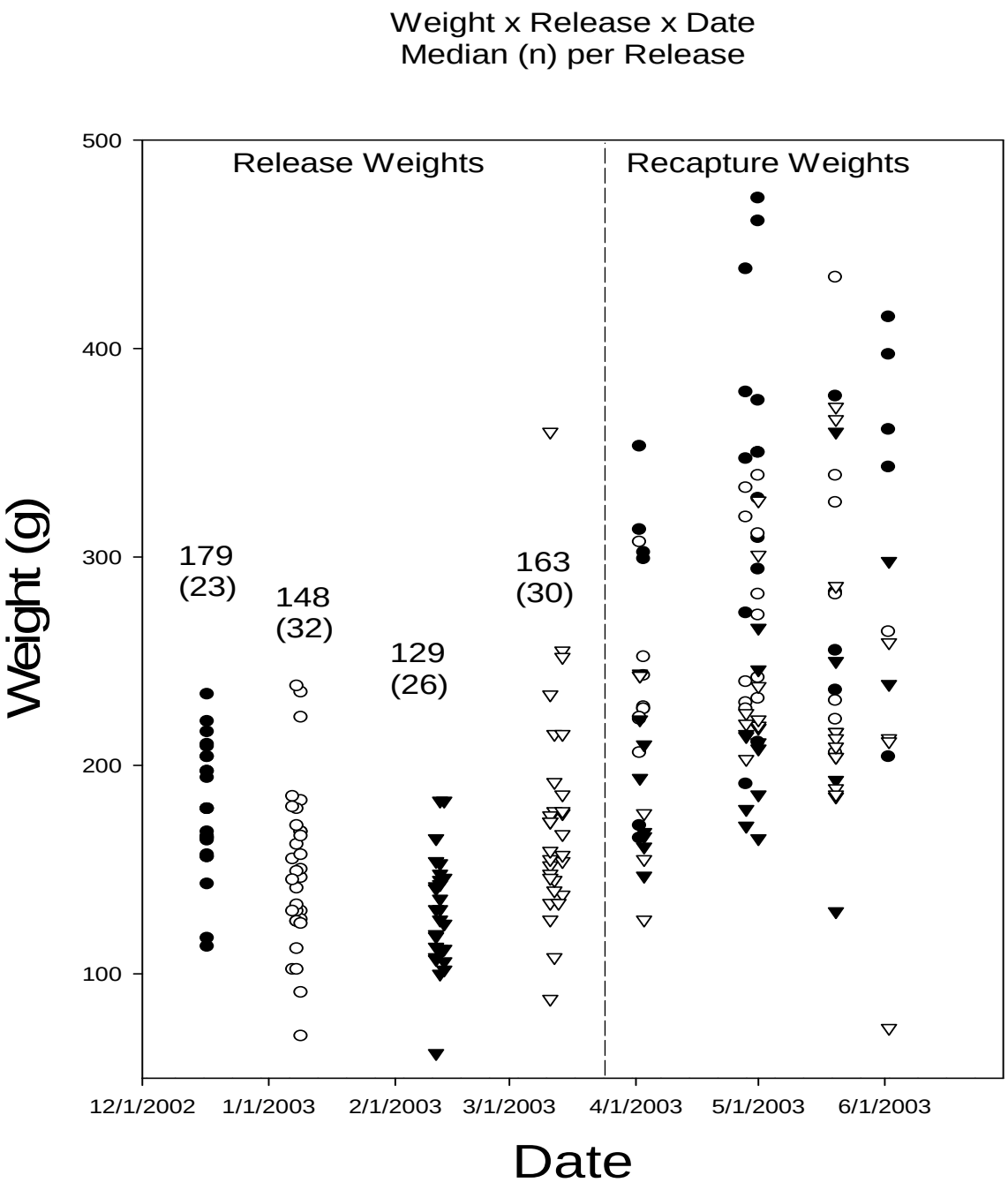
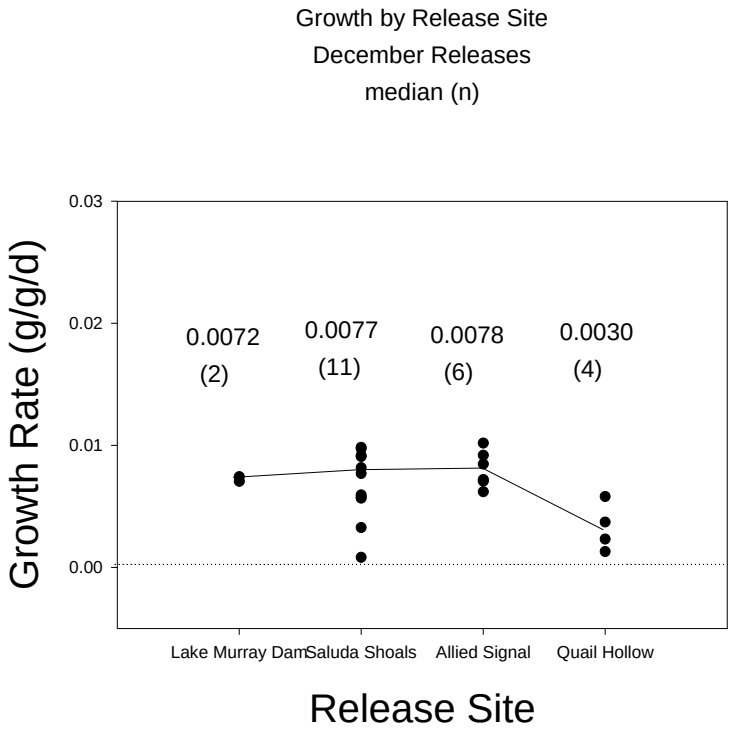


Figure B-2: Weight (g) of Recaptured Trout at Time of Release and Time of Recapture



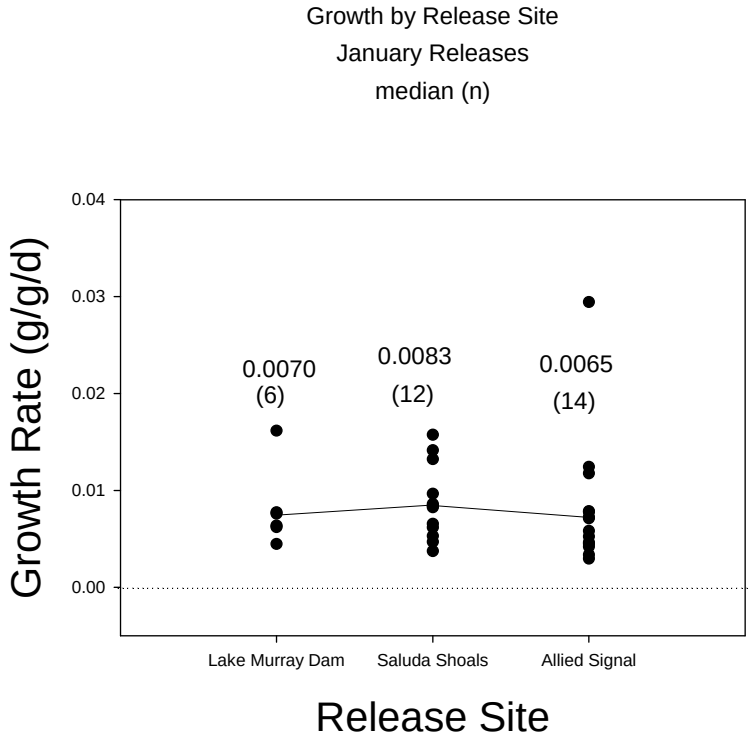
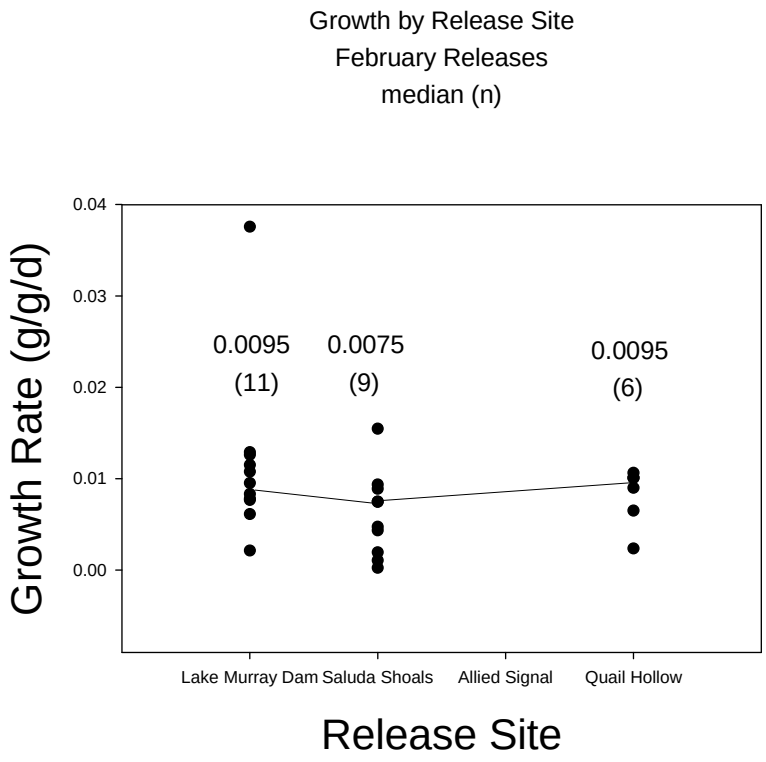


Figure B-2a: Growth Rate by Release Site for December and January Releases



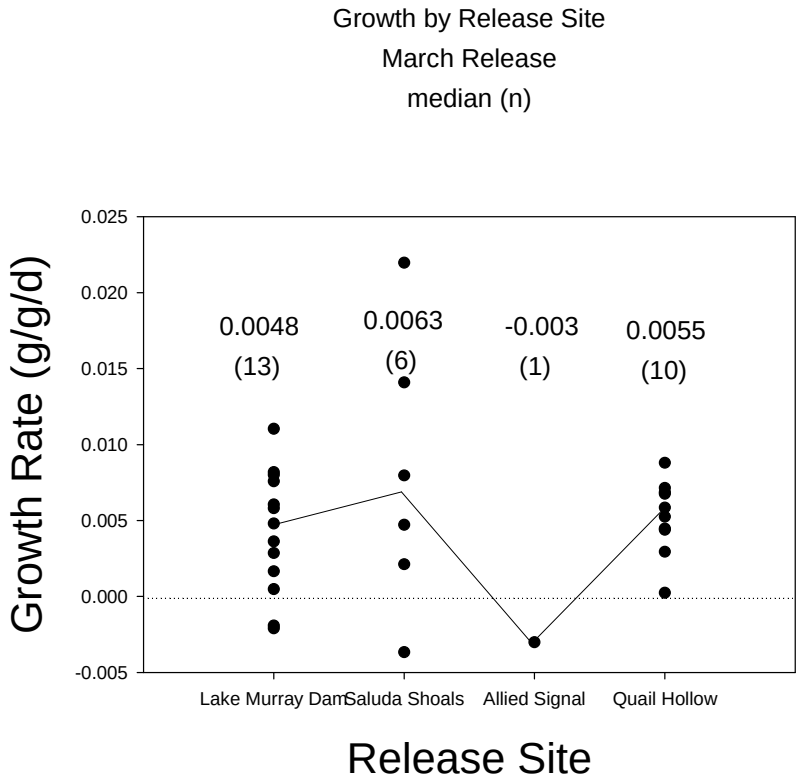


Figure B-2b: Growth Rate of Trout by Release Site for the February and March Releases

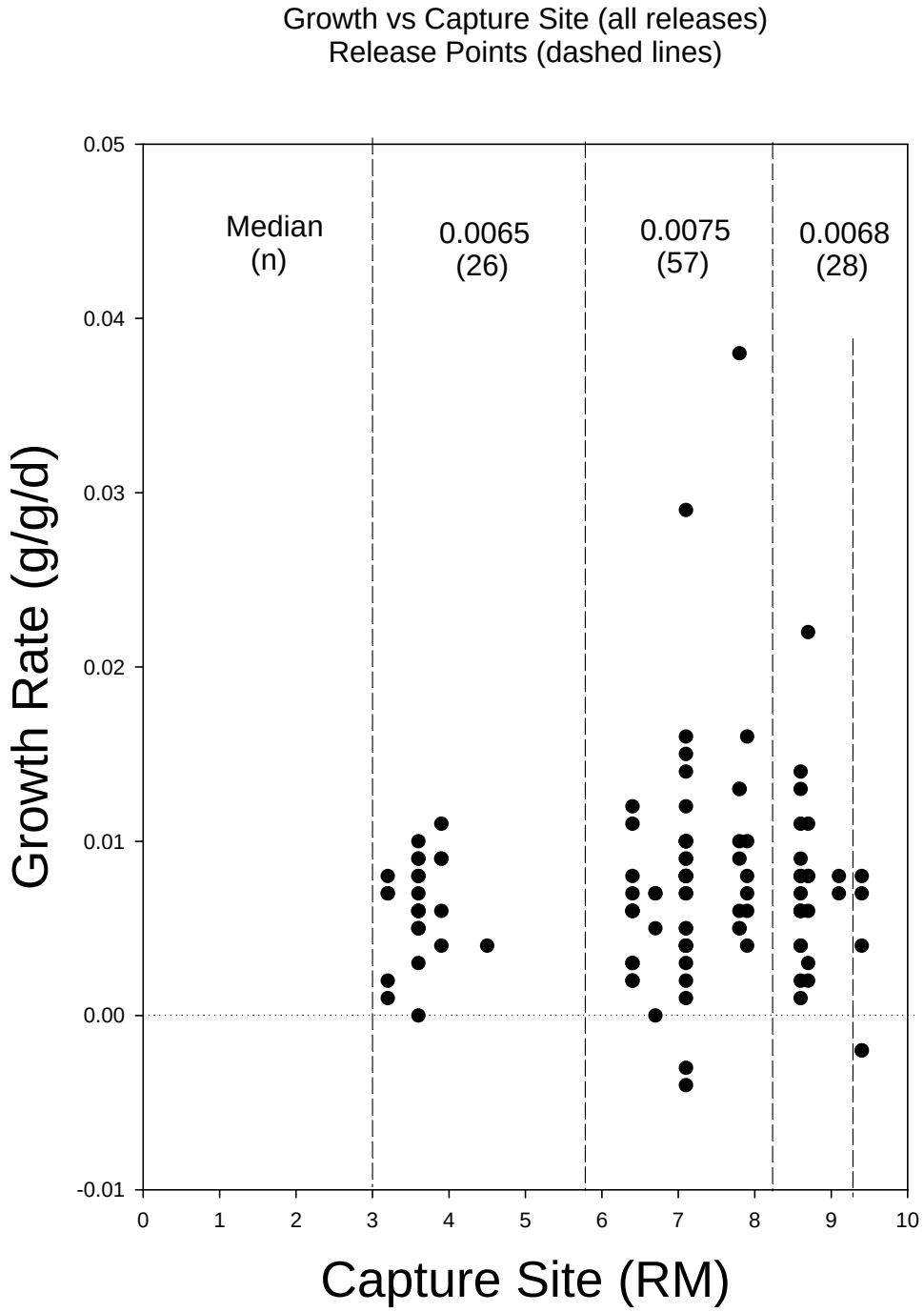


Figure B-3: Growth Rate is Shown as a Function of Recapture Location by River Mile. Release points are indicted by vertical dashed lines. From downstream to upstream these are Quail Hollow, Allied Signal, Saluda Shoals Park, and the immediate vicinity of the Lake Murray dam. No recapture efforts were made below the Quail Hollow release point (RM 3).

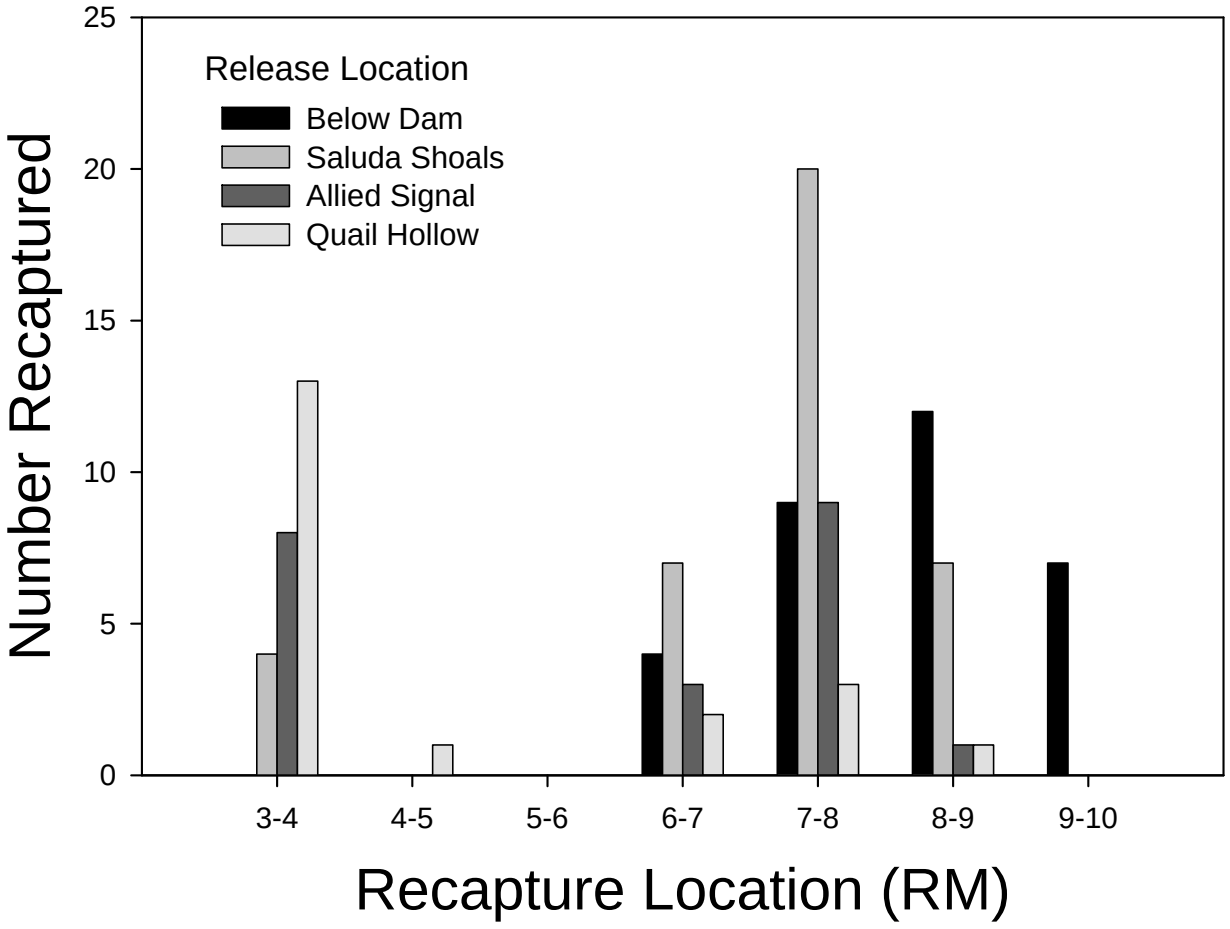


Figure B-4: Recapture Location (RM) and Site of Release. There was Limited Recapture Effort Between RM 4 and 6.

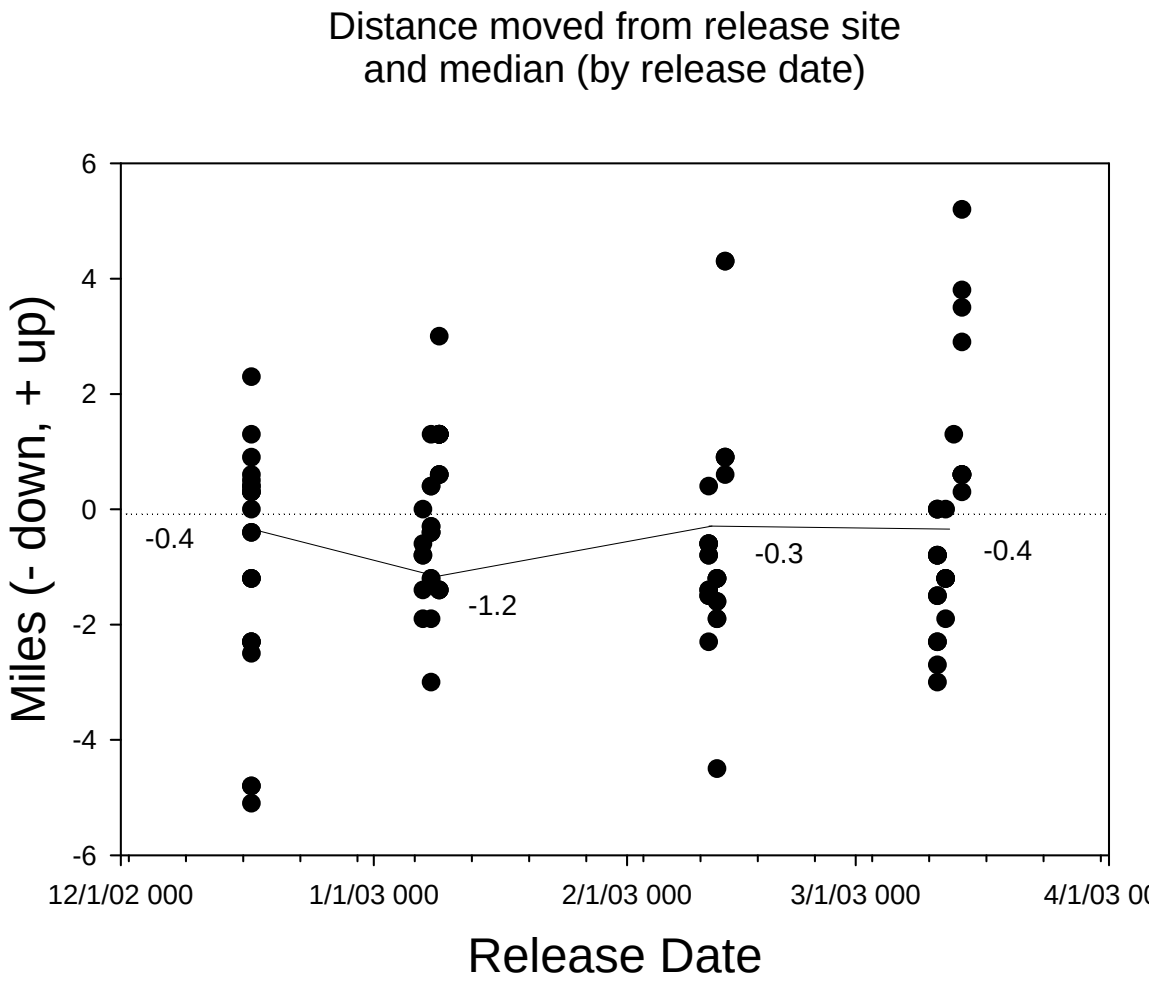


Figure B-5: Distance Moved from Release Site for Each Release Date. Median Distances are Shown on the Graph for each Release Date

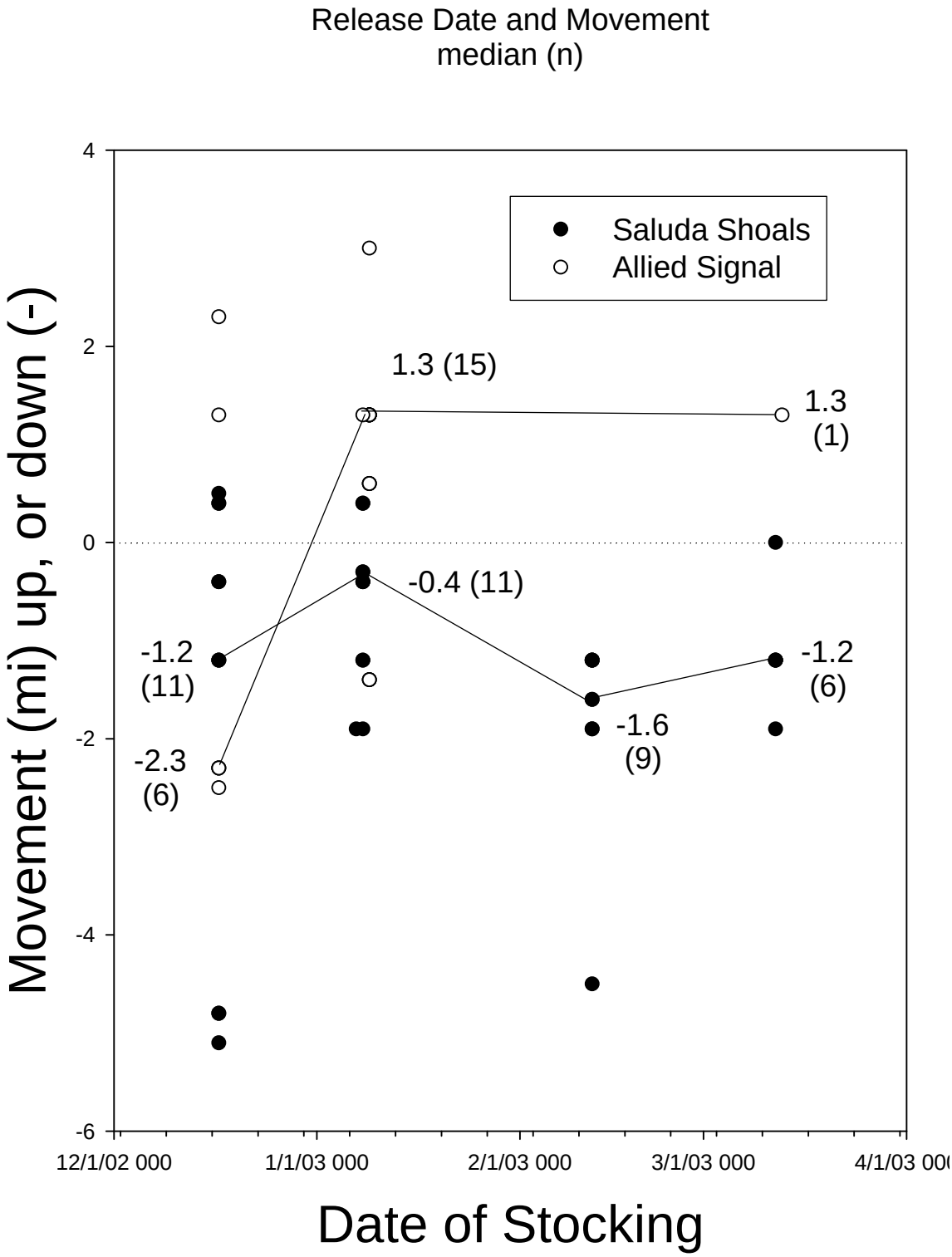


Figure B-6: Movement of Trout by Stocking Date from the Two Intermediate Release Sites where Upstream and Downstream Movement were not Limited by the Dam or by Sampling Site Limitations

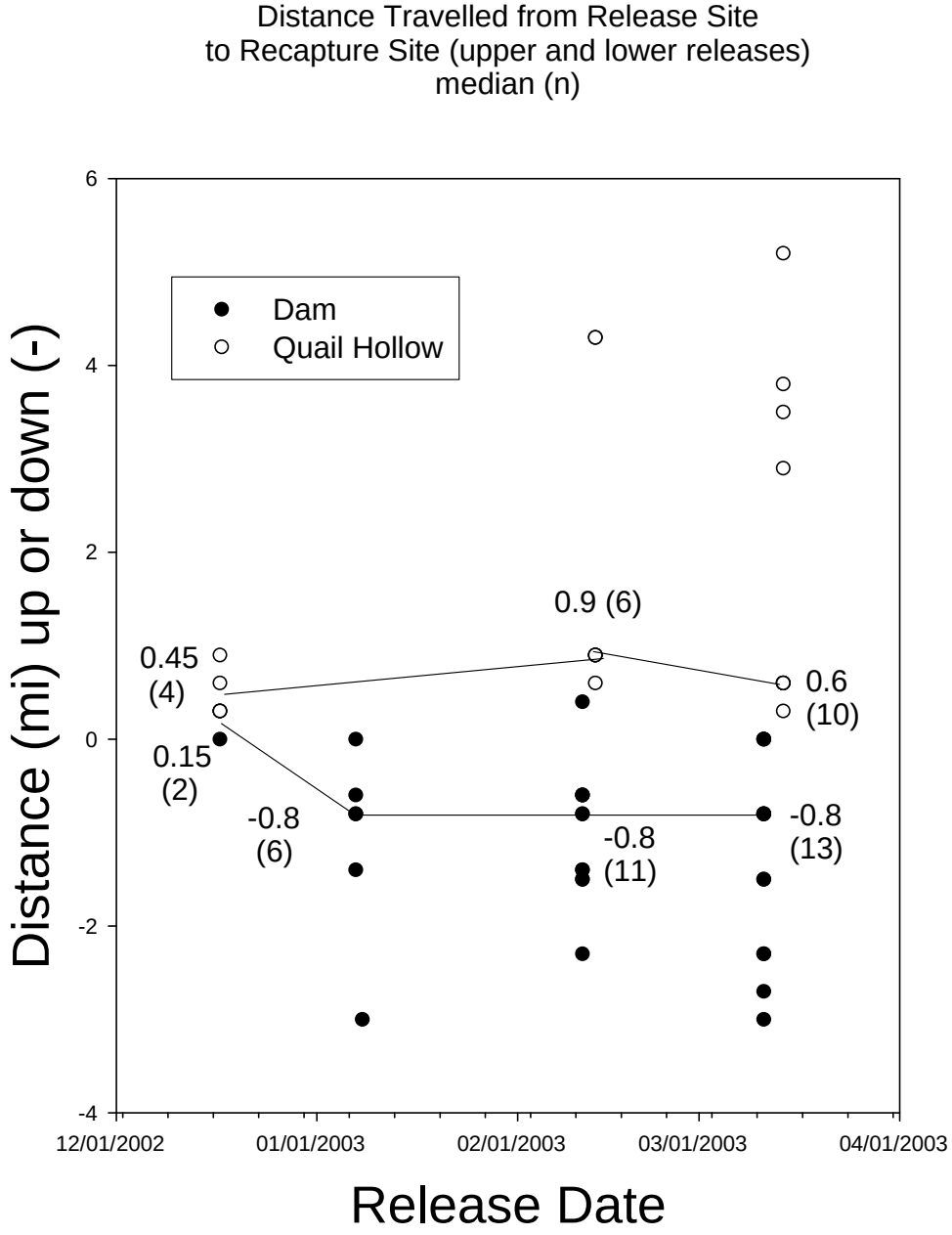


Figure B-7: Movement of Fish Following Release at Various Times at the Upstream Site Near Lake Murray Dam and at Quail Hollow

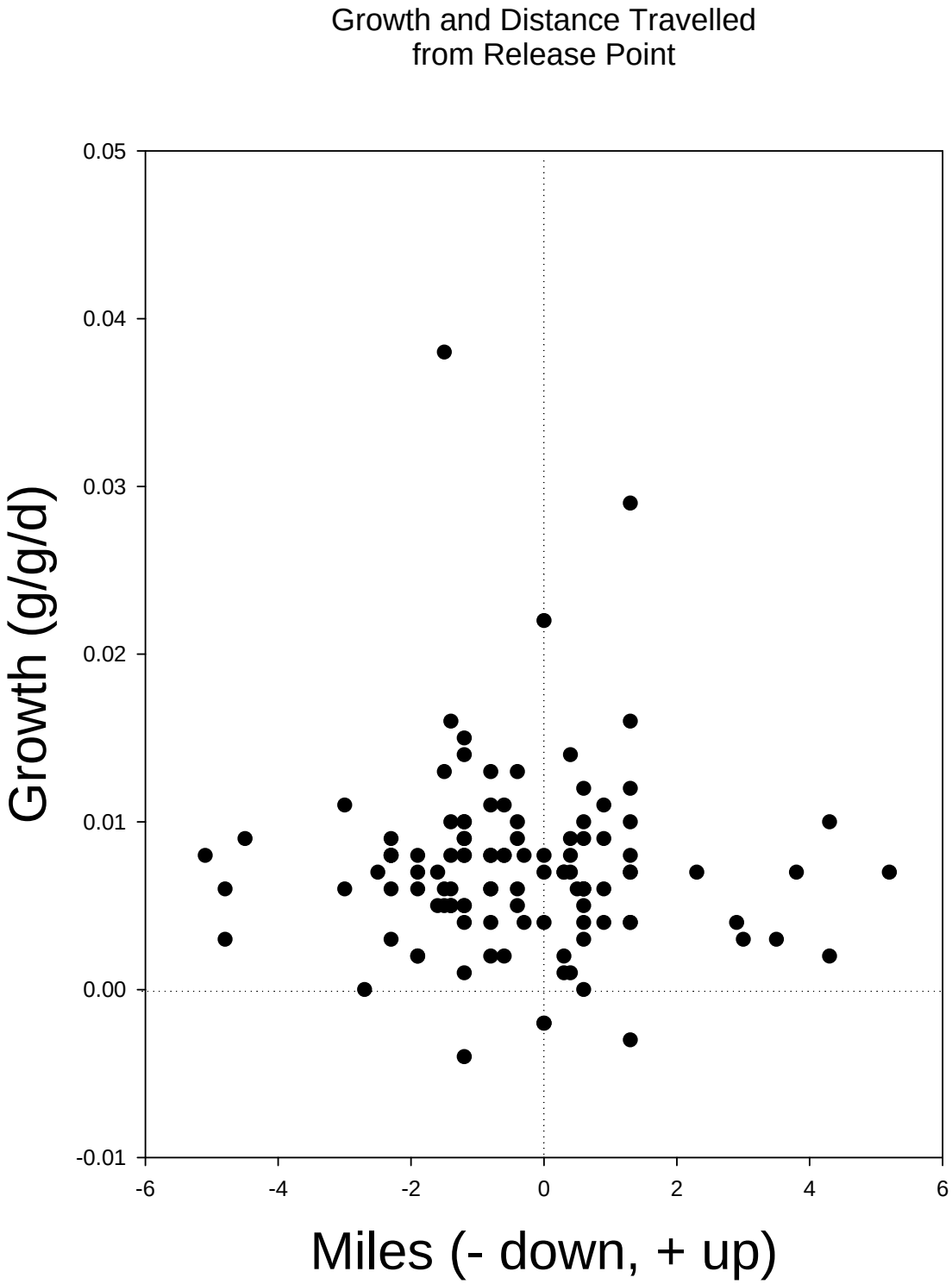


Figure B-8: This Figure Shows the Growth Rates for All 111 Fish as a Function of Their Movement Up or Downstream Following Release

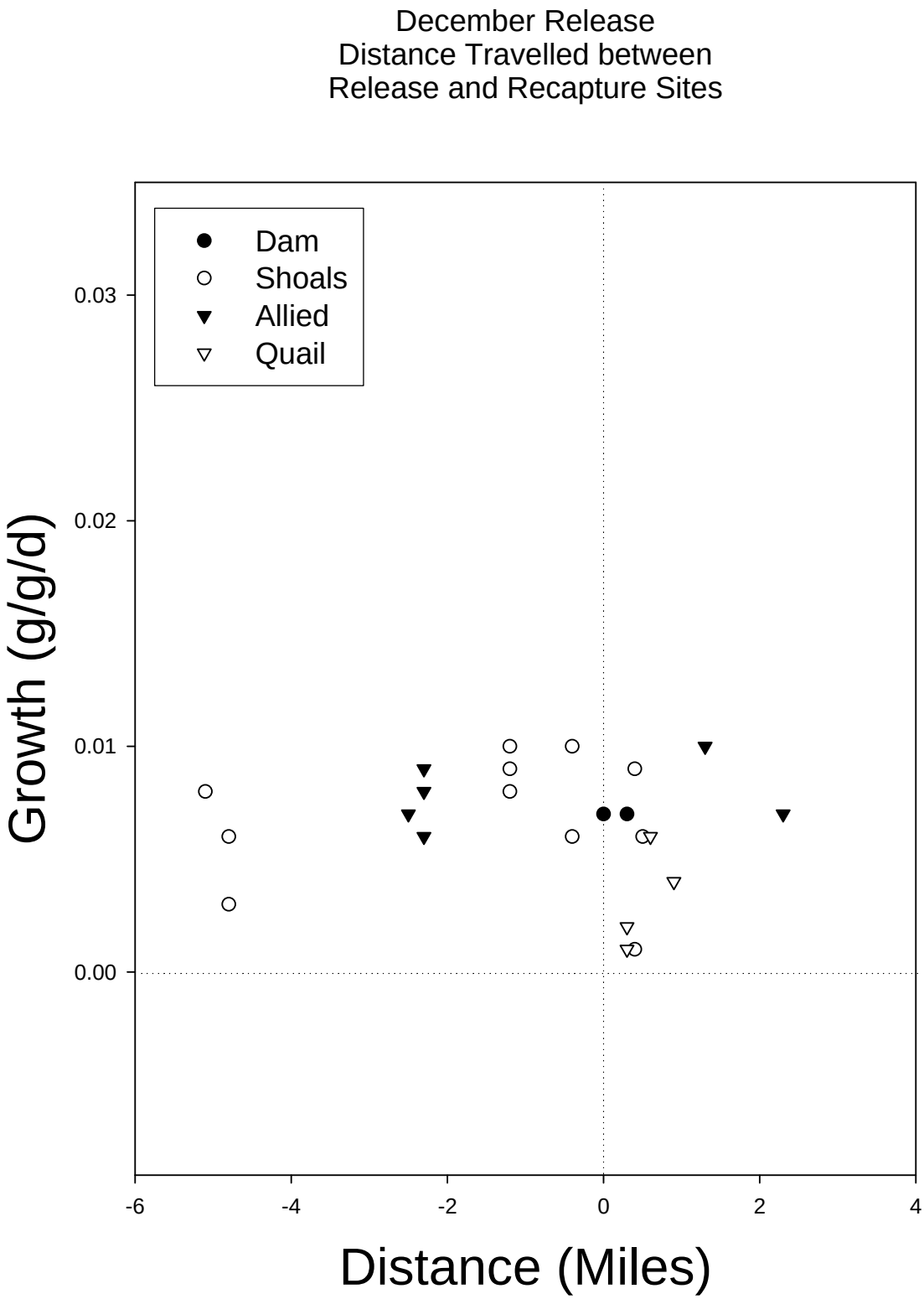


Figure B-9: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in December at the Four Release Sites

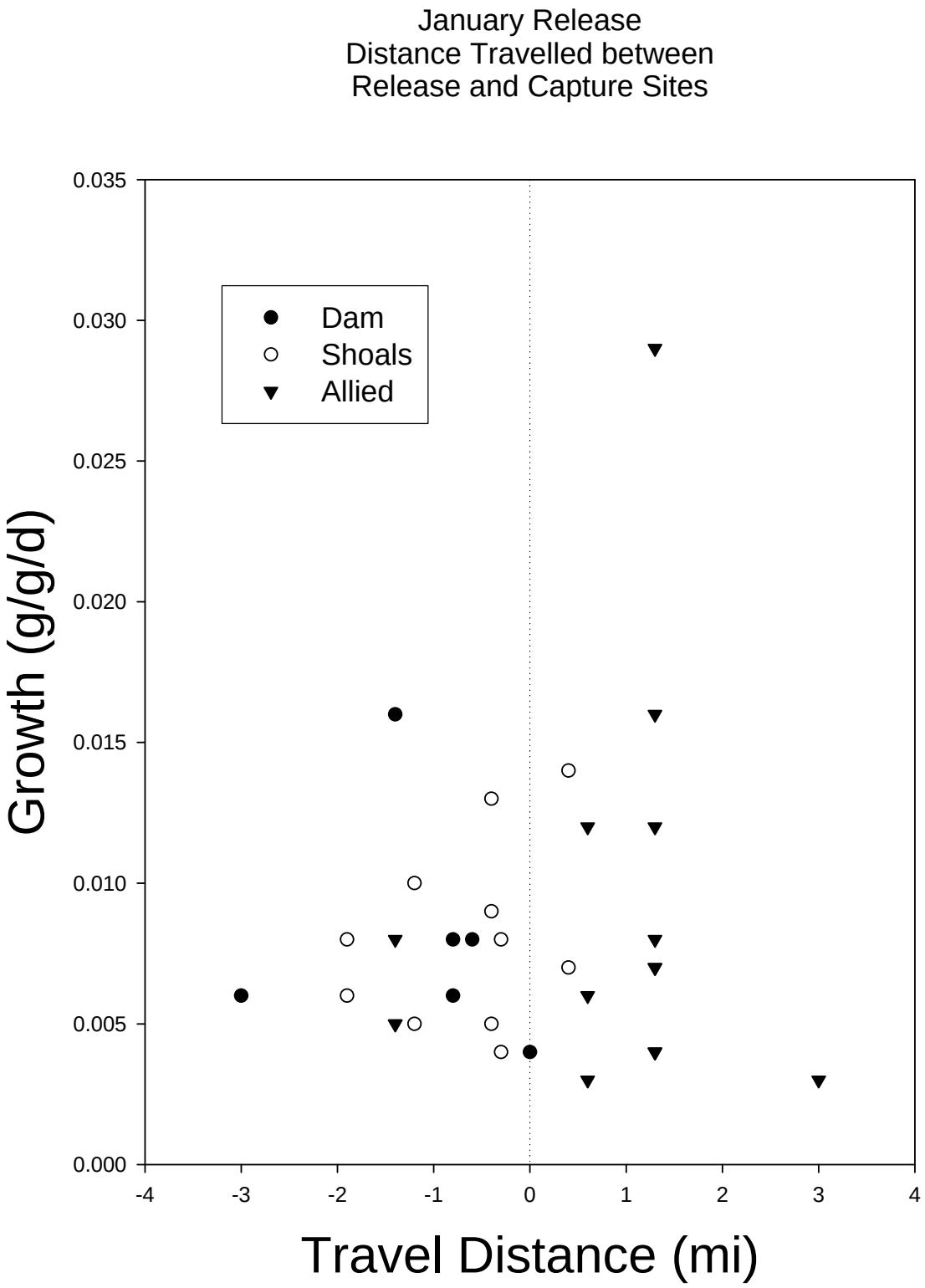


Figure B-10: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in January at the Three Release Sites

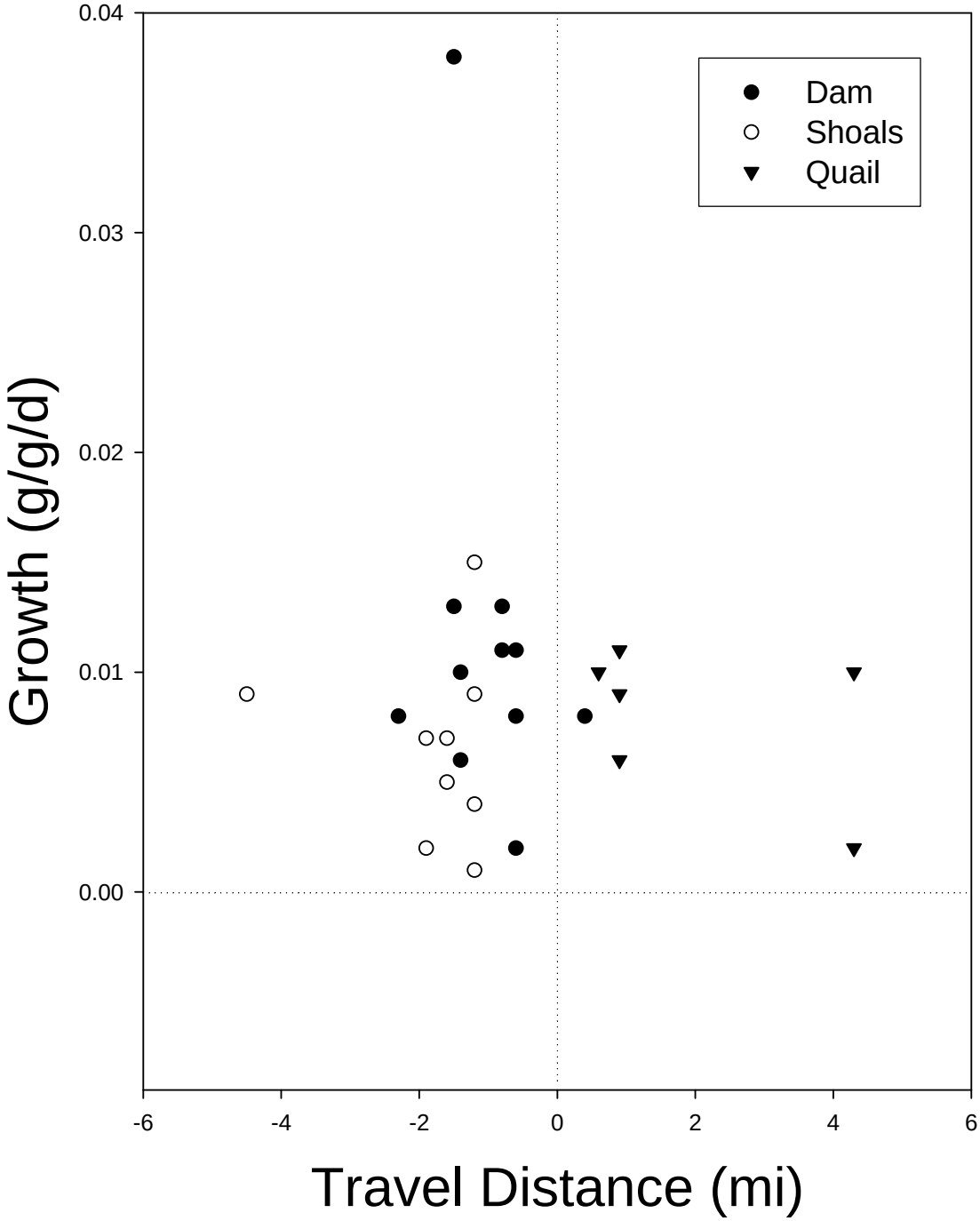


Figure B-11: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in February at the Three Release Sites

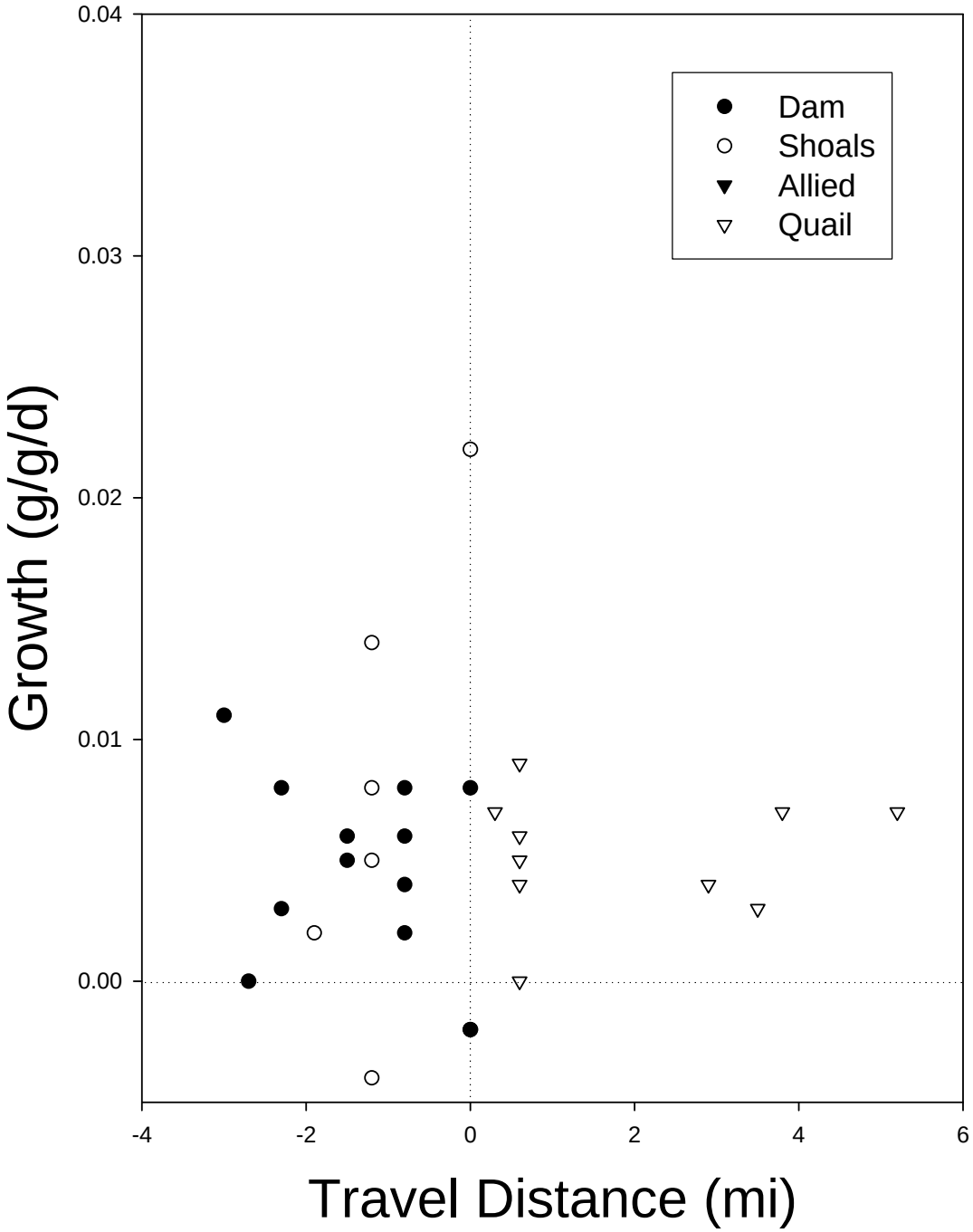


Figure B-12: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in March at the Four Release Sites

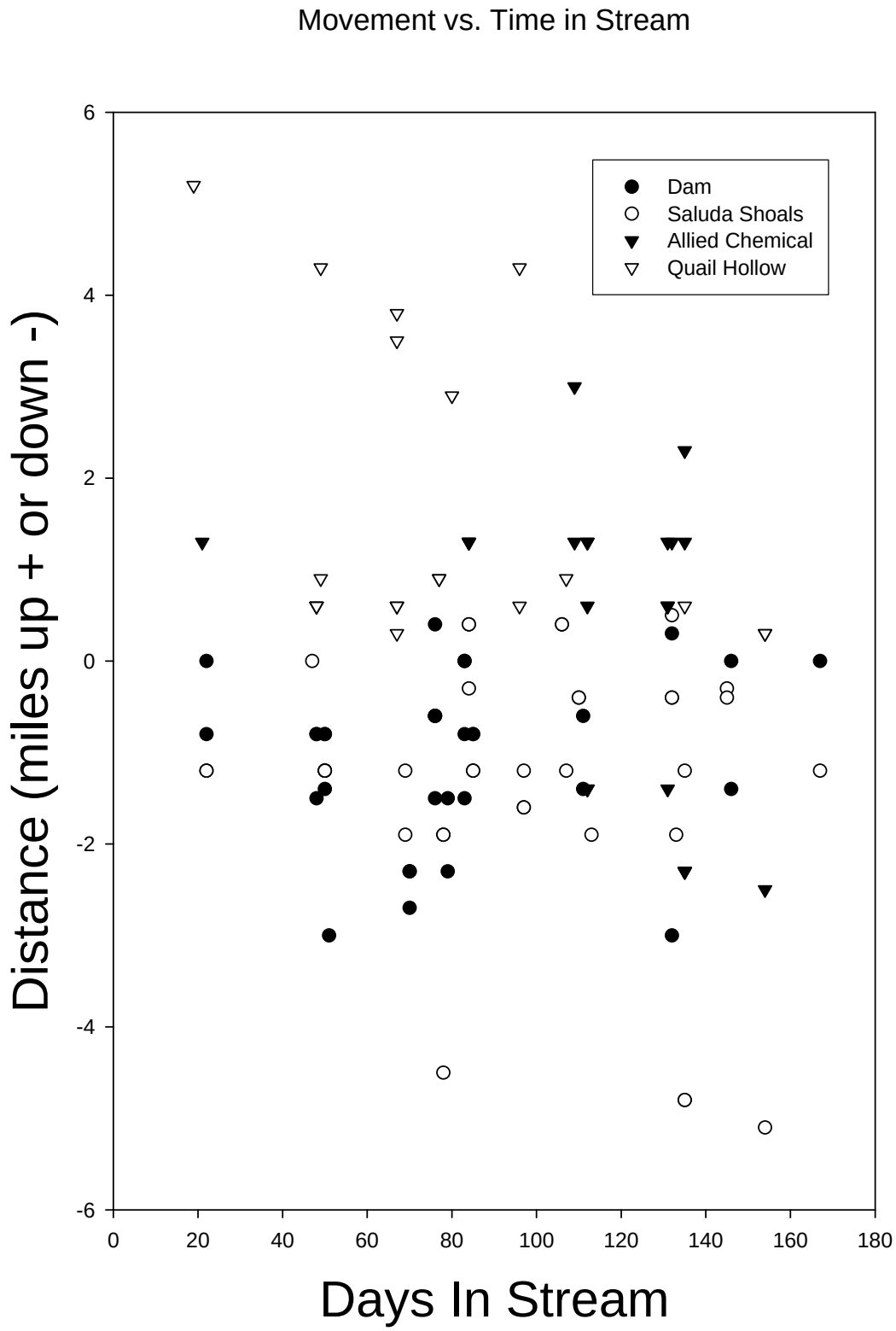


Figure B-13: Relationship Between Days in the Stream Between Release and Capture and the Distance Traveled from the Point of Release

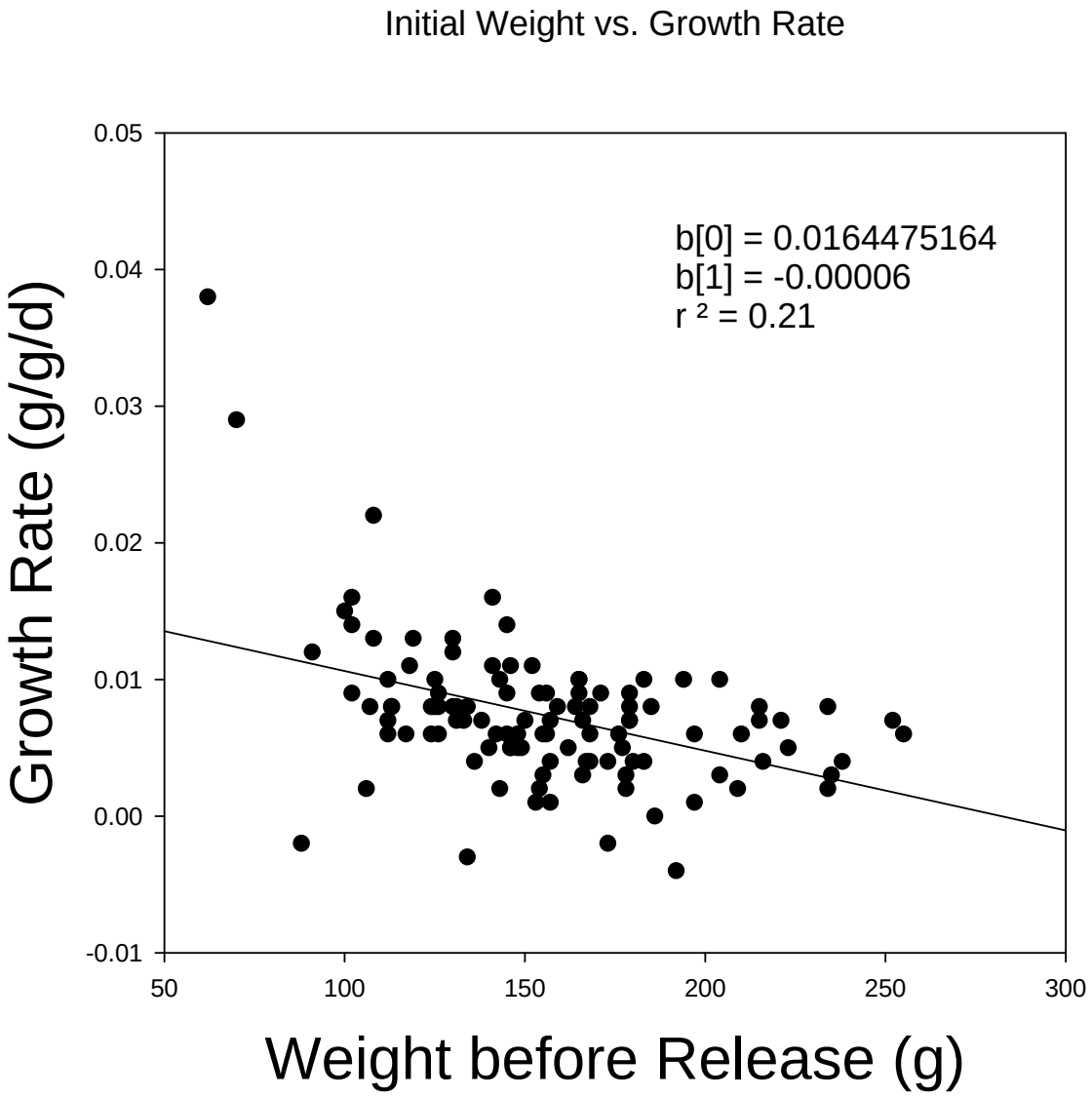


Figure B-14: The growth Rate of Trout in the LSR Showed a Slight Relationship with Size at Release

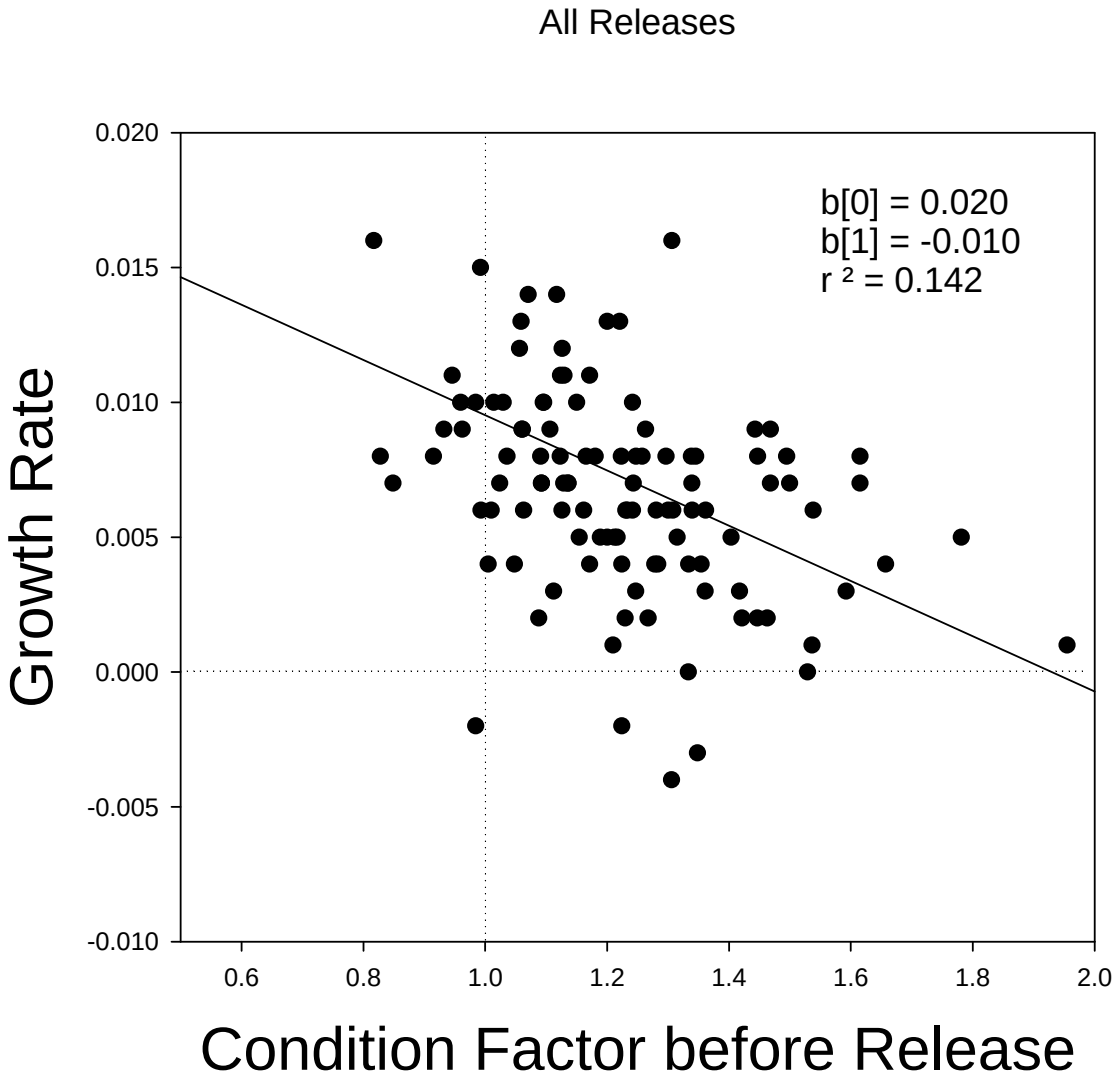


Figure B-15: Growth Rate was Greater in Fish with Lower Initial Condition Factors Following Release into the LSR

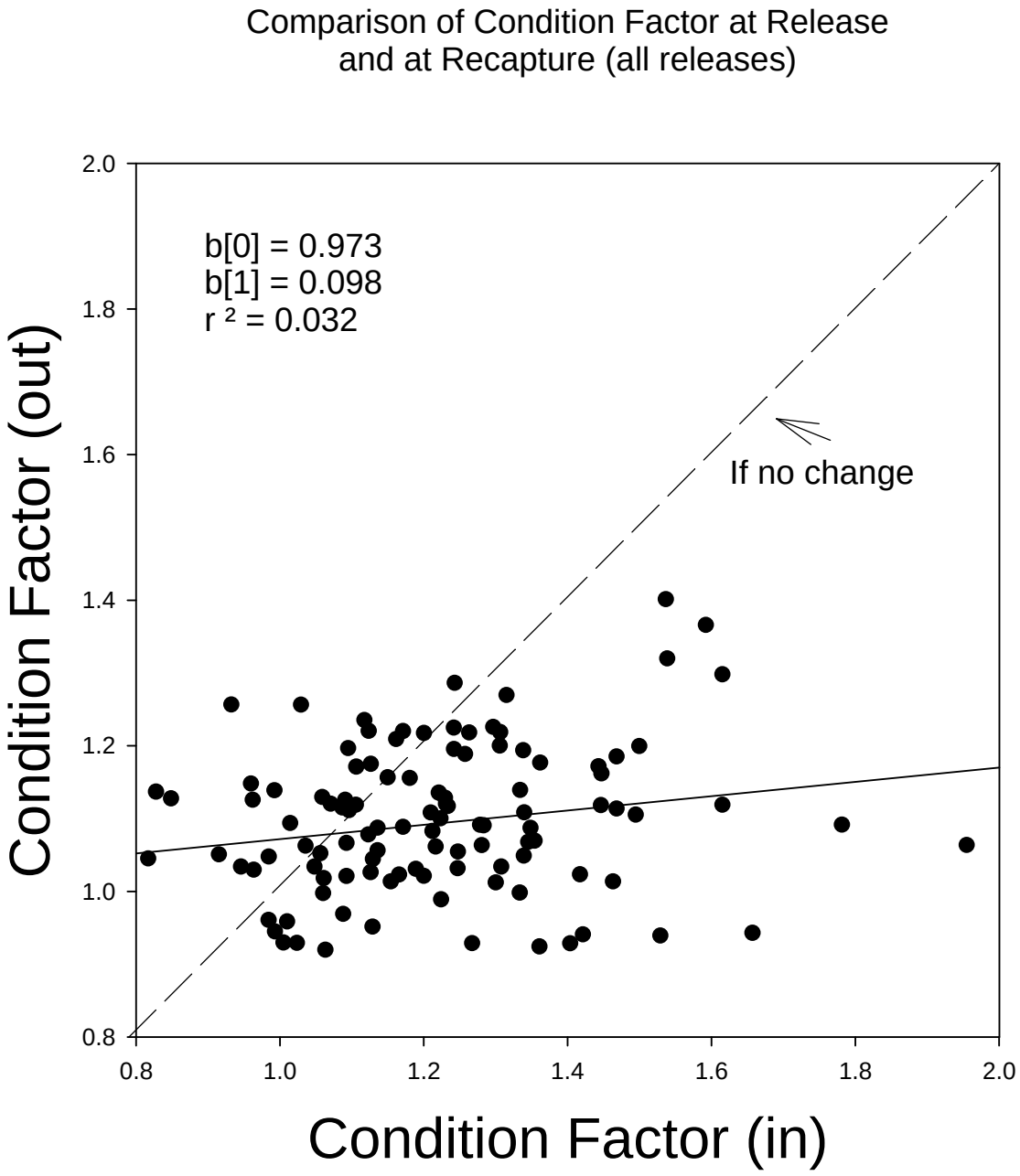
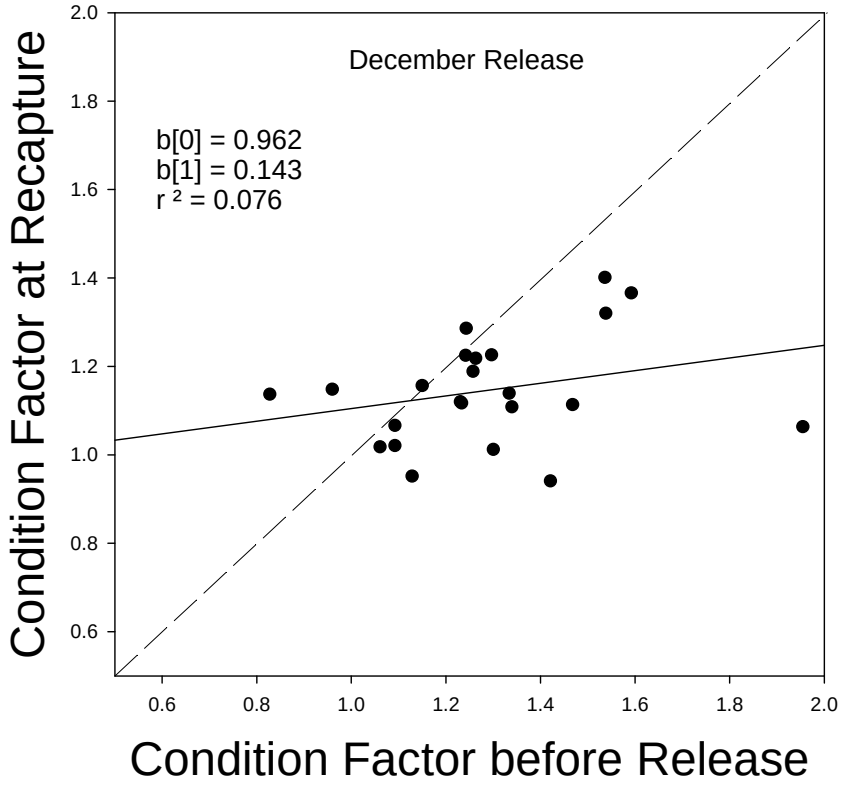


Figure B-16: The Condition of Trout in the LSR Became Much More Uniform Than That Seen at the Time of Release



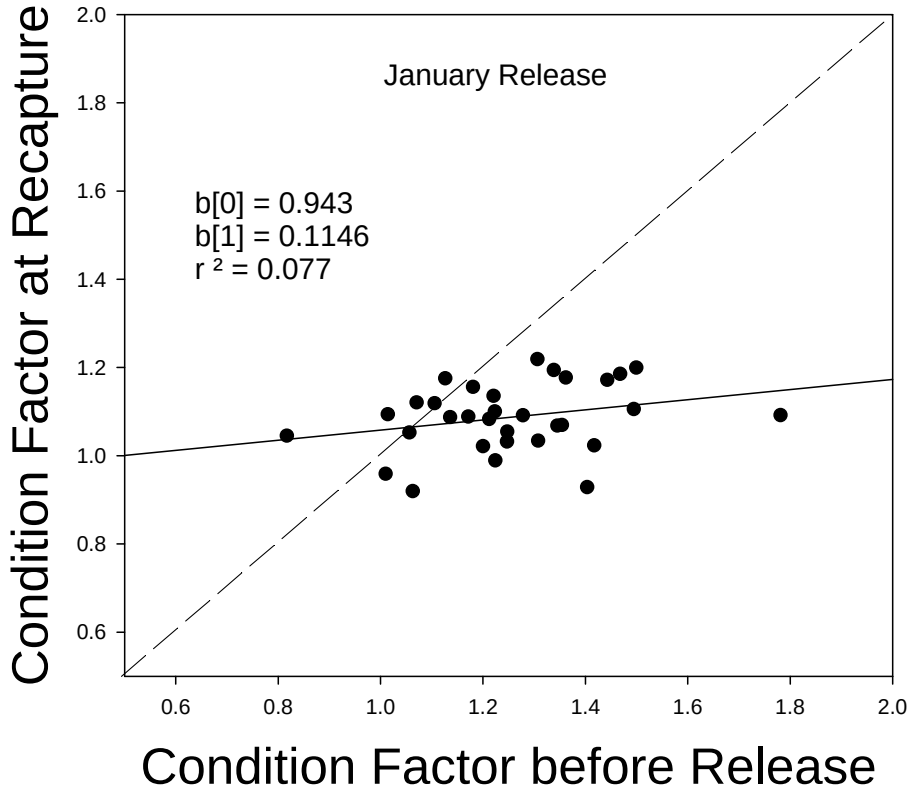
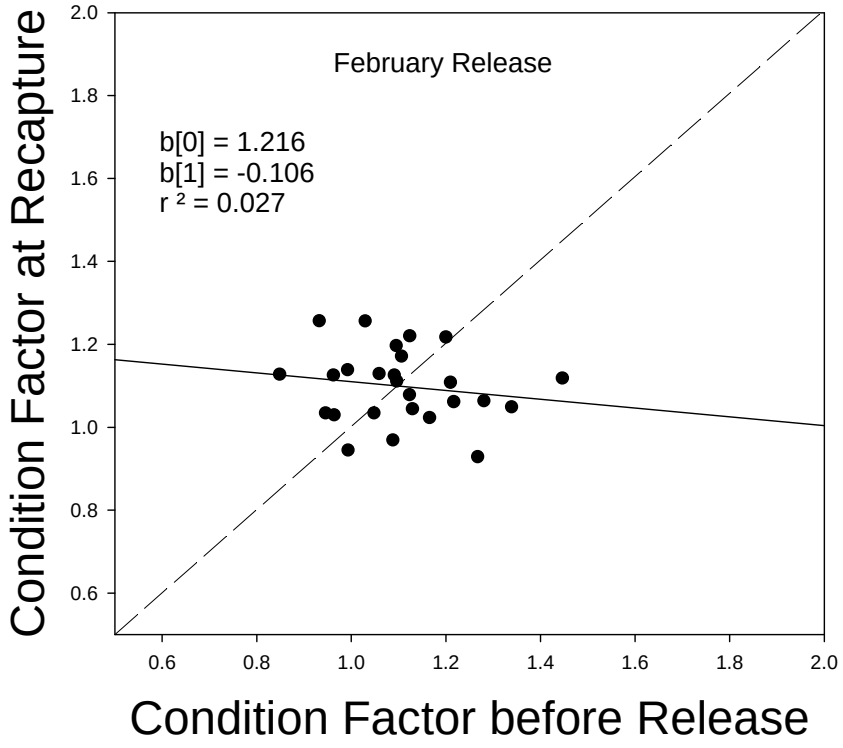


Figure B-17a: Condition Factor Change for December and January Releases



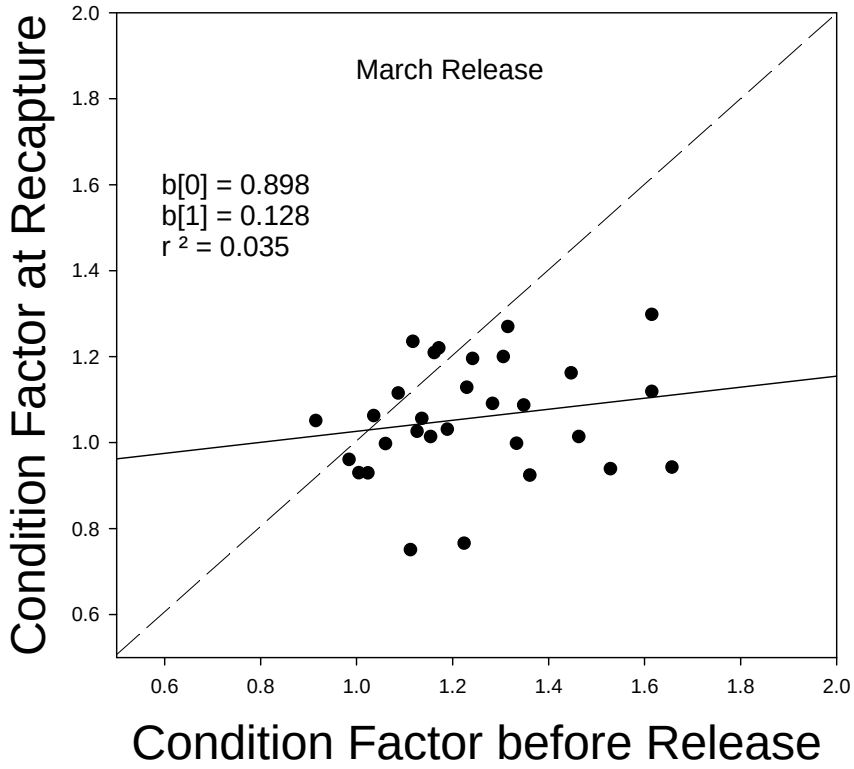
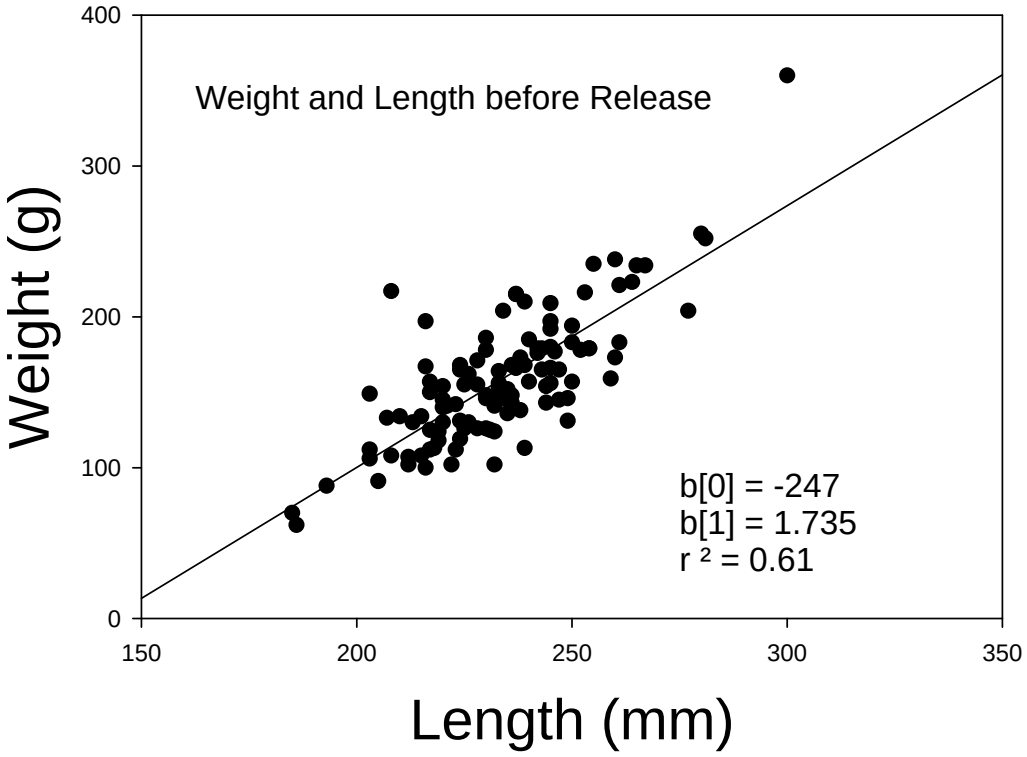


Figure B-17b:Condition Factor Change for January and March Releases



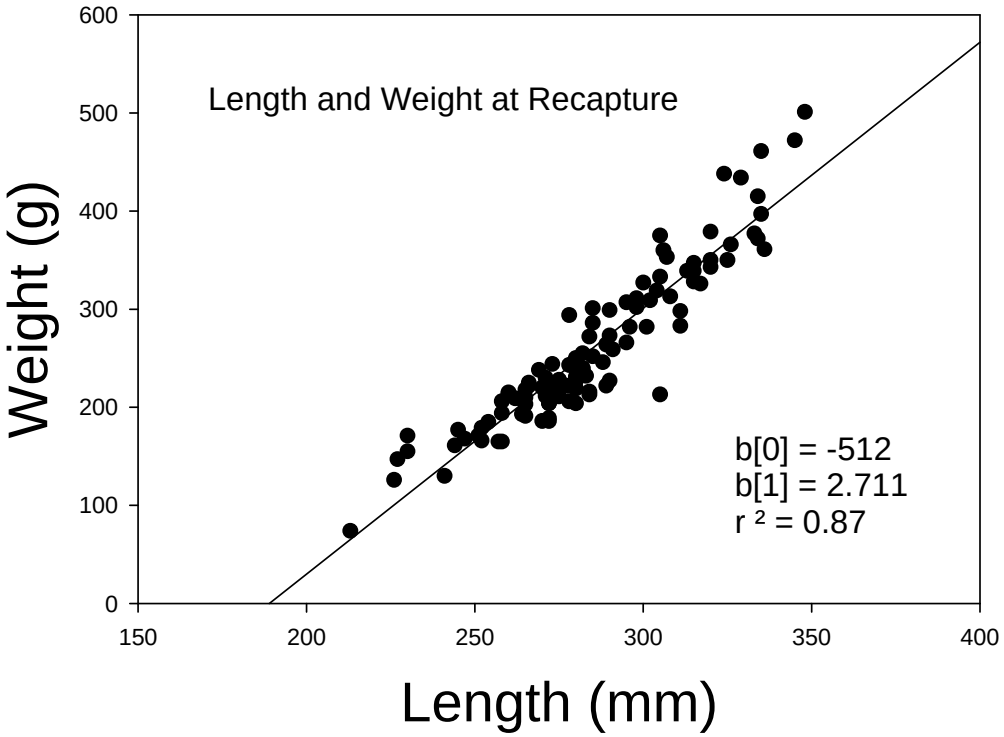


Figure B-18: Illustrating the Increased Uniformity of Trout Condition Following Release into the LSR

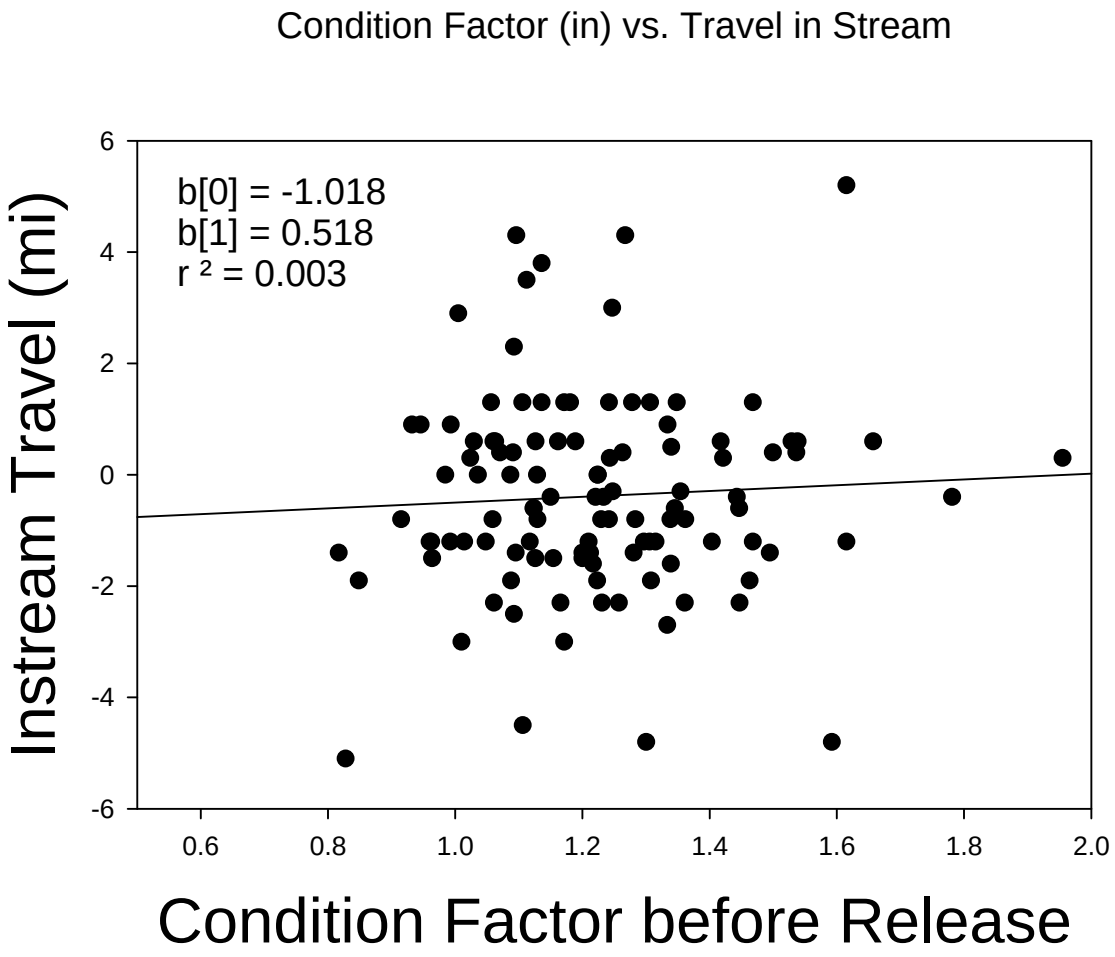


Figure B-19: There was No Significant Effect of Initial Condition Factor on the Tendency of Fish to Move Up or Downstream Following Release

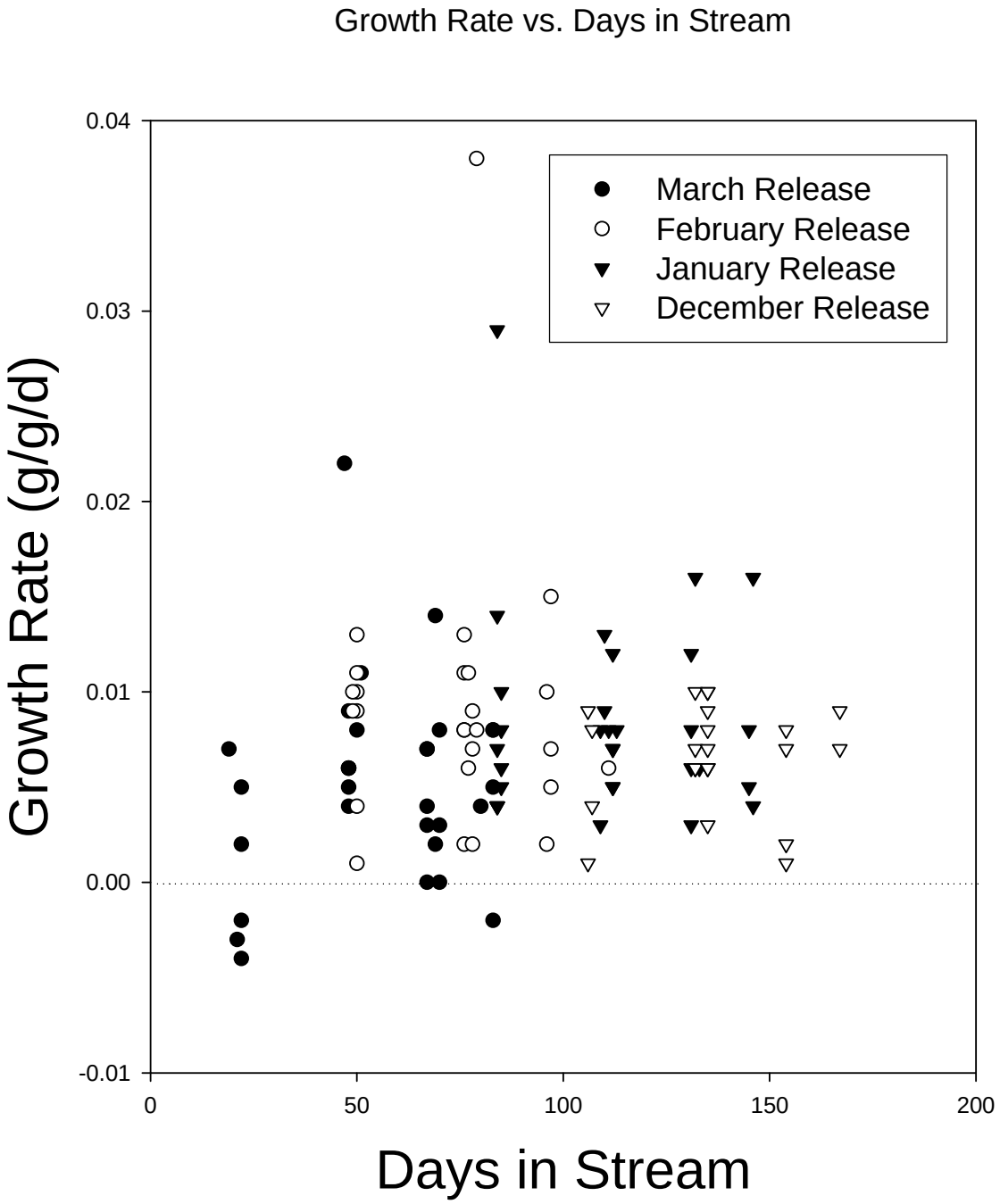


Figure B-20: There was No Appreciable Effect of Residency Duration on the Growth of Fish in the LSR

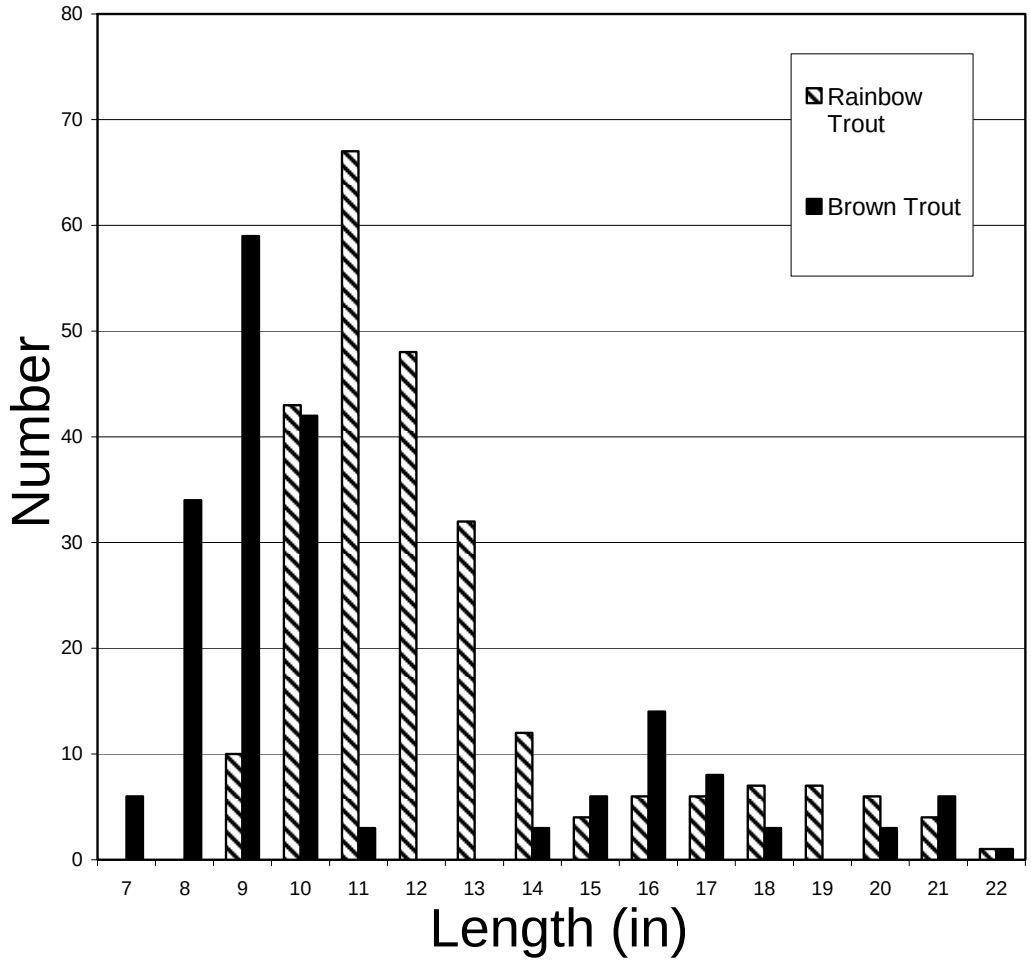


Figure B-21: Length Frequency Distribution of All Brown and Rainbow Trout Collected from the Lower Saluda River, April – June 2003

SOUTH CAROLINA ELECTRIC & GAS CO.
COLUMBIA, SOUTH CAROLINA

SALUDA DO STANDARD PROJECT
LOWER SALUDA RIVER TROUT GROWTH STUDY

1.0 DISSOLVED OXYGEN CRITERIA

In 1986 the U.S. Environmental Protection Agency (EPA) produced the Ambient Water Quality Criteria for Dissolved Oxygen (freshwater). This document replaced all previously published EPA aquatic life criteria for dissolved oxygen (DO). State water quality criteria may have the same numerical values as those in the EPA document or States may want to adjust their criteria to reflect local environmental conditions.

Site-specific criteria are allowed by regulation and are subject to EPA review and approval. Although no specific procedures are in place for establishing site-specific criteria for DO in freshwater, existing guidance and practice are that EPA will approve site-specific criteria developed using appropriate procedures. Site-specific criteria must be based upon a sound scientific rationale in order to protect the designated use. A site-specific criterion is intended to come closer than the national criterion to providing the intended level of protection to the aquatic life at the site, usually by taking into account the biological and/or chemical conditions at the site. The LSR trout growth study was the initial step in the use of the bioenergetic model to predict a DO standard that provides a level of protection of trout growth consistent with the EPA DO criteria.

The LSR growth study and the resultant growth model predictions are used to establish a long-term average concentration that will adequately protect trout growth in the LSR. In addition to the long-term average, the DO criteria also contain a short-term DO concentration that will prevent mortality as a result of acute hypoxia. Even short-term exposure to DO levels in the range of 1 to 2 mg/L can kill trout in a short period of time if they are not able to find local refugia where DOs are higher. In one case, mortality of trout has been reported after 3-4 day exposure to 2.4 mg/L at 20 C. In general, low DO is better tolerated at cooler temperatures than at warmer temperatures. In order to avoid direct mortality due to low DO, the EPA criteria

document recommends a minimum DO of 3 mg/L, a DO concentration that is survived by salmonids, including trout, in long-term growth studies.

Although EPA cited, and agreed with, reviews that concluded that invertebrates are generally protected by DO levels that protect fish, there were potential exceptions that induced EPA to recommend a minimum DO of 4 mg/L to protect sensitive species of mayflies, caddisflies, and stoneflies that are present in some areas of the western U.S. There are no data available on the many insect species that inhabit other habitats and regions.

In order to protect trout growth, EPA concluded that the growth attained at a constant, or 30-day running mean, DO concentration of 6.5 mg/L was adequate. The assumed level of protection was estimated to be the threshold of effect of DO on growth. Lower mean concentrations are adequate to protect important fishery resources, but risk slight growth impairment (6 mg/L) or moderate growth impairment (5 mg/L). EPA concluded that reductions in growth rate sometimes seen above 6 mg/L are usually not significant and that DO concentrations below 4 mg/L can have severe effects on growth. Between 4 and 6 mg/L the effect on growth is moderate to slight if the exposure is sufficiently long. It must be noted that these findings are derived from laboratory studies in which food was surplus.

Because DO affects fish growth primarily by reducing appetite and food consumption, growth effects are greatest when food is not limited according to the EPA criteria document. For example, in tests with coho salmon and DOs of 3, 5 and 8 mg/L, growth effects were seen only at food availability greater than 70% of maximum consumption and a DO of 3 mg/L. No effects were seen at 5 mg/L. This 70% food availability is similar to that estimated from the LSR growth study.

The most “natural” DO study included in the EPA criteria document was a test conducted in laboratory streams in which coho salmon fed on insects produced in the streams (9.5-15.5 C). At high growth rates (0.04 to 0.05 g/g/d) dissolved oxygen levels below 5 mg/L reduced growth, but at lower growth rates (0 to 0.02 g/g/d) no effects were seen at concentrations down to 3 mg/L. These lower growth rates are similar to those observed in the LSR. Although these studies were not conducted with rainbow trout, there is a general similarity in growth response to

DO in all tested salmonid species and these results are probably representative of rainbow trout as well.

Perhaps the most critical issue identified in the EPA criteria document was the application of data from tests with constant DO exposure levels to natural situations in which DO may fluctuate significantly. They concluded that existing data allowed for a tentative theoretical dosing model for fluctuating DO as applied to fish growth if daily average DO was calculated using as a maximum value the threshold concentration below which growth effects are observed under constant exposure conditions.

The publication of several fish bioenergetic model papers occurred almost simultaneously with the publication of the EPA criteria document for DO (Cuenco et al., 1985 a, b, c). It was immediately evident that the fish growth analysis performed for the EPA DO criteria document (JRB Associates, 1984) provided the DO-food consumption link that would enable a similar modeling approach to be used for generating growth-effect predictions for natural conditions with cycling DO. Consequently, EPA and TVA entered into a cooperative agreement to develop and test a fish growth model using DO-growth effect data and the other bioenergetic parameters common to established fish growth models. The EPA-TVA model also utilized many physiological parameters from another bioenergetics model developed by the University of Wisconsin Sea Grant Program (Hewett and Johnson, 1991). The resultant model (Shiao et al., 1993) forms the basis for the LSR growth study and the LSR site-specific DO criteria proposal. The 1993 model has been updated with data of better precision for rainbow trout respiration and food consumption relationships with temperature (From and Rasmussen, 1984) and with additional analysis of the rainbow trout growth studies from the EPA criteria document (Spoor, 1981).

This modeling approach provides a tool to address what EPA termed a most critical and poorly documented aspect of the dissolved oxygen criterion which is the acceptable minimum DO under cycles of varying periodicity.

2.0 LOWER SALUDA RIVER TROUT GROWTH STUDY

Prediction of trout growth in the LSR requires adequate knowledge of three key parameters: temperature, DO concentration, and food availability to trout. In-stream monitoring of temperature and DO, coupled with turbine intake DO, a turbine aeration model, and a tailwater water quality model, provided very good data and estimates of the actual temperature and DO to which trout are exposed. Food availability can be estimated by measuring fish growth, determining the temperature and DO during the period that growth was measured, and using the FISH bioenergetics model to estimate food consumption (availability). During the period of this growth study DO was sufficiently high that there was no significant effect of DO. Therefore, food consumption and growth were determined almost exclusively by temperature and food availability.

The growth study was conducted to closely simulate the typical pattern of rainbow trout release into the put, grow, and take trout fishery in the LSR. This pattern is characterized by periodic releases of catchable trout (8-10 inches) at several locations along the LSR.

The growth study began with the tagging of approximately 15,000 rainbow trout obtained from the South Carolina Department of Natural Resources Walhalla Fish Hatchery. The tagging efforts were divided into four nearly equal monthly batches beginning in November and concluding in February. The November batch of rainbow trout contained 3000 individuals while the remaining 3 batches contained approximately 4000 individuals.

Each monthly batch of rainbow trout (201.4 ± 49.7 mm total length, 136 ± 36.7 g; mean ± SD) was tagged with sequentially numbered, large format, soft Alphanumeric Visible Implant Elastomer (VI-alpha) tags produced by Northwest Marine Technology Inc. To conduct the tagging exercise, fish were crowded in a raceway and 10 - 20 individuals were transferred to 50 – L aerated holding containers containing an anesthetic (~ 90 mg/L MS 222). Once fish were anesthetized, each rainbow trout received one visible implant tag, injected using a syringe-like tag applicator designed and supplied by the manufacturer just below the surface of the clear adipose postorbital eye tissue. The fish were then returned to a separate raceway and held for a minimum of 21 days as required by federal regulation for drug clearance as mandated by the

Food and Drug Administration. During the holding period, fish were maintained in a flow-through raceway system at 4 – 12 C.

After the 21 day waiting period, all fish tagged for that month were individually weighted and measured {Total length (mm) and wet weight (g)} and the tag code recorded for each fish. All fish were left unfed two days prior to weighing and measuring. Each monthly batch of tagged fish were divided up into 1000 fish sub-units, with each sub-group designated for release at one of the four release locations. The December plantings were divided into 4 lots, one 300 batch (Lake Murray Dam), one 700 fish grouping (Saluda Shoals) and 2 1000 fish batches (Allied Signal and Quail Hollow) All other monthly stockings contained relatively equal stockings of 1000 (less tag loss). Monthly tagging numbers and tag retention rates appear in Table B1.

Trout were planted in four discreet releases, one each in December 2002, and in January, February and March of 2003. Release sites were three that are routinely used for the fishery (Saluda Shoals Park, Allied Signal, and Quail Hollow) plus an additional upstream site just below Lake Murray dam (Figure B-1).

The tagged fish arrived in hatchery trucks each outfitted with multiple cells to keep fish separated. To accomplish this, fish were taken from numbered raceways at the hatchery with each raceway containing known tagged fish. Fish were then placed in each of the designated cells for transport and release to the LSR. For the helicopter stocking, the fish were placed in the helicopter bucket and the pilot was given specific directions where to place the fish in the LSR. The remaining stockings were conducted via truck with each driver having a designated stocking location to release fish based on a pre-arranged raceway numbered matrix. During the January stocking, the lock on the access gate to Quail Hollow had been changed which required the driver to stock the fish at Allied Signal. To compensate and provide an even distribution of fish at all stocking locations, two 1000 batches of fish were released in the Quail Hollow area during February stocking event.

To determine trout growth, recovery of tagged trout was carried out by obtaining trout from the LSR by electrofishing as well as by obtaining weight and length data of freshly caught trout in the LSR sports fishery. Fish were collected from the LSR from April thru June using

primarily boat electrofishing means. The sampling area extended from the base of Lake Murray Dam to the I -26 bridge (Figure B-1). While no sampling was conducted below the I-26 Bridge, there were anecdotal reports of tagged fish being caught near Riverbanks Zoo, approximately 1 mile downstream. Boat electrofishing was conducted using a 16 foot aluminum boat outfitted with a generator, Smith-Root model VII-A Electrofisher, and anode and cathode umbrella droppers. Pulsed DC current was placed in the water and output amperage was adjusted to maximize electric current in the water. Voltage was regulated in attempts to maintain approximately 5 amps. During electrofishing sampling, electric current was directed to all microhabitats (shoals, ruffle run complexes and rock outcroppings) throughout the LSR. Electrofishing effort was typically expended over a two and three day period. All trout captured were placed in 100 L aerated containers. Fish were then evaluated to determine if they were tagged. Those fish that were tagged individual length and weight, data was collected, along with the corresponding tag color and number and recorded on field data sheets. Fish were then released back to the LSR in the general location of capture. Additionally untagged trout were collected and those individuals were enumerated and length data obtained.

2.1 Growth Results

A total of 111 tagged trout were collected, weighed and measured during April, May and June. The growth data were analyzed to determine if the data were sufficiently homogeneous to allow use of the entire data set for estimation of food availability in the LSR. There were several factors that might have caused growth (and food availability estimates) to be significantly different for one or more subsets of fish in the growth study. These factors included:

- Release site
- Release date
- Recapture site
- Size at release
- Condition at release
- Condition at recapture
- Direction of movement after release
- Distance of movement after release

- Time between release and recapture

Because growth was primarily influenced by temperature and food availability during the study period (DO was always high), any difference in these factors related to tailwater location or date could have caused differences in growth rate. In addition, size and condition of the fish might be related to fitness to the tailwater environment, including adaptability to feeding, as well as finding and competing for most-suitable habitat. Obviously, any factors that might tend to selectively crop fish through predation, movement out of the study area, or susceptibility to angler harvest could influence the study result. However, as these factors are always present, their exclusion, even if possible, would make the study less representative of the actual conditions for the trout remaining in the system.

2.2 Initial Data Analysis

A summary of the data collected for each recaptured fish from the growth study is provided in Table 2. The weight at release and recapture of the 111 fish used for the growth analysis is shown in Figure B-2. It is immediately evident that there was a large range in fish weight both at release and recapture. The range of trout weight at release is typical, as trout will feed and grow at different rates even in a hatchery environment where feeding is regular. The same phenomenon occurs in nature, as individual fish become more-or-less adapted to the natural habitat and more-or-less dominant in retaining better habitat niches.

2.3 Release Site and Date

The initial analysis of growth rate by release site and release date indicated that differences in median growth raters were relatively small (Table B-3). Because of periodic access problems, only 14 of the 16 potential release combinations (4 sites x 4 dates) were possible. The number of fish recaptures represented in these 14 combinations ranged from 1 to 14, with several releases being represented by fewer than a half-dozen individuals.

Comparing individual trout growth rates as a function of release site and release date indicated that only two of fourteen release groups had growth rates that appeared to be lower than the norm for the other release groups (Figures B-2a and 2b). The two groups with lower growth rates were the December group released at Quail Hollow and the March group released at Allied Signal. However, these two groups were represented by only four and one fish, respectively. With the large range of growth rates represented within each of the other groups and the fact that most groups in the March release had fish which lost weight following release, there was no reason to remove these two groups (five fish) from the overall data set of 111 trout.

2.4 Recapture Site

It is not possible to determine where an individual fish resided between the time of release and the time of recapture. For those fish that were recaptured near the release site it might be concluded that there was not a significant movement upstream or downstream from the point of release. Other fish that were recaptured farther from the release site may or may not have moved rapidly to the vicinity of the point of recapture. Given the pool-like nature of much of the study area, it is possible that many of the released trout moved freely up and down long stretches of the LSR and established no small-scale area of residency. On the assumption that recapture site might indicate the primary area of residency following release, the growth rate data were analyzed to see if there was a relationship between growth rate and recapture site (Figure B-3).

Growth rates were highly variable regardless of recapture site. Almost twice as many fish were recaptured between Allied Signal and Saluda Shoals than in the upstream or downstream sections. Median growth rates were slightly higher in this intermediate stretch (0.75 percent per day) as compared with upstream (0.68 percent per day) and downstream (0.65 percent per day). Given the highly variable growth rates, these relatively small differences were not seen as significant to the modeling effort. Fish from the Saluda Shoals releases were the most common at all recapture sites below RM 8 (and below the Saluda Shoals release site, ca. RM 8.3), and fish from the release immediately below the dam were most common above RM 8 (Figure B-4). The effect of movement from the site of release was analyzed separately from the site of recapture.

2.5 Growth and Movement

All four release times were characterized by fish moving both up- and down-stream from the release sites. In general, more fish moved downstream than upstream, with median movement ranging from 0.3 to 1.2 miles downstream. Although the pattern of movement differed slightly among the four release dates (Figure B-5) only fish from the January releases appeared to differ in any noticeable way from the overall pattern. This exception is perhaps more noteworthy because no fish were released at Quail Hollow during January, and fish that moved downstream from Quail Hollow were outside of the recapture area. In fact, only trout that were released at the two intermediate sites, Saluda Shoals and Allied Signal, could be sampled both above and below the release site. The Quail Hollow released fish were not sampled below the site of release and the fish released just below the dam were obviously limited to the immediate area of the release or movement downstream.

Analysis of fish movement for the two intermediate release sites indicated that both the Saluda Shoals and Allied Signal fish from the December release tended to move downstream (Figure B-6). [Note that in this and other figures some data points are identical and are superimposed in the figures, thus, the number of points visible may not equal the number of data points represented (n).] Later releases at Saluda Shoals followed this pattern, but the indications are that the Allied Signal fish may have moved upstream more frequently following the January and March releases (there was no February release at that site). The release of fish immediately below the dam may have populated the upstream section to the extent that competitive pressure produced the net downstream movement of Saluda Shoals fish. Of course, this movement pattern may also be a direct response to physical habitat characteristics.

Although the movement of trout released at the dam was limited to essentially staying put or moving downstream, and the Quail Hollow releases were only sampled at and above the release site, the analysis of this data is of interest (Figure B-7). The Lake Murray dam releases routinely had a median movement of 0.8 miles downstream. Perhaps the most interesting aspect of all the movement data was the relatively rapid upstream migration of several fish from the March release at Quail Hollow. Although

median movement was still less than one mile upstream, at least four fish moved 3-5 miles upstream in the period between release and sampling.

Given the wide range of dispersal seen among the fish (up to 5 miles up and downstream from the release site) the potential effect of this movement on growth was considered potentially important. As shown in Figure B-8, there was essentially no pattern seen in the growth data when distance and direction of post-release movement was included as a variable. A similar analysis broken down by release site and release date showed no appreciable pattern (Figures B-9-12). Figure B-13 shows the analysis of the relationship between time in the LSR after release and distance traveled between release and recapture. In general, there was no relationship between distance traveled and the time between release and recapture.

2.6 Size at Release and Growth Rate

The maximum growth rate of fish is in part dependent upon fish size, with smaller fish capable of higher food consumption rates and higher growth rates than larger fish. Hatchery feeding practices have routinely used size as a determinant of how much feed to provide trout (e.g., Leitritz, 1972: 2-inch fish 4x and 5-inch fish 2x the food fed 9-inch fish). The growth rate observed for fish in the LSR study indicated a weak relationship to size at release, with most growth rates >1 percent per day occurring in trout that were <150 grams at release (Figure B-14). Given the wide range of growth rates for fish of any particular size and the growth model expression of food availability as a percent of maximum consumption potential rather than absolute amounts of food consumed, there was no compelling need to consider size in determining food availability for the growth model.

2.7 Condition Factor and Growth Rate

Trout of any length may be judged as to their general condition by overall appearance and described as skinny, solid, plump, fat, etc. A quantitative term that describes the length and weight relationship is the “condition factor.” The condition factor (c.f.) is expressed as:

$$c.f. = (W \times 100) / (L)^3$$

where: W = weight in grams and L = length in cm.

A condition factor of 1.0 may be used as a general guide with factors <1 representing less than optimal condition in trout and those >1 representing well-fed trout.

Trout with lower initial condition factors tended to grow at a faster rate than those with higher initial condition factors (Figure B-15). This is an expected finding under circumstances where hatchery conditions can cause a wide spread in condition factor and where field conditions allow dispersal of fish into areas of adequate food. The overall range in initial condition factors (ca. 0.8-1.8 in this study) is not unusual in crowded fish culture units without extensive and frequent grading and separation of fish sizes. Once released into the LSR the fish were able to disperse and feed more uniformly. This tends to allow the skinny fish to bulk up and the fatter fish to become more trim, resulting in the growth rate relationship seen in Figure B-15. This phenomenon is probably typical of the LSR put, grow, and take trout fishery and does not complicate the use of this growth study with the bioenergetic growth model.

The change in condition factor is illustrated in Figure B-16. In general, trout with initial condition factors >1.2 became more trim and those with initial condition factors <1.0 became more robust. The central tendency in the population was to develop a condition factor of about 1.1. This same trend was evident for trout recaptured from each of the release periods (Figures B-17a and b). This trend towards uniformity of condition factor is clearly evident in the decreasing variability in the length-weight relationships between release and recapture (Figure B-18) where r^2 values improved from 0.61 to 0.87 during residency in the LSR. The trend to greater uniformity in condition simplifies the application of the bioenergetic growth model.

Because growth was related to condition factor, the data were analyzed to see if there was any relationship between post-release movement in the LSR and the condition factor of the trout at time of release (Figure B-19). There was no effect of condition factor on the movement of trout following release.

A final analysis of the data was to determine if there was any relationship between growth rate and the time between release and recapture. Except for an apparently reduced growth rate for fish captured shortly after the March release, growth was essentially independent of residence time. The slightly reduced growth seen in the early recapture of the March release is probably attributable to a period of recovery from handling procedures inherent in capture, transport and release of fish in the planting process. Some period of time is also probably needed for the fish to adapt to feeding in nature as opposed to feeding under hatchery conditions. It is likely that all four release periods underwent the same handling stress and adaptation process, but the December-February releases experienced that pattern long before the initial recapture effort in April 2003.

2.8 LSR Trout Fishery Information

Additional information collected during the growth study revealed significant numbers of rainbow and brown trout that appear to be carryovers from previous stockings. A total of 441 tagged and untagged trout were collected from the LSR, with 253 rainbow and 188 brown trout comprising the total catch.

Of the 441 rainbow and brown trout collected, 74 exceeded 16 inches in length, or nearly one in every six fish. The largest rainbow and brown trout collected during these surveys were 22 and 24 inches, respectively, with all fish appearing robust and healthy. Further examination of the data indicates that trout do appear to carryover from annual stockings. Figure B-21 illustrates that at a minimum two distinct age classes of fish were collected in the LSR during the study. However, without otolith examination it is not readily possible to determine what year classes these individuals represent. One likely contributor to this observed carryover is likely is the higher DO levels maintained in the LSR since the inception of SCE&G's turbine venting program than those DO levels historically observed.

3.0 SUMMARY

A detailed analysis of growth patterns and relationships with potentially significant variables relating to the LSR sites, release dates, and fish size indicated that there were no factors requiring either data deletion or subdivision prior to the use of observed growth rates for calculating food availability. Consequently growth rate data from all 111 recaptured trout were used to calibrate the bioenergetics model for the LSR.

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SOUTH CAROLINA ELECTRIC & GAS CO.
COLUMBIA, SOUTH CAROLINA

SALUDA DO STANDARD PROJECT
LOWER SALUDA RIVER TROUT GROWTH STUDY

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SOUTH CAROLINA ELECTRIC & GAS CO.

SALUDA DO STANDARD PROJECT

LOWER SALUDA RIVER TROUT GROWTH STUDY

AUGUST 2003

Prepared by:

Paladin Water Quality Consulting

Kleinschmidt Associates
Energy and Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS CO.

SALUDA DO STANDARD PROJECT

LOWER SALUDA RIVER TROUT GROWTH STUDY

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Table B-1: Number tagged, number of survivors, survival (%), number retaining tags, and proportion (%) retaining tags of rainbow trout tagged with large format, soft VI-alpha tags and held for 25 days

TAG DATE	TAGGED (N)	SURVIVORS (N)	SURVIVAL (%)	NUMBER RELEASED (N)	RETENTION (%)
12/8/02	3000	2975	99.2	2405	80.8
1/6/03	4000	3780	94.5	2979	78.8
1/20/03	4400	4281	97.3	3331	77.8
2/13/03	4000	3251	81.3	3089	95.0
Total	15400	14287	92.8	11804	82.6

Table B-2: Data on rainbow trout recaptured and used in the Bioenergetics Model from the Lower Saluda River Growth Study April- June

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
1	yellow	C27	242	307	179	353	Sandy Beach, way point 106	3	Saulda Shoals Park	2	12/17/2002	4/2/2003
2	yellow	D55	217	230	157	171	Sandy Beach, way point 106	3	Saulda Shoals Park	2	12/17/2002	4/2/2003
3	yellow	22D	233	290	164	299	Corley Island shoal	7	Saulda Shoals Park	2	12/17/2002	4/3/2003
4	yellow	X26	253	298	216	302	downstream of I-20 at house	10	Quail Hollow	4	12/17/2002	4/3/2003
5	yellow	R73	261	324	221	438	tailrace, near spillway inflow	1	Lake Murray Dam	1	12/17/2002	4/28/2003
6	yellow	50E	245	315	197	347	above Sandy Beach (near shoal)	2	Saulda Shoals Park	2	12/17/2002	4/28/2003
7	yellow	D42	233	290	156	273	Sandy Beach	3	Saulda Shoals Park	2	12/17/2002	4/28/2003
8	yellow	L97	243	320	165	379	Upstream of Rawls Creek at shoal	5	Saulda Shoals Park	2	12/17/2002	4/28/2003
9	yellow	R72	245	325	156	350	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
10	yellow	K20	244	315	143	328	downstream of I-20 bridge	11	unknown	n/a	12/17/2002	5/1/2003
11	yellow	J59	265	348	234	501	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
12	yellow	L41	234	278	204	294	downstream of I-20 bridge	11	Saulda Shoals Park	2	12/17/2002	5/1/2003
13	yellow	G73	239	305	210	375	downstream of I-20 bridge	11	Quail Hollow	4	12/17/2002	5/1/2003
14	yellow	I38	208	275	117	211	downstream of I-20 bridge	11	Saulda Shoals Park	2	12/17/2002	5/1/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
15	yellow	09D	239	302	168	309	downstream of I-20 bridge	11	Allied Signal	3	12/17/2002	5/1/2003
16	yellow	54E	250	335	194	461	Corley Island shoal	7	Allied Signal	3	12/17/2002	5/1/2003
17	yellow	35C	277	345	204	472	Corley Island shoal	7	Saulda Shoals Park	2	12/17/2002	5/1/2003
18	yellow	O7E	239	282	113	255	upstream of Quail Hollow, mile 4+	12	Saluda Shoals	2	12/17/2002	5/20/2003
19	yellow	X04	216	281	197	236.0	upstream of Quail Hollow, mile 4+	12	Quail Hollow	4	12/17/2002	5/20/2003
20	yellow	B97	245	311	209	283	upstream of Quail Hollow, mile 4+	12	Quail Hollow	4	12/17/2002	5/20/2003
21	yellow	56D	254	333	179	377	asphalt plant, mile 4+	11	Allied Signal	3	12/17/2002	5/20/2003
22	yellow	J22	245	336	166	361	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	12/17/2002	6/2/2003
23	yellow	L92	224	334	165	415	Corley Island shoal	7	Saluda Shoals	2	12/17/2002	6/2/2003
24	red	A96	240	295	185	307	Sandy Beach, way point 106	3	Lake Murray Dam	1	1/7/2003	4/2/2003
25	red	S22	220	266	145	222	Sandy Beach, way point 106	3	Lake Murray Dam	1	1/7/2003	4/2/2003
26	red	46B	212	271	102	223	Sandy Beach, way point 106	3	Saulda Shoals Park	2	1/8/2003	4/2/2003
27	red	B84	207	258	133	206	Sandy Beach, way point 106	3	Saulda Shoals Park	2	1/8/2003	4/2/2003
28	red	C59	260	308	238	313	downstream of Hope Ferry Landing	4	Saulda Shoals Park	2	1/8/2003	4/2/2003
29	red	64K	231	275	125	228	Corley Island shoal	7	Saulda Shoals Park	2	1/8/2003	4/3/2003
30	red	50G	226	290	162	227	Corley Island shoal	7	Saulda Shoals Park	2	1/8/2003	4/3/2003
31	red	P13	250	285	183	252	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003
32	red	88L	185	279	70	243	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
33	red	77D	236	275	168	227	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/3/2003
34	red	E36	237	280	166	227	above Sandy Beach (near shoal)	2	Allied Signal	3	1/9/2003	4/28/2003
35	red	E17	213	282	130	240	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	1/7/2003	4/28/2003
36	red	85E	220	304	130	319	Upstream of Rawls Creek at shoal	5	Saulda Shoals Park	2	1/8/2003	4/28/2003
37	red	A44	228	305	171	333	Upstream of Rawls Creek at shoal	5	Saulda Shoals Park	2	1/8/2003	4/28/2003
38	red	80M	219	271	124	230	Corley Island shoal	7	Allied Signal	3	1/9/2003	4/28/2003
39	red	92I	264	315	223	339	downstream of I-20 bridge	11	Allied Signal	3	1/9/2003	5/1/2003
40	red	P97	230	283	146	232	downstream of I-20 bridge	11	Allied Signal	3	1/9/2003	5/1/2003
41	red	51D	217	280	125	242	Honeywell Intake	9	Saulda Shoals Park	2	1/8/2003	5/1/2003
42	red	P95	226	298	130	311	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/1/2003
43	red	52M	240	296	157	282	Corley Island shoal	7	Allied Signal	3	1/9/2003	5/1/2003
44	red	V97	217	284	150	272	Corley Island shoal	7	Allied Signal	3	1/9/2003	5/1/2003
45	red	63C	228	301	155	282	Honeywell Intake	9	Saulda Shoals Park	2	1/7/2003	5/20/2003
46	red	K51	223	278	112	206	Honeywell Intake	9	Lake Murray Dam	1	1/8/2003	5/20/2003
47	red	P72	228	289	126	222	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/20/2003
48	red	07I	255	317	235	326	Honeywell Intake	9	Allied Signal	3	1/9/2003	5/20/2003
49	red	F67	224	313	168	339	asphalt plant, mile 4+	11	Allied Signal	3	1/9/2003	5/20/2003
50	red	H29	205	280	91	231	Corley Island shoal, mile 7+	7	Allied Signal	3	1/9/2003	5/20/2003
51	red	82H	221	329	141	434	Corley Island shoal, mile 7+	7	Saluda Shoals	3	1/8/2003	5/20/2003
52	red	23K	245	311	180	298	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	1/7/2003	6/2/2003
53	red	19B	232	320	102	343	downstream of Saluda Shoals	4	Lake Murray Dam	1	1/7/2003	6/2/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
54	red	50N	243	335	179	397	downstram of Saluda Shoals Park	4	Saluda Shoals	2	1/8/2003	6/2/2003
55	red	P41	203	289	149	264	downstram of Saluda Shoals Park, above "Logan's Point"	5	Saluda Shoals	2	1/8/2003	6/2/2003
56	orange	V09	224	258	119	194	Sandy Beach, way point 106	3	Lake Murray Dam	1	2/11/2003	4/2/2003
57	orange	I77	232	277	141	222	Sandy Beach, way point 106	3	Lake Murray Dam	1	2/11/2003	4/2/2003
58	orange	D20	247	273	165	244	downstream of Hope Ferry Landing	4	Lake Murray Dam	1	2/11/2003	4/2/2003
59	orange	Y10	233	244	153	161	Corley Island shoal	7	Saulda Shoals Park	2	2/12/2003	4/3/2003
60	orange	88J	217	247	112	168	Corley Island shoal	7	Quail Hollow	4	2/13/2003	4/3/2003
61	orange	N04	235	252	136	166	Corley Island shoal	7	Saulda Shoals Park	2	2/12/2003	4/3/2003
62	orange	47A	247	265	145	210	Corley Island shoal	7	Saulda Shoals Park	2	2/12/2003	4/3/2003
63	orange	46V	222	227	102	147	downstream of I-20 at house	10	Quail Hollow	4	2/13/2003	4/3/2003
64	orange	73V	218	254	113	185	tailrace, near spillway inflow	1	Lake Murray Dam	1	2/11/2003	4/28/2003
65	orange	G07	212	251	107	171	above Sandy Beach ("flat")	2	Lake Murray Dam	1	2/11/2003	4/28/2003
66	orange	U87	219	260	118	215	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	2/11/2003	4/28/2003
67	orange	26V	220	252	154	179	above Sandy Beach (near shoal)	2	Lake Murray Dam	1	2/11/2003	4/28/2003
68	orange	90P	208	260	108	214	Upstream of Rawls Creek at shoal	5	Lake Murray Dam	1	2/11/2003	4/28/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
69	orange	09Y	186	288	62	246	downstream of I-20 bridge	5	Lake Murray Dam	1	2/11/2003	5/1/2003
70	orange	Y79	249	295	146	266	downstream of I-20 bridge	10	Quail Hollow	4	2/13/2003	5/1/2003
71	orange	13B	225	265	126	218	downstream of I-20 bridge	10	Saulda Shoals Park	2	2/12/2003	5/1/2003
72	orange	74A	232	270	124	186	downstream of I-20 bridge	10	Quail Hollow	4	2/13/2003	5/1/2003
73	orange	M37	249	264	131	208	Honeywell intake area	9	Saulda Shoals Park	2	2/12/2003	5/1/2003
74	orange	18A	236	257	143	165	Honeywell intake area	9	Saulda Shoals Park	2	2/12/2003	5/1/2003
75	orange	73B	224	274	131	211	Corley Island shoal	7	Lake Murray Dam	1	2/11/2003	5/1/2003
76	orange	R44	261	306	183	360	asphalt plant, mile 4+	11	Quail Hollow	4	2/13/2003	5/20/2003
77	orange	62P	203	264	112	193	BC Components intake	8	Saluda Shoals	2	2/12/2003	5/20/2003
78	orange	J45	230	273	148	216	BC Components intake	8	Saluda Shoals	2	2/12/2003	5/20/2003
79	orange	D60	203	241	106	130	Corley Island shoal, mile 7+	7	Quail Hollow	4	2/13/2003	5/20/2003
80	orange	R77	216	280	100	250	Corley Island shoal, mile 7+	7	Saluda Shoals	2	2/12/2003	5/20/2003
81	orange	17C	223	282	142	239	downstram of Saluda Shoals Park	4	Lake Murray Dam	1	2/11/2003	6/2/2003
82	green	R76	267	278	234	243	Sandy Beach, way point 106	3	Lake Murray Dam	1	3/11/2003	4/2/2003
83	green	R79	260	258	173	165	SCE&G boat landing - tailrace, way point 108	1 (red)	Lake Murray Dam	1	3/11/2003	4/2/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
84	green	Z71	237	279	215	243	downstream of Hope Ferry Landing	4	Quail Hollow	4	3/14/2003	4/2/2003
85	green	22R	215	226	134	126	Corley Island shoal	7	Allied Signal	3	3/13/2003	4/3/2003
86	green	98G	220	230	140	155	Corley Island shoal	7	Saulda Shoals Park	2	3/12/2003	4/3/2003
87	green	L34	245	245	192	177	Corley Island shoal	7	Saulda Shoals Park	2	3/12/2003	4/3/2003
88	green	O00	215	270	108	220	above Sandy Beach (near shoal)	2	Saulda Shoals Park	2	3/12/2003	4/28/2003
89	green	N24	242	266	176	225	Sandy Beach	3	Lake Murray Dam	1	3/11/2003	4/28/2003
90	green	47G	238	265	173	203	Sandy Beach	3	Lake Murray Dam	1	3/11/2003	4/28/2003
91	green	81L	236	265	148	191	Upstream of Rawls Creek at shoal	5	Lake Murray Dam	1	3/11/2003	4/28/2003
92	green	O57	244	280	154	219	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
95	green	S64	280	300	255	327	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
93	green	91Y	246	278	177	222	downstream of I-20 bridge	11	Quail Hollow	4	3/14/2003	5/1/2003
94	green	37G	235	269	152	238	Honeywell Intake	9	Lake Murray Dam	1	3/11/2003	5/1/2003
95	green	Z21	237	285	215	301	Corley Island shoal	7	Saulda Shoals Park	2	3/12/2003	5/1/2003
96	green	30T	238	280	138	204	Quail Hollow, mile 3 to mile 4	12	Quail Hollow	4	3/14/2003	5/20/2003
97	green	H42	252	305	178	213.0	Honeywell Intake	9	Quail Hollow	4	3/14/2003	5/20/2003
98	green	11C	230	272	178	204.0	Honeywell Intake	9	Saluda Shoals	2	3/12/2003	5/20/2003
100	green	P34	281	326	252	366	BC Components intake	8	Quail Hollow	4	3/14/2003	5/20/2003
101	green	82R	230	272	186	189	asphalt plant, mile 4+	11	Quail Hollow	4	3/14/2003	5/20/2003
102	green	T65	216	284	167	216	upstream of I-20, ~mile 4.5	13	Quail Hollow	4	3/14/2003	5/20/2003
103	green	G41	300	334	360	372	BC Components intake	8	Lake Murray Dam	1	3/11/2003	5/20/2003

	Tag Color	Tag Number	Stocked Total Length (mm)	Recaptured Total Length (mm)	Stock Weight (g)	Recaptured Weight (g)	Location Recaptured	Location on Figure B-1 (blue except where noted)	Location Stocked	Location on Figure B-1 (Red unless noted	Stock Date	Recaptured Date
104	green	P89	235	285	145	286	Corley Island shoal, mile 7+	7	Saluda Shoals	2	3/12/2003	5/20/2003
105	green	09Y	225	272	155	186	Corley Island shoal, mile 7+	7	Lake Murray Dam	1	3/11/2003	5/20/2003
106	green	08R	210	262	134	209	Corley Island shoal, mile 7+	7	Lake Murray Dam	1	3/11/2003	5/20/2003
107	green	28B	193	213	88	74	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	3/11/2003	6/2/2003
108	green	G67	230	271	126	211.5	tailrace boat ramp & upstream	1 (red)	Lake Murray Dam	1	3/11/2003	6/2/2003
109	green	72Y	259	291	159	259.0	Sandy Beach (upstream of Saluda Shoals Park landing)	3	Lake Murray Dam	1	3/11/2003	6/2/2003
110	green	E35	250	284	157	213.0	Sandy Beach (upstream of Saluda Shoals Park landing)	3	Quail Hollow	4	3/14/2003	6/2/2003
111	green	N25	233	272	146	204.0	downstram of Saluda Shoals Park, above "Logan's Point"	5	Lake Murray Dam	1	3/11/2003	6/2/2003

Table B-3: Median growth rate (n) for each of the fourteen combinations of release site and release date. Overall median (n) growth rates are shown for each site, each date, and for all 111 recaptured trout. Growth rates are g/g/day and the overall rate of 0.0071 g/g/day is 0.71 percent weight gain per day.

	DEC.	**JAN.**	**FEB.**	**MAR.**	**ALL MONTHS**
Below Dam	0.0072 (2)	0.0070 (6)	0.0095 (11)	0.0048 (13)	**0.0075 (32)**
Saluda Shoals	0.0077 (11)	0.0083 (12)	0.0075 (9)	0.0063 (6)	**0.0076 (38)**
Allied Signal	0.0078 (6)	0.0065 (14)	No release	-0.0030 (1)	**0.0071 (21)**
Quail Hollow	0.0030 (4)	No release	0.0095 (6)	0.0055 (10)	**0.0056 (20)**
All Sites	**0.0071 (23)**	**0.0072 (32)**	**0.0083 (26)**	**0.0056 (30)**	**0.0071 (111)**

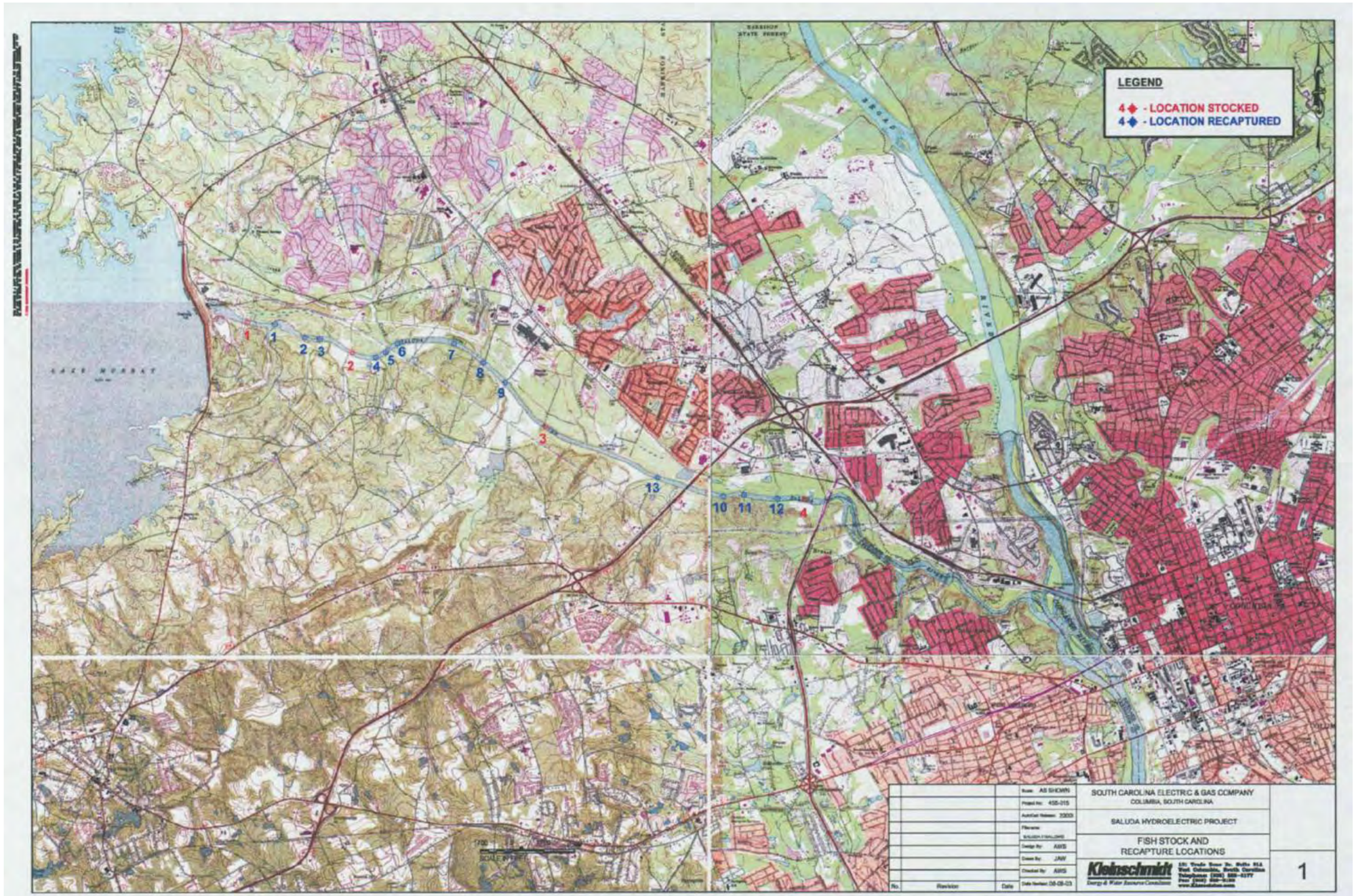


Figure B-1: Fish Stock and Recapture Locations

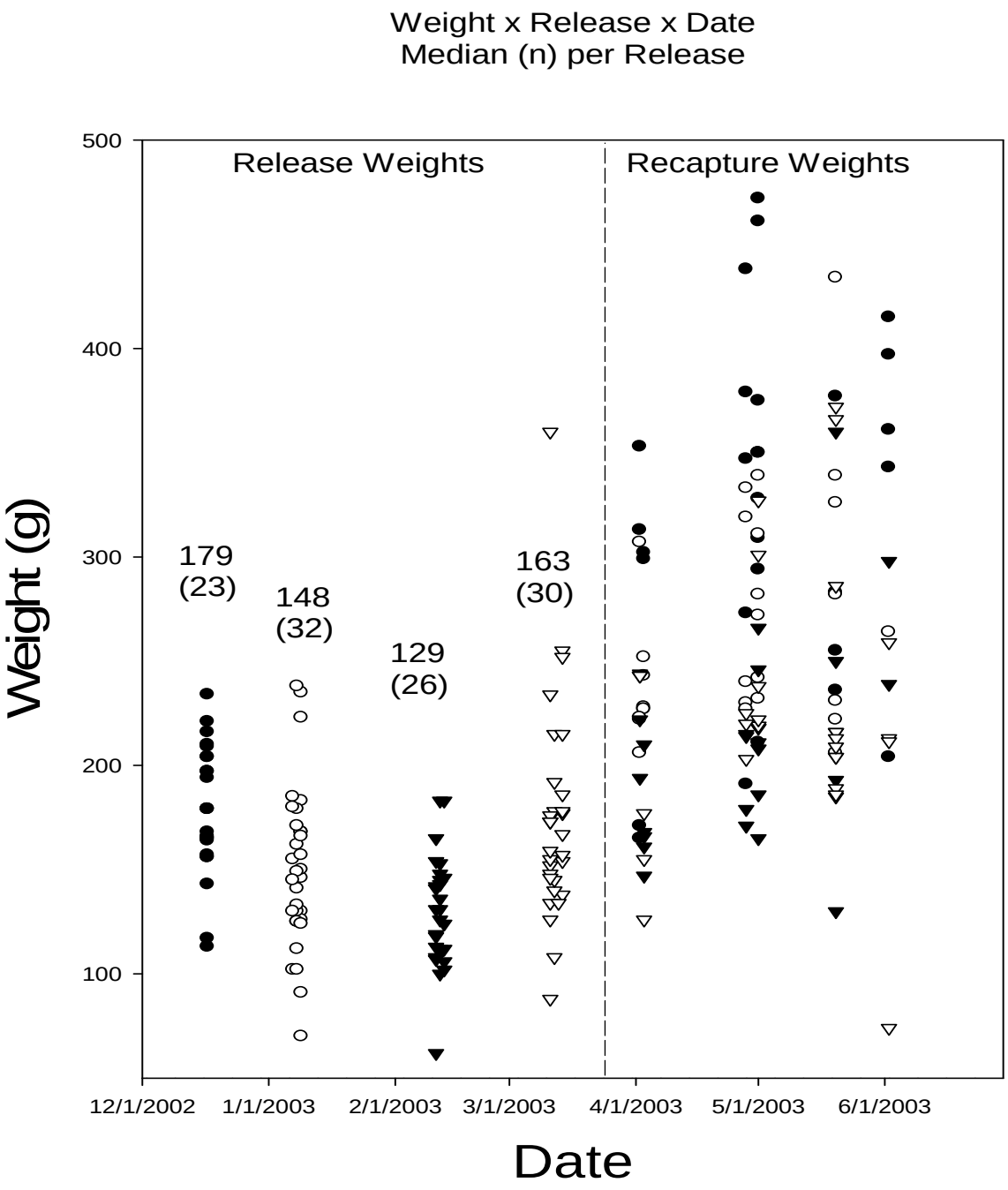
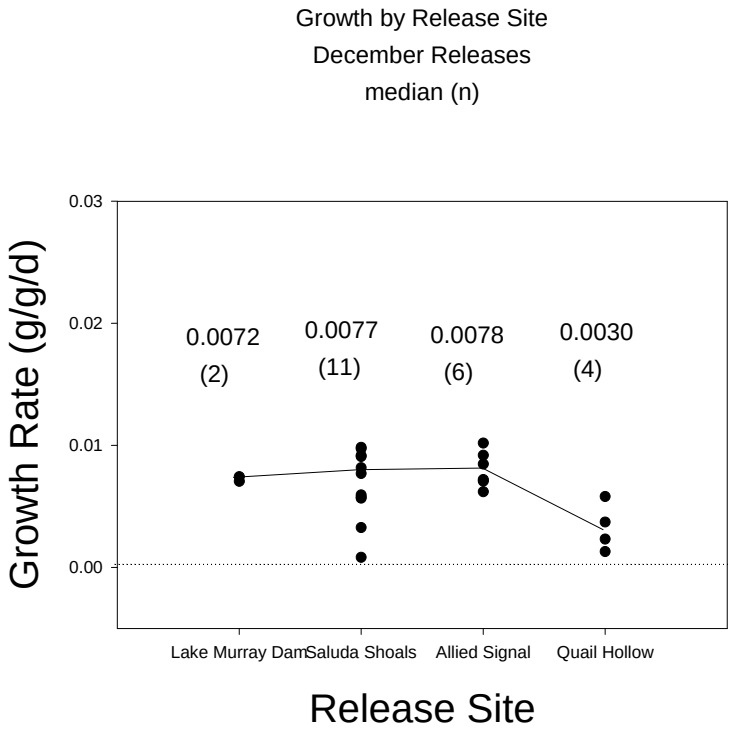


Figure B-2: Weight (g) of Recaptured Trout at Time of Release and Time of Recapture



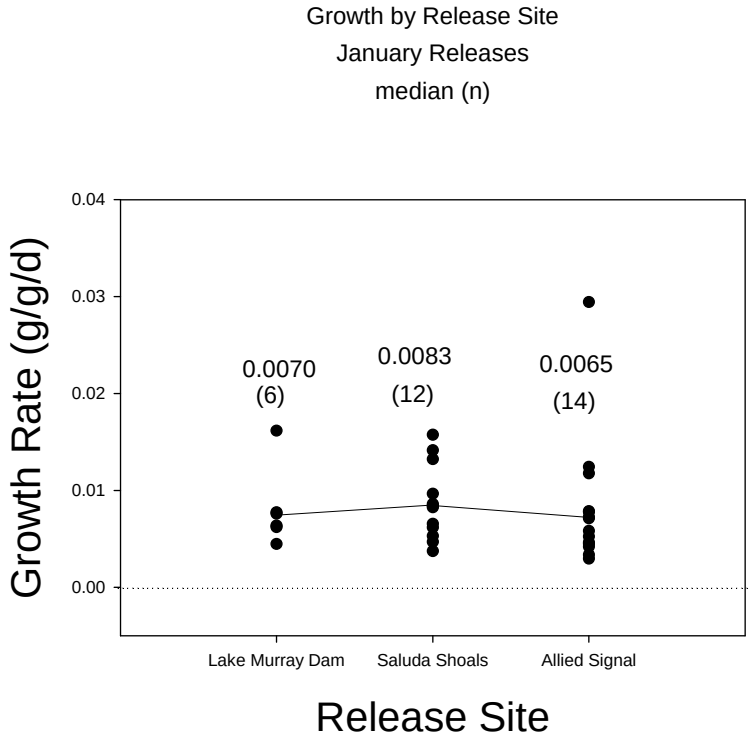
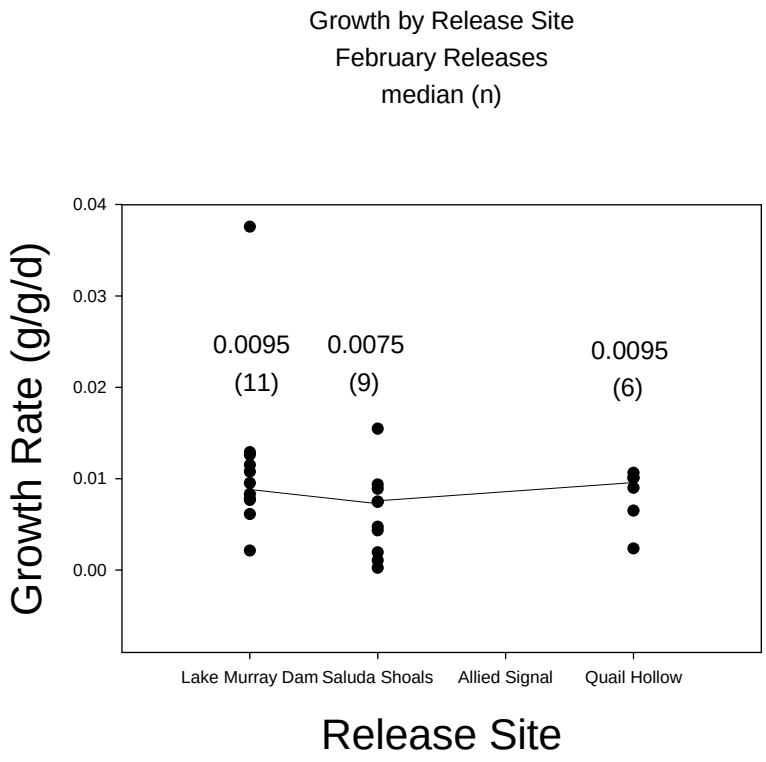


Figure B-2a: Growth Rate by Release Site for December and January Releases



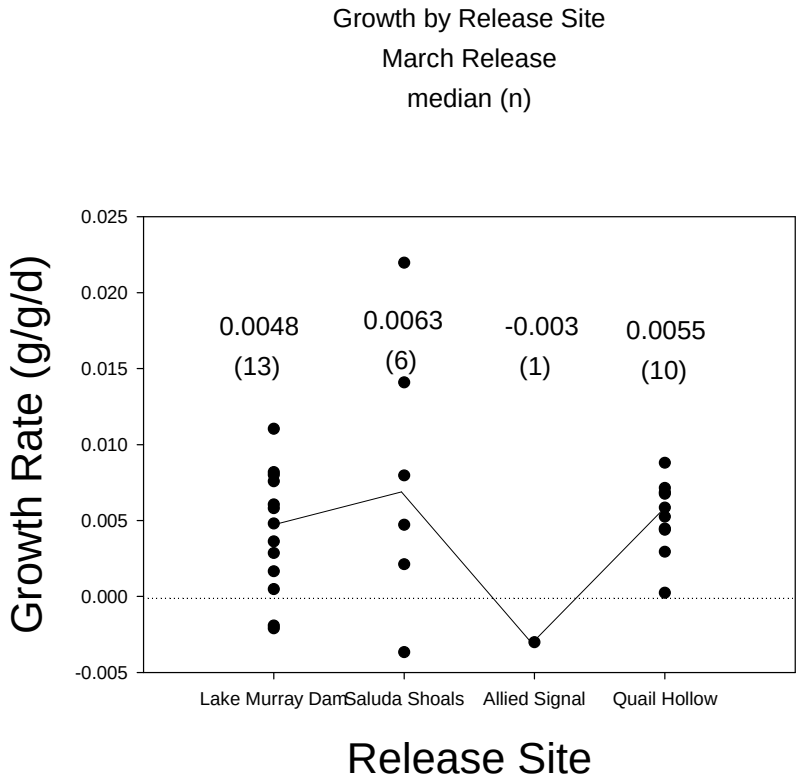


Figure B-2b: Growth Rate of Trout by Release Site for the February and March Releases

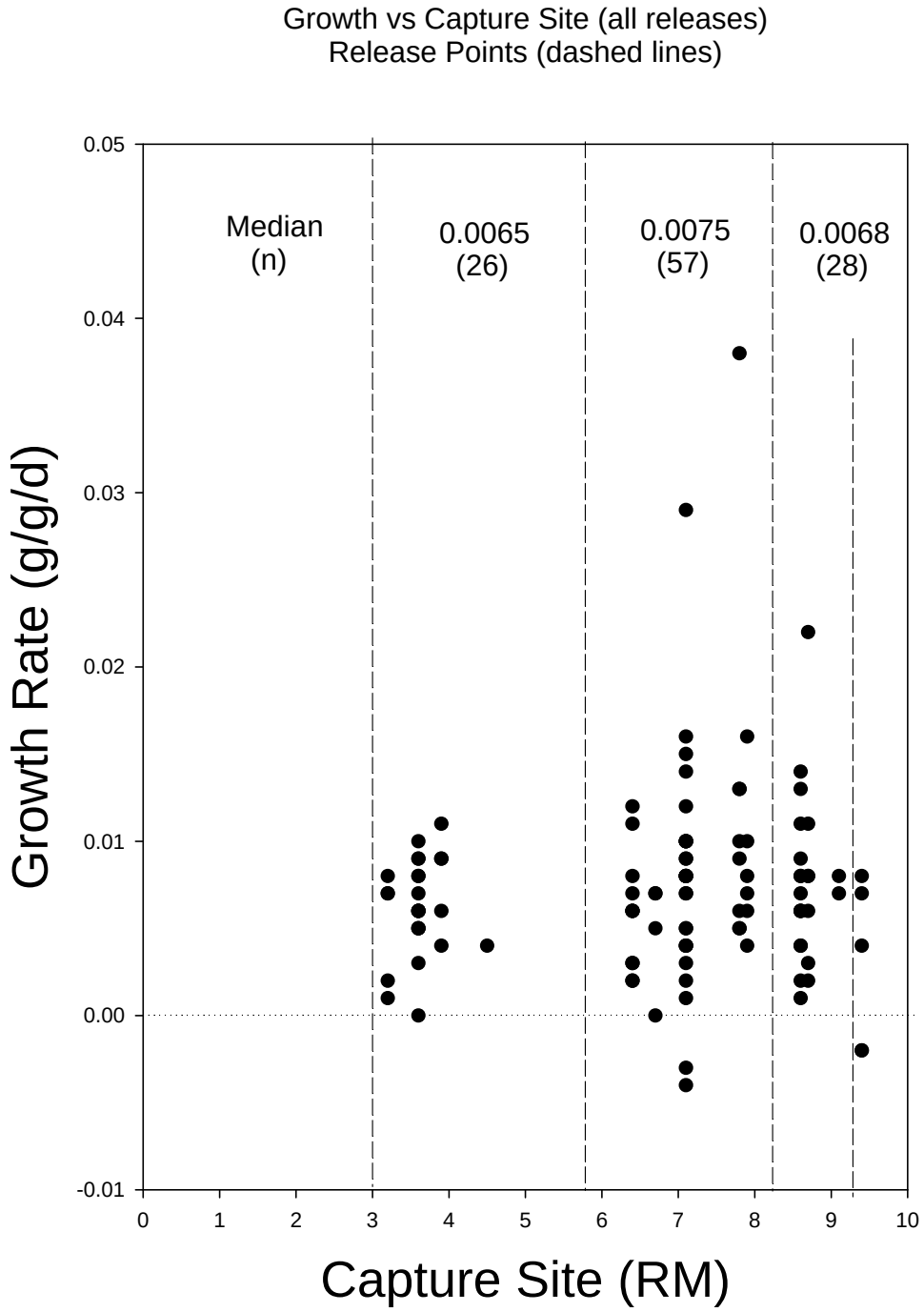


Figure B-3: Growth Rate is Shown as a Function of Recapture Location by River Mile. Release points are indicted by vertical dashed lines. From downstream to upstream these are Quail Hollow, Allied Signal, Saluda Shoals Park, and the immediate vicinity of the Lake Murray dam. No recapture efforts were made below the Quail Hollow release point (RM 3).

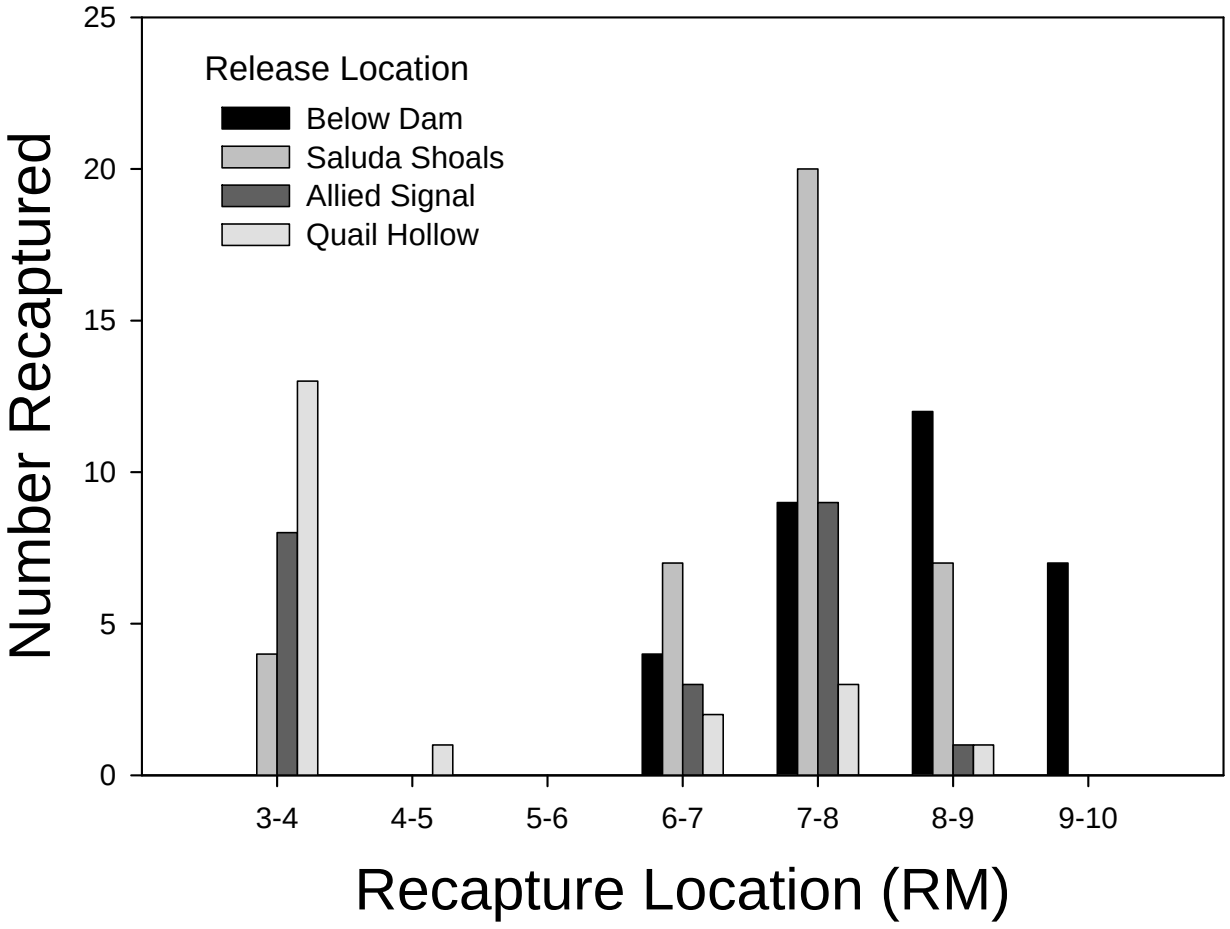


Figure B-4: Recapture Location (RM) and Site of Release. There was Limited Recapture Effort Between RM 4 and 6.

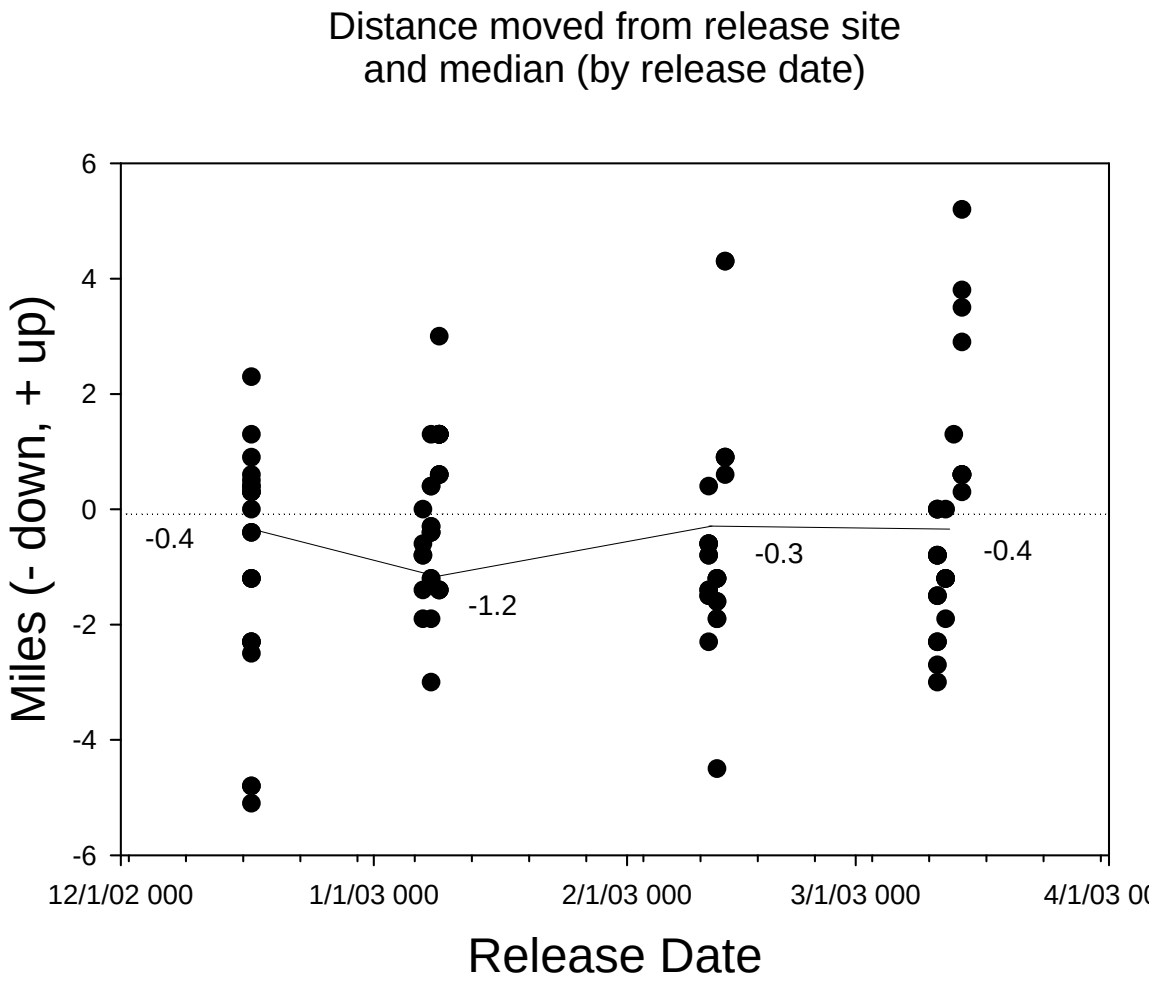


Figure B-5: Distance Moved from Release Site for Each Release Date. Median Distances are Shown on the Graph for each Release Date

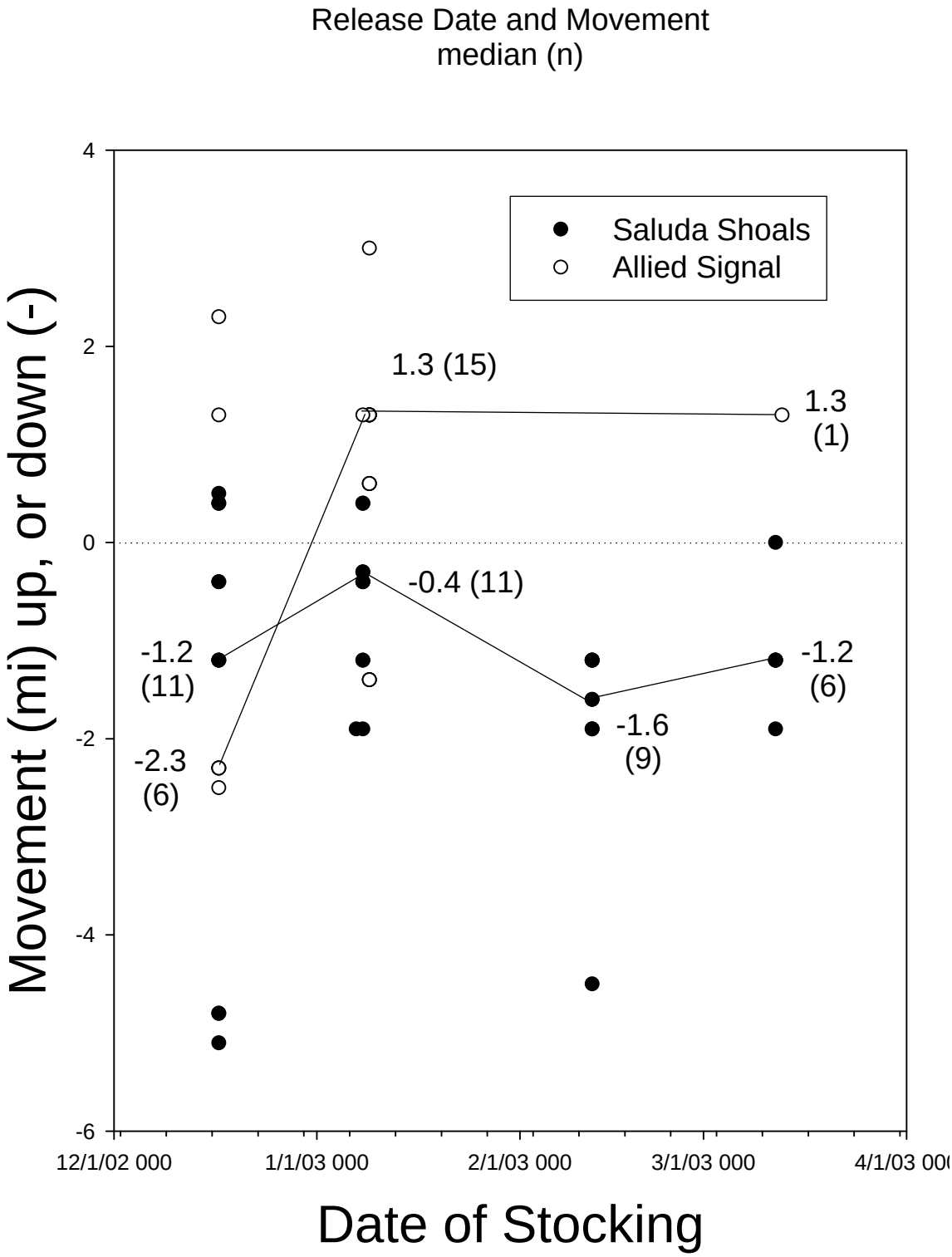


Figure B-6: Movement of Trout by Stocking Date from the Two Intermediate Release Sites where Upstream and Downstream Movement were not Limited by the Dam or by Sampling Site Limitations

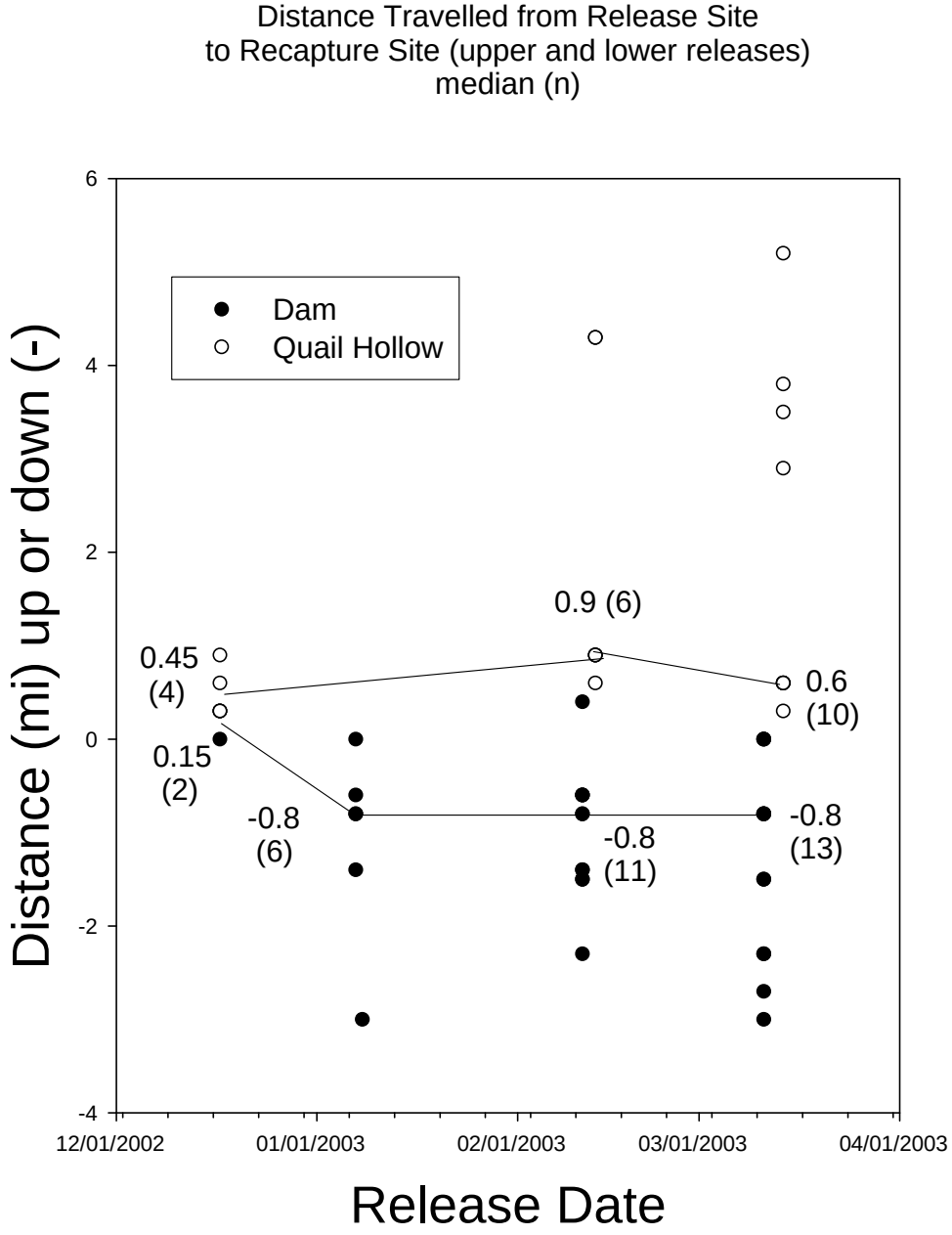


Figure B-7: Movement of Fish Following Release at Various Times at the Upstream Site Near Lake Murray Dam and at Quail Hollow

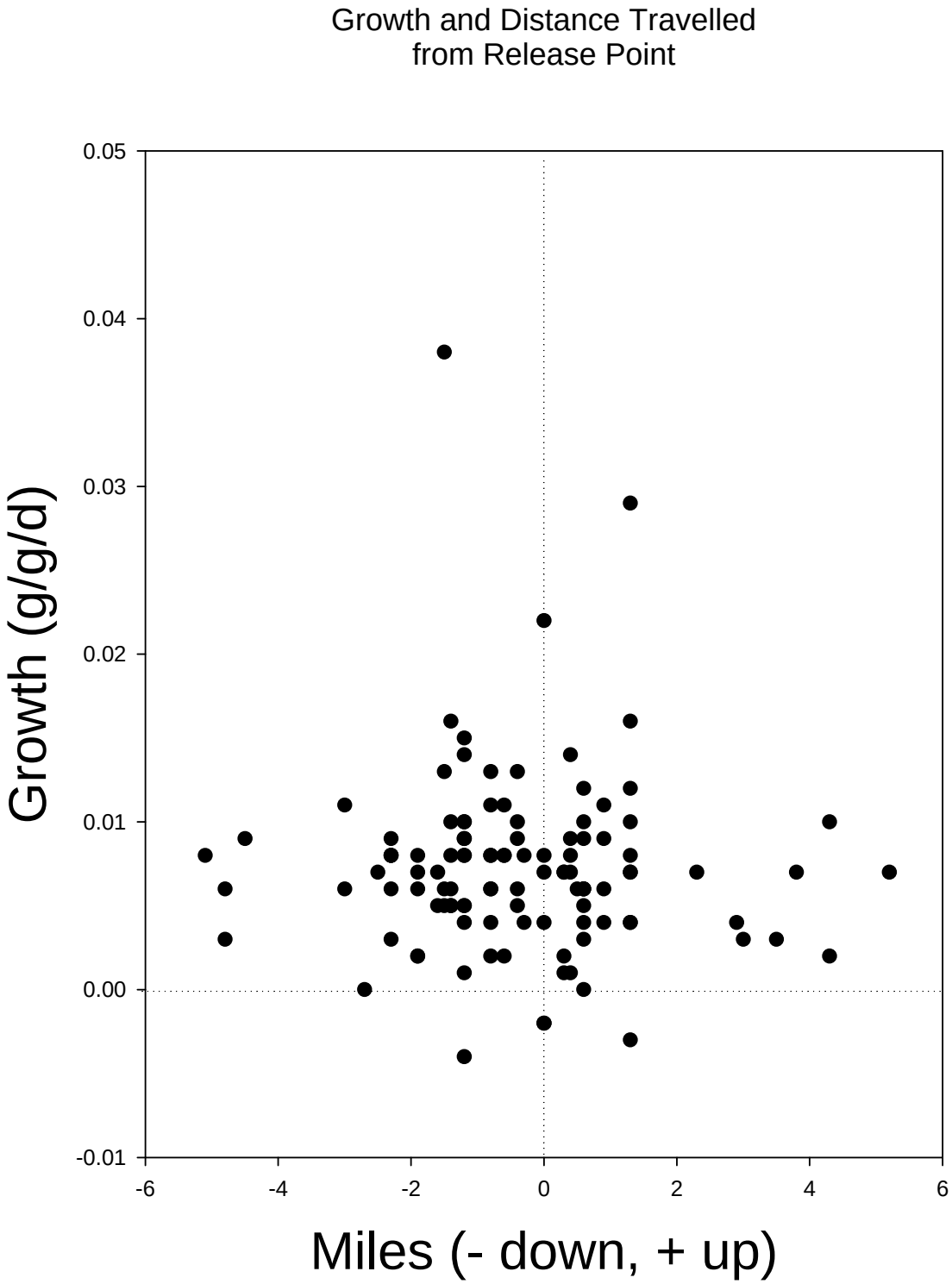


Figure B-8: This Figure Shows the Growth Rates for All 111 Fish as a Function of Their Movement Up or Downstream Following Release

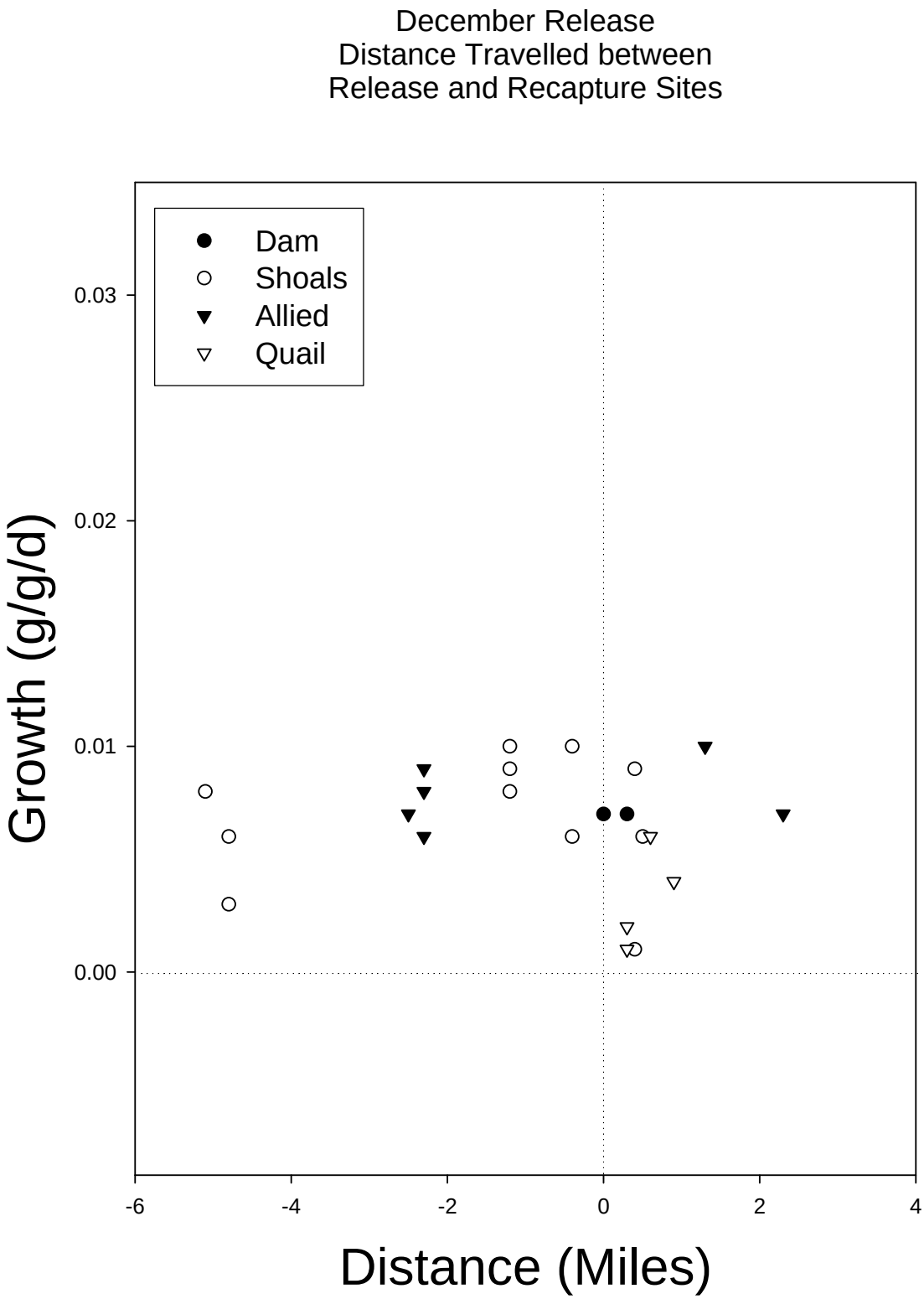


Figure B-9: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in December at the Four Release Sites

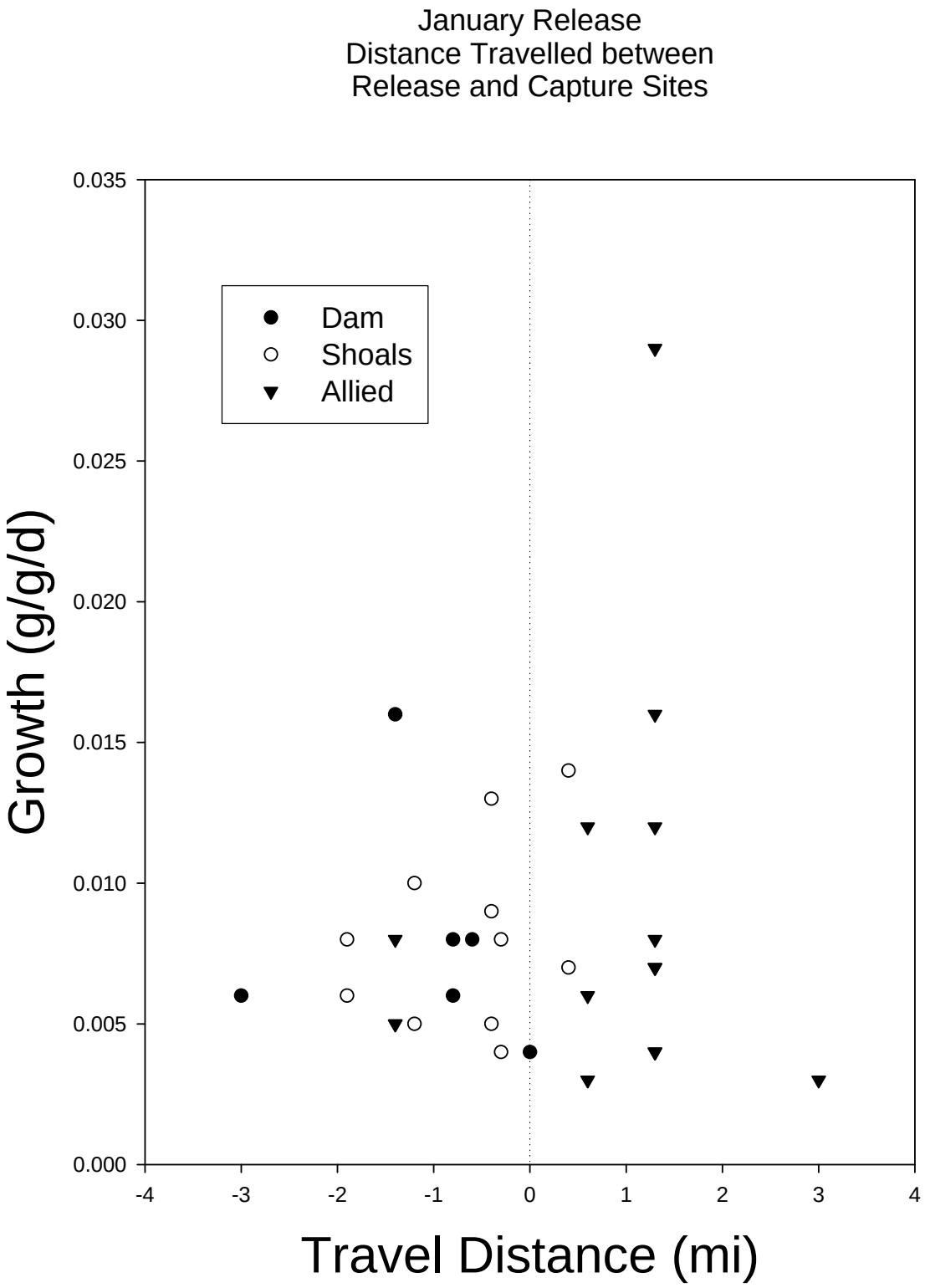


Figure B-10: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in January at the Three Release Sites

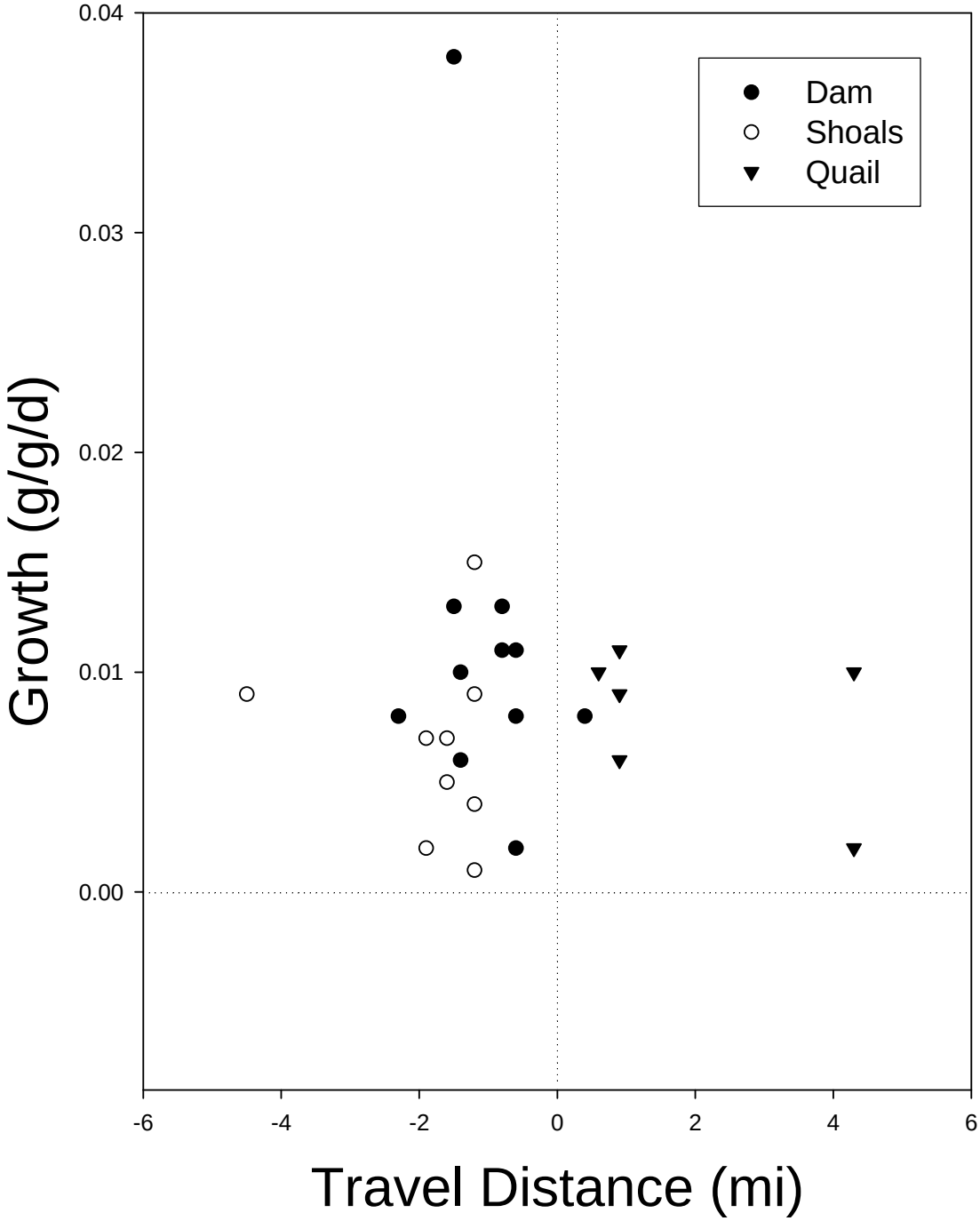


Figure B-11: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in February at the Three Release Sites

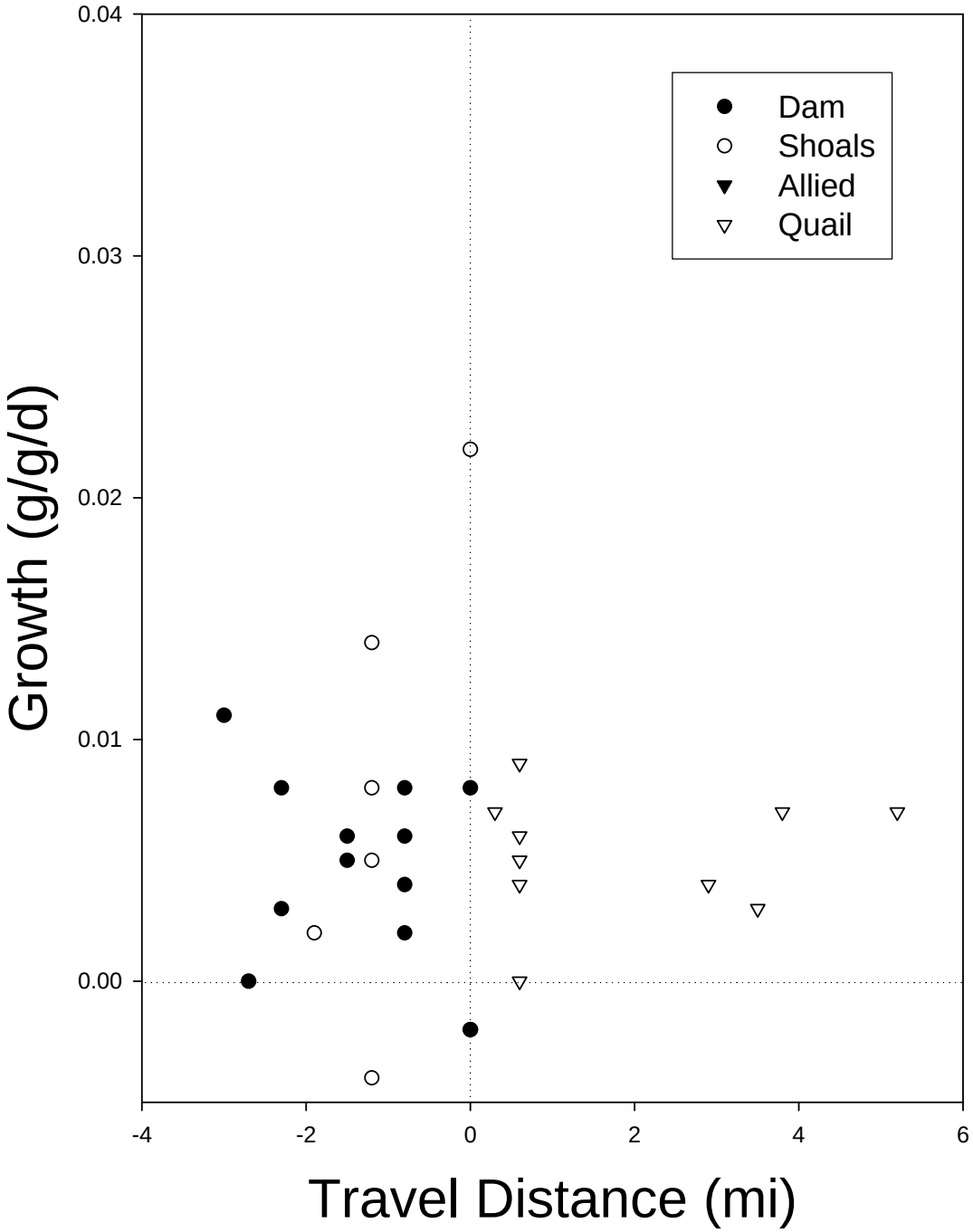


Figure B-12: Analysis of Growth Rate as a Function of Post-Release Movement for Fish Released in March at the Four Release Sites

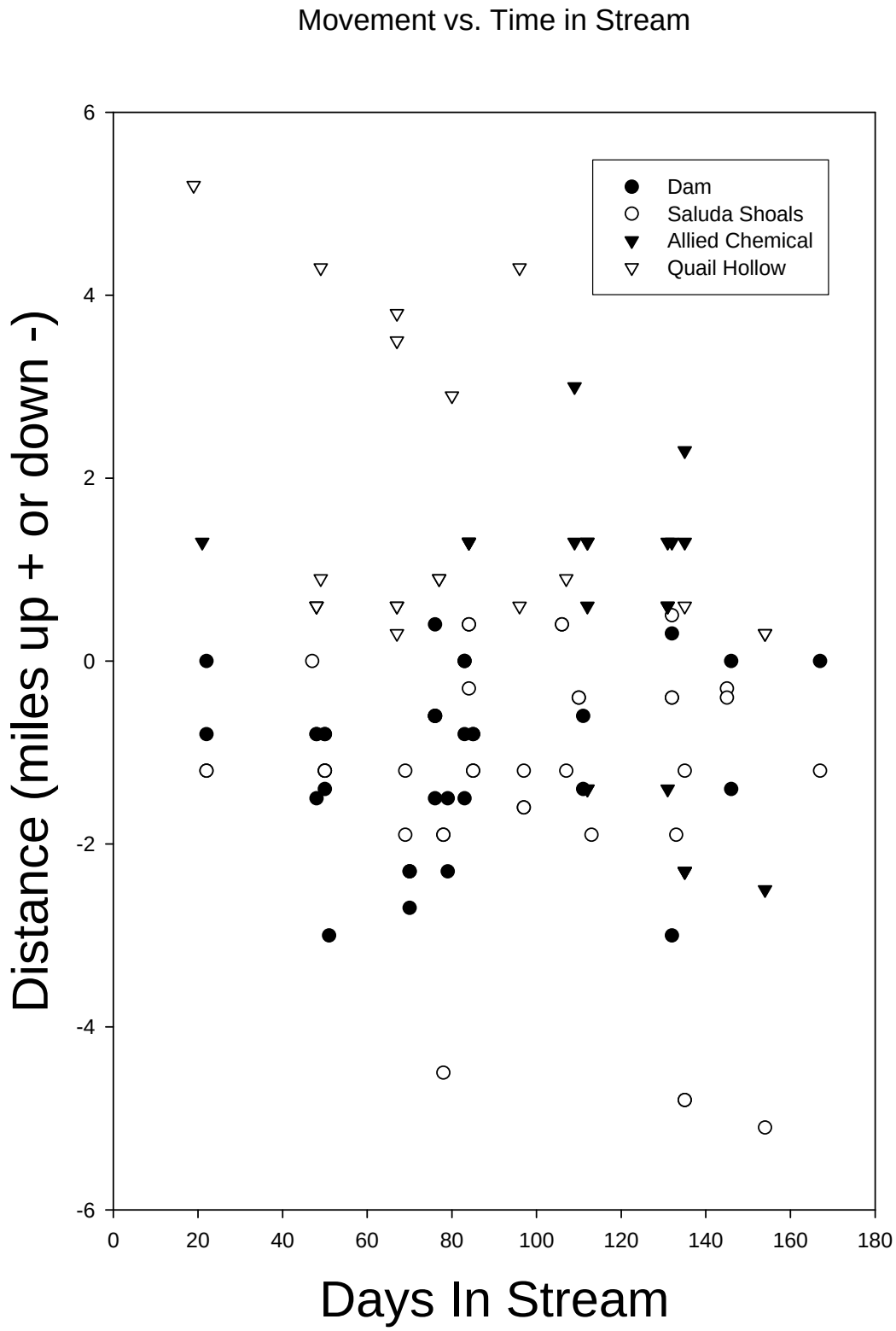


Figure B-13: Relationship Between Days in the Stream Between Release and Capture and the Distance Traveled from the Point of Release

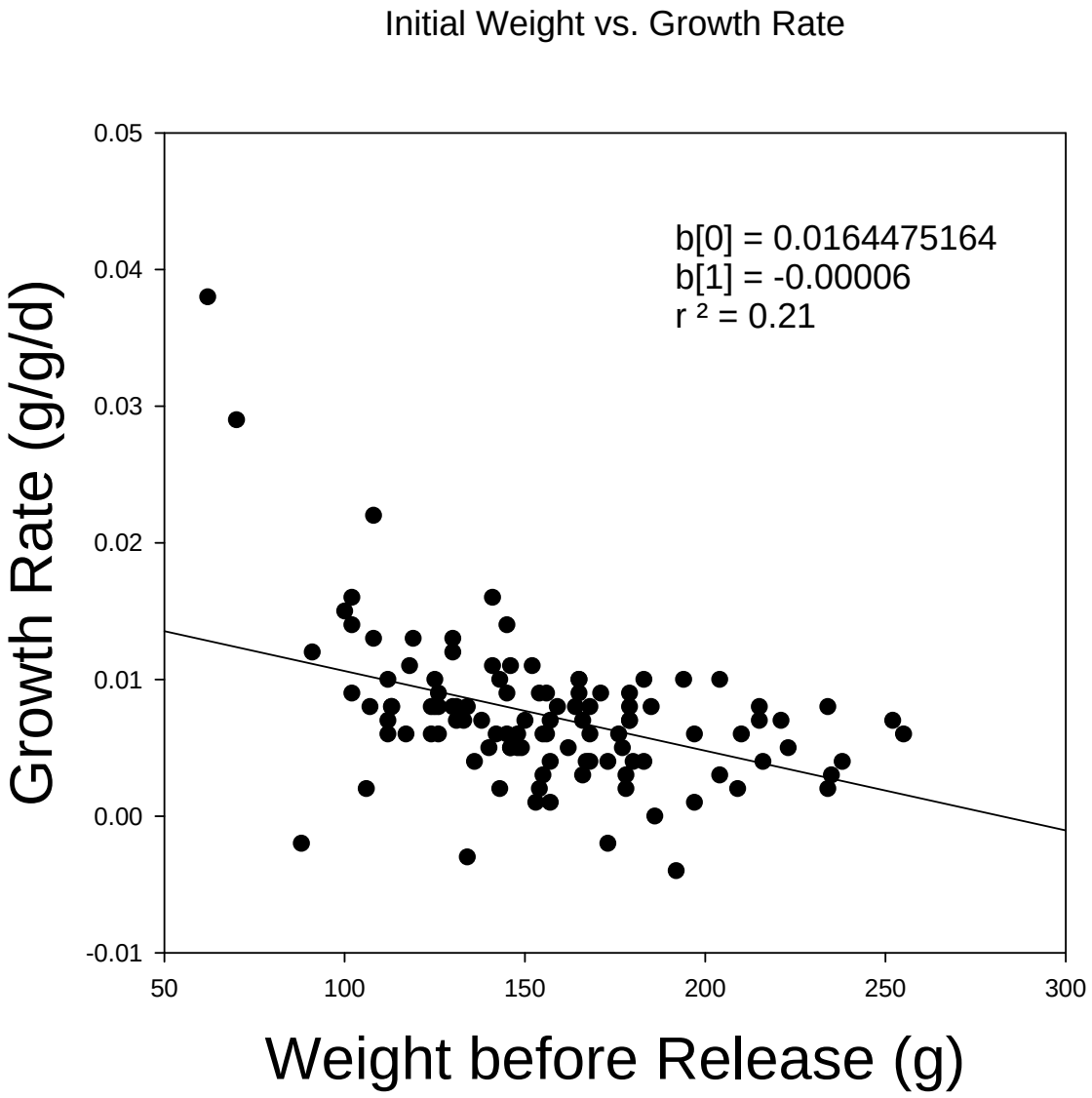


Figure B-14: The growth Rate of Trout in the LSR Showed a Slight Relationship with Size at Release

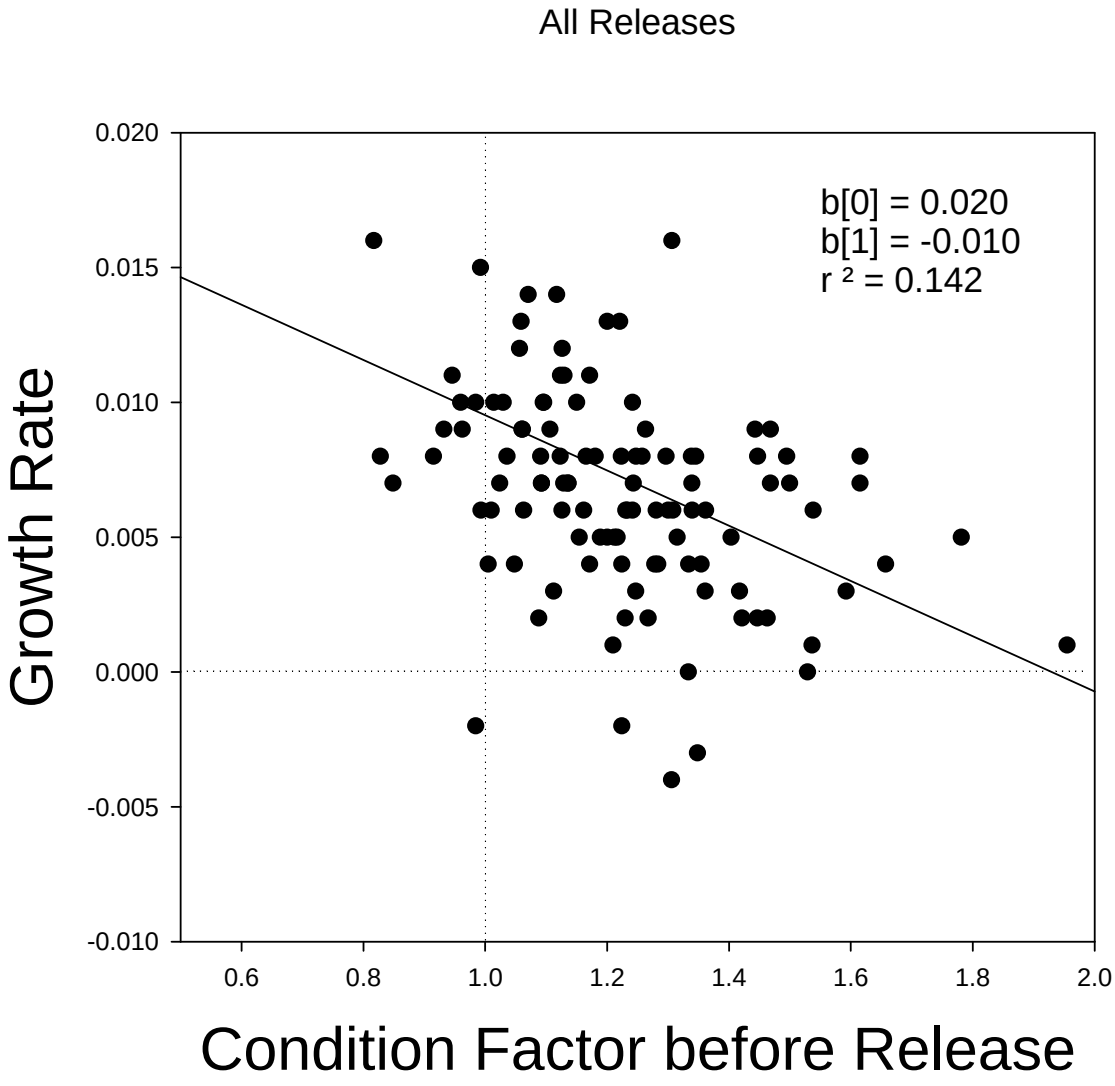


Figure B-15: Growth Rate was Greater in Fish with Lower Initial Condition Factors Following Release into the LSR

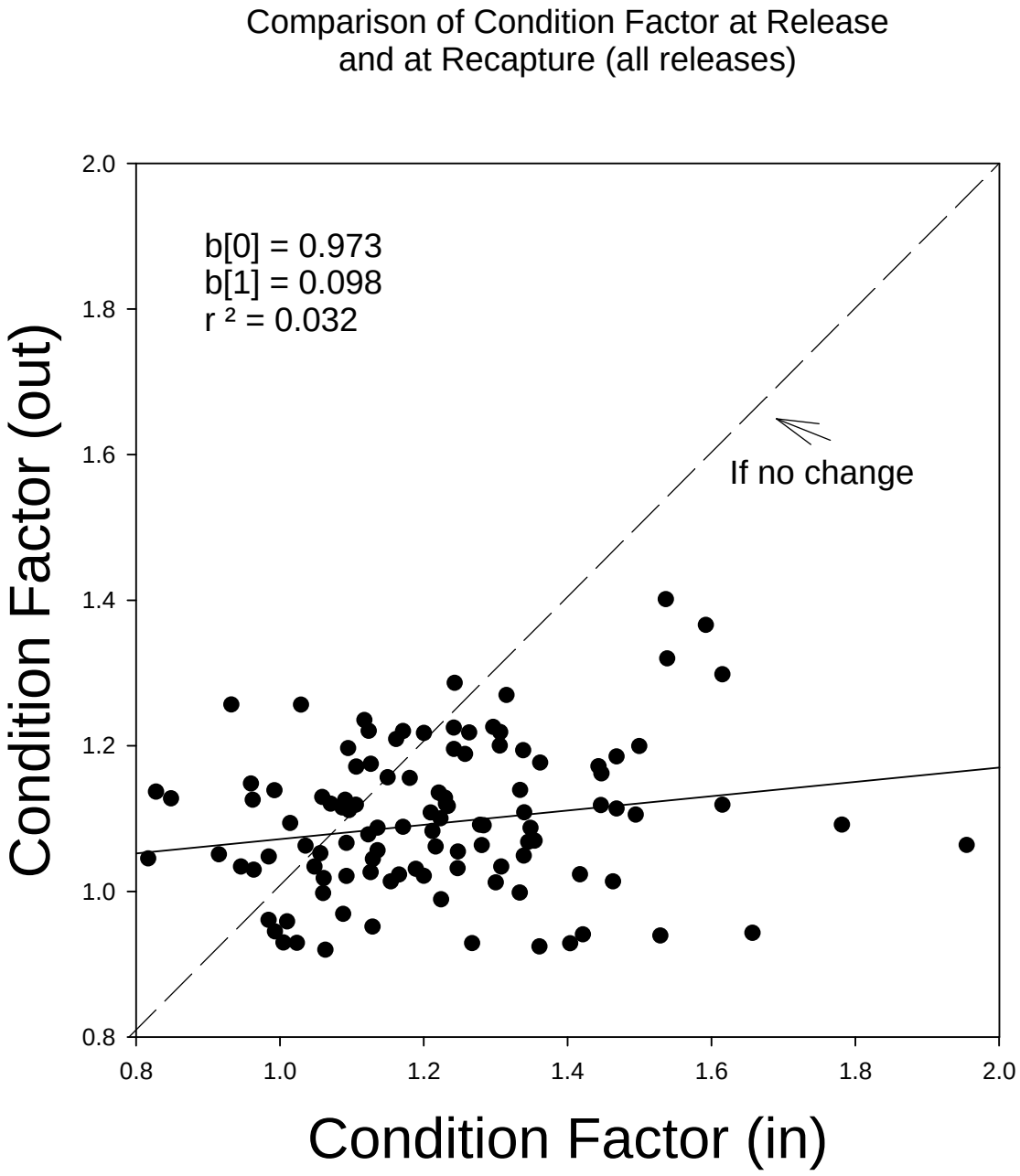
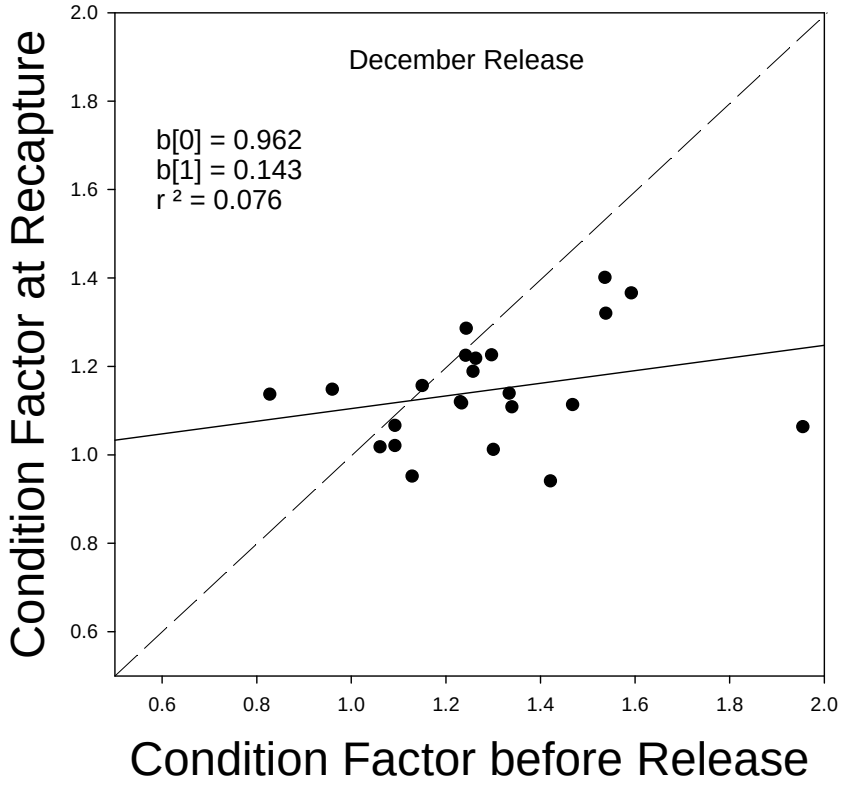


Figure B-16: The Condition of Trout in the LSR Became Much More Uniform Than That Seen at the Time of Release



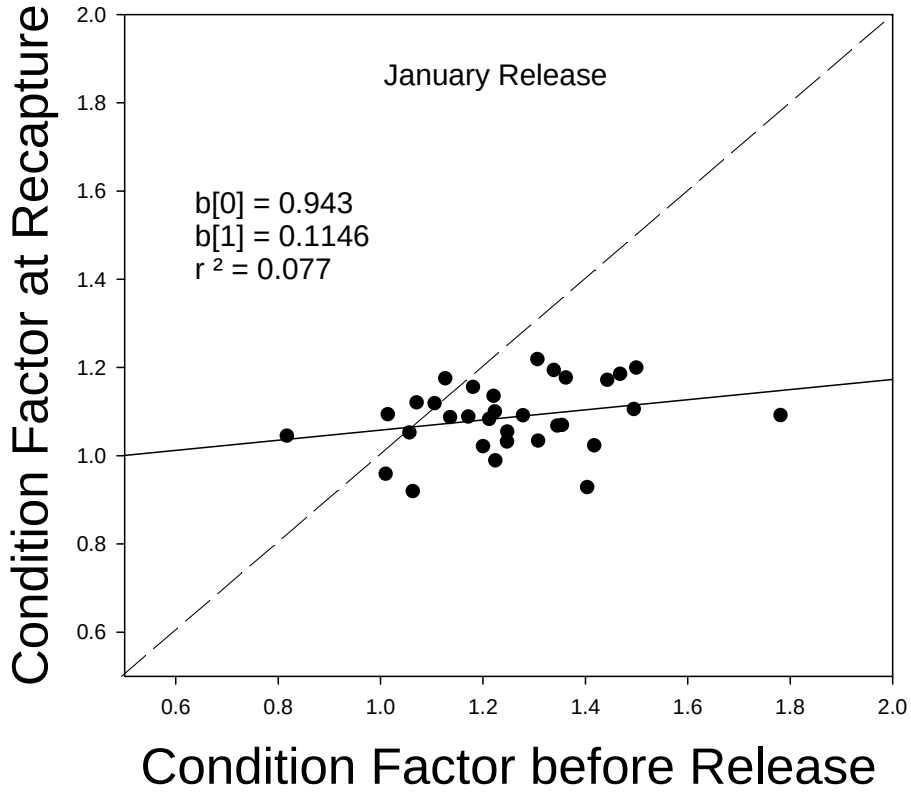
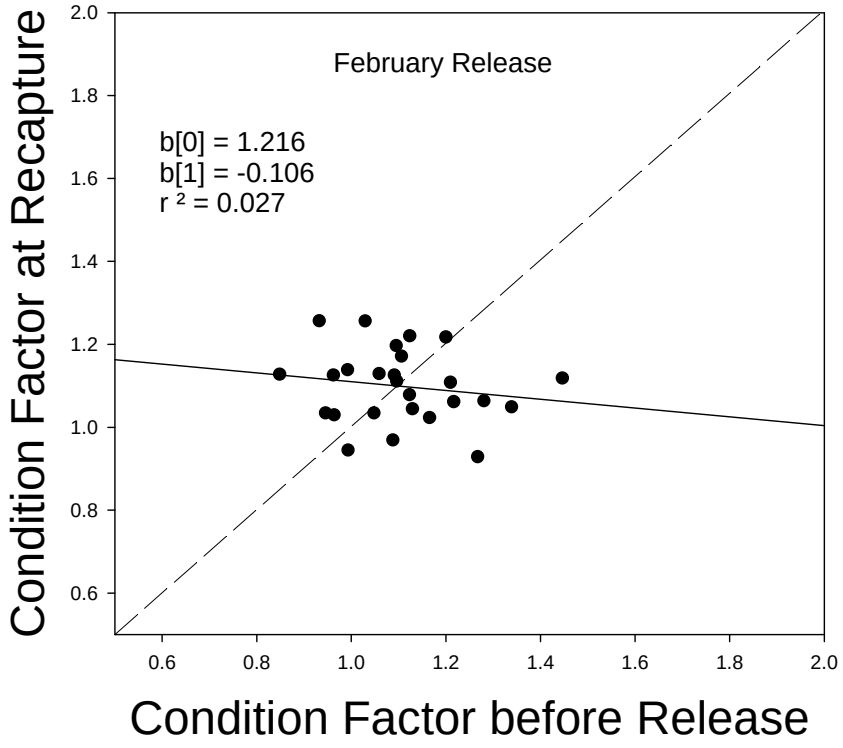


Figure B-17a: Condition Factor Change for December and January Releases



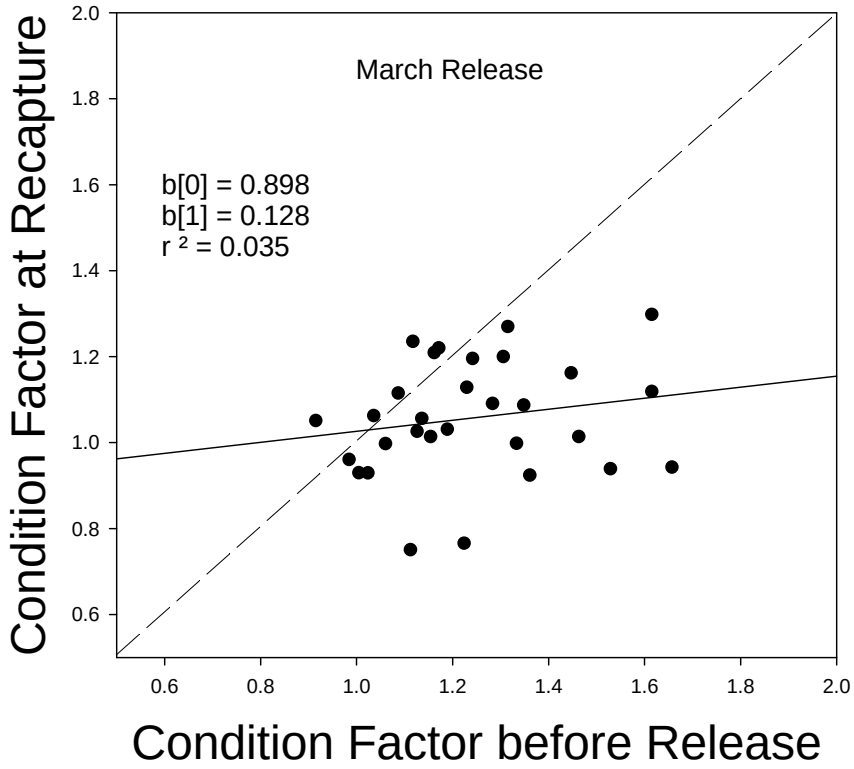
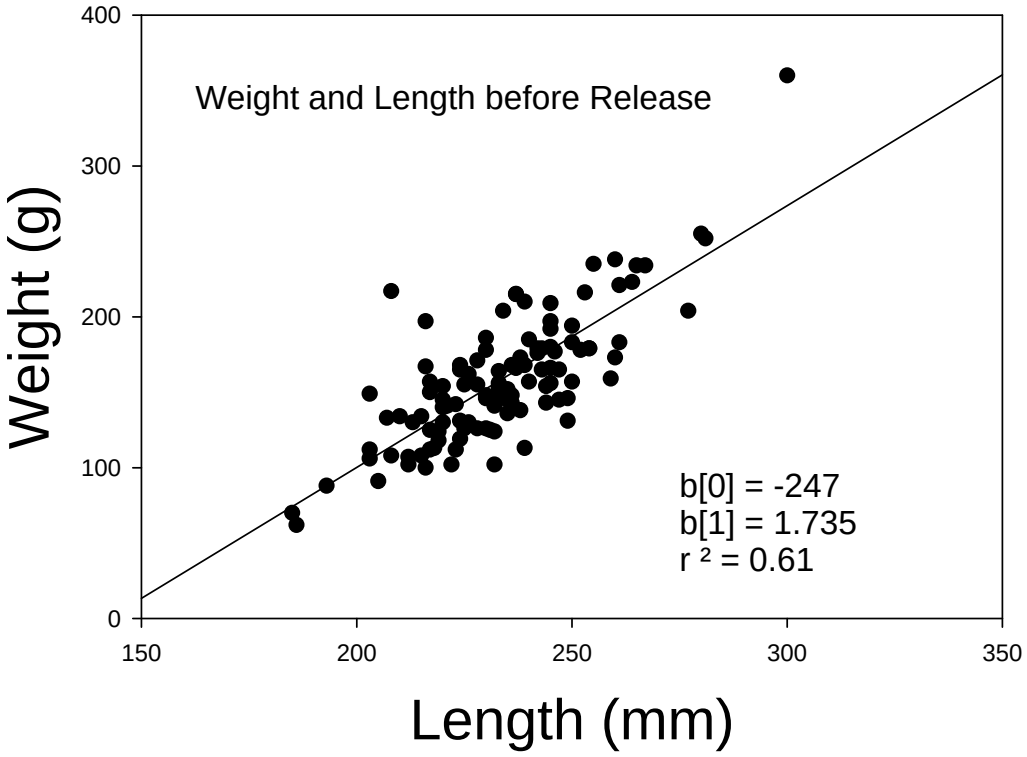


Figure B-17b:Condition Factor Change for January and March Releases



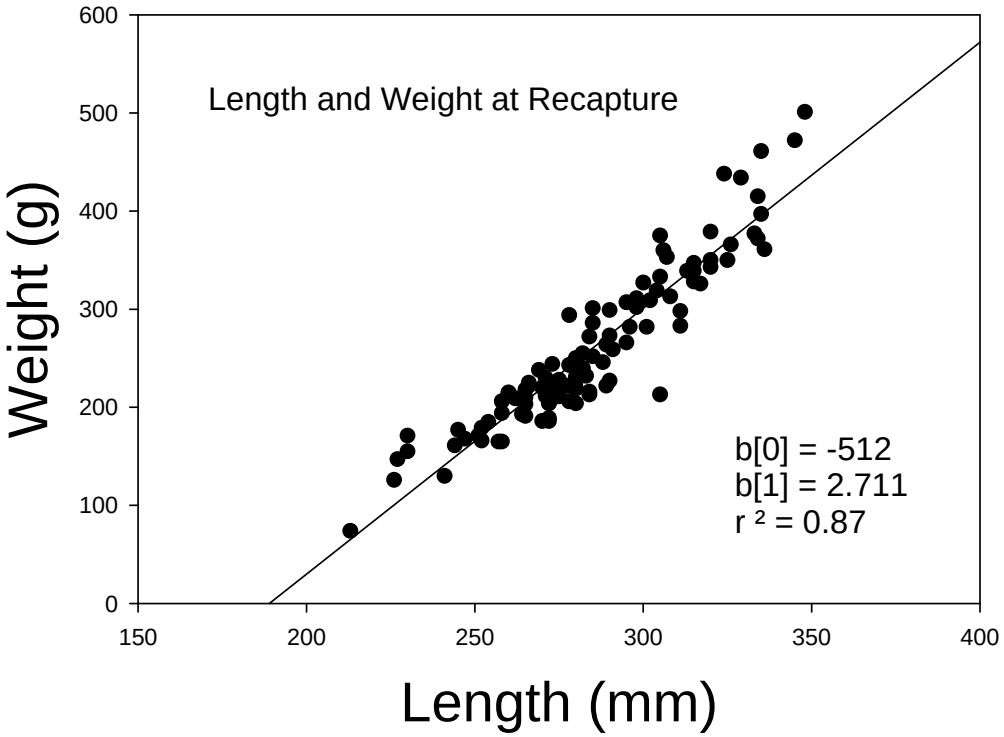


Figure B-18: Illustrating the Increased Uniformity of Trout Condition Following Release into the LSR

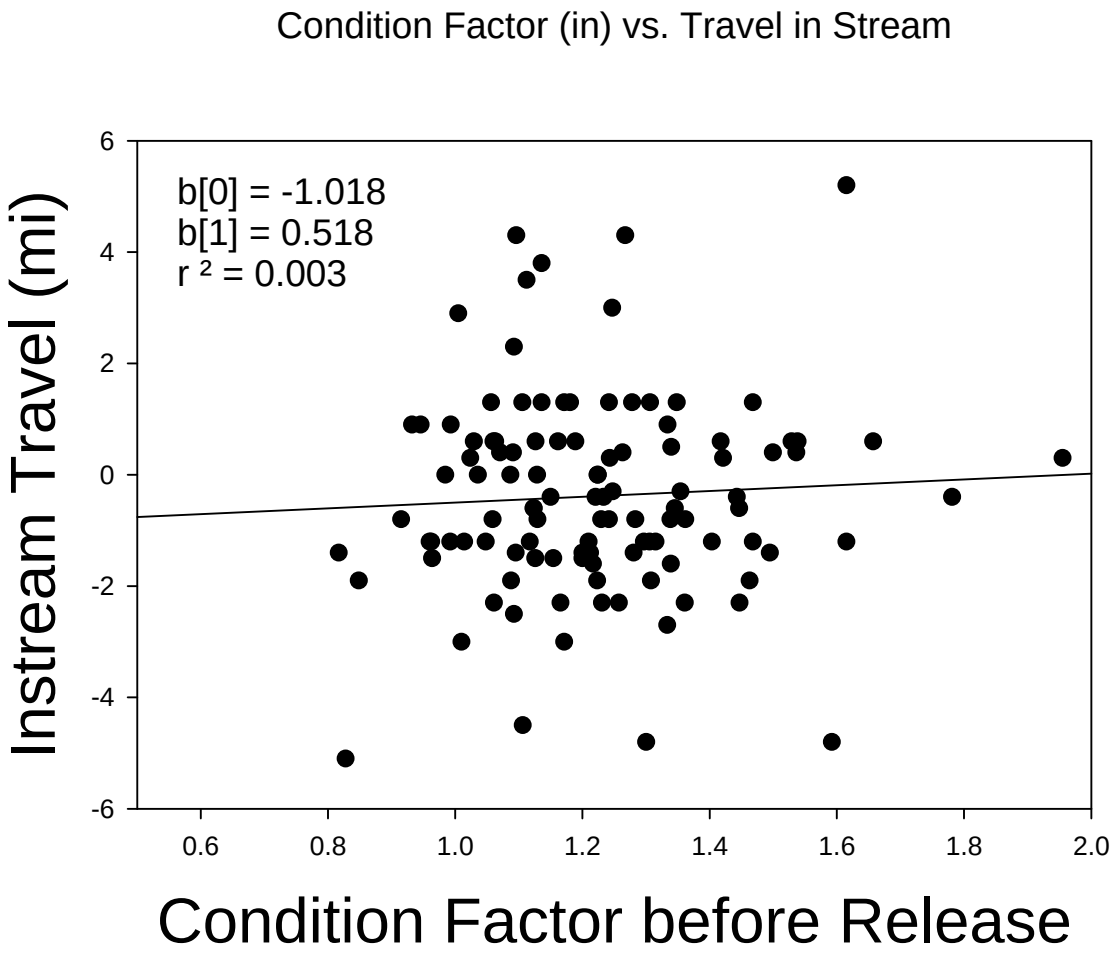


Figure B-19: There was No Significant Effect of Initial Condition Factor on the Tendency of Fish to Move Up or Downstream Following Release

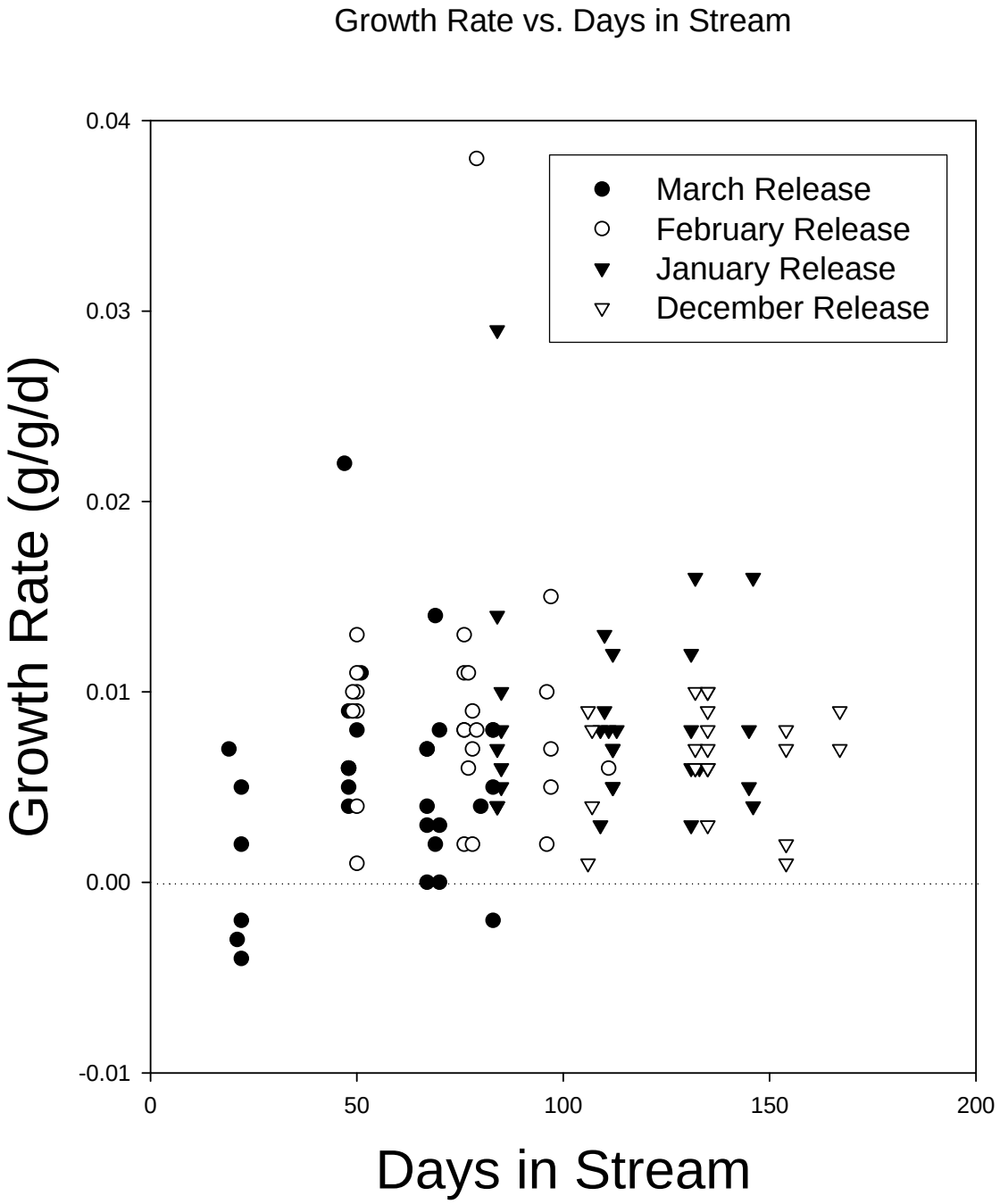


Figure B-20: There was No Appreciable Effect of Residency Duration on the Growth of Fish in the LSR

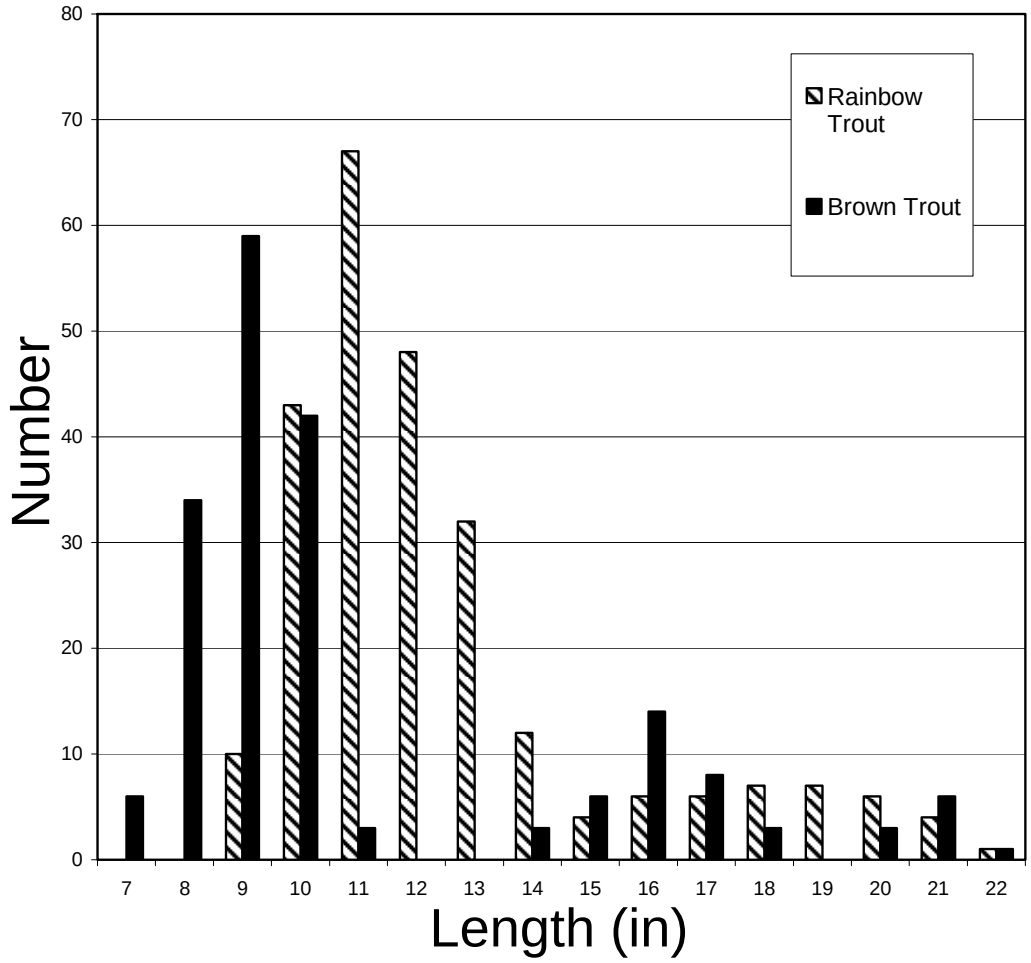


Figure B-21: Length Frequency Distribution of All Brown and Rainbow Trout Collected from the Lower Saluda River, April – June 2003

Appendix 7

Meeting Notes from the October 17th 2008 Fish and Wildlife TWC's

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
Joint Meeting of Fish and Wildlife Technical Working Committees
October 17, 2008

final CSB 12082008

ATTENDEES:

Vivian Vejdani, SCDNR
Alan Stuart, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates
Jeni Hand, Kleinschmidt Associates
Will Dillman, SCDHEC
David Eargle, SCDHEC
Milton Quattlebaum, SCANA Services
Bob Siebels, Riverbanks Zoo (retired)
Prescott Brownell, NOAA Nat. Marine Fisheries Serv.
Robert Newton, NOAA Nat. Marine Fisheries Serv.
Jennifer Price, Univ. of SC
Randy Mahan, SCANA Services
Amanda Hill, USFWS
Bill Argentieri, SCE&G
Steve Summer, SCANA Services

ACTION ITEMS:

- Finalize draft Trout Feasibility Program document and distribute to TWC for review
  Alan Stuart
- Update Benthic Macroinvertebrate Program document and distribute for TWC review
  Shane Boring
- Coordinate kick-off of technical group to guide upstream mussel restoration efforts
  Shane Boring
- Draft components of RT&E Species Awareness Program; distribute text to agencies for review
  Kleinschmidt/SCE&G
- Develop list of priority NMFS diadromous fish studies for submission to Santee Fish Accord Board; provide list to B. Argentieri
  Prescott Brownell
- Finalize next meeting date
  Shane Boring

NEXT MEETING:

Proposed for Mid-December, 2008

MEETING NOTES:

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 opened the meeting at approximately 9:00 AM. Following introductions, Shane noted that the purpose of the days' meeting was to review the three draft plans recently distributed to TWC members via e-mail: the Lower Saluda River Freshwater Mussel Restoration Program; the Lower Saluda River Benthic Macroinvertebrate Monitoring and Enhancement Program; and the Saluda Hydro Rare, Threatened and Endangered Species Management Program. It was noted that, if consensus could be reached on the programs, it was SCE&G's intent to propose these as PM&E measures under a new license for Saluda Hydro and that they would hopefully be included in the settlement agreement for project relicensing. Alan Stuart noted that, in addition to reviewing the documents associated with the above proposed programs, he would like to present a draft framework for trout monitoring in the lower Saluda River (LSR) under a new project license. He noted that the purpose of this trout monitoring program would be to address previous request for an adaptive management strategy to evaluate long-term potential for a self-reproducing trout population downstream of the project. It was noted that Prescott Brownell would also be leading a discussion to gather ideas on appropriate long-term monitoring/enhancement efforts for shortnose sturgeon and other diadromous species under a new license.

Freshwater Mussel Restoration Program

Shane opened the discussion by reviewing the results of the freshwater mussel survey conducted by John Alderman in 2006. Specifically, it was noted that significant mussel fauna had been documented in Lake Murray and its tributaries, downstream of the project in the Congaree River and in the adjacent Broad River, but that no mussels were found directly downstream of the project in the LSR. Shane added that resource agencies, in their comments on the Draft License Application, had requested mitigation for the lack of mussels and that the draft Program had been developed pursuant to that request. Shane added that the draft program was not set in stone and that it was mostly intended as a starting point to facilitate a dialogue.

Jennifer Price then gave a brief review of her research on mussel in the Congaree and Broad Rivers. As it pertains to the Saluda Hydro vicinity, Jennifer noted patterns similar to those observed by Alderman in 2006, with mussels being much more abundant on the Broad River side of the Congaree than the Saluda side. She also noted that preliminary investigations of gravidity this past summer found abundant gravid mussels in the Broad River upstream of the confluence of the LSR (and thus upstream of the influence of Saluda Hydro) and very few gravid mussels below the confluence with the LSR (at Blossom St Bridge). She noted that it is unclear why there are not mussels in the LSR, but that potential influencing factors might include: historic low DO issues, shear forces associated with high flow release event (particularly for easily-displaced juveniles), low water temperatures below the dam, and low flow events during non-generation that might result

in stranding. Jennifer added that, considering the recent improvements in DO levels in Project releases she did not think that DO is currently a limiting factor. She added she felt that temperature was likely a much more limiting factor, with several recent studies demonstrating significant impacts of coldwater dam releases on downstream mussel fauna.

Amanda Hill noted that she had discussed the temperature issue with Lora Zimmerman, the USFWS mussel expert in their office, and that Lora had serious concerns about whether reintroduction of mussels in the LSR would be successful due to low water temperatures, shear forces associated with project generation, and other issues. Following a brief discussion of the temperature regime in the LSR, the group agreed that reintroduction of mussels to the LSR would likely meet with little success and suggested scrapping the current plan. Amanda suggested that focusing efforts on upstream areas (above Lake Murray) might be more fruitful. After some additional discussion, it was agreed that a small technical working group should be formed to develop a strategy for freshwater mussels upstream of the Project dam, specifically in Lake Murray and its tributaries. It was agreed that a conference call would be the best method for a kick-off meeting. Group members identified a preliminary list of potential participants including: John Alderman, Jennifer Price, Shane Boring, Lora Zimmerman, David Eargle, and Milton Quattlebaum. Alan and Bill noted it would be best to have a Program for upstream areas finalized in time for inclusion in the relicensing Settlement Agreement, and as such, requested that the group be mobilized as soon as possible. Shane Boring was tasked with coordinating the group.

<u>Rare, Threatened and Endangered (RTE) Species Management Program</u>

Shane noted that this plan deals with three of the species that agency staff and other participating in the RTE TWC had identified as being in need of a management plan under a new FERC license for Saluda Hydro: bald eagle, wood stork, and rocky shoals spider lily. The group then addressed each of the species.

Bald Eagle
Shane noted that the proposed measures merely codify those items already required under the USFWS (1997) Bald Eagle Guidelines, which ensure compliance with the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. In general, the guidelines require that a buffer of 660 ft be maintained around nest trees during the nesting season and 330 ft during non-nesting. Shane noted these requirements were implemented in 1997 following de-listing of the bald eagle. He added that, according to Tommy Boozer, SCE&G was notified of the change by letter several months ago, and that they were already following the new measures as part of shoreline permitting activities. Steve Summer noted that SCANA has a Raptor Protection Policy and enquired whether it had been integrated with the plan being discussed. Shane indicated that adherence to the Raptor Protection Plan is referenced in the Program and that Laura Blake-Orr had reviewed and approved the bald eagle section of the RTE Program. The group agreed that the bald eagle management measures were acceptable.

Wood Stork

Shane briefly reviewed the measured proposed in the Program for Wood Stork, including:

- Documentation of any wood storks observed during fall/winter waterfowl surveys on Lake Murray
- Inclusion of wood stork in an RTE Species Public Awareness Program, including a mechanism to report stork sightings.
- Coordination with SCDNR Endangered Species staff to ensure that SCE&G has most current information on whether storks have been observed recently on Lake Murray.
- Report any new sightings of wood storks to SCDNR and USFWS staff.

The group agreed that the measures proposed for wood stork appeared acceptable.

Rocky Shoals Spider Lily
Shane explained that there are no RSSL plants in the LSR directly downstream of the project, and that the RSSL population referred to in the Program is located in the Saluda/Broad confluence area. He added that this population is currently managed under the Columbia Hydro Project RSSL Enhancement Plan, which SCE&G, the City of Columbia, Riverbanks Botanical Gardens and other partners began implementing in 2007. He added that the measures included in the RTE Management Program are intended to mirror those already implemented in the existing Columbia Hydro RSSL Enhancement Plan. The group generally agreed that using the RTE Management Program as a means to tie Saluda Hydro to the existing restoration efforts in the confluence was acceptable. Amanda indicated that she would like to have Lora Zimmerman have a look at the draft RSSL measures, but that she did not anticipate there being issues.

RTE Awareness Program
Several attendees enquired as to whether all of the RTE species occurring in the Saluda Project vicinity would be a part of the RTE Species Public Awareness Program (RSSL, Bald Eagle, Wood Stork, Shortnose Sturgeon). Alan and Bill indicated that these four species would be included. Amanda and Vivian requested that their agencies be allowed to review the program materials prior to implementation. Alan and Bill agreed. Shane enquired as to whether it would be acceptable to send the raw information (in MS Word format) for review and then allow SCE&G to handle the graphic design without further review. The group was agreeable to this approach.

<u>LSR Benthic Macroinvertebrate Monitoring and Enhancement Program</u>

Steve Summer noted that SCE&G has been conducting some type of macroinvertebrate monitoring on the LSR on an almost yearly basis since approximately the late 1990's. Shane noted that the proposed program would be a continuation and expansion of this monitoring effort under a new license for the project. Specifically, it was noted that the proposed program would include a bi-annual (twice yearly) Rapid Bioassessment for a period of 6 years following issuance of the new license, as well as bi-annual Hester-Dendy sampling during alternate years. It was noted that sampling would be conducted at 4 locations: the project tailrace, Oh Brother/Ocean Blvd rapids, Corley Island and adjacent to Riverbanks Zoo. Amanda asked whether there was anything special about the 6 year sampling period and enquired if any follow up sampling was planned. Noting that

SCE&G would likely continue sampling beyond the 6 years anyway, Bill proposed a commitment in the plan to consult with the agencies and if there is a need for additional information, initiate a 2-year follow-up survey cycle (2 years of Rapid Bioassessment and 1 year of Hester-Dendy sampling) 10 years following completion of the initial 6 years. The group concluded that this was acceptable. Shane Boring was tasked with updating the draft program document and distributing it to the TWC for review.

Proposed LSR Trout Monitoring Framework

Alan Stuart noted that, at the request of Trout Unlimited, a Trout White Paper had been prepared as part of relicensing to determine potential for a self-reproducing and/or self-sustaining trout fishery. He added that, while this early assessment determined that trout reproduction was unlikely in the LSR under current conditions, SCE&G committed to establishing an adaptive management strategy for trout to allow for reproductive potential to be re-examined once aquatic enhancements, such as minimum flows and DO enhancements, have been implemented under a new license. Alan then presented a proposed Trout Monitoring Framework.

Alan noted the proposed trout program would likely include formation of a technical committee to meet periodically to review pertinent data and guide management recommendations. Pertinent data to be considered for decision making will likely include a number of existing programs, including: water quality (DO and temp), flow (USGS gages), macroinvertebrate (from the SCE&G macroinvertebrate program described above), and electrofishing data (SCDNR, SCE&G). In addition to existing data, the program will likely include icthyoplankton sampling in the Ocean Blvd./Oh Brother Rapids area during the potential window for rainbow trout spawning (May), as well as visual searches for redds during the preceding weeks. It was noted that ichthyoplankton sampling and redd searches will likely be conducted for a period of 6 years (concurrent with the macroinvertebrate sampling). Alan noted the program will likely include a replication of the trout growth study (originally performed in 2003) following completion of the initial 6 years of macroinvertebrate, ichthyoplankton and redd monitoring (see macroinvertebrate program described above). Finally, the program will likely include an annual report summarizing the data collected during each year of the program.

Alan indicated that the program had not been fully developed, but that he wanted to present an outline today to get a feel of whether the TWC felt it was heading in the right direction. The group concluded that the program seemed generally acceptable. Alan noted that the plan would be further refined and distributed to the TWC for review in the near future.

Diadromous Fish Needs Under a New Saluda Hydro License

Shane noted that, in the comments on the Draft License Application, NMFS alluded to some long-term monitoring that might be appropriate for shortnose sturgeon under a new license term for Saluda. Prescott clarified the NMFS position, noting that some additional measures to promote sturgeon conservation would likely be needed considering the length of the license, the importance

of the Santee Basin to the recovery of shortnose sturgeon and other diadromous species, and the pending implementation of minimum flows and other enhancements. Prescott urged the group to not just focus on sturgeon, but on all diadromous species.

Bill A. asked if Prescott had specific monitoring in mind. Prescott mentioned a number of potential long-term monitoring efforts with potential to contribute to diadromous fish recovery, including: water quality/chemistry studies, fish population dynamics studies, and telemetry studies to better document fish movement and habitat use. Prescott noted that these are just a few potential studies and that, as with several other relicensing issues, some sort of adaptive management approach would likely be best. Prescott noted specifically the need for telemetry work in the confluence area to understand movement at the Broad/Saluda interface and that potential influence of newly-established fish passage on the Broad. He also noted a need for telemetry work in the upper Santee-Cooper Lakes to determine basin preferences (use of Wateree versus Congaree, etc.).

Amanda noted that much of what Prescott mentioned is already planned as part of the Santee Basin Diadromous Fish Accord. Bill enquired as to whether those measures being proposed under the Accord would satisfy the NMFS request for additional monitoring. Prescott noted that they might, but not being a signatory to the Accord, they would need to have a closer look at exactly what is being proposed. Bill noted that he would send Prescott the 10 year plan for the Accord and suggested that Prescott review the actions being proposed and pass along any additional requests he might have. Prescott agreed with this general approach. He added that an ideal approach would be to develop a mechanism to ensure they are kept abreast of developments in the Accord process and occasionally meet to discuss any items not addressed by the Accord. Bill suggested that SCE&G take the lead in letting NMFS know when Accord technical meetings are taking place and that NMFS could potentially attend as observers. Prescott noted that being kept informed of meetings would be very helpful, as attendance at these meetings would help them develop ideas regarding monitoring needs/studies. Bill indicated that he would notify the Accord Board that NMFS will likely be attending as an observer.

Amanda noted that sturgeon studies under the Accord are slated to start in 2010, but that specific studies have not been identified. She advised that NMFS should let SCE&G know of what studies they would like to see performed as soon as possible. Prescott then expanded a bit on a few of the studies NMFS feels might be most worthwhile, including: sturgeon telemetry studies, population dynamics, and characterization of spawning habitat. Bill proposed that SCE&G could present these ideas to the Accord group to ensure that they are addressed as part of the process. Prescott noted that he would like to get together with other agency staff from his agency, as well as possibly USFWS and SCDNR, to further refine the list of requested studies. Prescott indicated that he would try to have the list of studies to SCE&G by Friday, October 31. Bill noted that SCE&G and Kleinschmidt would incorporate the study recommendations into a draft PM&E Program once they are received from NMFS. Bill reiterated that SCE&G would work with NMFS to address any of the study requests not addressed under the Accord. Amanda noted that they would assist SCE&G in recommending the NMF requested studies to the Accord group.

The meeting adjourned at approximately 2:45 PM.

Appendix 8

DRAFT PROPOSED MAINTENANCE, EMERGENCY, AND HIGH/LOW INFLOW PROTOCOL

SALUDA HYDROELECTRIC PROJECT P-516
PROPOSED MAINTENANCE, EMERGENCY, AND HIGH/LOW INFLOW PROTOCOL
- DRAFT -

PURPOSE

The proposed Maintenance, Emergency, and Low Inflow Protocol (MELIP) for the Saluda Hydroelectric Project (FERC Project No. 516) is intended to provide operational guidance for abnormal operating situations caused by maintenance activities, emergency situations (including high inflow or flood events), and periods of sustained low inflow or drought conditions.

There are several types of maintenance activities which may require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases. Certain emergency situations involving the interconnected electric system ("grid"), project structures, equipment, or waterways may also require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases.

During periods of high inflow or flood events, the project must be operated to safely pass and/or store the high inflow without compromising the safety of the dam and other project structures. This may require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases, either to pass higher than normal inflow, or to draw down the reservoir in advance of forecast high inflow.

During periods of low inflow, the Licensee's goal is to conserve the remaining water stored in Lake Murray, in order to delay or prevent depletion of the usable storage in the reservoir. This will allow the project to continue to fulfill three primary critical functions for as long as possible during drought periods: Reserve electric generation, municipal water supply, and critical downstream flow releases. This will also act to preserve the recreational and environmental values of the reservoir.

PROPOSED TARGET RESERVOIR ELEVATIONS

Normal target reservoir elevations are defined by the proposed Reservoir Guide Curve (Appendix 1). These are reservoir elevations which the Licensee will endeavor in good faith to achieve, unless operating under one of the conditions listed in this Maintenance, Emergency, and Low Inflow Protocol.

PROPOSED MINIMUM FLOW SCHEDULE

The seasonal minimum flow regime for the project under normal inflow conditions is currently being evaluated by the Licensee in consultation with the stakeholders. Currently proposed values for the normal seasonal flow regime are:

January 1 – March 31: 700 CFS
April 1 – April 14: 1,000 CFS
April 15 – May 14: 1,300 CFS
May 15 – May 31: 1,000 CFS
June 1 – December 31: 700 CFS

At this time, the consensus of the stakeholders is that a low flow of 400 CFS is a reasonable value to provide minimal navigability and preserve suitable conditions for most fish and other aquatic species in the lower Saluda River during periods of low inflow.

OPERATION DURING MAINTENANCE ACTIVITIES

Under some maintenance conditions, it may be necessary to operate the project such that reservoir elevations and/or seasonal minimum or scheduled recreation flows cannot be maintained in the normal ranges, even during periods of normal inflow and hydrologic conditions. Examples of such conditions are:

- Scheduled or unscheduled project structure or hydro unit maintenance;
- Scheduled reservoir drawdown below normal minimum elevation due to required inspection or maintenance of project structures, or improvements to lakeside facilities.

To the extent practical, the Licensee will avoid scheduling project structure or hydro unit maintenance that would impact the ability of the Licensee to release the required seasonal minimum flow or scheduled recreation flows, unless it is likely that further damage or unscheduled maintenance would ensue if the work is delayed. If it is determined that the seasonal minimum flows cannot be maintained due to the scheduled maintenance activities, the Licensee will consult with the appropriate resource agencies to monitor and minimize impacts to water quality and aquatic habitat. To the extent practical, the licensee will also endeavor to replace any scheduled recreation flows which are impacted by the scheduled maintenance activities within the same calendar year as originally scheduled.

The reservoir may periodically be drawn down to its minimum level of el. 343.5' (el. 345.0' PD)[1] for repairs to the upstream riprap armor on the original earth dam, inspection or repairs to the intake towers or spillway structure, or to accomplish improvements to boat landings or other recreational sites. Scheduled drawdowns such as this would normally occur during October through February; however the time period may vary depending on the required scope of maintenance work. The Licensee will make public notification of scheduled drawdowns via media releases and announcements on the corporate web site as far in advance as practical.

An unscheduled reservoir drawdown due to unforeseen equipment damage or other reason is very unlikely; however it is possible that this would occur at some time. To the extent practical, the Licensee will take steps to limit the magnitude and duration of any unscheduled reservoir drawdown.

[1] All elevation references in this MELIP are given in North American Vertical Datum 1988 (NAVD 88); conversion to traditional plant datum (PD, used in numerous supporting studies for this license application and often erroneously referred to as MSL) requires the addition of 1.5 ft.

OPERATION DURING EMERGENCIES

During emergency conditions, it may be necessary to operate the project such that reservoir elevations and/or seasonal minimum or scheduled recreation flows cannot be maintained in the normal ranges, even during periods of normal inflow and hydrologic conditions. Examples of such emergencies are:

- Grid voltage or capacity emergency declared by the Licensee's System Operations Center or Transmission Operations Center;
- Dam safety emergency;
- Emergency plant shutdown due to equipment failure, fire, or other situations which endanger human health and safety or the environment;
- River access special circumstances (e.g., emergency rescue or recovery operations).

During a declared grid voltage or capacity emergency, the Licensee will operate the project as required to maintain or restore the reliability of the electrical system, with due regard to the safety of both the public and the project structures. This may result in deviation from scheduled recreation flows and/or normal reservoir operation levels.

During a dam safety emergency, the safety of the downstream population is paramount, and the Licensee will take actions as required to maintain or restore the integrity of all project water retaining structures. This may result in deviation from seasonal minimum flow, scheduled recreation flows and/or normal reservoir operation levels.

In the event of serious equipment failure, fire, releases or spills, or other conditions which endanger plant personnel, the public, or the environment, it may be necessary to completely shut down the Saluda Hydro plant and limit discharge from the facility to the minimum possible. This may result is deviation from seasonal minimum flow and/or scheduled recreation flows.

Upon request from local emergency response agencies, it may be necessary to decrease or increase the discharge from the Saluda Hydro plant in order to facilitate access to the lower Saluda River for rescue or recovery operations. This may result in deviation from seasonal minimum flow and/or scheduled recreation flows.

If it is determined that the seasonal minimum flows cannot be maintained due to an emergency condition, the Licensee will consult with the appropriate resource agencies as soon as is practical to monitor and minimize impacts to water quality and aquatic habitat. To the extent practical, the licensee will also endeavor to replace any scheduled recreation flows which are impacted by the emergency situation within the same calendar year as originally scheduled.

OPERATION DURING HIGH INFLOW PERIODS OR FLOODS

The Licensee has developed a Flow Forecast Model (FFM) for the purpose of anticipating high inflow events due to large amounts of rainfall in the Saluda River basin draining to Lake Murray. The FFM uses precipitation forecasts from the National Weather Service (NWS) and near real time data from the U.S. Geological Survey (USGS) to estimate inflow to Lake Murray up to 5 days in advance. The Licensee's System Operators also monitor the National Weather Service on a routine basis. In the event a weather system capable of producing heavy precipitation is forecast to impact the Saluda Project, the Licensee's engineering staff runs the FFM using the latest precipitation forecast and current streamflow data from the USGS gauge network. Based on the magnitude and duration of the inflow hydrograph computed by the FFM, the System Operators are advised as to what action to take in order to safely pass and/or store the projected inflow. Such actions may include:

- Reduction of reservoir level below the existing target elevation in advance of or during the weather system to provide storage volume for the forecast inflow;
- Operation of one or more spillway gates to pass inflow in excess of that which can be passed by generation and prevent the reservoir from rising above el. 358.5' (360.0' PD);
- Allowing the reservoir to rise above the existing target elevation in order to store all or a portion of the inflow and limit excessive downstream releases.

Any of these actions may result in deviation from scheduled recreation flows and/or normal reservoir operation levels. To the extent practical, the licensee will endeavor to replace any scheduled recreation flows which are impacted by the high inflow conditions within the same calendar year as originally scheduled.

OPERATION DURING LOW INFLOW PERIODS

For operation during periods of sustained low inflow or drought, the MELIP defines trigger points and procedures for incremental reductions in seasonal minimum flow and downstream recreation flows based on gauged inflow to the project. During periods of normal inflow, the Licensee will operate the Saluda Project to maintain the reservoir level at or near the current target elevation within the proposed normal operating range of el. 352.5' (354.0' PD) to el. 356.5.0' (358.0' PD), while providing the normal seasonal minimum downstream flow and normal scheduled recreation and safety training flows. The project will be available for reserve generation as required by the Licensee's system and obligations under the Virginia-Carolinas Electric Reliability Council (VACAR, or its successor) Reserve Sharing Agreement (VRSA). During times when inflow to the project exceeds the seasonal minimum flow and scheduled recreation flows, the project will generate on an as-needed basis to maintain the reservoir at or near the current target elevation.

If hydrologic conditions in the Saluda River basin draining to Lake Murray worsen and the 14 day average gauged inflow less estimated municipal usage ("net inflow")[2] falls below the scheduled minimum flow, water stored in Lake Murray will be used to augment project inflow to provide the normal seasonal minimum flow until the reservoir level falls to more than 1.0 ft. below the current target elevation. At that time, the Licensee will discharge target flow as follows:

14 Day Average Net Inflow	**Target Flow (except April 15 – May 14)**
< 1,000 CFS	700 CFS
< 700 CFS	500 CFS (400 CFS minimum)

If 14 day average net inflow falls below the scheduled minimum flow during the April 15 through May 14 period when the scheduled minimum flow is 1,300 CFS, a reduced continuous minimum flow with daily or twice daily pulses to facilitate fish passage over shoals in the lower Saluda River will be implemented as follows, once the reservoir falls to more than 1.0 ft. below the current target elevation:

14 Day Average Net Inflow	**Target Flow Provided April 15 – May 14**
≥ 1,000 CFS	1,300 CFS continuous
< 1,000 CFS	700 CFS continuous with (2) pulses per day of 3,000 CFS for 1.5 hours each. (Yields 988 CFS daily average flow.)
< 700 CFS	500 CFS continuous with (1) pulse per day of 3,000 CFS for 1.5 hours. (Yields 656 CFS daily average flow.)
≤ 500 CFS	500 CFS target (400 CFS minimum) continuous, no pulses.

[2] Gauged inflow will be computed each day as the sum of three scaled USGS gauge values for the Saluda River, Little River, and Bush River, less estimated municipal usage from the reservoir. The 14 day average of these daily values will be computed each day. See Appendix 2 for details of inflow scaling and computing net inflow.

If 14 day average net inflow should fall below the scheduled minimum flow between December 16th and January 17th, when the target reservoir elevation is within 1.0 ft. of el. 352.5' (354.0' PD), the reservoir will not be required to drop 1.0 ft. below the current target elevation before reducing the minimum flow. Additionally, at any time during a low inflow period (when 14 day average net inflow is less than the scheduled minimum flow), should the reservoir level fall below el. 352.5' (354.0' PD), the minimum flow from the project will be reduced to a target flow of 500 CFS (400 CFS minimum), and will remain at that value regardless of any increase of inflow until the reservoir level has risen above el. 352.5' (354.0' PD).

During low inflow periods, scheduled recreation flows will be reduced in stages. [This is to be determined in consultation with the Recreational Flow TWC.] Once the reservoir level falls to below el. 352.5' (354.0' PD), all scheduled recreation flows will be suspended until the reservoir level has risen above el. 352.5' (354.0' PD).

Scheduled spring and fall safety training flows for the Columbia Fire Department (CFD) Swift Water Rescue Team will be provided in full if the following criteria are met:

Spring: Reservoir level at least 354.5' (356.0' PD) on February 1 for early March safety training.

Fall: Reservoir level at least 354.5' (356.0' PD) on November 1 for early December safety training.

These criteria may be modified in a given year if circumstances warrant or permit. If the criteria for providing full safety training flows are not met, a prearranged reduced schedule of flows will be provided by mutual agreement between the Licensee and the Columbia Fire Department. [This is to be determined in consultation with the CFD.]

During extended periods of low inflow, when depletion of the reservoir below el. 348.5' (350.0' PD) is imminent, the Licensee will consult with the South Carolina Department of Natural Resources (SCDNR), the South Carolina Department of Health and Environmental Control (SCDHEC), and other applicable resource agencies to determine if further reductions in minimum flow below 400 CFS should be considered. At that time, the Licensee will also coordinate a joint meeting with consulting agencies and the managers of the municipal water systems which withdraw water from Lake Murray, to determine a drought management plan that could include voluntary or mandatory water conservation measures, as determined by the agencies.

COORDINATION OF LOW INFLOW PROTOCOL WITH MAINTENANCE ACTIVITIES OR EMERGENCY CONDITIONS

If maintenance or emergency conditions require modifications to the normal reservoir target elevations and/or the normal minimum flow schedule during low inflow periods, the requirements of the maintenance activity or emergency condition may supersede the Low Inflow Protocol operation if necessary.

Drawdown of the reservoir due to maintenance or emergency conditions will not automatically trigger reductions in minimum flow, unless 14 day average inflow falls below the scheduled minimum flow. During refilling of the reservoir after a drawdown, if 14 day average inflow falls below the scheduled minimum flow while the reservoir is below el. 352.5' (el. 354.0' PD), the target flow will be reduced to 500 CFS (400 CFS minimum) until the reservoir exceeds el. 352.5' (el. 354.0' PD).

It should also be noted that the South Carolina Department of Natural Resources (SCDNR) has certain statutory authority under the South Carolina Drought Response Act and Regulations, and nothing in this LIP is intended to abrogate that authority.

PERIODIC REVIEW OF PROTOCOL

Upon request, the Licensee will consult with the South Carolina Department of Natural Resources (SCDNR), the South Carolina Department of Health and Environmental Control (SCDHEC), and other applicable resource agencies every 5 years during the license term to evaluate the effectiveness of the MELIP during the previous 5 years, and to determine if any modifications to the MELIP are required.

APPENDIX 1

RESERVOIR GUIDE CURVE AND TABLES

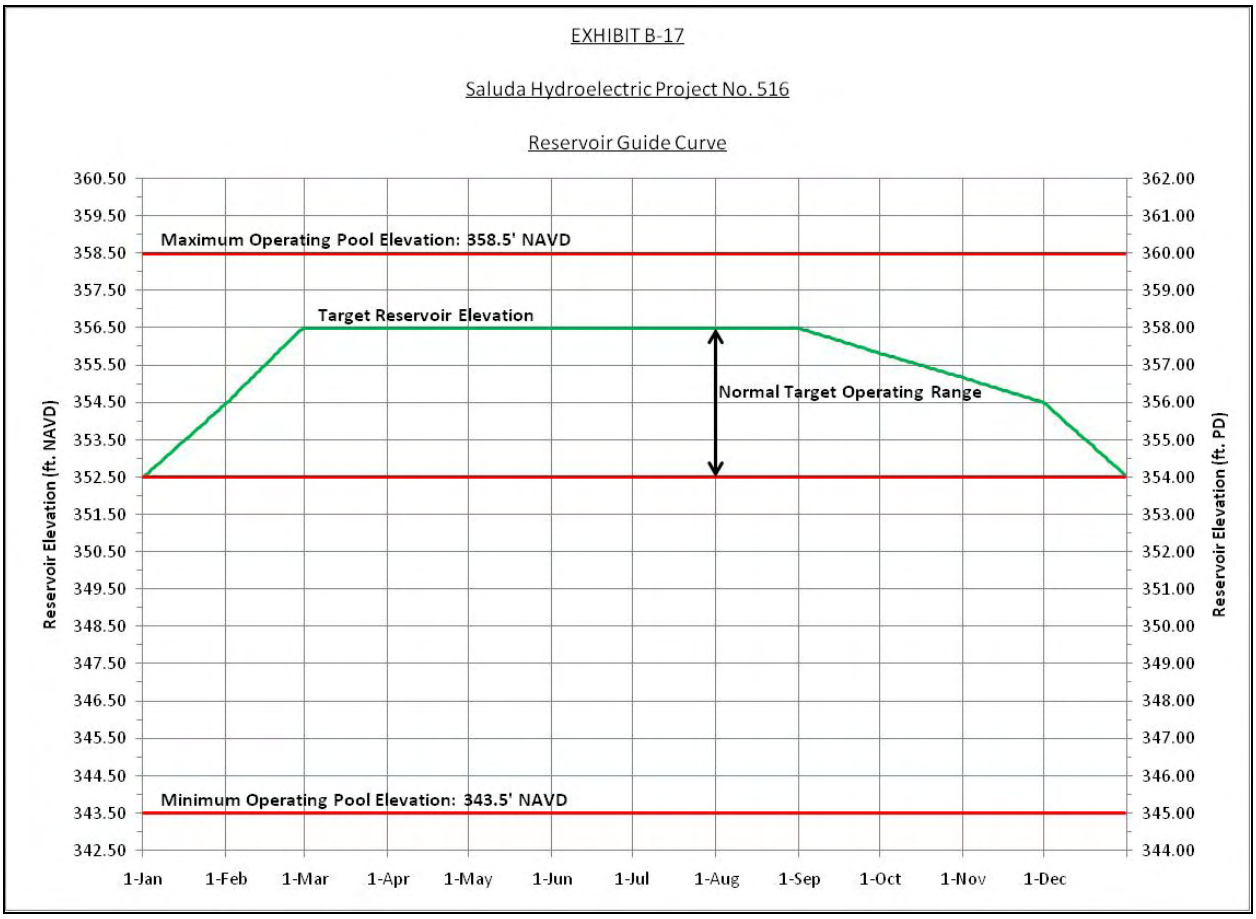


EXHIBIT B-17
Saluda Hydroelectric Project No. 516
Reservoir Guide Curve
Maximum Operating Pool Elevation: 358.5' NAVD
Target Reservoir Elevation
Normal Target Operating Range
Minimum Operating Pool Elevation: 343.5' NAVD
Reservoir Elevation (ft. NAVD)
Reservoir Elevation (ft. PD)
360.50
359.50
358.50
357.50
356.50
355.50
354.50
353.50
352.50
351.50
350.50
349.50
348.50
347.50
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1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

Reservoir Guide Curve Table – Elevations in Feet NAVD

	January	February	March	April	May	June	July	August	September	October	November	December
1	352.50	354.50	356.50	356.50	356.50	356.50	356.50	356.50	356.50	355.83	355.17	354.50
2	352.56	354.57	356.50	356.50	356.50	356.50	356.50	356.50	356.48	355.81	355.15	354.44
3	352.63	354.64	356.50	356.50	356.50	356.50	356.50	356.50	356.46	355.79	355.13	354.37
4	352.69	354.71	356.50	356.50	356.50	356.50	356.50	356.50	356.43	355.77	355.10	354.31
5	352.76	354.79	356.50	356.50	356.50	356.50	356.50	356.50	356.41	355.74	355.08	354.24
6	352.82	354.86	356.50	356.50	356.50	356.50	356.50	356.50	356.39	355.72	355.06	354.18
7	352.89	354.93	356.50	356.50	356.50	356.50	356.50	356.50	356.37	355.70	355.04	354.11
8	352.95	355.00	356.50	356.50	356.50	356.50	356.50	356.50	356.34	355.68	355.01	354.05
9	353.02	355.07	356.50	356.50	356.50	356.50	356.50	356.50	356.32	355.66	354.99	353.98
10	353.08	355.14	356.50	356.50	356.50	356.50	356.50	356.50	356.30	355.64	354.97	353.92
11	353.15	355.21	356.50	356.50	356.50	356.50	356.50	356.50	356.28	355.62	354.95	353.85
12	353.21	355.29	356.50	356.50	356.50	356.50	356.50	356.50	356.25	355.60	354.92	353.79
13	353.27	355.36	356.50	356.50	356.50	356.50	356.50	356.50	356.23	355.57	354.90	353.73
14	353.34	355.43	356.50	356.50	356.50	356.50	356.50	356.50	356.21	355.55	354.88	353.66
15	353.40	355.50	356.50	356.50	356.50	356.50	356.50	356.50	356.19	355.53	354.86	353.60
16	353.47	355.57	356.50	356.50	356.50	356.50	356.50	356.50	356.17	355.51	354.84	353.53
17	353.53	355.64	356.50	356.50	356.50	356.50	356.50	356.50	356.14	355.49	354.81	353.47
18	353.60	355.71	356.50	356.50	356.50	356.50	356.50	356.50	356.12	355.47	354.79	353.40
19	353.66	355.79	356.50	356.50	356.50	356.50	356.50	356.50	356.10	355.45	354.77	353.34
20	353.73	355.86	356.50	356.50	356.50	356.50	356.50	356.50	356.08	355.43	354.75	353.27
21	353.79	355.93	356.50	356.50	356.50	356.50	356.50	356.50	356.05	355.40	354.72	353.21
22	353.85	356.00	356.50	356.50	356.50	356.50	356.50	356.50	356.03	355.38	354.70	353.15
23	353.92	356.07	356.50	356.50	356.50	356.50	356.50	356.50	356.01	355.36	354.68	353.08
24	353.98	356.14	356.50	356.50	356.50	356.50	356.50	356.50	355.99	355.34	354.66	353.02
25	354.05	356.21	356.50	356.50	356.50	356.50	356.50	356.50	355.96	355.32	354.63	352.95
26	354.11	356.29	356.50	356.50	356.50	356.50	356.50	356.50	355.94	355.30	354.61	352.89
27	354.18	356.36	356.50	356.50	356.50	356.50	356.50	356.50	355.92	355.28	354.59	352.82
28	354.24	356.43	356.50	356.50	356.50	356.50	356.50	356.50	355.90	355.26	354.57	352.76
29	354.31	356.43	356.50	356.50	356.50	356.50	356.50	356.50	355.87	355.23	354.54	352.69
30	354.37		356.50	356.50	356.50	356.50	356.50	356.50	355.85	355.21	354.52	352.63
31	354.44		356.50		356.50		356.50	356.50		355.19		352.56

Reservoir Guide Curve Table – Elevations in Feet Plant Datum (PD)

	January	February	March	April	May	June	July	August	September	October	November	December
1	354.00	356.00	358.00	358.00	358.00	358.00	358.00	358.00	358.00	357.33	356.67	356.00
2	354.06	356.07	358.00	358.00	358.00	358.00	358.00	358.00	357.98	357.31	356.65	355.94
3	354.13	356.14	358.00	358.00	358.00	358.00	358.00	358.00	357.96	357.29	356.63	355.87
4	354.19	356.21	358.00	358.00	358.00	358.00	358.00	358.00	357.93	357.27	356.60	355.81
5	354.26	356.29	358.00	358.00	358.00	358.00	358.00	358.00	357.91	357.24	356.58	355.74
6	354.32	356.36	358.00	358.00	358.00	358.00	358.00	358.00	357.89	357.22	356.56	355.68
7	354.39	356.43	358.00	358.00	358.00	358.00	358.00	358.00	357.87	357.20	356.54	355.61
8	354.45	356.50	358.00	358.00	358.00	358.00	358.00	358.00	357.84	357.18	356.51	355.55
9	354.52	356.57	358.00	358.00	358.00	358.00	358.00	358.00	357.82	357.16	356.49	355.48
10	354.58	356.64	358.00	358.00	358.00	358.00	358.00	358.00	357.80	357.14	356.47	355.42
11	354.65	356.71	358.00	358.00	358.00	358.00	358.00	358.00	357.78	357.12	356.45	355.35
12	354.71	356.79	358.00	358.00	358.00	358.00	358.00	358.00	357.75	357.10	356.42	355.29
13	354.77	356.86	358.00	358.00	358.00	358.00	358.00	358.00	357.73	357.07	356.40	355.23
14	354.84	356.93	358.00	358.00	358.00	358.00	358.00	358.00	357.71	357.05	356.38	355.16
15	354.90	357.00	358.00	358.00	358.00	358.00	358.00	358.00	357.69	357.03	356.36	355.10
16	354.97	357.07	358.00	358.00	358.00	358.00	358.00	358.00	357.67	357.01	356.34	355.03
17	355.03	357.14	358.00	358.00	358.00	358.00	358.00	358.00	357.64	356.99	356.31	354.97
18	355.10	357.21	358.00	358.00	358.00	358.00	358.00	358.00	357.62	356.97	356.29	354.90
19	355.16	357.29	358.00	358.00	358.00	358.00	358.00	358.00	357.60	356.95	356.27	354.84
20	355.23	357.36	358.00	358.00	358.00	358.00	358.00	358.00	357.58	356.93	356.25	354.77
21	355.29	357.43	358.00	358.00	358.00	358.00	358.00	358.00	357.55	356.90	356.22	354.71
22	355.35	357.50	358.00	358.00	358.00	358.00	358.00	358.00	357.53	356.88	356.20	354.65
23	355.42	357.57	358.00	358.00	358.00	358.00	358.00	358.00	357.51	356.86	356.18	354.58
24	355.48	357.64	358.00	358.00	358.00	358.00	358.00	358.00	357.49	356.84	356.16	354.52
25	355.55	357.71	358.00	358.00	358.00	358.00	358.00	358.00	357.46	356.82	356.13	354.45
26	355.61	357.79	358.00	358.00	358.00	358.00	358.00	358.00	357.44	356.80	356.11	354.39
27	355.68	357.86	358.00	358.00	358.00	358.00	358.00	358.00	357.42	356.78	356.09	354.32
28	355.74	357.93	358.00	358.00	358.00	358.00	358.00	358.00	357.40	356.76	356.07	354.26
29	355.81	357.93	358.00	358.00	358.00	358.00	358.00	358.00	357.37	356.73	356.04	354.19
30	355.87		358.00	358.00	358.00	358.00	358.00	358.00	357.35	356.71	356.02	354.13
31	355.94		358.00		358.00		358.00	358.00		356.69		354.06

APPENDIX 2 – NET INFLOW COMPUTATION

INFLOW SCALING

The three USGS gauge stations used to compute inflow to Lake Murray are:

02167000 Saluda River at Chappells (gauged drainage area = 1,360 mi^2)
02167450 Little River near Silverstreet (gauged drainage area = 230 mi^2)
02167582 Bush River near Prosperity (gauged drainage area = 115 mi^2)

Since the total drainage area of the Saluda River basin at the Saluda Dam is 2,420 mi^2, the discharge values recorded at the gauge sites must be scaled to provide an estimate of the total inflow to Lake Murray. The project drainage basin has been divided into seven sub-basins, five of which are downstream of Lake Greenwood and represent inflow to Lake Murray. Two sub-basins (nos. 6 & 7) are un-gauged, and inflow from these areas is estimated based on the Bush River gauge using the scale factors in the table below. [Note: a streamflow gauge was installed in 2008 on the Little Saluda River near Saluda (No. 02167705), however there has been insufficient flow for the USGS to calibrate (rate) the gauge since it was installed. When this gauge has been rated, it will replace the Bush River gauge for estimating flow from sub-basins 6 & 7.]

Basin No.	Name	Area (SM)	Cum. Area (SM)	Gage No.	DA at Gage	Scale Factor		
1	Upper Saluda R.	1,034.0	1,034.0					
2	Lake Greenwood	126.0	1,160.0					
3	Chappells	227.3	1,387.3	02167000	1,360.0	**1.020**		
4	Little River	283.5	1,670.8	02167450	230.0	**1.233**		
5	Bush River	140.1	1,810.9	02167582	115.0	1.218	}	6.515
6	Little Saluda River	331.0	2,141.9	Scaled from 7582	115.0	2.878		
7	Lake Murray Direct	278.1	2,420.0	Scaled from 7582	115.0	2.418		

Using these scale factors, the total inflow (Q_{total}) to Lake Murray is computed as:

$$Q_{total} = (1.02)(Q_{Chappells}) + (1.233)(Q_{Little\ R.}) + (6.515)(Q_{Bush\ R.})$$

ESTIMATED MUNICIPAL WITHDRAWALS

Five municipal water intakes are permitted to withdraw water from Lake Murray. The total maximum withdrawal rate for these intakes is estimated to be approximately 120 CFS as of 2008[3]. The actual withdrawal rate varies throughout the year, as estimated in the following table.

Month	Estimated Withdrawal Rate (CFS)	Month	Estimated Withdrawal Rate (CFS)
January	60	July	120
February	60	August	120
March	60	September	120
April	90	October	100
May	100	November	60
June	120	December	60

[3] The existing municipal water intakes are approved for higher withdrawal rates than those shown in the table, which represent estimates of actual withdrawals as of 2008. If water withdrawal rates change or new intakes are approved, the Licensee may modify the estimated withdrawal rates used to compute net inflow.

The above withdrawal rates are subtracted from the total inflow to Lake Murray to compute the net inflow to the project. The 14 day running average of net inflow is used to determine minimum flow during low inflow periods.

Appendix 9

MEETING NOTES FROM THE LOW INFLOW PROTOCOL TWC:

AUGUST 5, 2008
AUGUST 19, 2008
SEPTEMBER 19, 2008
NOVEMBER 12, 2008

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
LOW INFLOW PROTOCOL (LIP) FOCUS GROUP

SCE&G's Lake Murray Training Center
August 5, 2008

Final-CSB

ATTENDEES:

Bill Argentieri, SCE&G
Bud Badr, SCDNR
Shane Boring, Kleinschmidt Associates
Gerrit Jobsis, Am. Rivers
Dick Christie, SCDNR
Tom Gitto, Midlands Striper Club
Steve Summer, SCANA Services
Alan Stuart, Kleinschmidt Associates
Steve Bell, Lake Watch
Ray Ammarell, SCE&G
Milton Quattlebaum, SCANA Services
Dave Landis, Lake Murray Association
Bill Marshall, SCDNR

ACTION ITEMS:

- Provide Steve Bell with copy of documents supporting zone-of-passage flow needs for striped bass at Millrace Rapids
  Alan Stuart

- Provide meeting attendees with copy of presentation summarizing alternative LIP and comparison of alternative and original LIP results
  Ray Ammarell

NEXT MEETING

August 19, 2008
Lake Murray Training Center

MEETING NOTES:

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.

Alan Stuart opened the meeting at approximately 9:30 am and thanked the group for attending the first meeting of the LIP Focus Group. Alan noted that it was obvious from previous meetings that there are a number of competing interests to be considering in establishing an effective LIP for the Saluda Project, and as such, a smaller "focus group" was deemed necessary. He noted that, due to the varying backgrounds of attendees, this initial meeting would focus on a number of presentations to familiarize the group with water management in the basin, Instream flow and lake level interests, and the LIP models and associated triggers that have been developed to date.

Dick Christie gave the opening presentation, a review of the South Carolina State water plan. He noted that the purpose of the plan was to establish a comprehensive policy for management of the state's water. It was noted that the plan, originally issued in 1998, was updated in 2004 following the drought of 1999-2003. Following a review of the general hydrology of South Carolina, Dick noted that one of the primary recommendations of the plan is establishment of regulations to govern withdrawals of surface and groundwater. Dick note that the plan also recommends a water sharing strategy that relates stream inflows and lake levels to downstream releases and other lake withdrawals in an effort to balance and mitigate the negative impacts that water shortages have on all water users. It was noted that a full version of the plan is available online at http://www.dnr.sc.gov/water/admin/pubs/pdfs/SCWaterPlan2.pdf.

Gerrit Jobsis then briefly discussed American Rivers' position on the LIP process. Specifically, Gerrit noted that he felt an LIP was needed to help preserve lake levels during low inflow periods, but added that any process must ensure that downstream needs, such the Congaree National Park and instream flow in the Congaree and Saluda rivers must be taken into consideration.

Steve Bell then presented Lake Watch's concerns regarding the current LIP. Specifically, Steve noted that their primary concern is that implementation of the LIP as proposed will not preserve enough water in the lake during low inflow periods, resulting in impacts to dock access, recreation, boating safety and shoreline environments. He added that, based on his group's observations, the lake is generally safe at levels at or above 354'. From an aquatic/shoreline habitat perspective, it was noted that the button bushes and other shoreline vegetation become wetted at around 356.' Steve noted that he generally did not have a problem with the instream flows being proposed, with the exception of the spring flows of 1000-1300 cfs for spring spawning/passage. Steve then asked for an explanation for why these flows are needed. It was noted that the 1300 cfs spring passage

flow is based on a zone-of-passage study conducted by SCDNR and represents the minimum flow needed to provide adequate upstream passage at Millrace Rapids for inmigrating striped bass. Steve asked if he could have copies of these supporting documents. Alan Stuart agreed to provide copies of the SCDNR Instream Flow Policy supporting document, which contains this information.

Ray Ammarell then presented a recap of the original LIP proposal that was presented at the All RCG's Meeting on May 22, 2008 (available online at) http://www.saludahydrorelicense.com/documents/SaludaHydroGuideCurveandLIP.pdf . Dave Landis noted that he felt that the lake level trigger points were not aggressive enough on the existing LIP and that as proposed the lake would be at an unacceptable level before conservation measures are triggered. Dave added that he did not like the use of the 70 yr period of record, as in his view it does not reflect the current low flow conditions. Steve Bell requested LIP model runs for the flowing guide curve scenarios: 1) lake level of 358' feet year-round and 2) a lake level that fluctuates annually between 354-356' (winter) and 358' (summer) (see written request for additional detail).

Bud Badr, SC State Hydrologist, then shared his views on the original LIP proposal. He noted that the he didn't see the two user groups (upstream and downstream) as being that far apart in terms of what they would like to see. He urged the group to remember that the state water plan requires that a number of factors be considered including: water quality (both upstream and downstream), sufficient water (both upstream and downstream) for municipal water users, and sufficient downstram flow to ensure ecosystem function in the LSR, the Congaree, and to aid in providing sufficient water to the Santee Basin to downstream issues such as saltwater intrusion below the Santee Cooper Lakes.

Ray Ammarell then presented results of an alternative LIP model that focuses on inflow as a trigger and does not consider lake levels, as well as a comparison of the results to the originally proposed LIP. Ray noted that, while the triggers are quite different from the original, the results (frequency of guide curve violation) were quite similar. Bud Badr noted that the state water plan states that minimum flows and any associated LIP should be a function of not only inflows, but also lake levels. Bud added that the two methods appear closer than anticipated. Ray enquired as to whether the group preferred one method over the other. SCNDR staff noted that the two were very close, but that they would like to have additional time to review the two proposals. Gerrit noted that he would be willing to support reductions in minimum flow during period when inflows to Lake Murray are less than corresponding minimum flow for that time of year; however, he would like to see evaoparation not be subtracted from the inflow calculation since it is a Project-related impact. He added that he didn't want the river to be penalized for reservoir-related effect of evaporation. Ray noted that this seemed like a reasonable request and that he would integrate it into the next

model runs. Several attendees requested a copy of the presentation. Ray agreed to provide the presentation via e-mail.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
Low Inflow Protocol Focus Group

Lake Murray Training Center
August 19, 2008

final ACG 10-31-08

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Scott Harder, SCDNR
Bill Marshall, LSSRAC, SCDNR
Ray Ammarell, SCE&G
Jim Cumberland, SCCCL
Steve Bell, LW
Bill Argentieri, SCE&G
Dave Landis, LMA
Tom Gitto, Midlands Striper Club
Bret Hoffman, Kleinschmidt Associates

DATE: September 19, 2008

INTRODUCTIONS AND DISCUSSION

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

The meeting was opened by Ray Ammarell, and it was noted that they would be reviewing comments from the August 5, 2008 LIP meeting. Ray also continued to note that he would like the group to provide input on the best LIP method to move forward with and how to evaluate the approach. When the floor was opened for discussions, Alan noted that the group needed to develop triggers for the LIP.

The group discussed when to implement the LIP and Ray explained that for a certain period of time the group may want to look at implementing a reduction in outflow adjusted based on an averaging period. Ray continued to explain that, in simulating project operation using actual net inflow from past years, the criteria that he used to identify potential LIP years was: if the reservoir dropped below 90 percent of its target lake level for more than 30 days, then that year became a candidate for the LIP.

The group discussed Gerrit Jobsis's suggestion of not subtracting evaporation in the determination of net inflows. It continued to be explained that Gerrit was concerned that the outflows were being penalized due to the large reservoir's evaporation potential. Dave Landis commented that creating the reservoir also creates the opportunity to control the outflows, of which there are benefits to the downstream concerns. Ray noted that that was valid because the reservoir does bank water that provides for the opportunity to regulate or maintain the flow downstream. Ray continued to explain that the USGS performed a study on reservoirs in South Carolina and found that overall reservoirs

boosted the low flow. The group discussed inflows, and conferred upon whether they should be calculated as gross inflow minus evaporation, gross inflow minus municipal withdrawals, or a combination of these. Bill Argentieri noted that if evaporation was not taken out of the equation, then they needed to set some sort of low lake level limit so that enough water was maintained in the reservoir to provide downstream flows. This is termed a "stop loss". Steve Bell noted that when the lake drops one foot below the guide curve then the downstream flows should be reduced in order to let the lake return to the guide curve. Alan explained that Dick Christie had noted in one of the meetings that there was plenty of water in the lake, and there was no reason why the downstream flows should be compromised until a significant drop in lake level occurred.

Dave explained that people were going to ask if the river is healthy at a 180 cfs outflow for a low flow, and the higher downstream flows can be provided for most of the time. Furthermore, Dave noted that as in nature, the dynamics of the river are such that they adapt. Alan gave the example that there was recently a mussel survey in the LSR, and no mussels were found. Alan continued to note that they were unsure as to whether this was due to flow, water temperature, or low DO, but there were mussels in the Broad/Congaree. Bill Marshall added that the goal of setting minimum flow was to enhance and improve the aquatic habitat. Steve replied that he believes that the 700 cfs would meet all of the downstream needs, however if the outflows exceeded the inflows, then the lake habitat is being affected. Ray noted that based on what he has looked at, the 1,300 cfs flow request is during the high flow period of the year. Ray also explained that during normal years, one will find very few times where there are problems in the April/May timeframe.

Steve Bell questioned the group as to what was wrong with the 400 cfs level at all times during a LIP. He continued to note that if the Lake was dropping off of the guide curve than 700 cfs should not be provided. Jim Cumberland noted that the CCL and American Rivers believed that the 400 cfs level was the "floor", however they would like to not have to reach the 400 cfs level.

The group discussed the inflow splitting method of the LIP. It was noted that at the last meeting the group discussed whether or not to subtract evaporation from inflows in order to determine whether or not an LIP should be implemented. It was reiterated that at the previous meeting, American Rivers had noted that they would like for evaporation not to be subtracted from inflows. Dave noted that there may be the need for a study to determine the economic impacts to the lake due to the balance of water. Alan noted that DNR typically does annual surveys in the reservoir in order to determine the general health of the reservoir. Furthermore, from a biological perspective, there are most likely not negative impacts of existing operations, relatively stable lake levels are typically what the reservoir needs.

Bret Hoffman presented information on the alternatives requested by Gerrit, which included the number of days spent in the LIP zones, based on the previous LIP proposal. Bret explained that they were trending towards the inflow splitting proposal, however, due to the fact that the initial LIP proposal is very cumbersome. The group noticed some items to be corrected in the information and moved on to discuss the Zone of Passage.

Bret presented information on the alternatives presented by Gerrit, the number of days spent in the zones, based on previous LIP proposal. Bill Argentieri explained that they are trying to move away from this first LIP proposal because it is very cumbersome, and move towards inflow splitting. The group noticed some items for questions, and moved to the LIP Pulse Flows for Zone of Passage (ZOP).

Alan discussed the ZOP with the group and explained that there was an IFIM study back in the early 80's and it was determined that Millrace Rapids was the most restrictive area for the passage of fish. Alan continued to explain that based on the criteria that was developed when DNR developed an instream flow policy, there was a certain depth and width that the striped bass needed in order to move upstream. It was further explained that the most recent IFIM confirmed this criteria. The group continued to discuss this issue, and it was noted that the driver for the 1,300 cfs was the criteria for fish passage through this area. It was shown that a higher pulse of water would provide good results due to less attenuation and use less water because it would be for a shorter period of time. Alan also pointed out that the interest was in more species than striped bass; the needs of striped bass were simply what the criteria was developed from.

The group discussed that as weather patterns change there may be a need to amend the LIP. Alan noted that it was important to have a set procedure, however to also have the flexibility to alter it if conditions change in the future. The group discussed 5 or 10 year increment review periods for this purpose.

Steve Bell began discussions on the LMHOC/LW proposal. He noted that he believed that SCE&G should have some flexibility in the 700 and 1300 cfs increments. Steve explained that the LMHOC proposal notes that when the lake level drops one foot below 358' then the downstream flows are cut back to 400 cfs, then as the lake rises more water is released downstream in the April/May time period.

The group continued to discuss the inflow splitting LIP proposal. Ray explained that the averaging period was a good method because it has the effect of smoothing out fluctuations in inflow. After lunch, Ray explained the inflow scaling and pointed out that scaled inflow accounts for the whole drainage area as it takes the sum of the three gages and adjusts it for the whole watershed. Ray also presented the group with evaporation values and municipal use values from Lake Murray. Ray showed that many times when evaporation and municipal withdrawals are subtracted from inflows, negative inflows are produced.

Ray then asked the group which approach to pursue: a reservoir driven LIP, or the inflow driven with "stop loss" reservoir limit. It was noted that an inflow driven LIP is what the group was leaning towards. Jim noted that he would check with Gerrit on the inflow driven LIP, and Scott Harder noted that he would check with Bud. The group also discussed a "stop loss" reservoir limit. Bill explained that the "stop loss" would be implemented when the LIP was in effect and the reservoir drops below 354'. Dave agreed that there was a point when lake level needed to be considered, however, he believed the 354 was too low.

The group discussed whether or not it was meaningful to look at upstream and downstream impacts for a certain number of days. Jim noted it was a good illustration, but it may not be meaningful. The group tabled the evaluation of upstream vs. downstream impacts. The group then discussed pulsing of flows in an LIP. Ray noted that during the 30 day period of April 15 to May 14 then:

- If inflows were > or equal to 1,300 than outflows would be > or equal to 1,300
- If inflows were < or equal to 1,000 than outflows would = 700 with 2, 3,000 cfs pulses for 1.5 hours a day

- If inflows were < or equal to 700 than outflows would be 500 with 1, 3,000 cfs for 1.5 hours a day
- If inflows were < or equal to 400 than Outflows would equal 400 with no pulsing.

Bill A. asked what happened when inflows were between 1,300 and 1,000. Ray replied that 1,300 is still released, that way it is not affected by the little dips in inflow. Bill M. asked that if SCE&G was going to generate 10,000 cfs one evening for reserve, if they would get into averaging for the minimum flows, as that was not desirable. Ray responded that they wouldn't, but asked if a reserve call could count for a pulse of water in the LIP. Bill A. noted that the pulses were at dawn and/or dusk. Alan noted that if it overlaps a dawn or dusk pulse then SCE&G should receive credit for it.

Jim Cumberland asked Ray to run a 45 day average for comparison. The group decided that a 14 day, 20 day, and 45 day should be looked at. Scott noted he would like to see the plots of the lake level with that. Dave also suggested adding in a stop loss trigger for 1 foot below 358' for the 30 and 60 day periods. The group also noted that they would like to view the plots that showed what the outflow was versus the inflow.

The group adjourned and scheduled the next meeting date for September 19th.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
Low Inflow Protocol Focus Group

Lake Murray Training Center
September 19, 2008

Final ACG 10-31-08

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Dick Christie, SCDNR
Bill Marshall, LSSRAC, SCDNR
Ray Ammarell, SCE&G
Steve Bell, LW
Bill Argentieri, SCE&G
Dave Landis, LMA

DATE: September 19, 2008

INTRODUCTIONS AND DISCUSSION

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

Ray opened the meeting and noted that the first discussion item would be to review the LIP runs that were recently distributed. Ray noted that he would like to come to a consensus on as many of the parameters as they could, so that he could start moving forward in putting an actual procedure together for review.

Ray briefly reviewed the LIP graphs with the group. It was shown that the reservoir fared a lot better with the LIP implemented than without. However, during the graphed scenarios the reservoir was not able to stay on the guide curve at all times during the low inflow years. The group discussed the current year and it was shown that there were good inflows up through April, therefore there would be no reason not to provide the higher minimum flows at that point. Ray pointed out that the lake was a little above 356' currently, and asked if that was actually a bad situation and if there was a burden on recreation. Furthermore, Ray added that for being in a drought, the lake was not faring too badly. Steve Bell explained that the reason the lake is at 356' this time of year is because SCE&G restricted releases during late winter and spring- below 400 cfs at times. Dick Christie explained that the water was available to drive the spring flows, and if it was a normal flow year, then the water would return. Dick continued to note that what the group seemed to be struggling with, was over the next 50 years, how often would this situation be expected to happen. Dick explained that he had spent a good amount of time reviewing the graphed years, and there are a number of years that were pretty close to equally sharing the water between upstream and downstream in the inflow tracking LIP. He further noted that the graphs show in some years that safety flows (City of Columbia Swift Water Rescue Training) do have an impact on

the lake, and in some years it is just a blip. Dick continued to add, however, that the safety flow was a very important flow. Bill pointed out that the graphs being shown by Ray include the full flows for the safety, however, after the LIP is developed we will approach the CFD to determine how to decrease the duration of the safety flows. The group discussed the fact that when the previous guide curve was established the forecasting was not as good, and that they may be able to keep levels higher in the spring. Although, there are dam safety implications with doing this, in the event of a large spring flood event.

Dave Landis noted that as the group was discussing "sharing the pain", the LMA believes that the provision of the 400 cfs flow during a drought situation was "sharing the pain". Ray shifted all of the outflow inputs to 400 cfs in the spreadsheet model, and the group viewed that although the graphed lines shifted up about one foot, the steepness of the line did not drastically change. Dick pointed out the graphs and noted that it was being suggested that the flows were benefiting more than the reservoir; however, the 2007 graph showed that the reservoir was reaching 87.5 percent of its storage, while the downstream flows are only receiving 80.7 percent of the targeted flow. If this combination was chosen, then the reservoir was going to receive a higher percentage of the available inflow then the outflows would. It was also shown that in 2006 the situation was reversed.

Dave Landis noted that the 700 cfs flow was the optimum flow for the river, and the minimum was 400 cfs flow; moreover, the guide curve was the optimum lake level. Dave continued to note that one option would be to reduce outflows to 400 cfs once there is a departure from the guide curve. In this way the lake level would not drop as drastically, and once the guide curve was reached then outflows could be increased. Ray commented that this would be an example of an LIP that would be very conservative for the reservoir, and more restrictive on downstream flow.

Dick noted that this method partitioned a larger share of the inflow to the reservoir. Dick suggested that the inflows be split 50-50. Steve noted that he believed that this took away from the littoral fishery. Dick replied that it could actually be positive to the fishery, it occurs infrequently, and allows things to break down and oxidize. He further noted that the fish are going to move a little deeper, and when there is water 8 years out of 10 in those areas, it has been proven that it is not a problem. Alan noted that fish spawn in a range of depths and Dick added that 2 to 4 feet is more important and minor fluctuations are not a big deal. Steve noted that they felt very strongly about having the lake up from April to June. Steve noted that it is important that the emergent vegetation which typically grows near the 357' contour be inundated with water during April 1 through early fall. Ray added that there was nothing special about the guide curve, but it is necessary to have target elevations to operate the reservoir and for the model to work.

Dave Landis asked the group if the river has survived sufficiently with the current flows. He noted that the 400 cfs minimum was something that they were trying to understand and explain to their group. Since there were no downstream representatives available, Dick noted that he was trying to balance the discussions even though both sides of the issue were important to DNR.

Bill A. noted that he would like to keep as much water in the lake as he could for generation purposes, however, he realizes the need for a balance. He continued to note that the reservoir was currently around 356' and he has not heard any complaints about the lake level. Bill A. explained that there is currently a minimum flow proposed by the Instream Flow TWC, and under the new license, when the spring comes SCE&G will be obligated to provide the required minimum flows. The goal is to figure out how inflows are going to be partitioned during low inflow years.

Furthermore, Bill A. noted there is an impression that this focus group was trying to change the minimum flows. He explained that the minimum flows are going to be provided if the inflows are available. Dick noted that he was not able to share DNR's thoughts on this issue before discussion with Bud Badr and Scott Harder, however, he noted that typically DNR's focus in other relicensing is to protect the downstream flows because there are a number of users on the reservoir side that typically try to hold-back the water. He continued to note that the scenarios were very helpful, and he would be interested in viewing the modeling of a six inch reservoir trigger and a 14 day averaging period. Steve noted that a six inch trigger would allow outflows of 700 cfs for 30 to 40 days before restrictions would occur, allowing adequate time for rain events to bring the lake back up to guide curve. Regarding downstream flow request, Steve noted that the Instream Flow TWC had not presented its findings specifically to the Fish and Wildlife RCG, therefore the lake groups have asked to meet with DNR to review the study and discuss the recommendations. Steve also indicated that the lake groups were completing a presentation on lake level impacts which would be discussed at the meeting. Steve indicated that justification for certain releases will be the key factor in getting buy in from lake leaders including the business community.

Moving along, the group discussed looking at a shorter averaging period and a smaller reservoir drop. Bill Marshall noted that after the last meeting, he thought that the shorter averaging looked suitable, and he was comfortable with the 1 foot lake level trigger. Ray reviewed the discussion points with the group as follows:

A. Net inflow – Ray noted that he believed that everyone at the meeting was agreeable to taking inflows, subtracting municipals, and leaving in evaporation. (Lake Watch noted that they do not support leaving in evaporation since reservoir storage significantly benefits downstream recreation and other flows).

B. Inflow averaging period – Ray reviewed that the group was leaning towards a shorter averaging period.

C. Reservoir level triggers - Ray reviewed that the individuals in this meeting are trending towards a smaller reservoir trigger, 6 inches to 1 foot or so.

D . Stop loss -

The group discussed the stop loss and Bill A. asked how it would be possible to have a stop loss elevation higher than 354'. Ray explained that it would be complicated and cumbersome. Bill A. asked if it would be possible to have a stop loss curve. Ray replied that the idea behind it is to at some point, even though inflows may become greater, keep the outflows depressed in order for the reservoir elevation to become higher. Several members of the group expressed that 354' was an acceptable stop loss, and Dick noted that he would discuss this with Bud and Scott.

E. April-May Pulsing –

Ray explained that they have carried this information forward with the only changes being the brackets for the inflow. Steve asked if pulsing was something that provides acceptable flows for downstream. Dick replied that it was not acceptable for use all the time. He explained that there are other issues. Dick noted that the pulses would meet the needs for the fish passage criteria,

however it did not address other ecological aspects, such as the habitat in the edges, and the sediment and water quality issues. Steve Bell suggested having pulsing instead of a constant minimum flow and a guaranteed 400 cfs flow. Alan noted that he believed that the IFIM TWC looked at that scenario and they were willing to take the risk in order to have the 1300, as opposed to a guaranteed 400 flow.

Ray reviewed the homework items with the group and noted that he would synthesize all of the discussion into a draft document to be distributed to the group. Dick noted that he would review discussion points with Bud Badr and Scott Harder and provide their thoughts back to the group.

Inflow Information from Whiteboard:

4-15 through 5-14 (30 day)

- If inflows were > or equal to 1,300 than outflows would be > or equal to 1,300
- If inflows were < or equal to 1,000 than outflows would = 700 with 2, 3,000 cfs pulses for 1.5 hours a day – 988 CFS daily average flow.
- If inflows were < or equal to 700 than outflows would be 500 with 1, 3,000 cfs for 1.5 hours a day – 656 CFS daily average flow.
- If inflows were < or equal to 400 than Outflows would equal 400 with no pulsing.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO PROJECT RELICENSING
Low Inflow Protocol Focus Group

Lake Murray Training Center
November 12, 2008

final ACG 1-6-09

ATTENDEES:

Alan Stuart, Kleinschmidt Associates
Alison Guth, Kleinschmidt Associates
Scott Harder, SCDNR
Bill Marshall, LSSRAC, SCDNR
Ray Ammarell, SCE&G
Jim Cumberland, SCCCL
Steve Bell, LW
Bill Argentieri, SCE&G
Dave Landis, LMA
Reed Bull, Midlands Striper Club
Dick Christie, SCDNR

DATE: November 12, 2008

INTRODUCTIONS AND DISCUSSION

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

Alan Stuart opened the LIP Focus Group meeting and noted that purpose of this meeting was to review concerns that DNR had on the LIP, as well as review additional information that Ray had put together. Alan also explained that at this point, he did not see the group achieving agreement on an LIP as they were still very far apart. However, it was noted that they would reevaluate at the close of the meeting.

Scott Harder began the meeting discussions with a presentation from DNR on their concerns with the LIP as it was currently being discussed. Scott began his presentation with the management guidelines for lakes from the State Water Plan. He pointed out that an important goal in the plan was the balance of water. Scott further noted that DNR must consider resources from a state perspective and when water shortages arise, the negative impacts should be balanced among the users and other lakes in the state.

Scott explained that using SCE&G's spreadsheet model, he has analyzed the outcomes of various LIP scenarios. He discussed both the fixed inputs to the scenarios as well as the varied inputs. SCE&G explained that the 400 cfs minimum outflow scenario was not applicable because the units could not reach a level that low efficiently; therefore 500 was more realistic. The group continued to review the graphs that Scott developed depicting different inputs and scenarios. Scott noted that the main question to be answered was how much to allow the lake level to drop before flows are reduced in the LSR.

Scott reviewed lake level graphs during low flow years under several proposed scenarios. An example of 2001 was shown and it was illustrated that the 0 foot drop scenario and the 1 foot drop scenario was very similar while the 2 foot drop and 4 foot drop was very similar. It was shown that in 2004 there were no differences between the triggers. In 2007 the group viewed that none of the LIP scenarios returned back to the guide curve.

Ray pointed out to Scott that whatever trigger is used for the LIP implementation (0,1,2 or 4), when the lake level drops off of the guide curve, the objective of the State Water Plan is being accomplished to some degree. The group then compared the different stages with 14, 30, and 45 day inflow averages. Bill Argentieri observed that the 30 and 45 inflow averages could cause the lake to drop 1.5 to 2 feet while waiting for the inflow average to taper off. Reed Bull asked the group if Jim Ruane had studied what happens to the water quality of the lake with the new minimum flows, as the Striper Club was interested in this information. Reed continued to note that from a striped bass standpoint, Jim had shown that the higher flow years were the worst for the striped bass. Reed expressed concern that the bad conditions could increase with the increased minimum flows. Alan noted that he would contact Jim Ruane to get his take on this question.

Scott went on to discuss the conclusions in the presentation, he noted that one key question was how long to maintain the recommended minimum flows in the spring and summer at the expense of the lake. Scott noted that the two foot trigger provides prolonged flows without much additional impacts on the lake. He further pointed out that in the worst drought situation that they had information on (2007 to 2008), there were minor differences between the 0,1, and 2 foot triggers. Scott concluded by noting that DNR believed using the 2 foot lake level trigger and the 14 day inflow averaging period is a reasonable balance between upstream and downstream users.

After the presentation, the group discussed DNR's proposal. Steve Bell noted that they were concerned about whether or not these same scenarios would be seen in the next 50 years. Dick Christie explained that the best science now was to establish a hydrologic period of record, such as 50 years, as one could not predict what would happen in the future. Dick continued to note that at some point in the future it would be wise to reconvene and discuss the LIP, as the period of record will have changed at that point.

Dave Landis explained that they had questions regarding how the current flows have actually affected the river over the past 70 years, as they have not observed the records where it has been detrimental. He further pointed out that if the river was in its optimal range, they would like the lake to be optimal as well. Dave continued to note that it originally seemed like individuals wanted a run of river scenario, where there were high flows and low flows and both sides shared the pain. However, he noted, now it seems that certain entities desire it to be more flow controlled.

Noting the discussions, Bill A asked if LMA and Lake Watch had a proposal that they would like to present to the group as DNR has done. Bill A. further pointed out that this proposal should be specific and not a generalization. Dave replied that as far as the averaging period goes, they believe the 14 day is reasonable. Dave continued to noted that they want to make sure there are procedures in place that slow the lake level drop as much as possible when providing flows downstream. Steve added that he would like further review on the proposed minimum flows. He also noted that if there was no rainfall coming in, that SCE&G would not drop it down to 354' immediately in the fall knowing that there will be fall safety flows. At this time, Steve and Dave reiterated their request to

meet with DNR about the minimum flows before making any decision on the LIP. Dick noted that he has been trying to coordinate with Bob Perry on a date and time for this meeting and that he would try to set something up before the end of this meeting. Reed added that if the lake goes below 354', recreation on the lake does not completely come to a halt. He continued to note that he believes the group has done a good job of putting stop losses in the model and he pointed out that at some point they are going to have to agree that that is the best they can achieve. Alan pointed out that he believed the common ground was to have a program in place that does not deplete the reservoir so far during one year that there is no water left the next year. The group discussed the need for an adaptive management scenario for the LIP. Dick explained that during the Catawba relicensing an annual meeting with a five year review process was put in place for the LIP, and the group agreed that this would be also appropriate for Saluda.

The group noted that they were close, the question was how to achieve agreement between the 1 foot and 2 foot lake level drops. Steve noted that they would put something together to present to DNR and the group. Dick noted that DNR was willing to make a presentation to homeowner groups if that is needed. Dick also noted that they would be happy to explain minimum flow needs. However the instream flow recommendation is from the instream flow group therefore, Dick noted that he does not believe DNR can speak to that recommendation.

The group discussed any questions on Ray's report that was issued to the group. There was a question on North American Vertical Datum '88 versus Plant Datum. Ray explained that Plant Datum was an arbitrary datum established prior to the construction of the dam and there is a 1.5 foot difference between that and NAVD. The group continued to make a few changes interactively to the wording of the document.

The group concluded that Lake Watch, LMA and DNR would meet on or around December 2 to discuss their opinions on an LIP. There will potentially be another LIP Focus Group meeting during the first part of January.

Group adjourned.

Appendix 10

Santee River Basin Accord For Diadromous Fish Protection, Restoration, and Enhancement

SANTEE RIVER BASIN ACCORD FOR DIADROMOUS FISH PROTECTION, RESTORATION, AND ENHANCEMENT

General

The Santee River Basin Accord ("Accord") is a collaborative approach among utilities with licensed hydroelectric projects, and federal and state resource agencies to address diadromous fish protection, restoration, and enhancement in the Santee River Basin ("Basin"). This Accord supports the *Santee-Cooper Basin Diadromous Fish Passage Restoration Plan* (2001) which was developed by the South Carolina Department of Natural Resources ("SCDNR"), the National Oceanic and Atmospheric Administration's National Marine Fisheries Service ("NMFS"), and the United States Fish and Wildlife Service ("USFWS"), and was accepted as a Comprehensive Plan by the Federal Energy Regulatory Commission ("FERC") as noted in the FERC's letter to the USFWS dated October 3, 2001.

Accord participants and hydroelectric projects (referred to herein singularly as "Project" and together as "Projects") that are the subject of this Accord include South Carolina Electric & Gas Company ("SCE&G"), licensee of the Saluda Hydroelectric Project No. 516, the Parr Hydroelectric Project No. 1894, and the Neal Shoals Hydroelectric Project No. 2315, and Duke Energy Carolinas, LLC ("Duke"), licensee of the Catawba-Wateree Hydroelectric Project No. 2232, the Ninety-Nine Islands Hydroelectric Project No. 2331, and the Gaston Shoals Hydroelectric Project No. 2332 (SCE&G and Duke referred to herein singularly as "Utility" and together as "Utilities") and their successors; and the SCDNR, the North Carolina Wildlife Resources Commission ("NCWRC"), and the USFWS (referred to herein singularly as "Agency" and together as "Agencies") and their successors. Singularly, any Utility or Agency that signs this Accord may be referred to herein as "Party". Collectively, the Utilities and Agencies that sign this Accord constitute the Cooperative Accord Partnership ("CAP" or "Parties"). The NMFS and the South Carolina Department of Health and Environmental Control ("SCDHEC") were also involved in the development of this Accord, but neither are currently signatories to the Accord and are therefore not CAP members. Future CAP members, if any, will be limited to federal and state resource agencies with authority for any diadromous fish species and their habitats in the Basin, and to owners of other FERC-licensed hydroelectric projects in the Basin. Non-governmental organizations and the general public will not be members of the CAP, but may participate via consultation with CAP members and may attend CAP meetings in a non-decision-making role. However, all discussions by non-CAP members in CAP meetings will be limited to a short public comment period (to include submission of written comments, if desired) at the start of a meeting, unless the CAP agrees by consensus on a case-by-case basis to do otherwise.

This Accord constitutes an agreement among the CAP members for the protection, restoration, and enhancement of diadromous fish in the Basin through implementation of a 10-year Action Plan ("Plan") that was initially developed by the USFWS (*Cooperative Accord 10-Year Action Plan For The Restoration and Enhancement of Diadromous Fish In The Santee Basin*—original draft dated January 24, 2007), and that includes no-sooner-than dates and biological triggers for fish passage as specified in this document. Tasks and cost estimates for each activity in the Plan are shown in Appendix A, and no-sooner-than dates, biological triggers, and other agreed-upon actions are noted in Appendix B. The agreements, activities, and biological studies identified in

the Accord, and in Appendices A, B, and C which are hereby incorporated by reference, will be used to support the development of fish passage prescriptions that will protect, restore, and enhance diadromous fish species in the Basin and will be filed with the FERC for inclusion in the new licenses for some of the above-referenced Projects. The CAP members have worked to create this Accord to meet the interests of CAP members while still allowing all Agencies and Jurisdictional Bodies to meet their respective statutory obligations for diadromous fish under §7 of the Endangered Species Act ("ESA") and under §4(e), §10(a), §10(j), and §18 of the Federal Power Act ("FPA"), and under §401 of the Clean Water Act ("CWA"), for the above-referenced Projects. The CAP has agreed to implement phased, deliberate, and effective activities that will initiate diadromous fish population enhancements in the near-term while collecting data and monitoring diadromous fisheries over a longer period for optimizing further restoration efforts.

Definitions

Consensus—a vote with no dissenting votes; abstention by a member is not a dissenting vote.

Jurisdictional Body—any governmental body, except Agencies, which has the authority to bind the Utilities by imposing requirements affecting the operation of the Projects that are the subject of the Accord.

Existing Project License—the hydropower license that as of the effective date of this Accord has been issued by the FERC for Projects No. 1894, No. 2315, No. 2331, and No. 2332 but does not include subsequent or renewed licenses, or their terms, even if some or all of the terms of a subsequent or renewed license are identical to terms in an Existing Project License.

Inconsistent Act—(A) any requirement, condition, prescription, or recommendation imposed by a Jurisdictional Body pursuant to §§4(e), 10(a), 10(j), or 18 of the FPA, §7 of the ESA, or §401 of the CWA for operation of a Project that materially varies any obligation concerning the restoration of diadromous fish, reservoir elevation limitations, required flow releases, and low inflow protocols or high inflow protocols from those set forth in the Catawba-Wateree Comprehensive Relicensing Agreement (CRA), as amended on December 29, 2006, or in an Existing Project License; or (B) any requirement, condition, prescription, or recommendation imposed by a Jurisdictional Body pursuant to §§4(e), 10(a), 10(j), or 18 of the FPA, §7 of the ESA, or §401 of the CWA that materially varies any obligation from those set forth in this Accord.

Breach—a failure of a Party to comply with the terms of the Accord in a significant and non-trivial manner and includes, but is not limited to: (A) a requirement, condition, prescription, or recommendation for a Project that is imposed by an Agency pursuant to §§4(e), 10(a), 10(j), or 18 of the FPA, or §7 of the ESA that materially varies any obligation set forth in this Accord; or (B) any CAP member's requesting, promoting, or supporting an Inconsistent Act or other requirements that materially varies any obligation set forth in this Accord.

Materially Vary or Varies—a requirement, condition, prescription, or recommendation materially varies if it imposes additional obligations that in the discretion of the affected Utility are significant and includes, but is not limited to: (A) reservoir elevation limitations; required flow releases; low inflow protocols or high inflow protocols that are significantly different from

those in the CRA or in an Existing Project License (whether by changing the actual obligation or by changing the method of implementing the obligation); (B) upstream or downstream passage of diadromous fish at a Project dam on a schedule different from that identified in the Accord; (C) installation of fishway equipment on a Project dam that is in addition to or different from what is required by the Accord; or (D) fish studies, monitoring, or analyses that are in addition to or different from what is required by the Accord.

Fish Passage Facilities, Fishways, and Prescriptions— defined in *Notice of Proposed Interagency Policy on the Prescription of Fishways Under Section 18 of the Federal Power Act,* (Federal Register/Volume 65, No. 247/Friday, December 22, 2000) for existing hydroelectric projects on the Saluda, Broad, and Catawba-Wateree rivers. These terms are used interchangeably throughout this document.

Key Agreements

The CAP members agree as follows:

General Agreements

1. The Utilities will not pursue Trial Type Hearings ("TTH") before an Administrative Law Judge pursuant to FPA §§4(e) or 18 to contest the USFWS's FPA §§4(e) or 18 diadromous fish requirements so long as the USFWS's ESA §7 requirements, FPA §§4(e) conditions, 10(a) and 10(j) recommendations, and 18 prescriptions do not materially vary reservoir elevation limitations, required flow releases, low inflow protocols or the high inflow protocols as set forth in: (A) the CRA; (B) Existing Project Licenses at the Ninety-Nine Islands and Gaston Shoals Projects; (C) a settlement agreement among the SCDNR, the USFWS, and SCE&G for the Saluda Hydroelectric Project; and (D) this Accord.

2. The Plan, which emphasizes research on fish movement (both upstream and downstream), distribution, and habitat use; fish population enhancement and restoration activities; and related funding responsibilities for American eels, American shad, Atlantic sturgeon, blueback herring, and shortnose sturgeon, will be implemented.

3. The Accord's no-sooner-than dates and biological triggers (in Appendix B) will be used to initiate conceptual design and subsequent construction of fish passage facilities for existing hydroelectric Projects on the Broad River and the Catawba-Wateree River.

4. The restoration target numbers for adult anadromous American shad and adult anadromous blueback herring restoration in the Broad River are set in Appendix C.

5. Subject to limitations regarding confidential and proprietary information, the CAP will establish and maintain a publicly accessible electronic archive for all data and documents created as a result of the Accord. When requested by a Utility, the Agencies will treat specific data provided by the Utility as confidential and proprietary, to the extent permitted by law. This may include pre-decisional work products, proprietary information, and sensitive resource data. In the event that any confidential or proprietary information is required by law to be released by an Agency, that Agency shall provide

CAP members affected by such a release with at least a 30-day written notice in advance of such release, unless a shorter notice period is required by law. Nothing herein shall be interpreted to prevent any Agency from complying with the Freedom of Information Act and 43 CFR Part 2, Subpart A and B.

6. If any Utility considers an action or omission to be an Inconsistent Act or a Breach, then that Utility may withdraw from this Accord by giving written notice of its intent to withdraw, pursuant to Paragraph 7; provided, however, that in the case of an Inconsistent Act, such notice of withdrawal may not take place until the time period to initiate administrative appeal of the Inconsistent Act has expired.

7. A withdrawing Utility initiates withdrawal by providing written notice of an Inconsistent Act or Breach and its intent to withdraw to all CAP members. This notice must include a brief statement setting forth: (A) the date and nature of the Inconsistent Act or Breach giving rise to the right to withdraw and (B) how the alleged Inconsistent Act or Breach meets the definition of "Inconsistent Act" or "Breach," as defined herein.

8. In the event of an alleged Accord Breach by any CAP member, the CAP member that is alleged to have breached the Accord shall have thirty (30) days after receipt of the notice of Breach within which to cure the Breach. If it is not reasonably possible to cure such Breach within thirty (30) days, the breaching CAP member shall notify the CAP Board ("Board," see Paragraph 26) of the time reasonably necessary to cure such Breach. If the Board can agree on the time reasonably necessary to cure the Breach, the breaching CAP member shall proceed to cure such Breach within such time as the Board shall agree. If the Board is unable to agree on the time reasonably necessary to cure the Breach, the breaching CAP member shall proceed to cure such Breach as soon as reasonably possible. The breaching CAP member(s) shall keep the Board informed of the progress in curing the Breach. Failure of the breaching CAP member to cure a Breach in accordance with this paragraph shall allow the CAP member that is harmed by the Breach to withdraw from the Accord.

9. In the event of a withdrawal by a Utility or the failure of a Utility to cure a Breach of the Accord, the Agencies have the option to reconsider any prior fish passage prescriptions submitted pursuant to FPA §18 for Projects owned by the withdrawing or breaching Utility. Withdrawal relieves the Utility of its performance obligations under this Accord, but will not result in the return of any funds previously contributed pursuant to Paragraph 37.

10. If the Accord Utility membership changes, the Plan will be adjusted by the remaining CAP members to be compatible with funding being provided by the remaining member Utilities.

11. The Agencies and Utilities agree that extension of the Plan beyond 2017 is optional, and the obligation and agreement to comply with the Accord is not conditioned upon a continuation of the Plan beyond the initial 10-year term.

12. The Agencies and the Utilities agree to use their best efforts to make this Accord a success and to participate in all Accord administrative activities at their own expense.

SCE&G Specific Agreements

13. The reservoir elevation limitations, required flow releases, low inflow protocols or high inflow protocols to be developed in a relicensing agreement for the Saluda Hydroelectric Project among the USFWS, SCDNR, and SCE&G along with the reservation by the USFWS of any fishway prescriptions for this Project will be filed with the FERC for the term of the new Saluda Hydroelectric Project license which is anticipated to be issued in 2010.

14. It is the understanding of the CAP that the diadromous fish study needs below the Parr Shoals Development Dam will be addressed through the Accord. Additional diadromous fish studies downstream of Parr Shoals Development Dam will not be required during the relicensing of the Parr Hydroelectric Project. A Fish Passage Feasibility Assessment (an evaluation of the upstream and downstream passage alternatives and their conceptual designs) will be conducted pursuant to the Accord, by SCE&G, and will commence upon attainment of the biological triggers as set out in Appendix B.

15. The Fish Passage Feasibility Assessment will commence at the Parr Shoals Development Dam within one year following passage of 50% of the adult anadromous American shad or adult anadromous blueback herring target restoration numbers as set out in Appendix B, upstream for any three years in a five-year period at the Columbia Diversion Dam Fish Passage Facility. Construction of a fishway at the Parr Shoals Development Dam will be initiated within one year and completed within three years following passage of 75% of the adult anadromous American shad or adult anadromous blueback herring target restoration numbers as described in Appendix B, upstream for any three years in a five-year period at the Columbia Diversion Dam Fish Passage Facility. In no event shall fish passage feasibility assessment or construction of the fishway commence before 2012. No changes will be required in the Parr Hydroelectric Project's current operations until issuance of the new FERC license for this Project. Any fish passage at this Project will not impact generation and pumping operations at the Fairfield Pumped Storage Facility until relicensing studies support the need for such a change and then only with the issuance of the new license for the Parr Hydroelectric Project (anticipated to be issued by FERC in 2020).

16. The USFWS agrees to reserve its FPA §18 authority to prescribe any type of fish passage facilities for sturgeon species at the Parr Shoals Development Dam until the new FERC license is issued for the Parr Hydroelectric Project, anticipated to be in 2020.

17. In the event that SCE&G applies for an amendment to the Parr Hydroelectric Project's current license for construction of a future power plant, the USFWS will reserve its authority under FPA §4(e) and §18 for this license amendment at that Project.

18. The Fish Passage Feasibility Assessment, including conceptual designs, will begin at the Neal Shoals Hydroelectric Project within one year following 50% of target restoration

numbers for adult anadromous American shad or adult anadromous blueback herring, as described in Appendix B, being passed upstream for any three years out of a five-year period at the Parr Shoals Dam. The construction of fish passage facilities at the Neal Shoals Hydroelectric Project will commence within one year and be completed within three years following passage of 75% of target restoration numbers of adult anadromous American shad or adult anadromous blueback herring being passed upstream three years out of a five-year period at the Parr Shoals Development Dam, but in no event shall the fish passage feasibility assessment or construction commence before 2016.

Duke Specific Agreements

19. For the Catawba-Wateree Hydroelectric Project, the obligation to operate a fishway and associated facilities as set out in the Accord will continue for the term of the new license, and the USFWS agrees that the prescription to be filed with the FERC for the new license will include such a provision. A trap and truck fish passage facility ("T&T facility") for adult anadromous American shad and adult anadromous blueback herring will be designed by Duke, in consultation with the Agencies and with input from the Accord Technical Committee ("TC;" see Paragraph 33), by December 31, 2015, and will commence operation by January 1, 2018, at the Wateree Development of the Catawba-Wateree Hydroelectric Project (see Appendix B). Fish trapped at this T&T facility will be placed in Lake Wateree. The year after the combined annual total catches of adult anadromous American shad and adult anadromous blueback herring equal or exceed 10,000, and in all subsequent years of the term of this Accord, all trapped adult anadromous American shad and adult anadromous blueback herring shall be trucked to upstream areas in the SC portion of the Catawba-Wateree River Basin designated by the TC. If the Accord is not functional, then the USFWS and the SCDNR will designate these upstream reaches in the SC portion of the Catawba-Wateree River Basin by consensus. Effectiveness studies (e.g., usefulness of attraction flows to increase capture of target fish and determination of target fish mortality associated with handling and transportation) for this T&T facility will be conducted by Duke during the first three years of operations, provided sufficient numbers of fish, as determined by the consensus of the Agencies with input from the TC, are available to do so. Information from the effectiveness studies will be used to improve effectiveness of the T&T facility.

20. The Agencies agree that operation of the T&T facility at the Wateree Development, as specified above and as incorporated in the prescription to be filed with the FERC for inclusion in the new license, will fulfill FPA §18 prescriptions and ESA §7 requirements for upstream passage for all adult anadromous fish (including but not limited to American shad, blueback herring, Atlantic sturgeon, and shortnose sturgeon) for all Catawba-Wateree Hydroelectric Project developments for the term of the new license.

21. The SCDNR will issue a scientific collection permit to operate the T&T facility at the Wateree Development pursuant to SC Code §50-11-1180 to ensure that Duke will not be held civilly or criminally responsible for any bycatch mortality, provided Duke is in compliance with its collection permit.

22. The Agencies agree that existing upstream fish passage facilities at the Wateree Development (i.e., partial ramp(s) and manual trap(s) in good repair and similar to that described in David Solomon's 2004 Fish Passage Design for Eels and Elvers) that use manual transport and release of captured American eels into Lake Wateree are sufficient to fulfill FPA §18 upstream prescriptions for catadromous fish (e.g., American eels) at the Wateree Development, when supplemented with additional partial ramp(s)/manual trap(s) determined by the results of partial ramp/manual trapping conducted in all seasons in 2009-2011 in areas adjacent to the spillway (data collected via the Catawba-Wateree River Elver Study in Appendix A). So long as American eels are passed upstream at the Wateree Development in an efficient, safe, and timely manner, Duke, at its sole discretion, may decide to continue operation of the ramp/trap fishway or construct a new passage facility. If Duke chooses to construct a new American eel passage facility at the Wateree Development, Duke will consult with the Agencies and the TC regarding facility design and construction.

23. The Agencies and Duke agree that a series of portable ramp/trap devices will be sufficient for the three-year monitoring studies, and that the studies will be conducted at each development in an orderly upstream sequence of the Catawba-Wateree Hydroelectric Project developments upstream of the Wateree Development. A template for the initial and subsequent studies to ascertain American eel abundance at each tailrace site is set out in the 10-Year Action Plan and is budgeted in Appendix A (location of such studies will occur in an orderly upstream sequence beginning at the Rocky Creek-Cedar Creek Development and ending at the Bridgewater Development at a time to be determined in consultation with the Agencies and with input from the TC). These data will allow effective design and placement of permanent or semi-permanent passage devices for best upstream passage at each development for American eels. Duke will develop a study plan for review and approval by the Agencies with input from the TC prior to commencing any studies at these upstream developments. Information collected from these studies shall include size, seasonality, and location of juvenile American eels in the tailrace areas where these fish may congregate. Captured American eels will be passed into the immediate upstream reservoir. The Agencies and the TC may approve a request for extension of the term of the initial monitoring study in the event few American eels are captured during the study phase.

24. Following the above monitoring for American eels described in Paragraph 23, Duke agrees to design, construct, and operate at each development (in consultation with the Agencies and with input from the TC after a review of the data collected during each three-year study) permanent or semi-permanent upstream passage facilities at each development within two years of completion of the monitoring study at a particular development. So long as American eels are passed upstream at each development in an efficient, safe, and timely manner, Duke, at its sole discretion, may decide to continue operation of the ramp/trap type fishways or construct a new passage facility at each Catawba-Wateree Project development.

25. Duke in cooperation with Agencies and with input from the TC will commence studies in 2024 to address the safe, timely, and effective downstream passage of American eels in the Catawba-Wateree system.

Management and Direction

CAP Board

26. The Accord will be directed by a Board composed of one representative appointed by each CAP member. Each CAP member may designate an alternate who may function as its Board representative in the absence of the appointed Board member. It shall be the responsibility of each CAP member to notify other members in writing within 14 calendar days following any change of the name or contact information for its Board member and/or alternate. On an annual basis, the Board shall elect a chairperson ("Chair") and may elect other officers as deemed necessary. Initial terms for Board members will be staggered so that there is continuity in the operation of the Accord over the long term, with Duke and USFWS Board members serving three-year initial terms and SCE&G and state agency members serving two-year terms. Successive Board members will serve two-year terms. Meetings by the Board will be held in compliance with the Freedom of Information Act in the jurisdiction where the meeting is held.

27. The initial Board shall establish and schedule at least one meeting of the Board per calendar year (Annual Meeting) for the duration of the Accord. The Chair will select the meeting location and will develop an agenda and provide draft minutes of the previous meeting within two weeks following each meeting and require all members to return their comments within two weeks following receipt of the draft minutes. Additional meetings (Called Meetings) of the Board may be called by the Chair or upon the agreement of at least 25 percent of the Board members, but no Called Meeting that is not called by consensus vote by the Board may be held with less than four weeks prior written notice.

28. A quorum is required for the transaction of business (e.g., official votes) at any Board meeting. A quorum is defined as the presence of a representative or alternate of each CAP member participating in the Accord on the date of the meeting. Once a quorum is established, it may not be broken by departure of one or more members' representatives or alternates, and voting may occur once a quorum is established.

29. Failure to comply with terms of the Accord, including the prompt payment of a Utility's annual contributions, will result in the revocation of that member's right to vote until the failure to comply is remedied.

30. The representatives of the members, or their alternates, may participate, which participation includes voting, in meetings by any means of communication by which all participants may simultaneously hear each other during the meeting. A member's representative or its alternate participating in a meeting by this means is deemed to be present in person at the meeting. No proxy voting shall be permitted. A member's alternate shall not vote if that member's regular representative is present.

31. In addition to conducting its affairs at meetings, the Board may also validly exercise its authority in writing. A proposal may be presented, whether in written or electronic format, to each member's representative. Upon the approval, whether in written or electronic format, of each member's representative to that written proposal, the action of

the Board concerning the proposal will constitute a valid exercise of the Board's authority. A complete record of all action taken by the Board without meeting shall be filed with the minutes of the proceedings of the members, whether done before or after the action so taken.

32. Final decisions must be made by consensus of Board members or their alternates.

Technical Committee (TC)

33. A TC comprised of fishery biologists and/or other qualified professionals representing each CAP member will be established by the Board and will advise the Board on technical issues associated with the Accord. The TC will exist for the duration of the Accord.

34. The TC will develop consensus recommendations to the Board and will guide the design and implementation of all Plan tasks for the duration of the Plan. Following the expiration of the term of the Plan, the TC will function as a scientific advisor to the Board regarding all matters related to the restoration of diadromous fish in the Santee Basin.

35. Failure to allocate and disburse funds according to direction of the Board will result in the revocation of that member's right to participate or to vote on matters brought to the TC, until the failure to comply is remedied.

36. For the duration of the Accord, the TC will provide a brief written annual progress report to the Board by February 15 of the following year.

Communications Protocol

The Board will develop a protocol to communicate clearly on all Accord-related resource study, protection, restoration, and enhancement activities occurring in the Basin. All CAP members shall adhere to the Communications Protocol. It is the intent of the Accord to publicly disseminate all technical and scientific findings of its monitoring and study efforts.

Term of the Accord and the 10-year Action Plan

The effective date of this Accord shall be April 15, 2008. The Accord shall terminate for SCE&G at the end of the term of the new FERC license for the Saluda Hydroelectric Project (expected to be issued by the FERC in 2010) and for Duke at the end of the term of the new FERC license for the Catawba-Wateree Hydroelectric Project (expected to be issued in 2009). Each annual extension, if any, of the applicable new licenses by the FERC (commonly referred to as an "annual license") will also extend the term of the Accord for the applicable Utility by one year. Since diadromous fish restoration can be a long-term endeavor, the Board may desire to extend the term of the Plan, or to increase funding during its term. Through a consensus vote of its members, the Board may alter or modify Plan tasks and expenditures within those amounts currently established by the Plan and such Plan modifications do not require new signatures on the Accord from the authorized representative of each CAP member's organization.

The term of the Plan shall be April 15, 2008, through December 31, 2017, unless extended as noted above. The Board shall consider revision or renewal of the Plan in 2015 and shall decide by consensus of its membership if the Plan shall be revised or renewed. A decision not to extend or renew the Plan does not affect the obligations of and agreements among the CAP members contained in the Accord.

Dispute Resolution

Major disputes regarding the Accord, if at all possible, will be resolved by the Board through good-faith negotiations which may be assisted by selecting the services of a neutral mediator (cost of the mediator to be shared as determined by the Board).

Roles and Responsibilities for Implementing the 10-year Action Plan

Utilities

37. Utilities will fund the Plan with SCE&G providing $200,000 per year (unadjusted annual contribution) and Duke providing $500,000 per year (contributions expressed in 2008 dollars and to be adjusted annually using the Consumer Price Index). Additional funding secured through grants or other sources by the CAP may be incorporated into the budget and is encouraged. Funding levels provided by the original Utilities are set at that described above. If the costs of proposed activities and studies under the Plan exceed the funding provided by the Utilities, then later activities and studies under the Plan will be abandoned or reduced appropriately as determined by the Board to accommodate the funding level agreed to in this document, unless the necessary additional funding can be obtained by new utility participants, non-CAP member entities, grants and/or existing Fisheries Enhancement Plans from within the Basin. However, funding by non-CAP members will not render otherwise ineligible entities eligible to guide Accord activities or become members of the CAP.

38. In addition to the funding set forth in Paragraph 37, Utilities will provide technical/scientific input to program development, personnel and in-kind services (as appropriate), while conducting some studies, and will provide assistance in the scheduling and conduct of studies.

State and Federal Agencies

39. Agencies will provide technical/scientific input to program development, assistance in the scheduling of studies, personnel and in-kind services (as appropriate) while conducting some studies, and assistance in reporting study results.

40. Agencies will investigate and solicit any sources of supplemental or matching funds.

41. Agencies will assist, to the extent practicable, with the issuance of all applicable permits.

Fund Management

Funds to be contributed by the Utilities shall be maintained by each Utility and accounted for in a separate CAP Fund Account. The CAP Board will develop and adopt procedures concerning when the Utilities will deposit their contributions to this account and how disbursements from this account are approved. Each Utility shall provide annually, no later than March 31, a report of all fund deposits, disbursements, and balances for the previous calendar year. Any funds obtained by a Utility from other sources that are to be used solely in the execution of the Plan shall be included in that Utility's CAP Fund Account and shall be identified in the annual report as a contribution by others. The annual reports provided by the Utilities to the CAP Board will be provided to all CAP members. All such funds, whether contributed by Utilities or others shall be the exclusive property of the CAP to be disbursed and spent according to the Board.

Disbursements from a Utility's CAP Fund Account shall be made only at the consensus direction of the CAP Board. Each Utility owes a fiduciary duty to manage and account for the funds for the benefit of the CAP and to follow the CAP Board's direction for disbursements.

It is the desire of the Utilities that all monies contributed to the Plan be spent during the term of the Plan. In the event that the Plan is not extended and unspent funds are available at the conclusion of the Plan term, the Board will decide by consensus and direct the Utilities to allocate these monies to other ongoing programs of a similar nature and the Utility CAP Fund Accounts will be closed, after which each Utility shall submit to the CAP Board a final accounting report within 60 days following closing its account.

Reserved Authority

The Utilities recognize that the USFWS will reserve authority to alter its FPA §4(e) conditions and FPA §18 prescriptions for diadromous fish. The Agencies and Utilities agree that the Accord provisions are appropriately based on current knowledge of diadromous fisheries in the Santee River Basin. The USFWS believes it will be able to meet its FPA §§ 4(e) and 18 and ESA §7 obligations consistent with its Accord commitments.

State Commitments

The SCDNR agrees to use its best efforts to make this Accord a success. In the event that the USFWS exercises its reserved authority and issues a FPA §18 prescription or a FPA §4(e) condition, or an ESA §7 requirement, or the SCDHEC issues a CWA §401 certification that is inconsistent with, or would impose obligations in addition to those set forth in the Accord or Project settlement agreement with the SCDNR, the SCDNR may exercise any procedural and substantive rights it may have to contest such a prescription, condition, or requirement.

The NCWRC agrees to use its best efforts to make this Accord a success. In the event that the USFWS exercises its reserved authority and issues a FPA §18 prescription or a FPA §4(e) condition, or an ESA §7 requirement, or the North Carolina Division of Water Quality issues a CWA §401 certification that is inconsistent with, or would impose obligations in addition to those set forth in the Accord or Project settlement agreements with the NCWRC, the NCWRC may exercise any procedural and substantive rights it may have to contest such a prescription, condition, or requirement.

Modification of the Accord

This Accord may be modified; however, except for modifications of the Plan as described above, no modification of the Accord will be effective or valid unless it is signed by the authorized representative of each CAP member's organization.

Miscellaneous Agreements

No Admission of Liability – The Accord is a compromise, balancing many interests. The actions taken hereunder are not intended nor shall be construed as an admission on the part of any CAP member, or its agents, representatives, attorneys or employees that such CAP member was so obligated in any manner independent of this Accord. Except as provided herein, no CAP member shall be prejudiced, prevented, or estopped from advocating in any manner or before any entity, including the FERC or any state agency, any position inconsistent with those contained in this Accord regarding the licensing, permitting and license compliance of these or any other hydropower projects other than those addressed in this Accord.

Accord Terms Contractual/Merger – The terms of the Accord are contractual and not mere recitals. This Accord, which includes and fully incorporates any and all Appendices and the Plan, constitutes the entire agreement among the CAP members with respect to the subject matter hereof. All prior contemporaneous or other oral or written statements, representations or agreements by, between or among any of the CAP members, with respect solely to fish passage and fishway prescriptions of the subject Projects are superseded hereby. Nothing herein shall be construed to affect, negate, or supersede obligations and benefits arising from Duke's Comprehensive Relicensing Agreement and SCE&G's potential settlement agreement for the Saluda Hydroelectric Project regarding reservoir elevation limitations, required flow releases, low inflow protocols or high inflow protocols.

Enforceability – All terms of the Accord not incorporated as FERC License Articles shall be enforced through remedies available under applicable state or federal law.

Compliance with Laws – It is the responsibility of the CAP members to comply with all applicable federal, state and local laws, codes, rules, regulations, and orders of any governmental authority, and, except as otherwise provided herein, each CAP member will obtain, at its own expense all permits and licenses pertaining to its obligations under the Accord. The Accord is not intended and shall not be construed as a defense to or a limitation on civil or criminal liability in any action brought by any governmental entity to enforce any law and shall not limit the assessment or award of any fees, fines, penalties, remediation costs or similar liabilities in any such enforcement action.

Force Majeure – The Parties agree that a CAP member shall not be in breach of the Accord to the extent that any delay or default in performance is due to causes beyond the reasonable control of the delayed or defaulting CAP member; provided, that the delayed or defaulting CAP member notifies the other CAP members as soon as possible of: (A) the event; (B) the expected duration of the event; and (C) the delayed or defaulting CAP member's plan to mitigate the effects of the delay or default. Such causes may include, but are not limited to, natural disasters, labor or civil disruption, acts of terrorism, the inability to secure any legal authorization from another entity

(e.g., a permit or license) where such legal authorization is a prerequisite or requirement for complying with the Accord, or breakdown or failure of the affected Project's works, so long as such causes are beyond the reasonable control of the delayed or defaulting CAP member.

Applicable Law and Venue – This Accord shall be governed by the law of the state wherein the subject hydroelectric development is located. Execution of the Accord does not constitute a consent to jurisdiction of any court unless such jurisdiction otherwise exists. Execution of the Accord also does not constitute a waiver of any immunity or privilege except as provided by law.

Waiver Independence – No consent to or waiver of any provision of the Accord shall be deemed either a consent to or waiver of any other provision hereof, whether or not similar, or a continuing consent or waiver unless otherwise specifically provided.

Water Rights Unaffected – Except as between the Parties hereto and as specifically set forth in this Accord, the Accord does not release, deny, grant or affirm any property right, license or privilege in any waters or any right of use in any waters. The Accord does not authorize any person to interfere with the riparian rights, littoral rights or water use rights of any other person. No person shall interpose the Accord as a defense in an action respecting the determination of riparian or littoral rights or other water use rights.

Parties' Own Costs – Except as expressly provided for in the Accord, all CAP members are to bear their own costs of participating in the Accord.

Existing Laws – Unless otherwise noted, any reference to any statute, regulation or other document refers to the statute, regulation or document as it exists on the date of the first signature on the Accord.

No Third-Party Beneficiary – The Accord shall not create any right in any individual or entity that is not a signatory hereto or in the public as a third-party beneficiary. This Accord shall not be construed to authorize any such third party to initiate or to maintain a suit in law or equity or other administrative proceeding.

No Commitment of Funds – Nothing in the Accord shall be construed as obligating any federal, tribal, state, or local agency to expend in any fiscal year any sum in excess of appropriations made by Congress, tribal councils, or state or local legislatures or administratively allocated for the purpose of this Accord for the fiscal year or to involve any federal, tribal, state, or local agency in any contract or obligations for the future expenditure of money in excess of such appropriations or allocations.

No Government Agency Delegation – Nothing in the Accord shall be construed as requiring or involving the delegation by any government agency to any other body of any authority entrusted to it by Congress, tribal council, or by the legislature of any state.

Successors and Assigns – The Accord shall apply to, and be binding on, the CAP members, their successors, transferees and assigns. No change of ownership in a Project or transfer of a license shall in any way modify or otherwise affect any other CAP member's interests, rights, responsibilities, or obligations under the Accord. (See the General section of the Accord for a list of Projects and current licensees.) Unless prohibited by applicable law, the licensee of the

affected Project shall provide in any transfer of the existing or new license for the Project, that such new owner shall be bound by, and shall assume the rights and obligations of the Accord upon completion of the change of ownership. In the event applicable law prohibits the new owner from assuming the rights and obligations of the Accord, any CAP member may withdraw from the Accord. The licensee of the affected Project shall provide written notice to the other CAP members at least 90 days prior to completing such transfer of the license.

Caption Headings – The paragraph titles and caption headings in the Accord are for convenience of reference and organization, are not part of the Accord, and shall not be used to modify, explain, interpret, or define any provisions of the Accord or the intention of the CAP members.

Limitation of Applicability – The CAP members have entered into the negotiations and discussions leading to the Accord with the explicit understanding that all discussions relating thereto are to be considered as settlement negotiations, shall not prejudice the position of any CAP member or entity that took part in such discussions and negotiations, and are not to be otherwise used in any manner in connection with these or any other proceedings. The CAP members understand and agree that execution of the Accord establishes no precedents, does not admit or consent to any fact, opinion, approach, methodology, or principle except as expressly provided herein.

Execution in Counterparts – This Accord may be signed in counterparts to expedite signatures, and shall become binding between the Utilities and the Agencies upon the last signature below by an authorized representative of each.

Full Legal Authority – Each signatory Party to the Accord represents that it has the full legal authority to execute this Accord and to bind the principal who it represents, and that by such representative's signature, such principal shall be bound upon full execution of the Accord.

Notices – Notices in connection with matters under the Accord shall be provided in writing and addressed to:

Hugh Barwick
Senior Environmental Resource Manager
Duke Energy Carolinas, LLC
526 South Church Street, P. O. Box 1006 (EC12Y)
Charlotte, NC 28201-1006
704/382-8614 FAX

William Argentieri, PE
Manager—Civil Engineering F/H Technical Services
South Carolina Electric & Gas Company
111 Research Drive
Columbia, SC 29203
803/933-7849 FAX

Bennett Wynne
Anadromous Fish Coordinator
NC Wildlife Resources Commission
901 Laroque Avenue
Kinston, NC 28501
252/522-9736 FAX

Richard Christie
FERC Coordinator
SC Department of Natural Resources
1771-C Highway 521 By-Pass South
Lancaster, SC 29720
803/286-5598 FAX

Tim Hall
USFWS Field Supervisor
176 Croghan Spur Rd., Suite 200
Charleston, SC 29407
843/727-4218 FAX

Brian Cole
USFWS Field Supervisor
160 Zillicoa Street
Asheville, NC 28801
828/258-5330 FAX

AGREED TO BY THE AUTHORIZED REPRESENTATIVES OF THE PARTIES NAMED BELOW ON THE DATES SHOWN BY THEIR SIGNATURES:

SOUTH CAROLINA ELECTRIC & GAS COMPANY

By: _____ Date: 4/18/08
James M. Landreth
Vice President, Fossil Hydro Operations
111 Research Drive
Columbia, SC 29203

DUKE ENERGY CAROLINAS, LLC

By: _____ Date: 4/10/08
Steven D. Jester
Vice President, Hydro Licensing and Lake Services
526 South Church Street
Charlotte, NC 28202

U.S. FISH & WILDLIFE SERVICE

By: _____ Date: 4/25/08
Sam Hamilton
Regional Director, Southeast Region
1875 Century Blvd., Suite 400
Atlanta, GA 30345

S.C. DEPARTMENT OF NATURAL RESOURCES

By: _____ Date: 5/14/08
John Frampton
Director
1000 Assembly Street
Columbia, SC 29202

N.C. WILDLIFE RESOURCES COMMISSION

By: _____ Date: 4/21/08
Fred Harris
Interim Executive Director
1701 Mail Service Center
Raleigh, NC 27699-1701

Appendix A. Projected annual costs for tasks in the Santee River Basin Cooperative Fish Passage Accord 10-Year Action Plan[1].

Task	Years										Total for all years
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Hatchery Operations	$ 340,000	$ 138,000	$ 142,000	$ 146,000	$ 151,000	$ 155,000	$ 160,000	$ 165,000	$ 170,000	$ 175,000	$ 1,742,000
Adult Shad Transport	$ 77,000	$ 80,000	$ 82,000	$ 84,000	$ 87,000	$ 90,000	$ 92,000	$ 95,000	$ 98,000	$ 101,000	$ 886,000
Elver Studies/Catawba-Wateree River	$ 43,000	$ 64,000	$ 46,000	$ 47,000	$ 75,000	$ 50,000	$ 52,000	$ 82,000	$ 55,000	$ 56,000	$ 570,000
Juvenile Shad Monitoring		$ 106,000	$ 109,000	$ 113,000	$ 116,000	$ 119,000	$ 123,000	$ 127,000	$ 130,000	$ 134,000	$ 1,077,000
Adult Shad Migration		$ 159,000						$ 190,000			$ 349,000
Sturgeon Studies			$ 109,000	$ 113,000	$ 116,000	$ 119,000	$ 123,000				$ 580,000
Elver Studies/Parr									$ 65,000	$ 34,000	$ 99,000
Estimated Annual Costs	$ 460,000	$ 547,000	$ 488,000	$ 503,000	$ 545,000	$ 533,000	$ 550,000	$ 659,000	$ 518,000	$ 500,000	$ 5,303,000
Available Funds	$ 700,000	$ 715,000	$ 730,450	$ 746,364	$ 762,755	$ 779,638	$ 797,027	$ 814,938	$ 833,386	$ 852,388	$ 7,731,946
Fund Balance[2]	$ 240,000	$ 408,000	$ 650,450	$ 893,814	$ 1,111,569	$ 1,358,207	$ 1,605,234	$ 1,761,172	$ 2,076,558	$ 2,428,946	

[1] Assumes an annual 3% inflation rate for all items except contributions by South Carolina Electric and Gas Company.

[2] Fund balance or contengency is the difference between the estimated task costs and available funds for that year, and includes the balance from the previous year.

Appendix B. No-sooner-than dates, total restorational numbers, and biological triggers for construction of fish passage facilities at selected Santee River Basin hydroelectric dams.

Utility	Dam	Date	Total number[1]	50% Trigger[2]	75% Trigger[3]
SCE&G	Saluda	Deferred	NA[4]	NA	NA
	Columbia[5]	2007	92,800 (464,000)	46,400 (185,600)	69,600 (348,000)
	Parr	2012	128,150 (640,750)	64,075 (320,325)	96,112 (480,562)
	Neal Shoals	2016	37,400 (187,000)	18,700 (93,500)	28,050 (140,250)
Duke	Wateree[6]	2018	NA	NA	NA

[1] Total restoration numbers for adult andaromous American shad (blueback herring) developed by the USFWS from surface acreage calculations of the river (including available tributaries) from that dam to the next dam upstream.

[2] 50% trigger or when 50% of the total restoration numbers for adult anadromous American shad (blueback herring) for the unblocked reach upstream of the dam are being passed at that dam. This would initiate a Fish Passage Feasibility Assessment at the upstream dam.

[3] 75% trigger or when 75% of the total restoration numbers for adult anadromous American shad (blueback herring) for the unblocked reach upstream of the dam are being passed at that dam. This would initiate construction of a Fish Passage Facility at the upstream dan

[4] NA = Not applicable

[5] Volitional Fish Passage Facility is operational and passage is currently being evaluated.

[6] Trap and Truck Fish Passage Facility operational by January 1, 2018.

Appendix C. **River miles, surface acreages of the mainstem river and associated tributaries, and restoration numbers (fish/acre) calculated** for adult anadromous American shad and blueback herring from selected reaches of the Broad River.

Restoration phase and Reach	River miles	Mainstem acres	Tributary acres	Total acres	Shad[1]	Herring[2]
Phase 1						
Columbia Dam to Parr Shoals Development Dam	24	1,758	98	1,856	92,800	464,000
Phase 2						
Parr Shoals Development Dam to Neal Shoals Dam	31	2,106	457	2,563	128,150	640,750

[1] American shad restoration numbers are the product of total acres and 50 fish/acre.

[2] Blueback herring restoration numbers are the product of total acres and 250 fish/acre.

Appendix 11

RARE, THREATENED AND ENDANGERED SPECIES MANAGEMENT PROGRAM

SOUTH CAROLINA ELECTRIC & GAS COMPANY

COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT

(FERC NO. 516)

RARE, THREATENED AND ENDANGERED SPECIES MANAGEMENT PROGRAM

SEPTEMBER 2008

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
(FERC NO. 516)

RT&E SPECIES MANAGEMENT PROGRAM

SEPTEMBER 2008

Prepared by:

Kleinschmidt
Energy & Water Resource Consultants

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
(FERC NO. 516)

RT&E SPECIES MANAGEMENT PROGRAM

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COLUMBIA, SOUTH CAROLINA

SALUDA HYDROELECTRIC PROJECT
(FERC NO. 516)

RARE, THREATENED & ENDANGERED SPECIES MANAGEMENT PROGRAM

1.0 INTRODUCTION

The Saluda Hydro Project (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 (Figure 1-1) that is owned and operated by South Carolina Electric & Gas (SCE&G or Licensee). 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 relicensing of the project, SCE&G prepared and issued the Initial Consultation Document (ICD) on April 29, 2005. 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 information regarding the status of a rare, threatened and endangered (RT&E) species in the Project Area and requested an assessment of potential impacts to theses species from Project operations.

To address RT&E species-related relicensing requests, SCE&G formed a RT&E Species Technical Working Committee (TWC), which included representatives from the USFWS, NMFS, SCDNR, NGOs, and other stakeholders. With oversight from the RT&E TWC, the Saluda Hydro Project Rare, Threatened and Endangered Species Assessment (Kleinschmidt, 2008) was developed to provide the requested information regarding status of RT&E species in the Project vicinity, as well as potential project-related impacts. The assessment identified three species of conservation concern as having been document within or in close proximity to the Project: rocky shoals spider lily (*Hymenocallis coronaria*), bald eagle (*Haliaeetus leucocephalus*), and wood stork (*Mycteria americana*). State and federal resource agency staff, as well as other RT&E TWC participants, subsequently requested that management plans be prepared for these species. This program was prepared pursuant to their request.

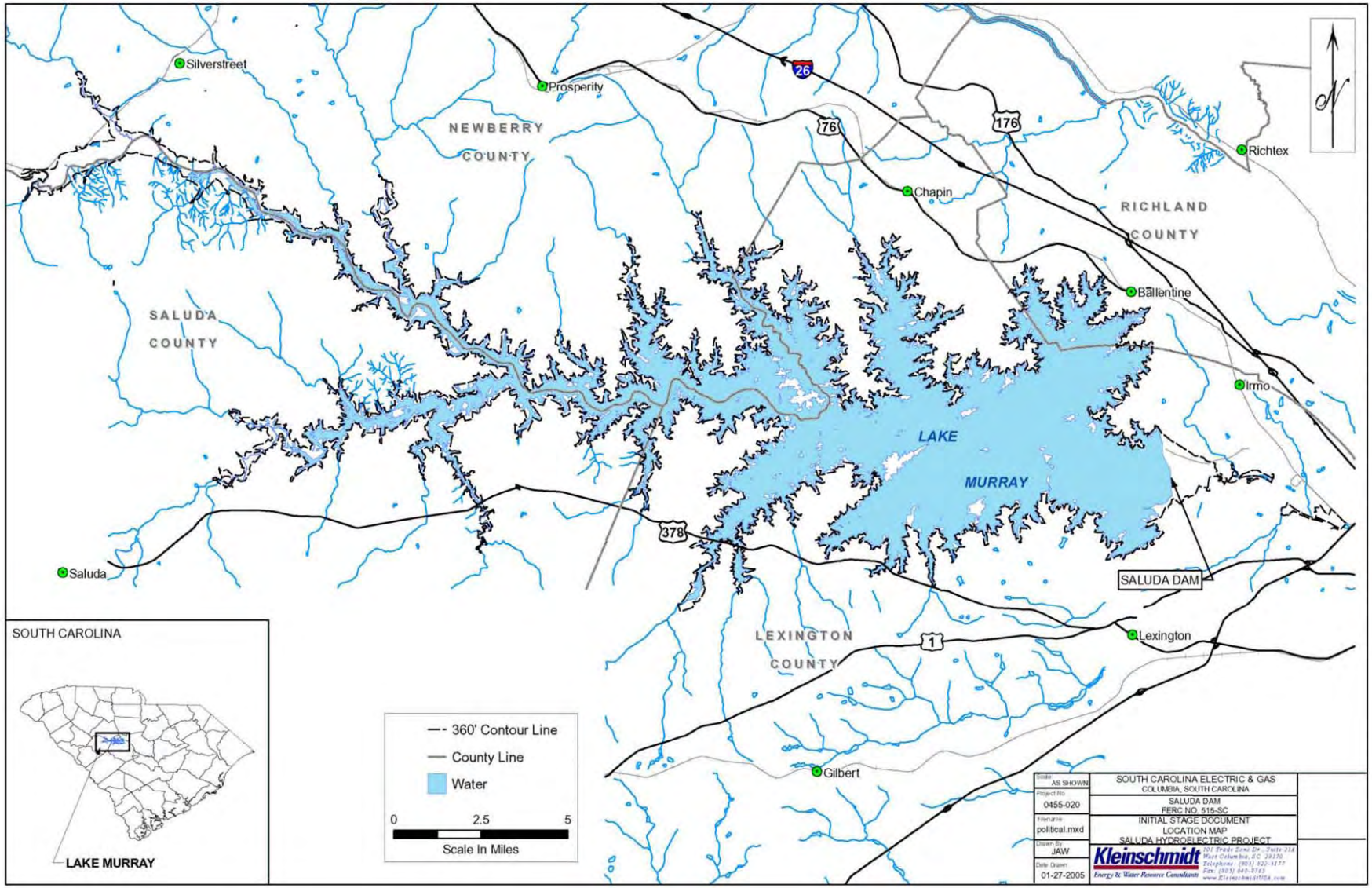

Figure 1-1: Location Map for the Saluda Hydroelectric Project (FERC No. 516)

2.0 BALD EAGLE

The bald eagle was listed as federally-endangered on March 11, 1967, partially due to significant population declines attributed to exposure to the pesticide Dichloro-Diphenyl-Trichloroethane (DDT). Subsequent to the banning of DDT, populations began to increase and the eagle's status was lowered from endangered to threatened on July 12, 1995 (USFWS 1995). Today, the species has recovered to the degree that it was recently removed from the Federal Endangered Species List, effective July 2007 (72 FR 37345 37372)(USFWS 2007). In South Carolina, the number of estimated nesting pairs has increased from 13 in 1977 to 181 in 2003 (Wilde et al. 2003). The bald eagle continues to receive protection under the South Carolina Nongame and Endangered Species Conservation Act as a state endangered species, as well as through the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (16 U.S.C.668-668d) (72 FR 37345-37372).

Bald eagles may be found throughout North America, typically around water bodies where they feed primarily on fish and scavenge carrion. Studies suggest reservoirs, especially those associated with hydroelectric facilities, are particularly attractive to foraging bald eagles (Brown 1996). Eagles nest in large trees near water and typically use the same nest for several years, making repairs to it annually (USFWS 1989). In South Carolina, the distribution of eagle nesting has shifted, from historically being located primarily along the coast, to encompass more inland areas; this expansion has been attributed to the construction of approximately 491,000 acres of large reservoirs in the state since the early 1900's (Wilde et al. 2003).

2.1 Status in the Project Area

Bald eagles have likely used Lake Murray for foraging and nesting since its construction in 1930. Eagles utilizing the lake for foraging are thought to be a mix of native nesting adults and juveniles from South Carolina and adult and juveniles from outside the state (Wilde et al. 2003). Eagles forage on Lake Murray year round, with peak usage likely occurring during the winter months. Nesting of bald eagles on Lake Murray was first documented in 1996, and since that time, the nesting population has increased significantly (Wilde et al., 1996). The most recent survey, performed by

SCDNR biologists as part of state-wide monitoring, documented seven active bald eagle nests on Lake Murray as well as one active nest on the lower Saluda River (LSR) (T. Murphy, SCDNR, unpublished data, 2007). Productivity (young produced) has also increased substantially around the lake from two chicks in 1996 to 10 chicks in the 2002/2003 nesting season (Wilde et al. 2003).

Lake Murray was one of four South Carolina reservoirs affected by an outbreak of Avian Vacuolar Myelinopathy (AVM), which was first documented at DeGray Lake, Arkansas in the winter of 1994-1995 (Jeffers 2000). AVM has been confirmed in birds from 11 reservoirs in five southern states (SC, NC, GA, AR, TX) and has resulted in the death of at least 93 bald eagles, thousands of American coots, and smaller numbers of waterfowl and other species (Wilde et al. 2003, Birrenkott et al. 2004). AVM is thought to be linked to an unknown neurotoxin that causes lesions in the white matter of the brain and the spinal cord. Affected animals demonstrate difficulty flying, swimming and walking (Jeffers 2000). Evidence suggests that bald eagles contract AVM by preying on afflicted coots and other waterfowl that are unable to evade predators (Wilde et al. 2003).

Researchers suspect that the neurotoxin thought to cause AVM may be the product of a cyanobacteria (blue-green algae) often found growing in association with aquatic vegetation (i.e., *Hydrilla*) (Wilde et al. 2003). Sampling conducted at AVM-affected reservoirs by SDCNR and the University of South Carolina (USC) during 2001 and 2002 found that one particular species of blue-green algae, which is known to produce toxic compounds, had the greatest incidence of colonization at the location with the highest eagle mortality from AVM (Strom Thurmond Lake on the South Carolina/Georgia border). In addition, a recently-published feeding study involving mallards found a cause-effect relationship between ingestion of *Hydrilla* from these sites and AVM infection (Birrenkott et al. 2004).

As part of the Saluda Dam Remediation Project, from 2002 to 2005 SCE&G funded monthly surveys on Lake Murray to monitor for the presence of AVM-affected birds, as well as periodic collections of American coots to screen for the disease. To date, there have been no known occurrences of AVM in the Lake Murray bald eagle population; however, a low percentage of the coots collected during the winters of 1999

(2 out of 17 collected), 2000 (5 out of 27 collected), and 2003 (1 out of 30 collected) did test positive for the disease, as well as one Canada goose collected during December 2000 (Wilde et al. 2003). Despite the presence of some affected prey species, SCDNR and USC scientists have concluded that, to date, the presence of AVM at Lake Murray does not appear to have resulted in extensive losses of breeding adult bald eagles as both the number and productivity of eagles nesting on Lake Murray have increased from 1996 level (Wilde et al. 2003). It should be noted that the presence of AVM in the lone coot from the 2003 collection was determined only through clinical testing, with no birds displaying obvious neurological impairment, suggesting that AVM was not severe at Lake Murray during the 2002/2003 season (Wilde et al. 2003).

2.2 Management Regime

Active bald eagle nests occurring within the Project Area will be managed in accordance with the National Bald Eagle Management Guidelines (USFWS, 2007), which were published following de-listing of the species to ensure adherence to the Bald and Golden Eagle Protection Act. While restrictions vary according to the type of disturbance, the guidelines generally prohibit potential "disturbance" within 660 ft of an active nest during the nesting season (September through May) and 330 ft during the non-nesting season. Additional details regarding the various disturbance categories, as well as restrictions associated with each category, are summarized in Table 2-1 and Table 2-2.

SCE&G will ensure adherence to the National Bald Eagle Management Guidelines by implementing the following:

1) As part of he shoreline permitting process, SCE&G Lake Management staff will consult the disturbance matrices (Table 2-1 and Table 2-2 below) to ensure that permitted shoreline activities do not violate the buffer requirements outlined in National Bald Eagle Management Guidelines (USFWS, 2007);
2) SCANA Corporate Environmental, SCE&G Lake Management, and/or their consultants will continue to coordinate with SCDNR endangered species biologists on an annual basis to acquire the most up-to-date data

information regarding the location and status of active eagle nests in the Project vicinity;

3) SCE&G Lake Management and/or SCANA Corporate Environmental will consult with SCNDR and/or USFWS Ecological Services staff in the event that a yet undocumented nest is discovered in an area of proposed shoreline disturbance, or if there is difficulty in determining the disturbance category of a proposed activity; and

4) SCE&G will implement a Rare, Threatened, and Endangered Species Public Awareness Program, which will include the bald eagle. The Program will likely include information on bald eagle identification, habitat requirements and natural history, recent rangewide recovery successes, and the importance of Lake Murray and the LSR in providing nesting and foraging habitat for South Carolina's resident bald eagles.

5) SCE&G will also adhere to its Avian Protection Plan (APP) that requires incident reporting and tracking of avian interactions (collisions and electrocutions) with SCE&G power lines and electrical equipment located in its substations. Repeat occurrences may result in retrofitting problem poles or spans of lines with raptor protection devices. The APP also includes a discreet subsection on Eagle Protection and addresses annual reporting requirements.

Table 2-1: Summary of Bald Eagle Disturbance Categories, Representative Disturbance Activates, and Minimum Setback Requirements
Source: National Bald Eagle Management Guidelines (USFWS, 2007)

CATEGORY	REPRESENTATIVE DISTURBANCE ACTIVITIES	DISTANCE FROM A BALD EAGLE NEST
A	Building construction, 1or 2 story, with project footprint of <0.5 acre Construction of roads, trails, canals, power lines, and other linear utilities Agriculture and aquaculture- new or expanded operations Alteration of shorelines or wetlands Installation of docks or moorings Water impoundments	See Table 2
B	Building construction, 3 or more stories or 1 to 2 stories but with a footprint of >0.5 acre Installation or expansion of marinas with a capacity of 6 or more boats Mining and associated activities Oil and natural gas drilling and refining and associated activities	See Table 2
C	Timber operations and forestry practices	No clear cutting or removal of trees within 330 feet of a nest No logging activities within 660 feet of a nest during the nesting season
D	Off-road vehicle use	330 - 660 ft (depending on visibility from the nest) during the nesting season*
E	Motorized watercraft use	330 ft during the nesting season
F	Non-motorized recreation and human entry	330 ft during the nesting season
G	Helicopters and fixed-wing aircraft	1,000 ft during the nesting season
H	Blasting and other loud, intermittent noises	0.5 miles (2,640 ft) during the nesting season

Table 2-2: Minimum Distances for Category A and B Disturbances for Bald Eagle Nests Source: National Bald Eagle Management Guidelines (USFWS, 2007)

	NO SIMILAR ACTIVITY WITHIN 1 MILE OF NEST	SIMILAR ACTIVITY WITHIN OF NEST
Activity will be visible from nest	660 feet	660 feet
Activity will not be visible from nest	Category A: 330 feet* Category B: 660 feet	330 feet*

*Activities that would involve cutting trees and changing the landscape should be done outside the breeding season or at distances >660 feet from a bald eagle nest.

3.0 WOOD STORK

The wood stork is a large wading bird endemic to coastal areas of South Carolina, Georgia, Florida and is the only stork species native to North America (USFWS, 1997). Like most other wading birds, wood 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 (USFWS, 1997). Typical foraging habitats include narrow tidal creeks, flooded tidal pools, freshwater marshes, and freshwater wetlands. Wood storks typically use tall cypresses or other trees near wetlands or marshes for colonial nest sites. Nests are usually located in the upper branches of large trees and there are typically several nests 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). The wood stork was federally listed as endangered in 1984, with population declines attributed primarily to general habitat loss (USFWS, 1997).

3.1 Status in the Project Area

A local resident reported observing foraging and roosting wood storks at a number of locations in Lake Murray between approximately 2001 and 2004. Presumably based on these reports, The FERC ordered SCE&G to designate two areas near Bush River and Big Bay Creek in Lake Murray as wood stork “conservation areas” (FERC Order 107 FERC ¶ 62,273 dated June 23, 2004). 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 evidence could be submitted to indicate that protection of these areas was not warranted.

In response to the wood stork sightings on Lake Murray and the subsequent FERC Order, SCE&G initiated consultation with the SCDNR and USFWS during Summer 2004. Biologists from SCDNR and Kleinschmidt Associates subsequently performed two wood stork reconnaissance surveys on Lake Murray in August 2004, during which approximately 60 storks were observed feeding at various locations in the

middle Saluda River and the upper portion of Lake Murray (Kleinschmidt 2004a). The surveys also documented two wetlands areas along the floodplain of the Saluda River upstream of the reservoir that contained nests similar to those of wood storks. Based on these initial findings, SCE&G, SCNDR, and USFWS cooperatively developed a five-year study plan aimed at documenting where and under what conditions wood storks were utilizing habitats within the Project boundary and in the Project vicinity (Kleinschmidt, 2004b).

In accordance with the Lake Murray Wood Stork Study Plan (Kleinschmidt 2004b), aerial surveys were performed monthly during February through November of 2005 and 2006. No wood storks were observed during 2005 surveys, and a limited number (approximately 12-13) were observed during August and September of 2006 (Kleinschmidt, 2005; 2007). The storks observed in 2006 consisted of scattered individuals soaring above and foraging in wetlands off the Saluda's main channel upstream of the reservoir. No nesting of wood storks was observed during 2005 and 2006. The suspected wood stork nest was found to be occupied by great blue heron during both 2005 and 2006.

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, 1997). 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, 1997).

Following completion of the 2005 and 2006 surveys, SCE&G met with representatives from the USFWS and SCDNR to discuss the status of wood stork monitoring on Lake Murray (see February 7, 2007 meeting notes). 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 and that timing of the observations during 2006 was consistent with post-dispersal migration. 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. Agency staff recommended, however, that an education program be developed to assist lake users in identifying and reporting wood stork occurrence in the future.

3.2 Management Regime

In accordance with the agency recommendations, SCE&G will implement the following:

1) SCE&G will document any wood storks observed during ongoing winter waterfowl surveys;
2) SCE&G will implement a Rare, Threatened, and Endangered Species Public Awareness Program, which will include information on wood stork identification, habitat requirements, and natural history, as well as a mechanism to report any storks observed in the Project vicinity;
3) SCANA Corporate Environmental, SCE&G Lake Management, and/or their consultants will coordinate annually with SCDNR endangered species biologists to determine whether wood storks were observed on the Lake Murray vicinity during routine bald eagle surveys on the reservoir; and
4) SCE&G will notify the USFWS and SCDNR in the event that additional wood storks are sighted on Lake Murray.

4.0 ROCKY SHOALS SPIDER LILY

Rocky shoals spider lily (RSSL), also referred to as Cahaba lily, is a flowering 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 to 12 inches (Aulbach-Smith, 1998). The decline of RSSL has historically been attributed to loss of shoals habitat due to construction of impoundments and other channel modifications. Threats to current populations include flow modifications and fluctuating water levels resulting from dam operations, water pollution, and collection for use in gardens. The RSSL is considered a species of concern by the State of South Carolina (SCDNR, 2007).

4.1 Status in the Project Area

A survey conducted in May 2006 in support of relicensing revealed no viable populations of RSSL downstream of the Project in the lower Saluda River (LSR) proper (See Kleinschmidt memorandum dates July 20, 2006). However, a large RSSL population occurs in the island complex at the confluence of the Broad and Saluda rivers and just upstream of the confluence in the bypassed reach of the Broad River downstream of the Columbia Hydroelectric Project (FERC Project No. 1895). The confluence population of RSSL was first documented during SCE&G's relicensing of the Columbia Project in the late-1990's, and at that time, was estimated to consist of 7,921 plants in 48 colonies (Kleinschmidt, 1998). Although not located within the Saluda Project Area, agency staff suggested during consultation that the portion of the population on the Saluda side of the confluence could potentially be "under Project influence" and requested that a management plan be prepared.

The RSSL population located in the confluence and lower Broad River area is managed under an existing RSSL Management and Enhancement Plan (Plan) (Appendix A). The existing Plan was developed by SCE&G in accordance with Article 409 of the current FERC license for the Columbia Hydroelectric Project and filed on behalf of the

City of Columbia (City), the current owner of the Columbia Project, on April 24, 2006. The Columbia Plan was implemented in 2007 and is a collaborative effort between the City, SCE&G, South Carolina Native Plant Society, Riverbanks Botanical Gardens, and SCDNR. Implementation of the Plan has resulted in hiring of a regional RSSL expert to guide monitoring and restoration efforts, development of a RSSL propagation facility at Riverbanks Botanical Garden, updated surveys of the existing RSSL colonies, and transplantation of approximately 94 RSSL seedlings into suitable habitat in the LSR. SCE&G, the City, and other collaborators have also conducted numerous educational and outreach programs in accordance with the Plan, including the First Annual Rocky Shoals Spider Lily Festival, which was sponsored by SCE&G at the Columbia Riverfront Park in May, 2008.

In accordance with Article 409 of the Columbia Hydroelectric Project license, the existing RSSL Plan, and the FERC Order approving the plan (116 FERC ¶ 62,046 dated July 19, 2006), SCE&G filed the two RSSL monitoring reports with the FERC on behalf of the City on November 30, 2006 and November 30, 2007 (Appendix B). The reports include two progress report from Ms. Cindy Aulbach, a botanist and regional RSSL expert hired to serve as technical lead for the RSSL monitoring and restoration efforts. According to the reports, a total of 1,443 RSSL plants in 183 colonies were found during surveys conducted during 2007, significantly fewer than indicated in the 1998 survey (7,921 plants in 48 colonies) (Kleinschmidt, 1998). Aulbach noted that, while differing personnel and survey methods between 1998 and 2007 likely contributed to the differences in population estimates, the magnitude of the disparity likely indicates a significant reduction in the RSSL population from 1998 to 2007. Ms. Aulbach speculated that the reduction in population could potentially be attributed to deeper water associated with recent implementation of license required minimum flow releases from the Columbia Project. Finally, the report found 12 of the 94 bulbs transplanted in the LSR during Fall of 2006 to be surviving (13%). Additional details regarding the 2007 surveys and other restoration and monitoring efforts to date are provided in the 2006 and 2007 RSSL reports, which are included as Appendix B.

4.2 Management Regime

Under a new license term for the Saluda Project, SCE&G will continue to assist and support the City and other partners with the RSSL monitoring and restoration efforts implemented under Columbia RSSL Enhancement Plan. Activities that will continue to be supported include:

1. RSSL Propagation – SCE&G will continue to support and assist the Riverbanks Botanical Gardens in their efforts to propagate RSSL bulbs for transplantation to the confluence area and LSR.
2. Technical Expertise – SCE&G and its partners will continue to employ the service of a regional RSSL expert to guide restoration, enhancement and monitoring efforts.
3. Monitoring – As outlined in the Columbia Plan, monitoring of RSSL colonies in the confluence area will be conducted on a minimum five year interval. Monitoring will consist of ground surveys of the entire confluence area, during which the number of live plants will be counted and colony locations documented using Global Positioning System (GPS) technology. Any diseased or distressed plants will be noted and documented.
4. Pilot Planting Phase – SCE&G will continue to support and assist the City and its partners in experimental planting of RSSL bulbs until such time that approximately 300 RSSL have been successfully transplanted. Only bulbs grown from seeds collected from the Broad River Basin will be transplanted, per request of the USFWS.
5. Phase I Planting – This phase will involve large scale propagation and transplantation of seedlings into the confluence and Broad River Bypass reach. Phase I will last for two years or more if necessary until such point that 3000 new RSSL plants have been established. Specific goals and schedule for this phase will be determined in consultation with the technical expert and agency staff and will be outlined in the annual report prior to implementation.

6. Phase II Planting – This phase will commence upon completion of Phase I and will involve commercial scale production of RSSL seedling utilizing the propagation facilities established at Riverbanks Botanical Gardens. This phase will aim at establishing up to 1,000,000 new RSSL plants. The Columbia Hydro RSSL Plan states that funding for this phase is to be provided by the River Alliance and that if funding is not available, the City will assist SCDNR and Riverbanks Botanical Gardens to obtain funding through public or business options. Specific goals and schedule for this phase will be determined in consultation with the technical expert and agency staff and will be outlined in the annual report prior to implementation.
7. Reporting – In accordance with Article 409 of the Columbia Hydroelectric Project license, the existing RSSL Plan, and the order approving the plan, a report will be filed annually to update the status of RSSL enhancement and restoration efforts. The annual report will be filed with the FERC, USFWS, SCDNR, River Alliance, and Riverbanks Botanical Gardens by November 30 or each year. A draft of the report will be circulated to the above noted parties for their review prior to filing of the annual report.
8. Public Awareness – As with the wood stork and bald eagle, the RSSL will be included as a component of the Rare, Threatened and Endangered Species Public Awareness Program. The program will likely include information on RSSL life history, tips for RSSL viewing during the blooming season, and information on the RSSL restoration and enhancement efforts that have been undertaken by SCE&G, The City and its partners in recent years.

This management plan is intended to serve as a regulatory link between the Saluda Hydroelectric Project and the restoration and enhancement efforts currently being conducted relative to the RSSL population located at the confluence of the LSR and Broad River.

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Appendix 12

Bald Eagle Nest Location Map

Due to the sensitive nature of the contents of this document, it is considered Privileged, and has been removed from the public version of this document

Appendix 13

USFWS RT&E Consultation - September 25, 2007

Shane Boring

From: Amanda_Hill@fws.gov
Sent: Tuesday, September 25, 2007 8:18 AM
To: Shane Boring
Subject: Re: Saluda Hydro Project Relicense: Draft Rare, Threatened and Endangered Species Assessment


Saluda RTE ssessment - Fig 1..


Saluda RTE ssessment Draft 20..


Saluda RTE ssessment - Append

Hey Shane,

The report seems adequate for federal T&E species, however, you should review the state listed threatened and endangered species for the four counties and include these in the report also.

Amanda Hill
Fisheries Biologist
U.S. Fish and Wildlife Service
176 Croghan Spur Rd., Suite 200
Charleston, SC 29407
843-727-4707 ext. 303
843-727-4218 fax
amanda_hill@fws.gov

"For all at last returns to the sea -
to Oceanus, the ocean river,
like the everflowing stream of time,
the beginning and the end." -Rachel Carson

"Shane Boring"
<Shane.Boring@KleinschmidtUSA.com>

09/20/2007 04:20 PM

To "Shane Boring" <shane.boring@kleinschmidtusa.com>, "Alan Stuart" <alan.stuart@kleinschmidtusa.com>, "Amanda Hill" <amanda_hill@fws.gov>, "Bill Argentieri" <bargentieri@scana.com>, <bseibels@yahoo.com>, "Gerrit Jobsis \(American Rivers\)" <gjobsis@americanrivers.org>, "J. Hamilton Hagood" <jhamilton@scana.com>, "Jennifer Summerlin" <Jennifer.Hand@KleinschmidtUSA.com>, "Jim Glover" <GloverJB@dhec.sc.gov>, "Randy Mahan" <rmahan@scana.com>, "Ron Ahle" <ahler@dnr.sc.gov>

cc

Subject

Saluda Hydro Project Relicense:
Draft Rare, Threatened and
Endangered Species Assessment

Attached for your review is the draft Rare, Threatened and Endangered Species Assessment for the Saluda Hydro Project Relicensing. Please note that Figure 1 and Appendix A are included as separate files. If possible, please have your comments on the assessment to me by Thursday October 4th 20007. Thanks for your continued participation in the Saluda relicensing process.

Shane

C. Shane Boring
Environmental Scientist
Kleinschmidt Associates
204 Caughman Farm Lane; Suite 301
Lexington, SC 29072
Phone: (803)951-2077
Fax: (803)951-2124

<<Saluda RTE Assessment - Fig 1.pdf>> <<Saluda RTE Assessment Draft 2007-09-20.doc>>
<<Saluda RTE Assessment - Appendix A.pdf>>

(See attached file: Saluda RTE Assessment - Fig 1.pdf)(See attached file: Saluda RTE Assessment Draft 2007-09-20.doc)(See attached file: Saluda RTE Assessment - Appendix A.pdf)

Appendix 14

Designate New Waterfowl Hunting Areas - Request for Time Extension – December 29, 2006

ORIGINAL

SCE&G®
A SCANA COMPANY

2007 JAN -3 P 3:02
2007 Jan 3

December 29, 2006

Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
ATTN: OEP/Division of Hydropower Administration and Compliance
888 First Street, N. E.
Washington, D. C. 20426

P-516-441
P-516-442

Subject: South Carolina Electric & Gas Company
Saluda Hydroelectric Project, FERC Project No. 516-442
Shoreline Management Plan – June 23, 2004 FERC Order
Paragraph I – Compliance with as-built drawings of two additional recreation sites proposed by SCE&G as future recreation areas;
Paragraph I – Designate New Waterfowl Hunting Areas – Request for Time Extension

Dear Secretary Salas:

South Carolina Electric & Gas Company (SCE&G), Licensee for Saluda Hydroelectric Project, FERC Project No. 516, hereby files an original and eight copies of its notice of compliance for one section and a request for an extension of time until August 31, 2008 to comply with another section of Paragraph I of the ORDER APPROVING LAND USE AND SHORELINE MANAGEMENT PLAN WITH MODIFICATIONS AND AMENDING EXHIBIT R issued by the Federal Energy Regulatory Commission (FERC) on June 23, 2004 and ORDER CLARIFYING AND MODIFYING ORDER AND DENYING REHEARING issued on October 28, 2004. By letter dated May 31, 2005 the Licensee requested an extension of time until August 31, 2008 to comply with Paragraph I of the original Order (two additional recreation sites proposed by SCE&G as future recreation areas and waterfowl hunting areas). The FERC issued ORDER GRANTING EXTENSION OF TIME TO FILE SUPPLIMENTS TO LAND USE AND SHORELINE MANAGEMENT PLAN dated December 15, 2005, concluding that the Licensee did not provide enough justification for the requested time extension for Paragraph I, and required compliance of this paragraph by December 31, 2006. The Licensee filed an interim report on June 1, 2006 describing the progress it is making to meet the new deadline and FERC acknowledged our progress by letter dated July 27, 2006. Paragraph I is repeated below followed by a description of our compliance with this paragraph of the FERC Order.

"(I) The licensee's proposed changes to its recreation facilities are approved and made a part of the project's Exhibit R-Recreation Plan. The proposed recreation changes shall include designation of Two Bird Cove and Hurricane Hole Cove as special recreation areas and a full description of the two additional recreation sites proposed by SCE&G as future recreation areas. The licensee shall also consult with the U.S Fish and Wildlife Service and South Carolina Department of Natural Resources and designate new waterfowl hunting areas for those lost to land sales and development, and indicate these areas in the Recreation Plan. The licensee's

proposed changes shall be implemented within 1 year of issuance of this order. The licensee shall file, for Commission approval, as-built drawings of the implemented recreation facilities within 60 days of completing construction. These changes shall be indicated in the next Land Use and Shoreline Management Plan update."

Compliance: Two Bird Cove and Hurricane Cove - as-built drawings of these two coves were filed with the Commission on September 1, 2006 in compliance with the June 23, 2004 FERC Order and subsequent correspondence. Upon approval of the as-built drawings this section of Paragraph I will be complete.

Two additional recreation sites (Saluda Shoals Regional Park and Lake Murray Estates Park) – Saluda Shoals Park is an expansion and improvement of an existing park identified as Site #9 on Exhibit R-1, located on Sheet K-5 drawing. An original and eight copies of the as-built drawings for these two recreation sites are enclosed in compliance with the June 23, 2004 FERC Order and subsequent correspondence. Upon approval of the as-built drawings this section of Paragraph I will be complete.

Designation of new waterfowl hunting areas - On February 9, 2006 SCE&G met with USFWS and SCDNR to discuss the appropriate action for waterfowl hunting areas within the project. Minutes of the February 9, 2006 meeting were filed with the June 1, 2006 interim report. The Licensee wishes to reiterate that currently all waters of Lake Murray that are physically accessible to hunters, excepting only those areas which by virtue of county ordinances addressing discharge of firearm set-backs near residences, are open to waterfowl hunting. Additionally, all SCE&G owned islands, except those that are leased, are available for public waterfowl hunting opportunities. The SCDNR is specifically interested in creating a hydraulically manipulated impoundment in the upper area of Lake Murray. The resource agencies indicated that while designating specific areas within Lake Murray may protect waterfowl hunting opportunities for hunters it would not provide an overall benefit to waterfowl numbers and species, as they would prefer. SCDNR suggested that creating an agency managed waterfowl impoundment area would better serve their overall management strategies by simultaneously providing hunting opportunities and enhancing waterfowl and other wildlife habitats.

SCE&G understands SCDNR interest in this unique opportunity to potentially partner to explore the creation of such a unique habitat enhancement program that may provide a greater benefit to the overall resource. SCDNR has expressed to SCE&G their understanding that such a project would require more data, planning, and consultation beyond what is typically considered for designating waterfowl hunting areas at existing water bodies. On June 6, 2006 and July 28, 2006 SCE&G and representatives from SCDNR, USFWS, and State department waterfowl biologists met to review hydrologic data and perform on-site visits to evaluate potential areas for the waterfowl enhancement program in the upper reaches of Lake Murray. On October 2, 2006 and October 19, 2006 SCE&G and SCDNR met to discuss a scope of work necessary to evaluate the

feasibility of creating an impoundment for waterfowl hunting opportunities at a proposed site within Lake Murray's project boundary. SCE&G in consultation with SCDNR conducted soil studies, surveys, and a flood analysis of this proposed site. The results of these analyses are still being evaluated, but do not appear to provide a good foundation for a waterfowl hunting area. Due to the preliminary results of the initial studies, survey, and analysis of the first site, two other sites are being evaluated for potential compatibility as a waterfowl hunting area. These other sites will be visited in 2007 and studies, surveys, and engineering analyses will be conducted at that time.

Attached is a letter and Interagency Field Review report provided by SCDNR dated December 14, 2006 that describes their involvement and concurrence with the current investigation associated with the waterfowl hunting area mitigation required in the FERC Order. The SCDNR letter requests that the portion of the lake and Saluda River channel, project boundary, fringe lands and adjacent Wildlife Management Area (WMA) lands between SC 121 and SC 395 (Higgin's and Kempson's bridges) be designated as *special waterfowl and waterbird management area*. This will include the area of the original proposed sub-impoundment, a substantial acreage of disjoint beaver ponds on both sides of the river, several undeveloped or relatively undeveloped creeks, tributaries and Bush River all having headwaters providing potential waterfowl and waterbird habitat. SCE&G will evaluate their request as part of the land reclassification evaluation associated with the Saluda Relicensing process. The Licensee needs to first determine what the implications might be to making such a designation. Designating a body of water or portion of land without the appropriate input from the general public that uses this area could cause additional problems. Obviously, there can be a lot of ramifications, at least in the public perceptions and resulting fallout as the Commission will recall happened with deciding to designate Two Bird Cove and Hurricane Cove as "special recreation areas." This issue will best be evaluated during the relicensing process in which the public will be represented through our Resource Conservation Groups.

Prior to the final designation of a site as a waterfowl hunting area, SCE&G in consultation with SCDNR will need to identify soil conditions, perform the appropriate engineering analysis, design the berm, pump, and weir configuration to provide for planting and flooding at the appropriate times of the year, investigate acquisition of the appropriate land necessary to provide hunting buffers to this designated area, determine appropriate land ingress and egress to the site, investigate the potential impact of archaeological sites within the designated area, and obtain the appropriate federal, State and local permits necessary to construct an appropriate facility. If one of the proposed designated areas is suitable for a waterfowl impoundment based on an evaluation of the above listed activities, SCE&G will file the appropriate documentation and design details for a designated waterfowl hunting area. However, if these sites are not suitable for a waterfowl hunting area, SCE&G will continue to consult with SCDNR and USFWS to determine the best way to comply with this section of Paragraph I of the June 23, 2004 FERC Order.

In an effort to comply with the June 23, 2004 FERC Order by working in consultation with SCDNR and USFWS and hopefully, providing clarification of the scope of work and enough justification to the Commission, SCE&G respectfully requests that the Commission grant an extension of time until August 31, 2008 to comply with the designation of a waterfowl hunting area section of Paragraph I of the June 23, 2004 Order.

The above referenced documents are submitted to the Commission for approval and close-out of the two additional recreation sites proposed by SCE&G as future recreation areas section of Paragraph I and requesting of an extension of time for the waterfowl hunting area designation section of Paragraph I associated with the ORDER APPROVING LAND USE AND SHORELINE MANAGEMENT PLAN WITH MODIFICATIONS AND AMENDING EXHIBIT R issued by the Commission on June 23, 2004.

If you have any questions about this filing, please call Mr. William Argentieri at (803) 217-9162 or Mr. Tommy Boozer at (803) 217-9007.

Very truly yours,

William R Argentieri for

Michael C. Summer, General Manager
Fossil/Hydro Technical Services

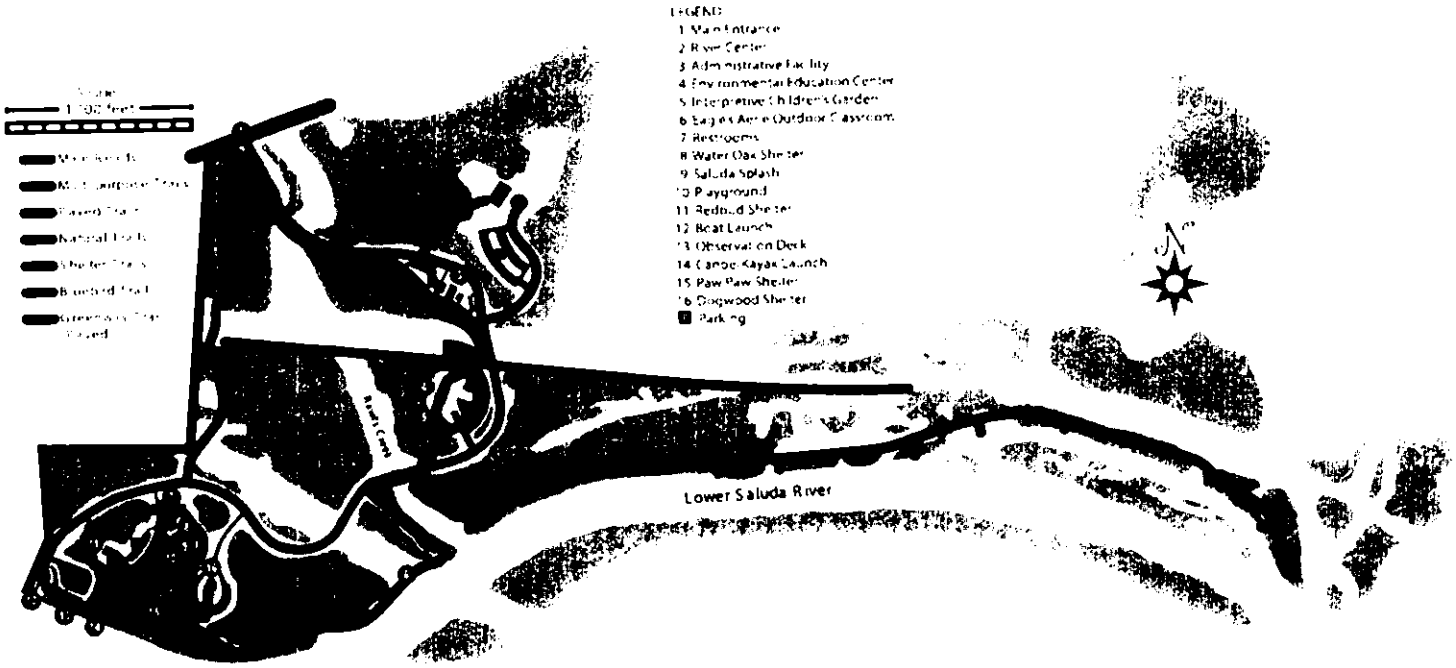
WRA/wa

Enclosures

c: M. C. Summer/W. R. Argentieri/SHFile
A. I. Spell/M. C. Clonts/J. R. Stockman
T. C. Boozer
R. R. Mahan
T. G. Eppink
Corporate Records
B. J. McManus - Jones Day
R. W. Christie – SCDNR
A. K. Hill – USFWS
D. M. Murray – FERC Washington (MC PJ 12.2)

Saluda Shoals Park

5605 Bush River Road
Columbia, SC 29212
803-731-5208



Saluda Shoals Park
A 270 acre riverfront park with and observation deck, walking trails, canoe launch, boat ramp, picnic tables, fish cleaning station, playground and administrative building.

The Environmental Education Center
A 12,000 square foot facility that features a 100-seat auditorium, two classrooms and an exhibit hall.

Picnic Shelters
Four various sized picnic shelters equipped with ceiling fans, grills, and running water that accommodate groups as small as 15 and as large as 140.

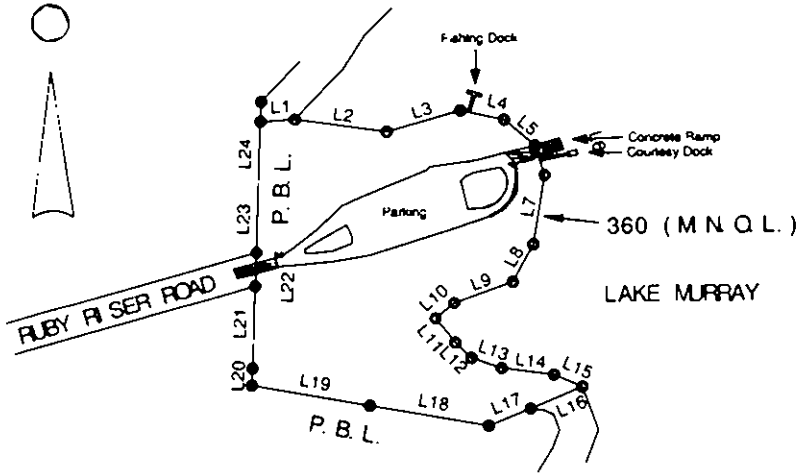
The River Center
A 11,000 square foot conference center with over 5,000 square feet of meeting space. The River Center is a versatile, full-service conference center that can accommodate small and large business meetings and social functions. A beautiful wedding gazebo is also available for outdoor weddings.

Saluda Splash
A zero-depth touch activated water playground.

Barking Lot Dog Park
A one-acre permanent fenced dog park facility for unleashed pets.

Saluda Shoals
PARK

SITE-22		
7.15 ACRES		
LINE	LENGTH	BEARING
L1	70.66	N 86°47'01" E
L2	188.21	S 81°43'37" E
L3	155.02	N 74°08'04" E
L4	91.74	S 77°20'51" E
L5	82.34	S 49°09'45" E
L6	65.20	S 17°17'48" E
L7	144.79	S 09°55'29" W
L8	88.60	S 29°19'37" W
L9	127.25	S 70°24'17" W
L10	49.71	S 49°21'37" W
L11	63.67	S 38°28'38" E
L12	45.14	S 45°16'40" E
L13	65.17	S 70°27'44" E
L14	108.54	S 82°18'11" E
L15	63.43	S 66°12'20" E
L16	115.09	S 67°49'48" W
L17	91.93	S 68°25'44" W
L18	245.59	N 79°46'55" W
L19	244.91	N 79°43'51" W
L20	34.92	N 02°36'59" E
L21	170.45	N 02°38'02" E
L22	69.40	N 02°32'04" E
L23	135.22	N 02°36'44" E
L24	135.96	N 02°37'41" E



LAKE MURRAY ESTATES
SEE SHT. K-12
EXH. R-1, INDEX 8

SITE 22

South Carolina Department of
Natural Resources

Bob Perry
Certified Wildlife Biologist
Office of Environmental Programs
1000 Assembly Street Room 310A
PO Box 167
Columbia, SC 29202
803-734-3766
perryb@dnr.sc.gov

John E. Frampton
Director
Robert E. Duncan
Director, Office of
Environmental Programs

14 December 2006

Mr. William R. Argentieri
South Carolina Electric & Gas Company
111 Research Drive
Columbia, SC 29203

Dear Mr. Argentieri,

Reference is made to the proposed sub-impoundment off the Saluda River, a project staff of South Carolina Department of Natural Resources (DNR) have been discussing with you and other South Carolina Electric & Gas (SCE&G) personnel and staff of Kleinschmidt Associates in an effort to pursue mitigation for lost waterfowl habitat and waterfowl hunting opportunity on and around Lake Murray as a result of decades of development.

Pursuant to all investigations undertaken thus far, we are in agreement that extraordinary measures and costs would be required in order to develop the proposed sub-impoundment, and it cannot be determine there is reasonable assurance of successful water level control, a critical need. Accordingly, we agree it prudent to pursue other options and abandon this proposal at this time. We submit all parties have agreed that the concept to develop the sub-impoundment would be an appropriate step substantially mitigating for both lost habitat and opportunity. However, development and management of the sub-impoundment cannot be supported based on current examination of soil types, hydrology and other findings. DNR does request SCE&G agree that we be able to return to this project for further discussion if future data is presented or new technology or innovative design be made available making it worthwhile to develop the sub-impoundment in the future.

Personnel of DNR and SCE&G have invested considerable effort attempting to locate areas within the project boundary of Lake Murray to pursue the stated and desired mitigation. We submit the area of the upper end of the lake associated with the Saluda River is the most suitable area and arguably the only area with desired waterfowl habitat characteristics and lack of development. We specifically request future designation as a *special waterfowl and waterbird management area* all that portion of the lake and Saluda River channel, project boundary, fringe lands and adjacent Wildlife Management Area (WMA) lands between (Higgin's and Kempson's

bridges) SC 121 and SC 395. This will include the area of the proposed sub-impoundment, a substantial acreage of disjoint beaver ponds on both sides of the river, several undeveloped or relatively undeveloped creeks, tributaries and Bush River all having headwaters providing potential waterfowl and waterbird habitat. We pledge to work with SCE&G to continue to evaluate these habitats to determine beneficial and cost effective habitat management options to enhance the area for waterfowl and other waterbirds. We submit there may be substantial potential for habitat enhancement in beaver wetlands, as yet not fully inventoried. Early in this process we discussed potential development of certain beaver wetland habitats by impounding them and installing water control devices. We submit it may be necessary to return to this discussion and evaluate these possibilities. Finally, we have pledged to SCE&G staff to examine, early in January, additional sites above Higgin's Bridge in order to determine if there are any other suitable sites potentially meeting the stated mitigation needs.

I have attached a copy of the whitepaper developed several months ago when we began an examination of the proposed sub-impoundment. Please feel free to use this document, as you deem necessary in your response to the Federal Energy Regulatory Commission. We believe this document appropriately describes the area we request be designated for waterfowl and waterbird management in addition to providing the rationale for pursuing the sub-impoundment proposal. Any further development of water management capability for the purpose of enhancing beaver wetlands for waterfowl habitat would follow a similar water management scenario as described in the whitepaper.

We have been pleased with the cooperative and enthusiastic response demonstrated by SCE&G staff in pursuit of the stated mitigation need, and we look forward to working with you and your staff in the coming weeks to finalize a project meeting resource requirements and providing replacement public use opportunities. Please do not hesitate to contact me if you have any questions regarding this transmittal.

Very truly yours,

Bob Perry

Bob Perry

Opportunities to Mitigate for Lost Waterfowl Habitat on Lake Murray
Prepared for Interagency Field Review
Prepared by Bob Perry, SCDNR
28 July 2006

Statement of Need

In the context of FERC re-licensing there is a need to mitigate for loss of waterfowl habitat and loss of public waterfowl hunting opportunity on Lake Murray pursuant to shoreline development occurring over the past several decades and loss of submerged aquatic vegetation occurring within the past several years.

Discussion

Limited data and anecdotal evidence indicate Lake Murray historically provided considerable waterfowl habitat and public hunting opportunity. Examination of the estimated statewide waterfowl harvest during the period 1971-80 indicates 8% of the total South Carolina (SC) annual mallard (*Anas platyrhincos*) harvest was reported from Lexington, Newberry, Richland and Saluda counties (Carney et al. 1983). During that same period these counties accounted for 5% of the total estimated annual SC waterfowl harvest (Carney et al. 1983). The preponderance of waterfowl habitat in these counties available during that time period was on or directly associated with Lake Murray.

Shallow water margins of the lake provide a substantial amount of potential waterfowl foraging, resting and loafing habitat for dabbling ducks. Deeper waters provide potential rafting/loafing and some foraging habitat for a wide range of diving duck species wintering in SC. Although shallow waters of other wetland types may be of more importance to waterfowl, interior lakes such as Lake Murray, provide important migrating and wintering habitat for ducks and geese (Chamberlain 1960, Addy 1964, Bellrose 1976).

Johnson and Montalbano (1989) described waterfowl habitat, waterfowl winter utilization, habitat management practices and limiting factors affecting SC reservoirs and lakes including Lake Murray. Through the Fish and Wildlife Coordination Act of 1934 (FWCA) the US Fish and Wildlife Service (FWS) has the opportunity to use reservoir projects constructed or licensed through the Federal Energy Regulatory Commission (FERC) for migratory bird habitat development (White and Malaher 1964). FWS is required to protect, develop and manage migratory bird habitat in accordance with FWCA amendments added in 1946 and 1958 (Shaw and Fredine 1956, White and Malaher 1964). An example of a major waterfowl habitat project developed in SC under the FWCA is Santee NWR. The South Carolina Department of Natural Resources (DNR) also is obligated to protect, manage and develop migratory bird habitat to the benefit of the citizens of SC and for the quality of life in SC.

Despite successes under the FWCA reservoirs such as Lake Murray do not always provide optimum wintering and migrating waterfowl habitat due to inadequate forage resources (Neely and Davidson 1971, Chabreck 1979) because water level fluctuations restrict establishment and utilization of desirable aquatic plant communities (Taylor and Taylor 1976), and because of direct and cumulative impacts associated with shoreline development (Johnson and Montalbano 1989).

Reservoirs constructed for flood control and hydroelectric generation often apply a rule or operational curve to pool levels such that drawdown occurs during winter months when inflow does not equal or exceed outflow due to hydro generation and maintenance of storage capacity prior to spring/summer wet periods (Chabreck 1979, Johnson and Montalbano 1989). Reservoir operational curves also dictate that full pools likely occur during spring and summer. Reservoir levels therefore often are not in accordance with needs of wintering and migratory waterfowl such that full pools would occur in winter to flood shallow, productive margins and backwaters, and such that draw-downs would occur in late summer to expose mudflats and shallows stimulating desirable emergent aquatics and make available a diverse invertebrate forage. Shoreline development of southern reservoirs increases human disturbance and degrades shallow, shoreline habitat causing wintering waterfowl to seek more reclusive foraging and loafing habitat (Baldassarre and Bolen 1994). Since the early 1980s wintering dabbling duck utilization of Lake Murray has declined so as to be virtually non-existent (DNR, unpublished data)..

Submerged and emergent aquatic vegetation is recognized as a valuable component of the surface water environment providing many life cycle needs to numerous species of wildlife including waterfowl (Baldassarre and Bolen 1994). The presence of limited quantities of submerged aquatics may improve water quality and enhance wetland aesthetics. Wildlife foraging, plant senescence, and competition usually maintain a desirable balance of submerged aquatics, however submerged aquatics can become a nuisance taking over entire water columns to the point of blocking navigation, stopping water flow and reducing water quality. Establishment of an invasive submerged aquatic in Lake Murray occurred 1995 – 2003 to the point of proliferation of hydrilla (*Hydrilla verticillata*). Wintering waterfowl, particularly ring-necked ducks (*Aythya collaris*) exploited rafts of submerged hydrilla and associated invertebrates during this period. These wintering diving ducks provided significant public hunting opportunities. Subsequently submerged aquatic vegetation on Lake Murray effectively has been eliminated using a combination of herbivorous sterile grass carp (*Cteno pharyngodon*) and selective herbicides. As a result of the loss of submerged aquatics, waterfowl utilization of Lake Murray and associated public hunting opportunities again have plummeted (B. Baker, DNR, person. comm.).

The FERC Process

Re-licensing of Lake Murray under the FERC process presents a unique opportunity to examine opportunities to mitigate for lost waterfowl habitat and public waterfowl hunting opportunities. Staff from DNR and SCE&G has conducted a

comprehensive examination of areas within the Lake Murray project boundary potentially available for development of a meaningful, successful waterfowl management area. The upper Lake Murray project boundary associated with the Saluda River presents the most likely, and arguably the only, site available to develop waterfowl habitat. The area identified is that portion of the Saluda River channel between SC 121 and SC 395.

Current Habitat Conditions

Some of the former river bottomlands in this area were converted to pine plantations by SCE&G in the late 1970s and early 1980s, and much of this type habitat has been invaded by and is impounded by beavers (*Castor canadensis*). Beavers can create considerable, productive shallow wetlands (Jenkins and Busher 1979) of high value to wintering waterfowl and resident wood ducks (*Aix sponsa*) (Arner and Hepp 1989).

Arner and Hepp (1989) described the habitat types, successional stages of beaver ponds and their value as waterfowl habitat. Hepp (1977) described a classification system for beaver ponds in the piedmont region of SC. Hepp's (1977) classification follows a successional pattern, and several of the classifications or successional stages have high value as waterfowl habitat. New beaver ponds contain open water and dying or dead trees as a result of beaver activity and continuous flooding. As ponds trap sediments water depth decreases with pond age (Naiman et al. 1986), and emergent plants transition from desirable to undesirable (Arner and Hepp 1989). Beaver pond age and vegetation are key factors determining the suitability of beaver ponds to waterfowl.

Beaver ponds offer significant potential to manage water levels and thereby emergent vegetation or planting of cereal grains to the benefit of the waterfowl resource (Arner 1963, Landers et al. 1977, Fredrickson and Taylor 1982). Landers et al. (1977), Mayer et al. (1986) and Arner and Hepp (1989) indicated beaver ponds to be of particular importance to wintering wood ducks, mallards, green-winged teal and hooded mergansers (*Mergus cucullatus*) as well as of significant importance as wood duck nesting and production habitat. Yarrow and Yarrow (1999) described effective techniques for seasonally draining beaver ponds in order to manage naturally occurring vegetation and/or plant cereal grains for winter flooding including the most efficient technique yet devised, the Clemson Beaver Pond Leveler (Clemson Univ. 1991).

Beaver habitat in the Saluda River corridor selected for investigation is considered to be mature and thus of limited value to wintering waterfowl. The area is providing foraging and nesting habitat for a variety of shorebirds and non-migratory wood ducks. A documented great blue heron (*Ardea herodias*) rookery exists in the area, and wood storks (*Mycteria americana*) are known to use the area for foraging habitat. There may be as much as 300 acres of mature beaver habitat occurring on a combination of both sides of the Saluda River in the Lake Murray project boundary

between SC 121 and SC 395. Most of the beaver habitat is currently in the Wildlife Management Area system under cooperative agreement between DNR and SCE&G.

Adjacent to and downstream of the majority of the beaver habitat is an area forming a shallow embayment of Lake Murray. This embayment is flooded only when the lake is at full or nearly full pool. A stream system flows through the edge of this embayment and thence into the Saluda River. DNR has recognized the importance of this area to waterfowl, and wood duck nest boxes were erected and are maintained in the area in coordination with SCE&G. Under the historic rule curve for Lake Murray the embayment is flooded during early spring through early summer, and begins to dry out as the lake level drops by mid- to late summer. During the period when migratory waterfowl are wintering in SC the embayment is typically dry and unavailable to this resource. The embayment is a nursery for fish production although it is considered to be of limited importance to overall Lake Murray fisheries production (pers. comm. Val Nash, DNR). When the embayment is flooded, it is used by fishermen. At times when the embayment is flooded, and during de-watering, it is exploited by foraging wading and shore birds.

A Habitat Development Opportunity

Conceptually the embayment could be developed as waterfowl and wading bird habitat by creating a system providing water control. A natural river levee occurs on the Saluda River side of most of the embayment. This natural river levee would require linkage entailing wetland fill and stream alteration at strategic points. At least 2 water control structures of strategic design would be required to be engineered and installed as well as a low head, reversible pump. Regulatory approval for wetland fill will be required through the US Army Corps of Engineers (Section 404 of the Clean Water Act) and through SC Department of Health and Environmental Control (Section 401 of the Clean Water Act and SC Navigable Waters Act).

The engineering required to develop this habitat is accomplishable using a proven successful model of embankment design and construction as well as water control structure design and placement (Perry 1987, Perry 1995, Williams et al. 1991). The design would not be unlike those typically employed in coastal, tidal systems where wetlands have been successfully developed and managed for these birds and human recreational use. Raising the natural river levee to a required height and spanning the stream channel before it merges with the Saluda River would construct an outer embankment. A gravity flow water control structure would be installed in the embankment in order to pass water in either direction as necessary to fulfill water management and water level objectives. The water control structure also would allow natural flow of the stream at stream level when the lake is low and the management unit is dewatered. A low head, reversible pump would be required to be installed in conjunction with the water control structure in order to fulfill water management and water level objectives when gravity flow is not possible, e.g., at times when the level of the lake and the Saluda River are opposite of what is desired.

A key regulatory issue needing to be addressed is public access and navigability once embankments are constructed. This would be achieved through design and installation of a second water control structure in the form of a weir of sufficient depth and width to pass fishing boats when the lake is full, e.g., when boats historically have accessed the embayment. The bottom of the weir would be equal to the elevation of the bed of the embayment.

A Conceptual Waterfowl and Wading Bird Habitat Management Scenario

March – May: When the lake is normally a high level, the level of the embayment would be equal to the lake with the water control structure doors open on both ends and the weir open to boat traffic. Water flow, navigability, fish movement, bird foraging opportunities, etc., would be as per normal lake conditions.

March – May: When the lake is abnormally low, the water control structure would be set to keep water in the embayment and spill excess, and/or the pump would be used to keep the embayment at full pool level. The weir would be closed to hold water. The closed weir during this scenario does not prohibit navigability that historically could not occur at a low lake level. Stream flow is otherwise normal although spilling rather than occurring at stream bed level. Fishing opportunity is preserved, but would be restricted to bank fishing, wading or by use of small boats hauled over the dike. Habitat for fish and wildlife is maintained when it otherwise would be unavailable.

June – August: When the lake normally is falling, the water control structure would be set to dewater providing moist-soil wetland management conditions. Water flow, navigability, and fish movement are as per normal lake conditions. Under heavy rainfall and low flow conditions the water control structure should maintain drawdown. Under unusual surge events the water control structures would be set to keep water out of the embayment and the pump would remove water as necessary preserving habitat management opportunities and shorebird utilization. Water flow, navigability, fish movement, bird foraging opportunities, etc., would be as per normal lake conditions.

August – October: When the lake is low due to low flow and hydro generation, the water control structure would be set to dewater providing moist-soil wetland management conditions. Under extreme drought the pump would be used to moisten the embayment to maintain moist-soil management. Water flow, navigability, and fish movement are as per normal lake conditions. Under heavy rainfall and low flow conditions the water control structure should maintain drawdown. Under unusual surge events the water control structures would be set to keep water out of the embayment and the pump would remove water as necessary preserving habitat management opportunities and shorebird utilization. Water flow, navigability, fish movement, bird foraging opportunities, etc., would be as per normal lake conditions.

October – February: When the lake is low and rising, the water control structure would be set to retain stream flow filling the embayment and spill excess maintaining optimum waterfowl and wading bird foraging opportunities. The pump would take in river water

under drought conditions to maintain optimum waterfowl and wading bird foraging opportunities. Water flow would be as per normal lake conditions once the embayment is full. Fisheries habitat, waterfowl and wading bird foraging opportunities would be enhanced, as the habitat would normally be dry and unavailable. In-stream fish movement would be reduced. Navigability is not an issue under this scenario. Public fishing would be prohibited by regulation to allow waterfowl utilization. Public waterfowl hunting would be restricted to a limited number of hunters using the area once weekly during morning hours. Other regulations further restricting waterfowl hunting would apply.

October – February: When the lake is high, the water control structure would be set to remain open on each end maximizing stream flow and in-stream fish movement. The pump would be used only to maintain the embayment water level as necessary. Water flow would be as per normal lake conditions once the embayment is full. Fisheries habitat, waterfowl and wading bird foraging opportunities would be enhanced, as the habitat would normally be dry and unavailable. In-stream fish movement would be reduced. Navigability is not an issue under this scenario. Public fishing would be prohibited by regulation to allow waterfowl utilization. Public waterfowl hunting would be restricted to a limited number of hunters using the area once weekly during morning hours. Other regulations further restricting waterfowl hunting would apply.

Advantages

1. The embayment would become permanent manageable waterfowl and wading bird habitat.
2. The public benefit would be served by providing enhanced waterfowl opportunity where it has limited potential under the present conditions.
3. An opportunity to mitigate for lost habitat and public use will be realized.
4. Fisheries habitat would be maintained and fishing would be possible during spring at times when the lake is low.

Issues

1. Wetland fill and permitting will be required. The amount of fill necessary is to be determined.
2. Water control structures will be needed also requiring permitting.
3. Navigability will be restricted at certain times during the management cycle, e.g., during winter when the lake is unusually full and during summer when the lake is unusually full. Navigability, however, will be normal during spring when the lake is normally full.
4. Water flow would be seasonally restricted, e.g., when the embayment is full or filling at times when the lake is low.

Other Considerations

DNR would propose the larger area to be a specific waterfowl management area including beaver habitat complexes and the embayment. Certain portions of the larger area would be set aside as inviolate sanctuaries not to be hunted. Beaver habitat would be improved and managed by application of species specific herbicides in order set back plant succession and allow seed producing pioneering plants to return. Other habitat management options exist and can be used for the benefit of the waterfowl and wading bird resources.

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Appendix 15

Designate New Waterfowl Hunting Areas – 2007 Update – December 10, 2007

SCE&G®
A SCANA COMPANY

December 10, 2007

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
ATTN: OEP/Division of Hydropower Administration and Compliance
888 First Street, N. E.
Washington, D. C. 20426

Subject: South Carolina Electric & Gas Company
Saluda Hydroelectric Project, FERC Project No. 516
Shoreline Management Plan – June 23, 2004 FERC Order
Paragraph I – Designate New Waterfowl Hunting Areas – 2007 Update

Dear Secretary Bose:

South Carolina Electric & Gas Company (SCE&G), Licensee for Saluda Hydroelectric Project, FERC Project No. 516, hereby files an original and eight copies of its 2007 update for the designation of a new waterfowl hunting area associated with Paragraph I of the ORDER APPROVING LAND USE AND SHORELINE MANAGEMENT PLAN WITH MODIFICATIONS AND AMENDING EXHIBIT R issued by the Federal Energy Regulatory Commission (FERC) on June 23, 2004 and ORDER CLARIFYING AND MODIFYING ORDER AND DENYING REHEARING issued on October 28, 2004. By letter dated December 29, 2006 the Licensee filed a report describing the progress we are making to meet this requirement and requested an extension of time until August 31, 2008 to comply with this section of Paragraph I of the original Order (waterfowl hunting areas). The FERC issued ORDER GRANTING EXTENSION OF TIME TO FILE DOCUMENTATION OF WATERFOWL HUNTING AREA DESIGNATION dated March 6, 2007 approving this extension of time request and ordered that a report be filed with the Commission on or before December 31, 2007 describing the progress the Licensee is making to meet the extended deadline. Paragraph I of the June 23, 2004 FERC Order is repeated below followed by a progress report of the waterfowl hunting areas designation section of this paragraph.

"(I) The licensee's proposed changes to its recreation facilities are approved and made a part of the project's Exhibit R-Recreation Plan. The proposed recreation changes shall include designation of Two Bird Cove and Hurricane Hole Cove as special recreation areas and a full description of the two additional recreation sites proposed by SCE&G as future recreation areas. The licensee shall also consult with the U.S Fish and Wildlife Service and South Carolina Department of Natural Resources and designate new waterfowl hunting areas for those lost to land sales and development, and indicate these areas in the Recreation Plan. The licensee's proposed changes shall be implemented within 1 year of issuance of this order. The licensee shall file, for Commission approval, as-built drawings of the implemented recreation facilities within 60 days of completing construction. These changes shall be indicated in the next Land Use and Shoreline Management Plan update."

Progress Report: Designation of new waterfowl hunting areas – On January 4 and January 22, 2007 SCDNR and SCE&G made site visits to a property that had been discussed earlier by these two parties and was determined to be a potential candidate for a waterfowl hunting area. At this time, SCDNR planned to contact the State and federal permitting agencies to coordinate a meeting with them at this site. In March SCE&G contracted with a mapping company to generate topographic maps for this site. On May 25, 2007 a third site visit was made by SCDNR and SCE&G to this property. At that time the topographic maps were distributed to SCDNR. In June 2007 designs for a pump/intake structure from another project were provided to a design engineer to assist in the design development of a similar structure for this property. In September 2007 SCDNR drops effort to coordinate with State and federal permitting agencies due to conflicting schedules. Licensee design engineer and SCDNR located a local chapter of Ducks Unlimited that can perform design of pumps and intake structure once a specific site is selected. In October the Licensee started working with the owner of the proposed property site to secure an option-to-buy contract until further issues resolution negotiations between SCE&G and SCDNR, associated with the new license application, are developed.

Prior to the final designation of a site as a waterfowl hunting area, SCE&G in consultation with SCDNR will need to identify soil conditions, perform the appropriate engineering analysis, design the berm, pump, and weir configuration to provide for planting and flooding at the appropriate times of the year, investigate acquisition of the appropriate land necessary to provide hunting buffers to this designated area, determine appropriate land ingress and egress to the site, investigate the potential impact of archaeological sites within the designated area, and obtain the appropriate federal, State and local permits necessary to construct an appropriate facility. If this proposed site can be acquired and negotiations with SCDNR can be resolved during the new license application process, SCE&G will file the appropriate documentation and design details for a designated waterfowl hunting area. However, if for any reason this property is not able to be procured and converted into a waterfowl hunting area, SCE&G will continue to consult with SCDNR and USFWS to determine the best way to comply with this section of Paragraph I of the June 23, 2004 FERC Order.

This report reflects the status of the waterfowl hunting areas designation requirement identified in Paragraph I of the ORDER APPROVING LAND USE AND SHORELINE MANAGEMENT PLAN WITH MODIFICATIONS AND AMENDING EXHIBIT R issued by the Commission on June 23, 2004 and subsequent orders as listed above.

If you have any questions about this filing, please call Mr. William Argentieri at (803) 217-9162 or Mr. Tommy Boozer at (803) 217-9007.

Very truly yours,

Michael Summer

Michael C. Summer, General Manager
Fossil/Hydro Technical Services

WRA/wa

c: M. C. Summer/W. R. Argentieri/SHFile
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R. W. Christie – SCDNR
A. K. Hill – USFWS
D. M. Murray – FERC Washington (MC PJ 12.2)

Submission Contents