BASELINE FISHERIES RESOURCES REPORT

PARR HYDROELECTRIC PROJECT
FERC NO. 1894

Prepared for:

South Carolina Electric & Gas Co.
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
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SOUTH CAROLINA ELECTRIC & GAS CO.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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BASELINE FISHERIES RESOURCES REPORT

PARR HYDROELECTRIC PROJECT
FERC NO. 1894

SOUTH CAROLINA ELECTRIC & GAS CO.

1.0 INTRODUCTION

The Parr Fairfield Hydroelectric Project (FERC No. 1894) ("Parr Fairfield Project" or "Project"), owned and operated by the South Carolina Electric & Gas Company ("SCE&G" or "Licensee"), is currently licensed by the Federal Energy Regulatory Commission ("FERC" or "the Commission") through June 2020. The Project consists of the 14.9 megawatt (MW) Parr Hydro Development and the 511.2 MW Fairfield Pumped Storage Facility Development. These Developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina, approximately 31 river miles downstream of Neal Shoals and 24 river miles upstream of Columbia Diversion Dam (Figure 1).

During preliminary relicensing discussions that began in the fall of 2012, the South Carolina Department of Natural Resources (SCDNR), U.S. Fish and Wildlife Service (USFWS), NOAA National Marine Fisheries Service (NMFS), American Rivers and other stakeholders indicated a need for information characterizing the fisheries resources of the Project. The purpose of this request was to provide a baseline for assessing potential impacts of the relicensing and continued operation of the Project. This baseline fisheries report was subsequently prepared utilizing existing fisheries data available for the waters associated with the Parr Fairfield Project including Parr Reservoir, Lake Monticello, and the Lower Broad River, located below the Parr Shoals Dam.

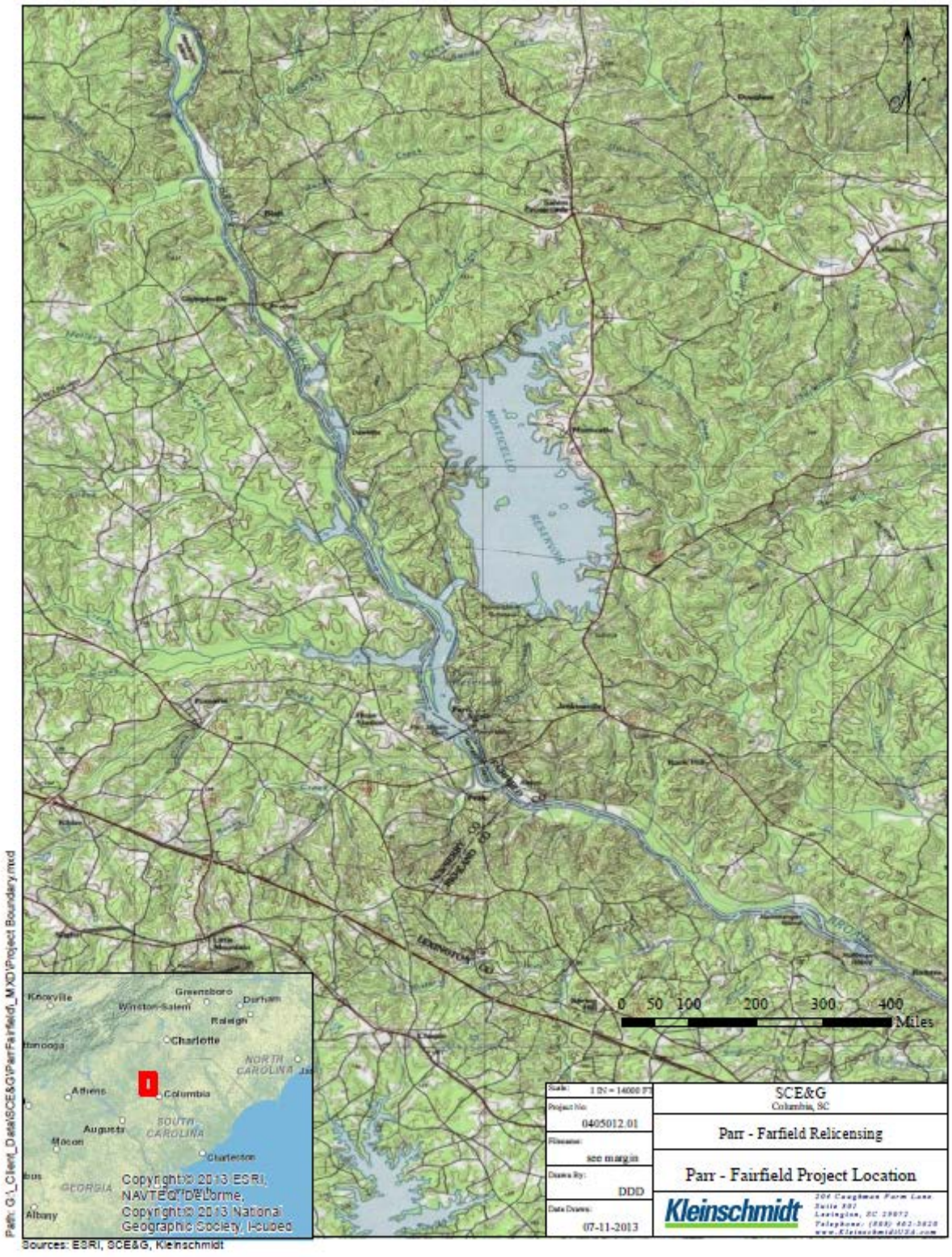


FIGURE 1 LOCATION MAP FOR THE PARR FAIRFIELD HYDROELECTRIC PROJECT

2.0 GOALS AND OBJECTIVES

The goal of this report is to describe the fisheries communities occurring in Parr Reservoir, Lake Monticello, and the reach of the Broad River downstream of the Parr Shoals Dam in order to provide a baseline for assessing potential effects of relicensing and continued operations at the Project.

3.0 EXISTING FISHERY DATA

The Broad River basin supports a diverse fish community representative of Piedmont rivers in South Carolina. A recent basin-wide inventory documenting 51 species from nine families, with Cyprinidae contributing the most species (14), followed by Centrarchidae (10 species) and Catostomidae (10 species) (Bettinger et al. 2003). The Broad River also supports a smallmouth bass (*Micropterus dolomieu*) fishery unique among Piedmont rivers in South Carolina. Smallmouth bass were first introduced to the Broad River in South Carolina by SCDNR in 1984 to enhance sportfishing opportunities (Bettinger et al. 2003); however, stocking has recently been curtailed due to significant natural reproduction (Hal Beard, SCDNR, Personal Communication). Smallmouth growth rates in the Broad River are comparable to other Piedmont systems in the Southeast (Bettinger et al. 2003).

Recent and relevant data describing the fisheries community of the Project vicinity comes primarily from two sources. Specifically, data for Parr and Monticello Reservoirs (areas upstream of Parr Dam) are primarily from surveys conducted by SCANA Corporate Environmental Services and its contractors in support of licensing and compliance activities for the V.C. Summer Nuclear Station (Normandeau 2007, 2008 & 2009; SCANA, 2013). Conversely, data from the reach of the Broad River downstream of the Parr Dam are primarily from an ongoing fish community study being conducted by SCDNR Region 3 Freshwater Fisheries staff (Ron Ahle, SCDNR, unpublished data). These data are discussed in greater detail below.

3.1 RESERVOIR FISHERIES

Available data suggest that the Parr and Monticello reservoirs support warmwater fish communities typical of impounded river reaches in the Piedmont of South Carolina. Recent survey work by SCANA Corporate Environmental Services and their contractors has documented 30 species of fish occurring in Parr Reservoir and 24 in Lake Monticello (Table 1). Although some seasonal variations in community structure have been documented, the fish communities are generally similar between the two reservoirs, with gizzard shad, blue catfish, bluegill, channel catfish and white perch often being the dominant species (Normandeau 2007, 2008, 2009; SCANA 2013). Additional detail regarding the community structure for each of the reservoirs is provided below and detailed relative abundance and catch per unit effort (CPUE) data for the above referenced studies are included in Appendix A.

TABLE 1 FISH SPECIES DOCUMENTED AT PARR AND MONTICELLO RESERVOIRS (SOURCE: NORMANDEAU 2007, 2008, 2009; SCANA 2013)

COMMON NAME	SCIENTIFIC NAME	PARR	MONTICELLO
Black crappie	*Pomoxis nigromaculatus*	x	x
Blue catfish	*Ictalurus furcatus*	x	x
Bluegill	*Lepomis macrochirus*	x	x
Channel catfish	*Ictalurus punctatus*	x	x
Flat bullhead	*Ameiurus platycephalus*	x	x
Flathead catfish	*Pylodictis olivaris*	x	
Gizzard shad	*Dorosoma cepedianum*	x	x
Golden shiner	*Notemigonus chrysoleucas*	x	x
Highfin carpsucker	*Carpiodes velifer*	x	
Largemouth bass	*Micropterus salmoides*	x	x
Longnose gar	*Lepisosteus osseus*	x	
Northern hogsucker	*Hypentelium nigricans*	x	x
Notchlip redhorse	*Moxostoma collapsum*	x	x
Pumpkinseed	*Lepomis gibbosus*	x	x
Quillback	*Carpiodes cyprinus*	x	x
Redbreast sunfish	*Lepomis auritus*	x	x
Redear sunfish	*Lepomis microlophus*	x	x
Robust Redhorse	*Moxostoma robustum*	x	
Sandbar shiner	*Notropis scepticus*	x	
Shorthead redhorse	*Moxostoma macrolepidotum*	x	x
Smallmouth bass	*Micropterus dolomieu*	x	x
Snail bullhead	*Ameiurus brunneus*		x
Spottail shiner	*Notropis hudsonius*	x	x
Threadfin shad	*Dorosoma petenense*	x	x
Warmouth	*Lepomis gulosus*	x	
White bass	*Morone chrysops*	x	
White catfish	*Ameiurus catus*	x	x
White perch	*Morone americana*	x	x
Whitefin shiner	*Cyprinella nivea*	x	x
Yellow bullhead	*Amierus natalis*	x	x
Yellow perch	*Perca flavescens*	x	x

3.1.1 PARR RESERVOIR

SCE&G commissioned Normandeau Associates to conduct surveys of Parr Reservoir fish community in the fall of 2006 and spring of 2007. Fish were collected at three locations in the lower reservoir. Three gear types (electrofishing, gill nets, hoop nets) were employed, but all (476) fish were collected by electrofishing and gill netting (Normandeau 2007). Four groups dominated collections: Ictaluridae (33.8 % of total; 3 species), Moronidae (24.8 %; one species), Centrarchidae (17.6 %; 6 species), and Clupeidae (12.6%; one species) (Figure 2). Seventeen fish species, all relatively common Piedmont species, were collected. Channel catfish (26.1% of the total), white perch (24.8% of the total), gizzard shad (12.6% of the total), largemouth bass (7.8% of the total), blue catfish (7.1% of the total), and bluegill (7.1% of the total) were the species most often collected.

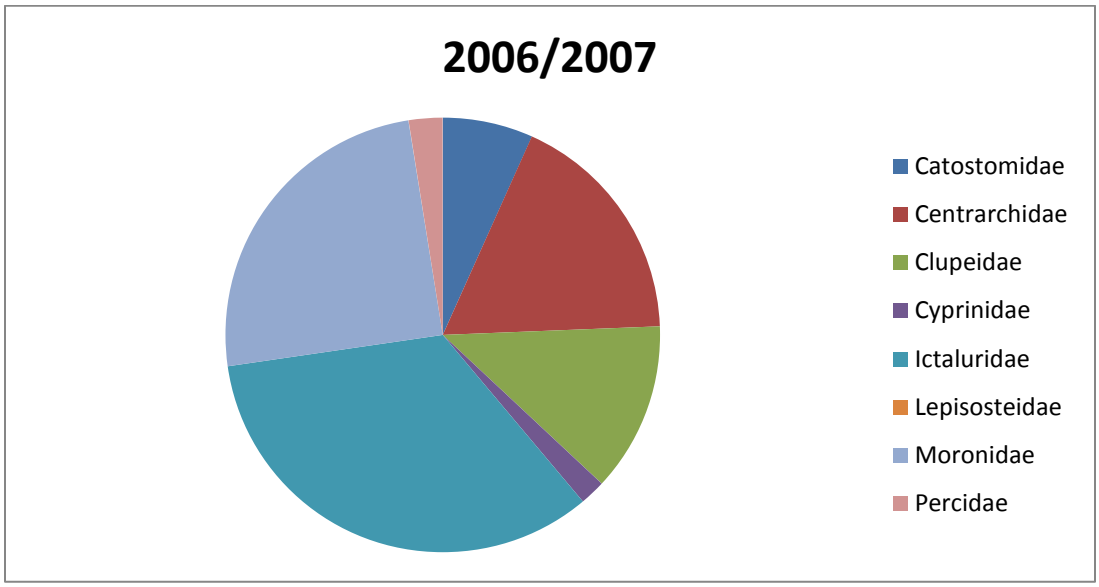


FIGURE 2 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR RESERVOIR, FALL 2006 AND SPRING 2007

Normandeau collected additional samples at the same three locations in July 2008 and February 2009 using electrofishing gear and gill nets (Normandeau 2008, 2009). Hoop nets, which were ineffective collecting fish in 2006-2007, were not used in 2008. Collections in July 2008 were dominated by gizzard shad (52.4 % of total), accounting for the dominance of Clupeids in the sample (Figure 3). Substantial numbers of bluegill (14.3 %), white perch (7.6 %), largemouth bass (6.1 %), blue catfish (4.3 %), and channel catfish (3.7 %) were also collected (Normandeau

2008). February 2009 collections were dominated by Centrarchids, which accounted for almost 50% of the catch, followed by Ictalurids, Cyprinids and Clupeids (Figure 4). From a species perspective, bluegill (33.6%), largemouth bass (9.2%), spottail shiner (9.2%), channel catfish (9.2%) and blue catfish (8.4%) were dominant (Normandeau 2009). The numerical dominance of gizzard shad in July 2008 samples reflects the fact that large numbers of small (50-100 mm TL) gizzard shad were present. Gizzard shad young-of-the-year grow rapidly, but are heavily preyed upon by a variety of predatory fish species including largemouth bass, crappies, and catfishes (Michaletz 1997). Thus, large numbers of young shad are typically present in summer (most spawning occurs in April and May), but numbers tend to decline in fall and winter as predation takes its toll. Gizzard shad are also prone to sudden die-offs in late summer (Mettee et al. 1996).

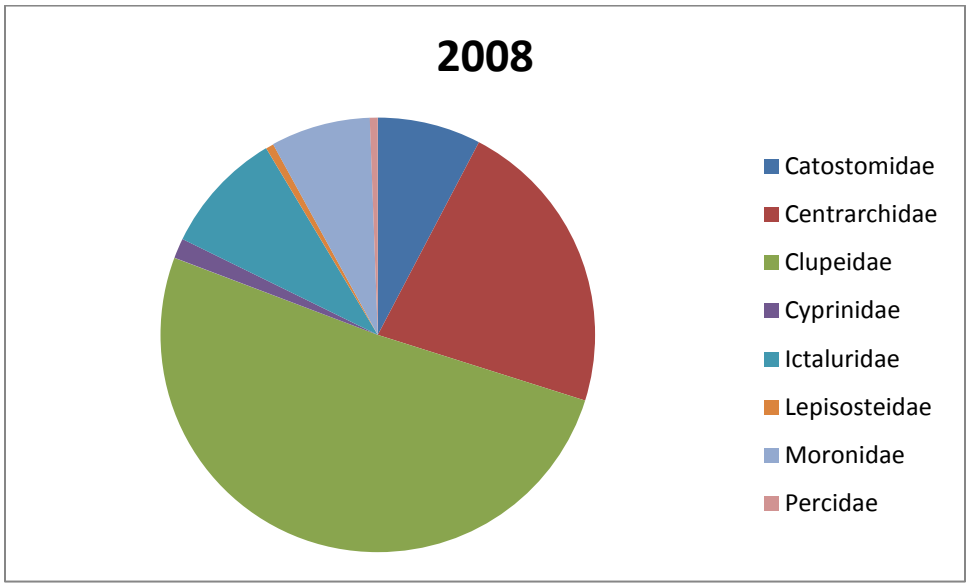


FIGURE 3 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR RESERVOIR, SUMMER 2008

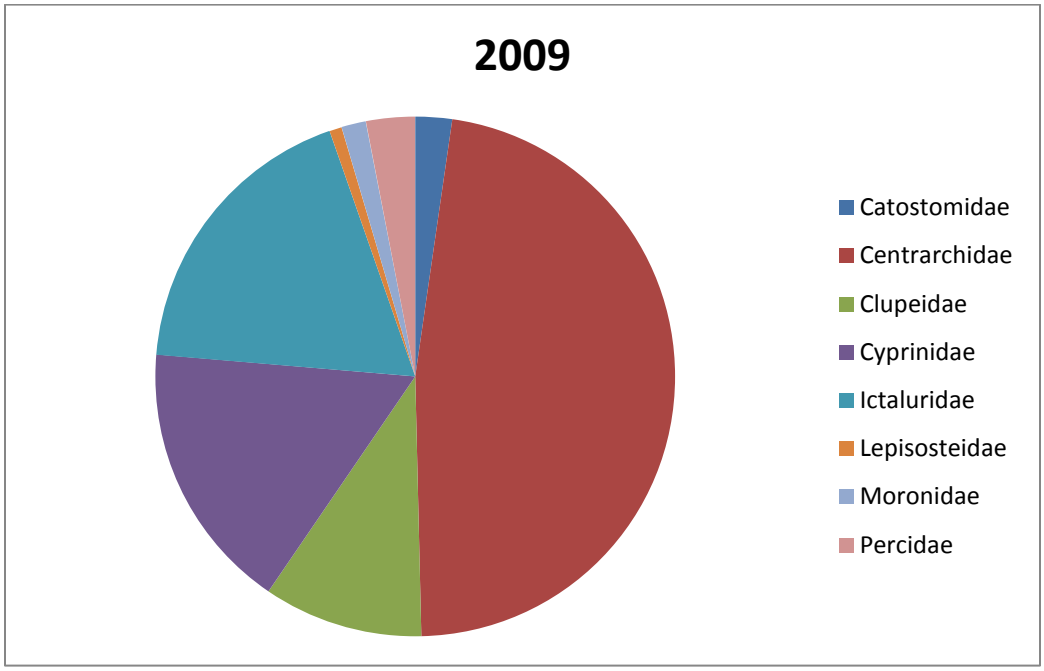


FIGURE 4 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR RESERVOIR, WINTER 2009

Additional gillnet and boat electrofishing was conducted during the spring and fall of 2012 by personnel from SCANA Corporate Environmental Services, yielding 20 species (SCANA 2013). Results were very similar to those obtained by Normandeau during the spring of 2006 and fall of 2007 and were dominated by Ictalurids, Morones, Centrarchids and Clupeids (Figure 5). From a species perspective, channel catfish (24.5%), white perch (18.9%), gizzard shad (13.2%), bluegill (12.6%) and blue catfish (10.1%) accounted for 79% of the catch. Only blue catfish, bluegill and channel catfish appeared in both spring and fall samples, supporting the Normandeau assertion of significant seasonal variation among species such as white perch and gizzard shad.

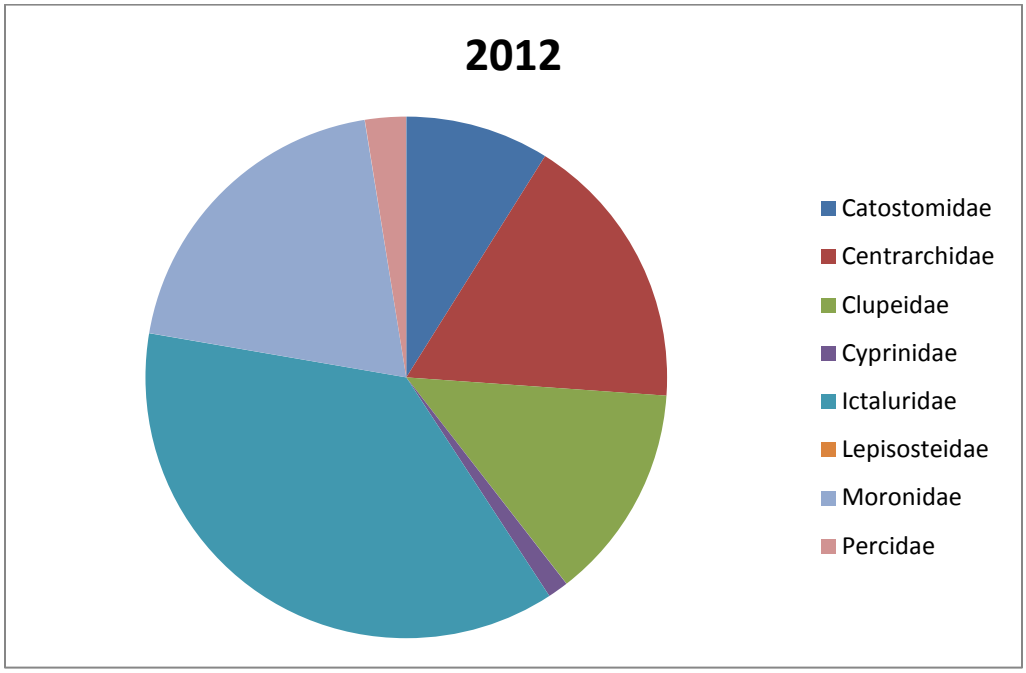


FIGURE 5 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR RESERVOIR, SPRING AND FALL 2012

It should be noted that two robust redhorse (*Moxostoma robustum*) have been documented from Parr Reservoir, one during the July 2008 Normandeau sampling and a second in the fall of 2012 by SCANA staff (Normandeau 2009, SCANA 2013). The robust redhorse is a large, long-lived member of the redhorse sucker family. In 1995, a Robust Redhorse Conservation Committee (RRCC) was created to improve the status of the species throughout its former range. The RRCC is a cooperative, voluntary partnership formed under a Memorandum of Understanding (MOU) between state and federal resource agencies, private industry, and the conservation community. From 2004 through 2012, the SCDNR has stocked a total of 25,316 fingerling robust redhorse suckers in the Broad River above the Parr Hydroelectric Facility. Through 2012, a total of seven robust redhorse suckers have been captured in the Broad River drainage above the Parr Hydroelectric Facility by various state and private entities (SCANA 2013).

3.1.2 MONTICELLO RESERVOIR

Sampling of Monticello Reservoir by Normandeau in the fall of 2006 and spring of 2007 yielded results similar to those of Parr Reservoir for the same time period, with the fish community dominated by Centrarchids (48.8 %), Clupeids (19.6 %) and Ictalurids (17.3 %) (Figure 6).

Bluegill (32.6%), gizzard shad (19.6%), blue catfish (11.0%), white perch (9.5%) and largemouth bass (8.7%) were the species most often collected (Normandeau 2007).

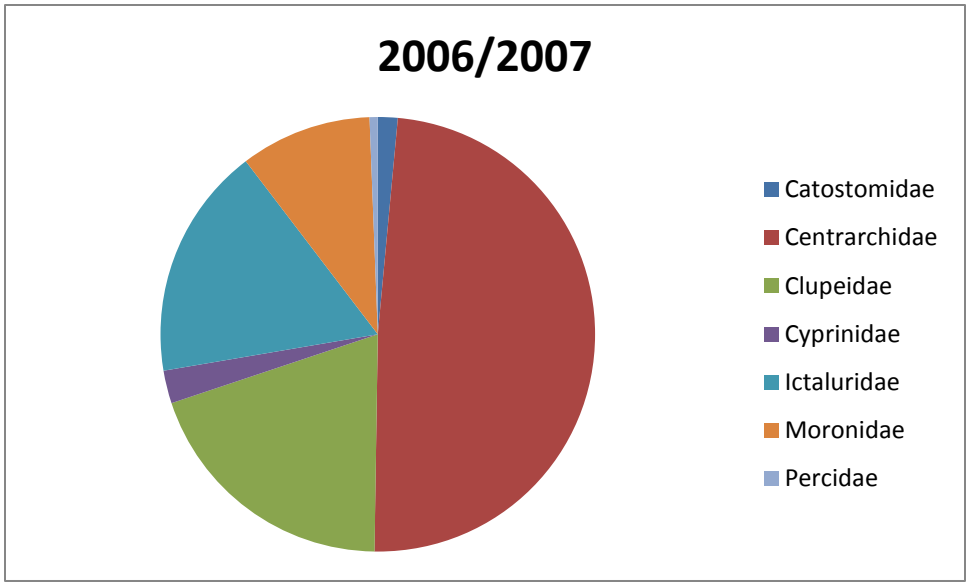


FIGURE 6 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN MONTICELLO RESERVOIR, FALL 2006 AND SPRING 2007

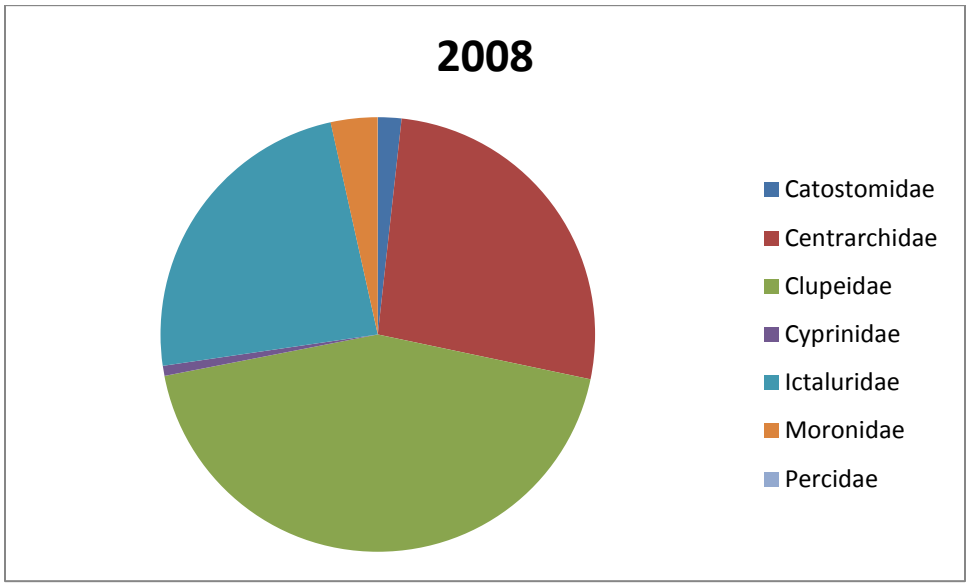


FIGURE 7 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN MONTICELLO RESERVOIR, SUMMER 2008

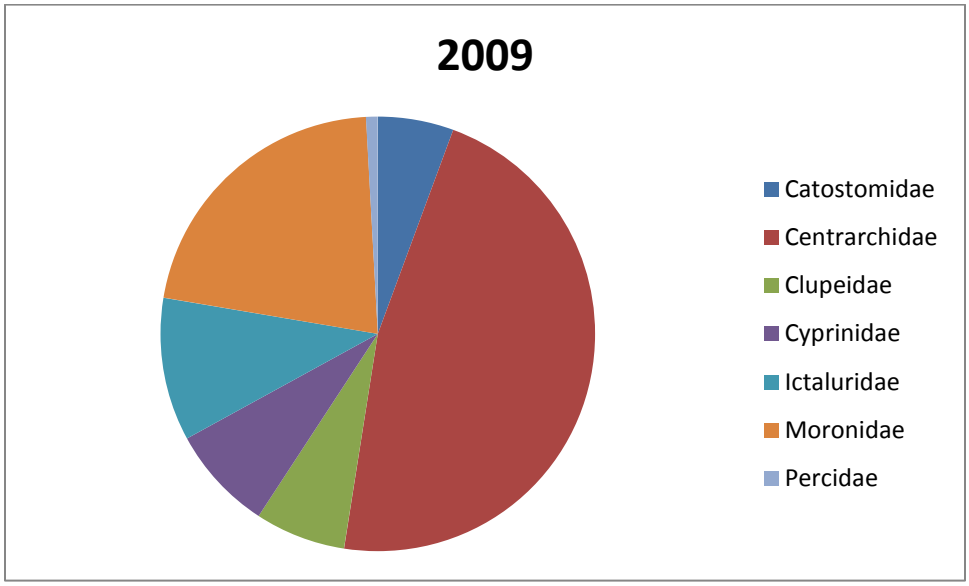


FIGURE 8 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN MONTICELLO RESERVOIR, WINTER 2009

Additional sampling of Monticello Reservoir fish was conducted in July 2008 to obtain information on possible seasonal differences in the reservoir's fish populations. Clupeids, Centrarchids and Ictalurids dominated the sample (Figure 7), with three species—gizzard shad (42.2 %), bluegill (23.2 %), and blue catfish (20 %)—accounting for more than 85 % of all fish captured. Smaller numbers of white perch (3.6 %), channel catfish (2.6 %), largemouth bass (1.4 %), and white catfish (1.4 %) were also collected. As previously noted, the same species dominated samples in 2006-2007, only bluegill ranked first in abundance and gizzard shad second. Relatively high numbers of gizzard shad in Parr and Monticello Reservoir collections in July 2008 reflect the fact that large numbers of small (50-100 mm TL) gizzard shad were present. Gizzard shad young-of-the-year grow rapidly, but are subject to high rates of mortality. Thus, it is understandable that large numbers of young are present in summer, but these numbers decline in fall and winter. This is corroborated by sampling conducted during February 2009 (Figure 8), which was dominated by bluegill (33.4%), white perch (21.5%), and largemouth bass (7.6%), with gizzard shad only accounting for 6.7 % of the catch (Normandeau 2009).

Although somewhat less productive than other older reservoirs in the region, Monticello Reservoir continues to provide fishermen in the South Carolina Midlands and Upstate with a variety of fishing opportunities. Roving creel surveys in 1997–1998 and 1998–1999, that included interviews of selected anglers, revealed that roughly half (51% in 1997–98, 42% in

1998–99) of all fishing effort in Monticello Reservoir was directed at catfish (Christie and Stroud 1999). Less effort was expended fishing for black crappie (15% in 1997–98, 5% in 1998–99), largemouth bass (12% in 1997–98, 10% in 1998–99), and other species (bluegill, carp, white bass, white perch). The creel surveys indicated that fishing effort (number of hours fished per annum) had increased substantially since the late 1980s. They also showed that fishing pressure (hours fished per acre) was lower on Monticello Reservoir than on other reservoirs in the region (Christie and Stroud 1999).

3.2 BROAD RIVER DOWNSTREAM OF PARR DAM

An ongoing fish community study being conducted by SCDNR Region 3 fisheries staff provides significant data describing the fish community in the Lower Broad River downstream of the Parr Shoals dam. This study has sampled the Lower Broad River fish community since 2009. For the purposes of this review, data from three sample reaches between the Parr Shoals dam and the impoundment of the downstream Columbia Hydroelectric Project will be reported (Figure 9). Study reach one (1) extents from the Project dam to the Palmetto Trail trestle crossing and is delineated into two sub-reaches: the Project tailrace (delineated as 1t on Table 2) and the "bypass" reach located on the western side of the island immediately below the dam (delineated as 1b on Table 2). The next downstream reach extends from the Palmetto Trail trestle crossing to the downstream terminus of Huffman Island and is delineated as reach 2a on Figure 9. The lowermost reach (2b on Figure 9) extends from the downstream terminus of Huffman Island to the downstream terminus of Boatright Island.

Data from the study suggests significantly higher diversity in the downstream riverine reaches, as compared to the two upstream reservoirs (54 species compared to 24-30 in the Parr and Monticello reservoirs) (Table 2). As expected, diversity appears to increase with increased distance from the dam, although redbreast sunfish, whitefin shiner, bluegill and snail bullhead generally dominate from a relative abundance standpoint at all sites (Table 2). Reach 1b, the "bypass" reach, displays the lowest diversity (13 species) and is dominated by Cetrarchids, with bluegill and redbreast sunfish accounting for more than 85% of the total catch in the reach (Figure 10, Table 2). Conversely, the project tailrace (Reach 1t) supports a much greater diversity of fishes, most notably an abundance of riverine suckers (Catostomidae) (Figure 11). The downstream sites (reaches 2a and 2b) support similar fish communities with Centrarchids,

Cyprinids, Ictalurids and Percids (*Etheostoma* spp. and *Percina* spp.) being well represented (Table 2, Figure 12, Figure 13).

Finally, it is noteworthy that robust redhorse have been detected in the Project tailrace (Reach 1t) and consultation with SCDNR suggests that significant spawning habitat may exist in the reach (Ron Ahle, SCDNR, Personal Communication).

Bettinger et al. (2003) also sampled a site downstream of the Parr Shoals Dam (just below Bookman Island) as part of a basin-wide aquatic resource inventory. Results from this effort were generally similar to those of the current SCDNR effort, with a total of 34 species documented. Boat electrofishing samples were dominated by redbreast sunfish, redear sunfish, whitefin shiner and sandbar shiner, while redbreast sunfish, margined madtom, Piedmont darter, whitefin shiner and seagreen darter dominated backpack electrofishing samples (Table 3).

3.2.1 DIADROMOUS FISH

American shad (*Alosa sapidissima*), an anadromous species, were collected at the downstream sampling sites, as well as in the Project tailrace (Reach 1t) (Table 2). The source of these fish is likely a combination of recent stocking efforts by the SCDNR and passage at the Columbia Fishway. The Columbia Fishway was constructed in 2006 at the Columbia Hydroelectric Project (FERC No. 1895), located on the Lower Broad River approximately 23 miles downstream of the Parr Shoals Dam. The fishway was designed to provide safe, timely and effective upstream passage for anadromous American shad and blueback herring (*Alosa aestivalis*) to historical spawning and maturation habitats upstream of the Columbia Diversion Dam, including areas of the Lower Broad River downstream of the Parr Shoals Dam. The most recent monitoring data suggests that an estimated 1,730 American shad were passed upstream during the 2013 migration season, which is the highest estimated passage numbers observed since monitoring began in 2007 (Kleinschmidt 2013).

During review of an earlier draft of this report, TWC members requested information summarizing American shad and American eel (*Anguilla rostrata*) studies conducted on the Lower Broad River and funded by the Santee Basin Cooperative Fish Passage Accord (Accord). The Accord is a cooperative program between USFWS, SCDNR, North Carolina Wildlife Resources Commission, SCE&G and Duke Energy Carolinas aimed at restoring diadromous fish

(American shad, blueback herring, and American eels) in the Santee River Basin. Results of Accord-funded studies of American shad and American eels are summarized in Appendix B.

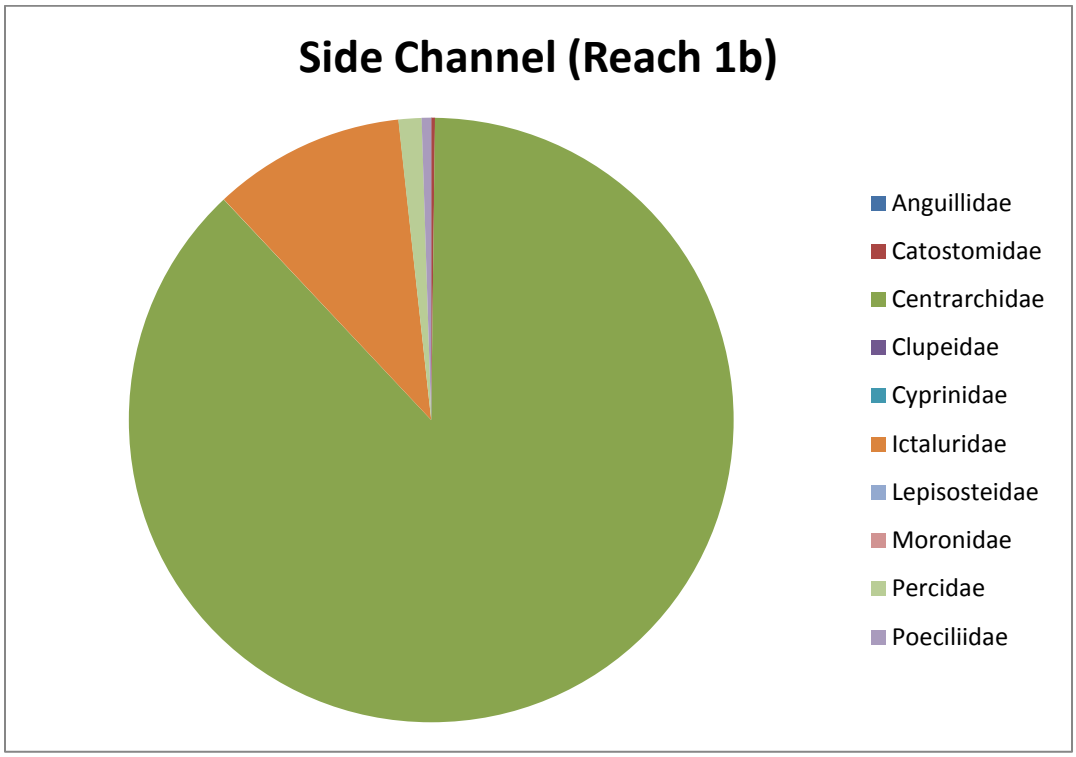


FIGURE 9 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR DAM "BYPASS" REACH (SCDNR SAMPLE REACH 1B), FALL 2009 – SPRING 2013

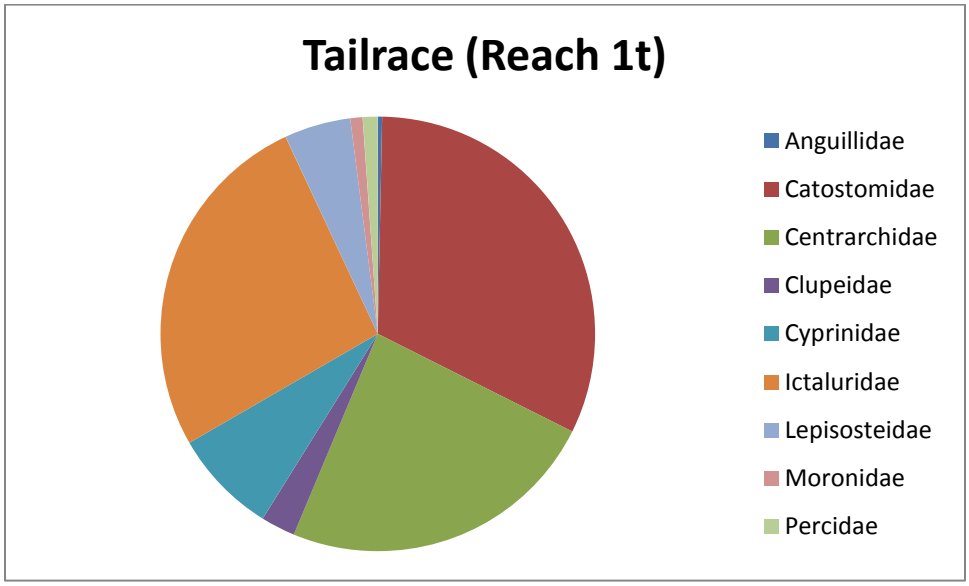


FIGURE 10 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN PARR DAM TAILRACE (SCDNR SAMPLE REACH 1T), FALL 2009 – SPRING 2013

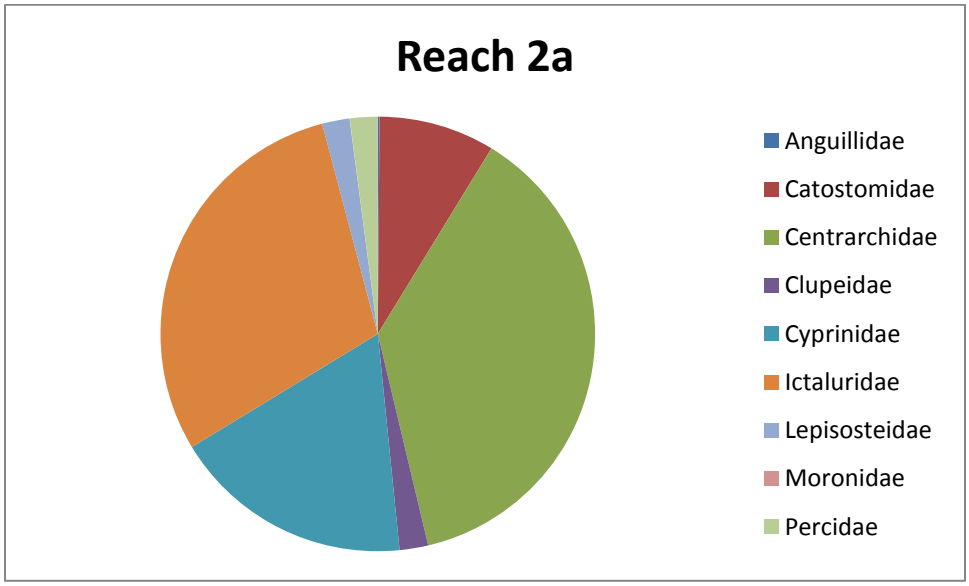


FIGURE 11 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN SCDNR SAMPLE REACH 2A, FALL 2009 – SPRING 2013

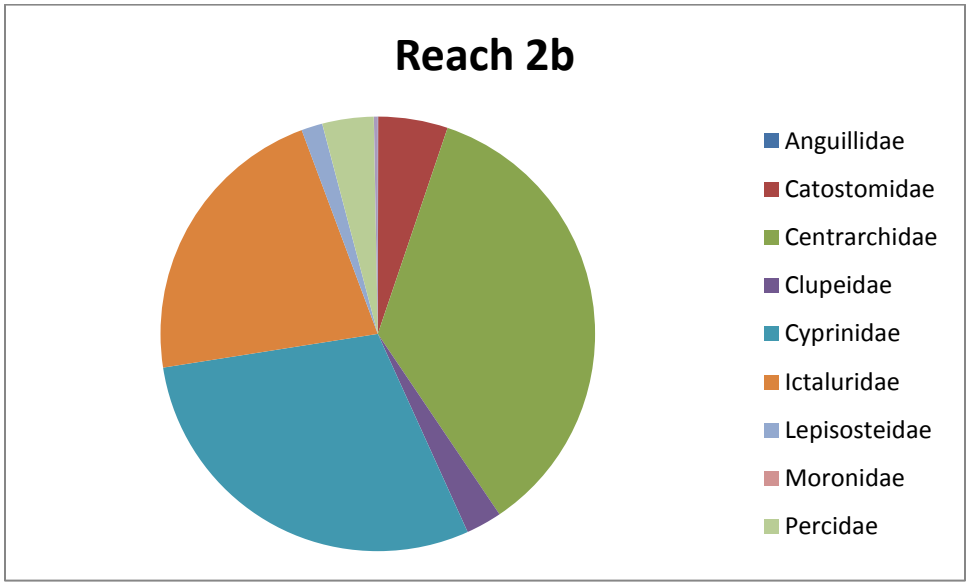


FIGURE 12 RELATIVE ABUNDANCE BY FAMILY OF FISH COLLECTED IN SCDNR SAMPLE REACH 2B, FALL 2009 – SPRING 2013

TABLE 2 PRELIMINARY RESULTS FROM THE LOWER BROAD RIVER FISH COMMUNITY STUDY, FALL 2009 THROUGH SPRING 2013

		TOTAL		PARR BYPASS		PARR TAILRACE		UPPER NATURAL		LOWER NATURAL	
COMMON NAME	SCIENTIFIC NAME	N	RELATIVE ABUNDANCE (RA)	1B	RA	1T	RA	2A	RA	2B	RA
redbreast sunfish	*Lepomis auritus*	5455	30.21%	595	60.59%	505	15.99%	1090	28.65%	1701	28.75%
snail bullhead	*Ameiurus brunneus*	2884	15.97%	81	8.25%	604	19.13%	830	21.81%	1026	17.34%
whitefin shiner	*Cyprinella nivea*	1824	10.10%			134	4.24%	305	8.02%	1042	17.61%
bluegill	*Lepomis macrochirus*	1440	7.97%	253	25.76%	86	2.72%	156	4.10%	138	2.33%
brassy jumprock	*Scartomyzon sp. (1-27-06)*	774	4.29%	1	0.10%	521	16.50%	153	4.02%	90	1.52%
sandbar shiner	*Notropis scepticus*	585	3.24%			18	0.57%	236	6.20%	294	4.97%
largemouth bass	*Micropterus salmoides*	446	2.47%	3	0.31%	93	2.94%	79	2.08%	87	1.47%
margined madtom	*Noturus insignis*	415	2.30%			10	0.32%	208	5.47%	144	2.43%
spottail shiner	*Notropis hudsonius*	414	2.29%			51	1.61%	85	2.23%	181	3.06%
longnose gar	*Lepisosteus osseus*	345	1.91%			156	4.94%	78	2.05%	93	1.57%
notchlip redhorse	*Moxostoma collapsum*	315	1.74%			130	4.12%	78	2.05%	77	1.30%
shorthead redhorse	*Moxostoma macrolepidotum*	294	1.63%			236	7.47%	33	0.87%	16	0.27%
piedmont darter	*Percina crassa*	285	1.58%	3	0.31%	21	0.66%	46	1.21%	180	3.04%
redear sunfish	*Lepomis microlophus*	275	1.52%	9	0.92%	55	1.74%	54	1.42%	47	0.79%
flat bullhead	*Ameiurus platycephalus*	212	1.17%	17	1.73%	19	0.60%	66	1.73%	86	1.45%
channel catfish	*Ictalurus punctatus*	188	1.04%			122	3.86%	16	0.42%	28	0.47%
v-lip redhorse	*Moxostoma pappillosum*	161	0.89%			64	2.03%	41	1.08%	43	0.73%
smallmouth bass	*Micropterus dolomieu*	159	0.88%			11	0.35%	46	1.21%	78	1.32%
bluehead chub	*Nocomis leptocephalus*	145	0.80%					10	0.26%	11	0.19%
threadfin shad	*Dorosoma petenense*	140	0.78%			5	0.16%	7	0.18%	128	2.16%
coastal shiner	*Notropis petersoni*	126	0.70%			23	0.73%	17	0.45%	75	1.27%
gizzard shad	*Dorosoma cepedianum*	114	0.63%			57	1.80%	44	1.16%	5	0.08%
american shad	*Alosa sapidissima*	109	0.60%			19	0.60%	30	0.79%	25	0.42%
northern hogsucker	*Hypentelium nigricans*	102	0.56%			27	0.85%	15	0.39%	50	0.85%
greenfin shiner	*Cyprinella chloristia*	85	0.47%			2	0.06%	18	0.47%	38	0.64%
blue catfish	*Ictalurus furcatus*	67	0.37%			65	2.06%	2	0.05%		
seagreen darter	*Etheostoma thalassinum*	55	0.30%			10	0.32%	31	0.81%	12	0.20%

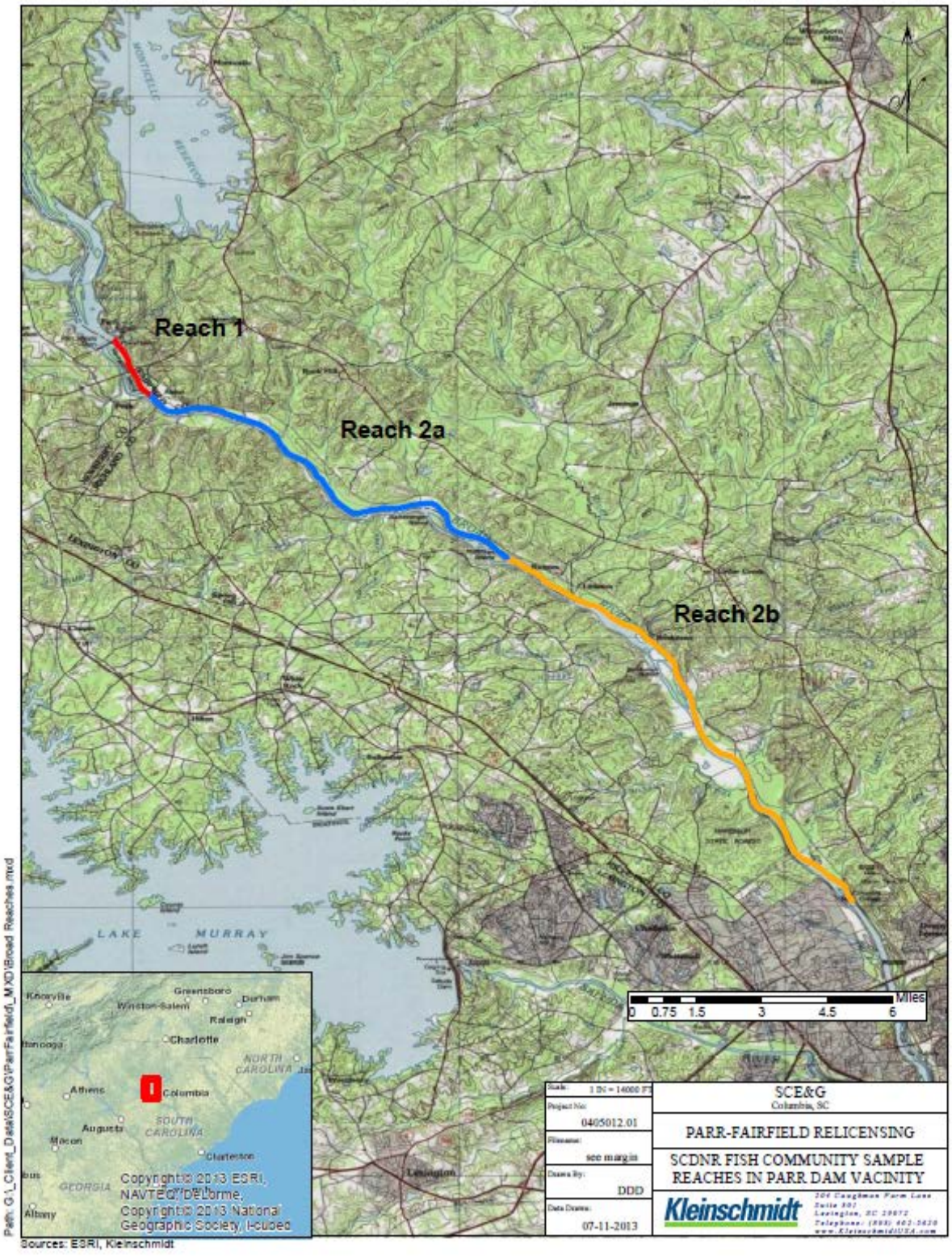
		Total		Parr Bypass		Parr Tailrace		Upper Natural		Lower Natural	
Common Name	Scientific Name	N	Relative abundance (RA)	1B	RA	1T	RA	2A	RA	2B	RA
thicklip chub	*Cyprinella labrosa*	51	0.28%							49	0.83%
tessellated darter	*Etheostoma olmstedi*	51	0.28%	9	0.92%	3	0.09%	1	0.03%	34	0.57%
highback chub	*Hybopsis hypsinotus*	46	0.25%					4	0.11%	42	0.71%
mosquitofish	*Gambusia affinis*	43	0.24%	5	0.51%			1	0.03%	17	0.29%
green sunfish	*Lepomis cyanellus*	36	0.20%							33	0.56%
warmouth	*Lepomis gulosus*	32	0.18%	2	0.20%	2	0.06%			4	0.07%
spotted sucker	*Minytrema melanops*	29	0.16%	1	0.10%			1	0.03%	12	0.20%
quillback	*Carpiodes cyprinus*	26	0.14%			22	0.70%			4	0.07%
white perch	*Morone americana*	26	0.14%			26	0.82%				
white catfish	*Ameiurus catus*	19	0.11%	3	0.31%	12	0.38%				
robust redhorse	*Moxostoma robustum* ##	18	0.10%			14	0.44%	4	0.11%		
American eel	*Anguilla rostrata*	17	0.09%			10	0.32%	5	0.13%	2	0.03%
striped jumprock	*Moxostoma rupiscartes*	17	0.09%					2	0.05%	13	0.22%
black crappie	*Pomoxis nigromaculatus*	14	0.08%			3	0.09%	3	0.08%	4	0.07%
swallowtail shiner	*Notropis procne*	14	0.08%			14	0.44%				
carp	*Cyprinus carpio*	11	0.06%			4	0.13%	4	0.11%		
flathead catfish	*Pylodictis olivaris*	9	0.05%			1	0.03%	1	0.03%	5	0.08%
blackbanded darter	*Percina nigrofasciata*	3	0.02%							1	0.02%
grass carp	*Ctenopharyngodon idella*	2	0.01%					2	0.05%		
striped bass	*Morone saxatilis*	2	0.01%			2	0.06%				
tadpole madtom	*Noturus gyrinus*	2	0.01%					2	0.05%		
creek chubsucker	*Erimyzon oblongus*	1	0.01%					1	0.03%		
Santee chub	*Hybopsis zanema*	1	0.01%							1	0.02%
white bass	*Morone chrysops*	1	0.01%			1	0.03%				
yellow perch	*Perca flavescens*	1	0.01%			1	0.03%				

(Source: Ron Ahle, SCDNR Freshwater Fisheries Region 3, data unpublished)

TABLE 3 RELATIVE ABUNDANCE OF FISH SPECIES COLLECTED BY BOAT AND BACKPACK ELECTROFISHING BELOW BOOKMAN ISLAND (SOURCE: BETTINGER ET AL. 2003)

SPECIES	BOAT	BACKPACK
longnose gar	0.8	
gizzard shad	0.1	
threadfin shad	0.4	
greenfin shiner	0.1	0.4
whitefin shiner	6.4	9
common carp	0.1	
eastern silvery minnow	0.1	
thicklip chub		4.3
bluehead chub		1.7
spottail shiner	0.5	0.9
yellowfin shiner	0.2	1.3
sandbar shiner	8.3	3.2
silver redhorse	4.8	
shorthead redhorse	0.1	
striped jumprock	0.2	
brassy jumprock	3.6	
snail bullhead	0.9	7.7
flat bullhead	0.6	1.0
channel catfish	0.2	0.1
margined madtom	0.2	13.6
white perch	0.3	
white bass	0.1	
flier	0.1	
redbreast sunfish	41.8	35.9
pumpkinseed	0.1	
warmouth	0.8	
bluegill	16.2	0.3
redear sunfish	7.5	
largemouth bass	4.2	0.5
black crappie	0.4	
tessellated darter	0.1	1.0
yellow perch	0.8	
seagreen darter		8.3
Piedmont darter	0.1	10.6
	100%	100%

FIGURE 13 SCDNR FISH COMMUNITY SAMPLING SITES IN THE VICINITY OF PARR SHOALS DAM



4.0 SUMMARY

Parr and Monticello reservoirs support warmwater fish communities typical of impounded river reaches in the Piedmont of South Carolina, with recent work having documented 30 species in Parr Reservoir and 24 in Monticello. Although some seasonal variations occur, fish communities are generally similar between the two reservoirs, with gizzard shad, blue catfish, bluegill, channel catfish and white perch often being the dominant species. Both reservoirs appear to support relatively high numbers of gizzard shad during the summer months (often numerically dominating the population); however, existing data suggests that these populations decline rapidly during the fall and winter, presumably due to high levels of predation and/or seasonal die-offs. No species that are state or federally listed as threatened or endangered have been documented in Monticello or Parr reservoirs, although robust redhorse, which is considered a species of highest conservation concern by the SCDNR (2005), has been documented in limited numbers in both reservoirs.

The reach of the Broad River downstream of the Parr Dam appears to support a diverse and robust fishery characteristic of large rivers in the Piedmont of South Carolina, although some influence from the Project is evident primarily in the reach extending from the dam to the Palmetto Trail trestle crossing (SCDNR Study Reach 1). The fish community within Reach 1 differs significantly between the Project tailrace (SCDNR Study Reach 1t) and the "bypass" reach located on the western side of the island immediately below the dam (SCDNR Study Reach 1b). The "bypass" reach is characterized by relatively low diversity and is dominated by sunfishes, with redbreast and bluegill account for more than 85% of the catch during recent sampling. Conversely, the tailrace channel side of Reach 1 supports a much more robust fish community and approached what would be expected in a Piedmont river. Most notably, an abundance of riverine suckers (Catostomids) have been documented in the reach, and it is thought to represent a potential spawning area for robust redhorse. Downstream of the Palmetto Trail trestle crossing, the fish communities appear to stabilize, with the two remaining SCDNR sample reaches upstream of the Columbia Hydro Impoundment (Reaches 2a and 2b) having very similar composition at the family level (See Figures 12 and 13). These reaches support a balanced community primarily consisting of Centrarchids, Cyprinids, Ictalurids and Catostomids, with redbreast sunfish, whitefin shiner, bluegill and snail bullhead as dominant species. The diverse fish community occurring in the reach provides an abundance of fish hosts for native

freshwater mussels, as is evidenced by a recent survey by Alderman (2012) which found the highest freshwater mussel diversity in the Broad River Sub-basin in North and South Carolina upriver from the Columbia Diversion Dam occurring immediately downstream of Parr Shoals Dam.

No species that are state or federally listed as threatened or endangered have been documented in Monticello or Parr reservoirs or in the downstream reach of the Broad River between Parr Dam and Columbia Hydro Impoundment; however, 16 species that are considered to be priority species in the SCDNR's Comprehensive Wildlife Conservation Strategy (SCDNR 2005) are found in the Project area (Table 4).

TABLE 4 SOUTH CAROLINA CWCP PRIORITY SPECIES

					SCDNR DOWNSTREAM STUDY REACHES			
COMMON NAME	SCIENTIFIC NAME	PRIORITY STATUS	PARR	MONTICELLO	1B	1T	2A	2B
American eel	*Anguilla rostrata*	Highest				X	X	X
American shad	*Alosa sapidissima*	Highest				X	X	X
Flat bullhead	*Ameiurus platycephalus*	Moderate	X	X	X	X	X	X
Greenfin shiner	*Cyprinella chloristia*	Moderate				X	X	X
Highfin carpsucker	*Carpiodes velifer*	Highest	X					
Notchlip redhorse	*Moxostoma collapsum*	Moderate	X	X		X	X	X
Piedmont darter	*Percina crassa*	High			X	X	X	X
Quillback	*Carpiodes cyprinus*	High	X	X		X		X
Robust Redhorse	*Moxostoma robustum*	Highest	X			X	X	
Santee Chub	*Hybopsis zanema*	High						X
Seagreen darter	*Etheostoma thalassinum*	High				X	X	X
Snail bullhead	*Ameiurus brunneus*	Moderate		X	X	X	X	X
Striped bass	*Morone saxatilis*	Moderate				X		
Thicklip chub	*Cyprinella labrosa*	Moderate						X
V-lip redhorse	*Moxostoma pappillosum*	Moderate				X	X	X
White catfish	*Ameiurus catus*	Moderate	X	X	X	X		

5.0 REFERENCES

Alderman, J.M. and J.D. Alderman. 2012. Freshwater Mussel Surveys within The Broad River, East of Hampton Island. Prepared by Alderman Environmental Services, Inc. for SCANA Services, Inc. October 29, 2012. 48 pp.

Bettinger, J., J. Crane, and J. Bulak 2003. Broad River Aquatic Resources Inventory Completion Report (Draft). Prepared by SCDNR as part of the Broad River Comprehensive Entrainment Mitigation and Fisheries Resource Enhancement Program. January 28, 2003.

Christie, R. W. and R. M. Stroud 1999. *Fisheries Investigations in Lakes and Streams,* District IV. South Carolina Department of Natural Resources Annual Progress Report F-63-4-4, 1999.

Mettee, M. F., P.E. O'Neil, and J.M. Pierson. 1996. *Fishes of Alabama.* Oxmoor House, Birmingham, AL.

Michaletz, P. H. 1997. *Influence of abundance and size of age-O gizzard shad on predator diets, diet overlap, and growth.* Transactions of the American Fisheries Society 126: 101-111.

Normandeau Associates (Normandeau) 2007. *Monticello and Parr Reservoirs Fisheries Surveys: Final Report.* Prepared for Tetra Tech NUS, Inc., Aiken, SC, by Normandeau Associates, Bedford, NH. September 2007.

Normandeau Associates (Normandeau). 2008. *Monticello and Parr Reservoir Fisheries Surveys: Summer Report.* Prepared for Tetra Tech NUS by Normandeau Associates, Bedford, NH. August 2008.

Normandeau Associates (Normandeau). 2009. *Monticello and Parr Reservoir Fisheries Surveys: Summer Report.* Prepared for Tetra Tech NUS by Normandeau Associates, Bedford, NH. April 2009.

SCAIS (South Carolina Aquatic Invasive Species Task Force) 2008. State Management Plan for Aquatic Invasive Species: an AIS Management Plan for the State of South Carolina. Prepared by South Carolina Aquatic Invasive Species Task Force for South Carolina Department of Natural Resources. September 2008.

SCANA Services, Inc (SCANA). 2013. Fish Community Assessment of Parr Reservoir 2012. March, 2013.

South Carolina Department of Natural Resources (SCDNR). 2005. SC Comprehensive Wildlife Conservation Strategy.

APPENDIX A

RELATIVE ABUNDANCE AND CPUE DATA FOR PARR AND MONTICELLO RESERVOIRS, 2007 - 2013

RELATIVE ABUNDANCE OF FISH COLLECTED ON PARR AND MONTICELLO RESERVOIRS, FALL AND SPRING 2007 (SOURCE: NORMANDEAU 2007)

Species	Monticello		Parr	
	# Individuals	Relative Abundance	# Individuals	Relative Abundance
Quillback	1	0.1	3	0.6
Northern Hogsucker	1	0.1	0	0.0
Shorthead Redhorse	10	1.2	29	8.1
Redbreast	3	0.4	0	0.0
Pumpkinseed	12	1.5	8	1.7
Warmouth	6	0.7	0	0.0
Bluegill	267	32.6	34	7.1
Redear	7	0.9	3	0.6
Smallmouth Bass	2	0.2	1	0.2
Largemouth Bass	71	8.7	37	7.8
White Perch	78	9.5	118	24.8
White Bass	2	0.2	0	0.2
Black Crappie	32	3.9	1	0.2
Gizzard Shad	161	19.6	60	12.6
Whitefin Shiner	15	1.8	2	0.4
Golden Shiner	0	0.0	5	1.1
Spottail Shiner	5	0.6	2	0.4
White Catfish	14	1.7	3	0.6
Flat Bullhead	7	0.9	0	0.0
Blue Catfish	90	11.0	34	7.1
Channel Catfish	31	3.6	124	26.1
Yellow Perch	5	0.6	12	2.5

ELECTROFISHING CPUE FOR PARR AND MONTICELLO RESERVOIRS, FALL AND SPRING 2007 (SOURCE: NORMANDEAU 2007)

Species	Monticello Reservoir		Parr Reservoir	
	Fall2006 CPUE	Spring2007 CPUE	Fall2006 CPUE	Spring2007 CPUE
Quillback	0.00	0.00	0.00	3.99
Northern Hogsucker	0.00	3.99	0.00	0.00
Shorthead Redhorse	0.00	19.96	7.98	19.96
Redbreast	7.99	4.00	0.00	0.00
Pumpkinseed	43.91	3.99	19.94	7.98
Warmouth	23.97	0.00	0.00	0.00
Bluegill	806.20	239.38	59.82	75.84
Redear	7.98	7.98	7.97	3.99
Largemouth Bass	31.92	143.74	39.90	35.93
White Perch	0.00	55.90	0.00	0.00
Black Crappie	0.00	0.00	0.00	3.99
Gizzard Shad	0.00	23.94	119.69	63.86
Whitefin Shiner	55.92	3.99	7.97	0.00
Spottail Shiner	3.99	3.99	0.00	7.98
White Catfish	0.00	51.89	0.00	0.00
Flat Bullhead	15.97	0.00	0.00	0.00
Blue Catfish	0.00	0.00	3.99	0.00
Channel Catfish	0.00	31.95	0.00	3.99
Yellow Perch	19.98	0.00	11.96	23.95

RELATIVE ABUNDANCE OF FISH COLLECTED ON PARR AND MONTICELLO RESERVOIRS, SUMMER 2008 (SOURCE: NORMANDEAU 2008)

Common Name	Parr		Monticello	
	Total	Abundance	Total	Abundance
Quillback	2	0.6	0	0
Northern Hogsucker	0	0	1	0.1
Notchlip Redhorse	2	0.6	9	1.2
Shorthead Redhorse	11	3.4	4	0.5
Robust Redhorse	1	0.3	0	0
Redbreast	0	0	3	0.4
Pumpkinseed	3	0.9	6	0.8
Bluegill	47	14.3	181	23.1
Redear	3	0.9	4	0.5
Smallmouth Bass	1	0.3	1	0.1
Largemouth Bass	20	6.1	11	1.4
White Perch	25	7.6	28	3.6
Black Crappie	1	0.3	7	0.9
Gizzard Shad	172	52.4	330	42.2
Whitefin Shiner	0	0	2	0.3
Spottail Shiner	5	1.5	4	0.5
Snail Bullhead	0	0	1	0.1
White Catfish	5	1.5	11	1.4
Yellow Bullhead	0	0	1	0.1
Flat Bullhead	0	0	2	0.3
Blue Catfish	14	4.3	156	19.9
Channel Catfish	12	3.7	20	2.6
Longnose Gar	2	0.6	0	0
Yellow Perch	2	0.6	0	0

ELECTROFISHING CPUE FOR PARR AND MONTICELLO RESERVOIRS, SUMMER 2008 (SOURCE: NORMANDEAU 2008)

Common Name	Parr	Monticello
Northern Hogsucker		3.99
Notchlip Redhorse	3.97	35.88
Shorthead Redhorse		3.99
Redbreast		5.98
Pumpkinseed	11.97	23.92
Bluegill	89.76	143.99
Redear	11.97	7.95
Smallmouth Bass	3.96	3.99
Largemouth Bass	26.44	13.27
White Perch	7.98	33.92
Gizzard Shad	333.05	182.40
Whitefin Shiner		3.98
Spottail Shiner	9.97	7.98
Snail Bullhead		3.97
White Catfish	3.99	14.58
Yellow Bullhead		3.97
Flat Bullhead		7.94
Blue Catfish		3.97
Channel Catfish	15.95	11.96
Yellow Perch	7.98	

RELATIVE ABUNDANCE OF FISH COLLECTED ON PARR AND MONTICELLO RESERVOIRS, WINTER 2009 (SOURCE: NORMANDEAU 2009)

Common Name	Parr		Monticello	
	Total	Abundance	Total	Abundance
Quillback	1	0.8		
Northern Hogsucker			2	0.4
Notchlip Redhorse			8	1.7
Shorthead Redhorse	2	1.5	16	3.5
Redbreast	1	0.8	6	1.3
Pumpkinseed	2	1.5	10	2.2
Bluegill	44	33.6	154	33.4
Redear	1	0.8	2	0.4
Smallmouth Bass	2	1.5	1	0.2
Largemouth Bass	12	9.2	35	7.6
White Perch	2	1.5	99	21.5
Black Crappie			8	1.7
Gizzard Shad	9	6.9	31	6.7
Threadfin Shad	4	3.1		
Whitefin Shiner			16	3.5
Eastern Silvery Minnow	7	5.3	8	1.7
Golden Shiner	3	2.3		
Spottail Shiner	12	9.2	12	2.6
White Catfish	1	0.8	8	1.7
Flat Bullhead			1	0.2
Blue Catfish	11	8.4	14	3
Channel Catfish	12	9.2	26	5.6
Longnose Gar	1	0.8		
Yellow Perch	4	3.1	4	0.9

ELECTROFISHING CPUE FOR PARR AND MONTICELLO RESERVOIRS, WINTER 2009 (SOURCE: NORMANDEAU 2009)

Common Name	Parr	Monticello
Northern Hogsucker		3.99
Notchlip Redhorse		5.98
Shorthead Redhorse	3.96	3.99
Redbreast	3.97	7.95
Pumpkinseed	3.98	13.29
Bluegill	58.17	121.74
Redear	3.99	7.97
Smallmouth Bass	7.94	3.99
Largemouth Bass	13.25	31.81
White Perch	3.99	56.81
Black Crappie		7.97
Gizzard Shad	11.97	16.9
Threadfin Shad	7.97	
Whitefin Shiner		63.79
Eastern Silvery Minnow	27.72	15.95
Spottail Shiner	23.82	15.96
White Catfish	3.99	9.31
Blue Catfish		3.99
Channel Catfish		35.88
Yellow Perch	3.96	5.32

RELATIVE ABUNDANCE OF FISH COLLECTED ON PARR RESERVOIR, SPRING AND FALL 2012 (SOURCE: SCANA 2013)

Species	# Individuals	Relative Abundance
blue catfish	16	10.06
bluegill	20	12.58
channel catfish	39	24.53
flathead catfish	1	0.63
gizzard shad	21	13.21
highfin carpsucker	10	6.29
largemouth bass	4	2.52
notchlip redhorse	2	1.26
redbreast sunfish	1	0.63
redear sunfish	1	0.63
robust redhorse	1	0.63
sandbar shiner	1	0.63
shorthead redhorse	1	1.89
spottail shiner	1	0.63
warmouth	1	0.63
white bass	1	0.63
white catfish	1	0.63
white perch	30	18.87
yellow bullhead	1	0.63
yellow perch	4	0.63

APPENDIX B

SANTEE RIVER ACCORD

AMERICAN EEL AND AMERICAN SHAD SUMMARIES

Introduction

The following is a summary of information gathered as part of the "*Santee River Basin Accord for Diadromous Fish Protection, Restoration, and Enhancement*" (Accord). The Accord is a collaborative approach among utilities with licensed hydroelectric projects, including South Carolina Electric & Gas (SCE&G) and Duke Energy Carolinas, LLC (Duke), and federal and state resource agencies, including the South Carolina Department of Natural Resources (SCDNR), the North Carolina Wildlife Resources Commission (NCWRC), and the United States Fish and Wildlife Service (USFWS) to address diadromous fish protection, restoration, and enhancement in the Santee River Basin. The Accord supports the *Santee-Cooper Basin Diadromous Fish Passage Restoration Plan* which was developed by the SCDNR, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the USFWS, and was accepted as a Comprehensive Plan by the Federal Energy Regulatory Commission (FERC).

American Eel Summary

The South Carolina Department of Natural Resources studied American eel abundance and distribution along the spillways of the Lake Wateree Dam on the Wateree River and Columbia Dam on the Broad River. The study occurred from January 1, 2010 through December 31, 2012. The objectives of this study were to quantify the migrational timing and abundance of American eels at various locations along the spillways of the Lake Wateree Dam and the Columbia Dam, evaluate factors that effected this distribution, and identify areas where American eel collection rates could be maximized. Eel ramp traps of a standard design were used and consisted of a ramp covered with a textured surface, attraction flow and covered collection container with aeration or flow-through water supply. Traps were set at several locations across the base of the Lake Wateree Dam and the Columbia Dam. Traps were deployed in early January and monitored biweekly until eels were detected, then weekly until April 1, and then every other day through June. Monitoring then reverted to biweekly for the remainder of the year after catch numbers subsided. The presence and abundance of eels in the vicinity of the Wateree Dam was evaluated by monthly electrofishing efforts from March through June, and then bi-monthly for the remainder of the year. Electrofishing was also conducted below Columbia Dam 2-3 times each year. All eels collected were enumerated, measured and released or retained for further study.

Some of the eels collected were tagged or marked as part of a pilot study to evaluate tagging methods and tag retention for future movement studies or population estimates.

The study results showed that American eels were not abundant below Columbia Dam or Wateree Dam during 2010, 2011 and 2012. Only 25 American eels (13 at Columbia and 12 at Wateree) were collected during the three year study, with 16.5 hours of electrofishing and 4,500 trap days of effort. Although too few eels were collected to thoroughly address the objectives listed above, it was found that eels were collected most frequently during the months of April through June. Eels were most frequently collected near the powerhouse at Wateree, and near the fish passage structure at Columbia. The study also suggested that few eels make it above the Santee-Cooper lakes. During 2012, 13 eels were captured at the Columbia and Wateree sites, while 17,500 eels were captured in the two ramp traps below St. Stephen's.

American Shad Summary

Adult

Each year adult American shad pass through the Santee-Cooper lake system via the St. Stephen fish lift. It is assumed that once fish exit the fish lift, they continue their upriver spawning migrations to the upper Santee, Wateree, and Congaree Rivers. In 2009, ultrasonic telemetry was used to gain a better perspective on the distribution and migration range of American Shad beyond the St. Stephen fish lift. Three hundred ninety six American shad were collected and implanted with ultrasonic transmitters and released above the fish lift to resume their journey upriver. Tagging was distributed to account for the early, mid and latter portions of the shad migration, with personnel downloading locations of transmitted fish weekly from the various receivers located throughout the study area (Figure 1). Several manual tracking trips were also conducted, to account for fish that were located between receivers.

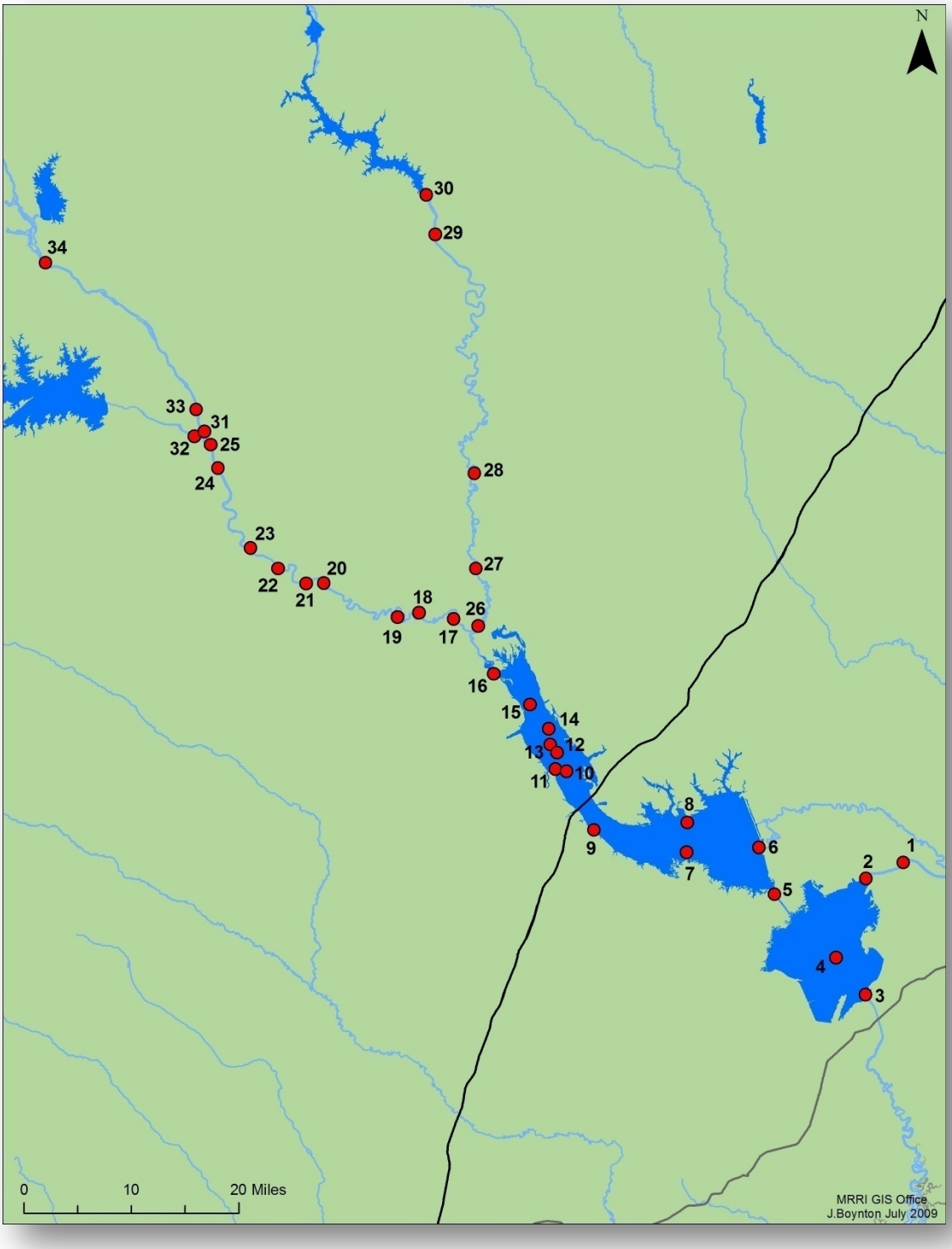


Figure 14 Acoustic Telemetry Receiver Locations in the Santee River Basin, SC

Results from the 2009 Adult American Shad Study indicated that shad were not reaching upper river habitats, but that most shad (67%) were utilizing the area between I-95 and the confluence of the Congaree and Wateree rivers. To determine if this was normal behavior or an anomaly, the study was repeated on a smaller scale in 2010. Two hundred forty seven shad were implanted with transmitters, and identical locations were used for receivers. Tagging was distributed to account for the early, mid and end portions of the shad migration, with personnel downloading locations of transmitted fish weekly from the various receivers. There were also several manual tracking trips conducted to account for fish that were located between receivers.

Of the 247 fish tagged with transmitters, 240 were detected by at least one receiver. 58 American shad were pulled through the turbines or the outmigration bypass system and ended up downstream of the St. Stephen Dam, but two of these fish traveled back upstream through the fish lift and re-entered the lake system. One hundred eighty one fish traveled upstream to Lake Moultrie, with 155 travelling through the Diversion Canal to enter Lake Marion. One hundred nine of the transmitted American shad traveled to the upper portion of Lake Marion, between the I-95 Bridge and Low Falls Landing, on the upper Santee River. This area appears to be where the majority of spawning is taking place. Eighty fish were detected approximately 10 km downstream of the Wateree/Congaree confluence. Fifteen American shad were detected in the lower portion of the Wateree River, and three of these fish continued upstream to the SCE&G Plant. Thirty three American shad were detected in the Congaree River where Hwy 601 crosses the river, and 9 of these fish continued upstream to Congaree National Park. Only two fish traveled far enough upstream to be detected by the receiver in the Congaree River at Rosewood Landing (rkm 77). One tagged American shad successfully traveled through the Columbia Fishway and was detected at the most upstream receiver just below Parr Dam. No American shad were detected in the bypassed reach of the Broad River adjacent to the Columbia Hydro Plant, nor were any American shad detected by receivers in the Saluda River.

Juvenile

As part of the Santee Basin Cooperative Accord, diadromous fish populations in upstream river reaches are being rebuilt through enhancement activities and the construction of permanent passage facilities at dams. Enhancement activities include population augmentation with hatchery-reared American shad fry, as well as re-locations of pre-spawning adults.

As part of an ongoing study, electrofishing is conducted on a weekly basis each year during June through November at several predetermined nursery sites. The study area includes: the Broad River, upstream and downstream of the Columbia Fishway; three sites in the Congaree River between rkm 0-6; four sites in the Upper Santee River between rkm 0-26; three sites in the Wateree River between rkm 39-47; Lake Marion at Harry's Fish Camp, Big Water and Indian Bluff; the Diversion Canal upstream of the Hwy 45 bridge; and Lake Moultrie at Bonneau Beach.

Young-of-year juvenile shad and herring are collected to determine abundance, distribution, growth rates, food habits and out-migration timing. Shad otoliths are also analyzed to determine the relative contribution of naturally produced versus hatchery produced shad juveniles. Each year, American Shad are collected and counted, and the sagittal otoliths are examined to determine if they are from hatchery stock. Results from the study are summarized in Table 1. This study was conducted in 2013 and will continue in 2014 in order to establish trends in abundance and determine overall hatchery contribution to the system.

Table 3 Santee Accord Juvenile American Shad Study Results

YEAR	# AMERICAN SHAD COLLECTED	# AMERICAN SHAD EXAMINED	% HATCHERY STOCK
2010	2,845	2,689	2.8%
2011	3,176	3,167	0.7%
2012	2,277	2198	0.8%