

Study Plan

Study Plan Name: Fish Community Survey and Assessment **Study Plan Designation:** Aquatics 01

Study Short Description: Survey of Fish Communities within and Adjacent to the Project Area

Applicable Hydro Projects/Developments: portions of all developments

Prerequisite Study Designation: none

The purpose of this document is to describe the study scope, methodology and uses for the results. Previous versions of the study scope document have been reviewed and discussed by the resource agencies and other members of the Aquatics Resource Committee or Study Team and based on these discussions appropriate methodologies have been added. This document is intended to be the final Study Plan for Aquatics 01.

I. Study Objective

- a) Conduct fish community surveys, including small non game species, in bypasses, tailrace areas, riverine reaches, and major tributaries of the Catawba – Wateree project
- b) Conduct field sampling to assess presence and relative abundance of robust and Carolina redhorses and highfin carpsuckers in the free-flowing river reaches downstream of Bridgewater, Wylie, and Wateree Projects

II. Geographic Scope

Supplemental fish community survey data will be collected from several types of affected areas. These affected areas include bypass reaches, riverine sections, tailraces, and tributary streams.

- a) Bypass reaches occur below the Catawba River Dam (Lake James), the Paddy Creek Dam (Lake James), the Mt. Island Dam (Mt. Island Lake), and downstream of Fishing Creek Hydro.
- b) Riverine sections occur downstream of Bridgewater, Oxford, Wylie, and Wateree Hydros.
- c) Tailrace areas, and an associated downstream location, to be sampled are below Rhodhiss, Lookout Shoals, Cowans Ford, Mountain Island, Fishing Creek, Great Falls/Dearborn, and Rocky Creek/Cedar Creek Hydros.
- d) Project influenced areas to be sampled in tributary streams include the Catawba River (Lake James Headwaters); Johns River and Warriors Fork (Lake Rhodhiss); Lower Little River (Lookout Shoals); Balls Creek (Lake Norman); Long Creek (Lake Wylie); Sixmile and Waxhaw Creeks (below Wylie Hydro); Cane Creek (Fishing Creek Reservoir); Fishing Creek (Great Falls Reservoir); Big Wateree Creek (Lake Wateree); and Grannies Quarter Creek (below Wateree Hydro).

Robust redhorse and Carolina redhorse surveys will occur at locations (near shoals and gravel bars) where fish will most likely be concentrated in spawning aggregations at relatively shallow depths. Highfin carpsucker surveys will occur at locations (near deeper areas of gravel) where fish will most likely be concentrated in spawning aggregations. Adjacent pools and associated woody debris, where adults will most likely be staging prior to spawning will also be sampled to the extent practicable. The occurrence of these catostomids will also be noted during biweekly diadromous fish surveys (Aquatics 03) occurring from early March through May 2004.

Global positioning system coordinates will be collected at all sampled locations.

III. Temporal Scope

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Supplemental fish community survey data will be collected from bypass reaches, riverine sections, tailraces, and tributary streams at various seasons of the year. For the purpose of this study plan spring will be defined as the months of March, April, or May and summer will be defined as the months of June, July, or August.

- a) Bypass reaches consisting of stream segments will be sampled once in summer while bypass reaches consisting of dewatered channels (isolated pools) will be sampled once in Spring and once in Summer.
- b) Riverine sections will be sampled once in spring and once in summer.
- c) Tailrace and downstream areas will be sampled once in spring and once in summer.
- d) Project influenced areas in tributary streams will be sampled once in summer.

Carolina and robust redhorse surveys will occur in spring at water temperatures ranging from 18 to 24°C. These temperatures occurred in the Catawba River below the Wylie Hydro beginning from approximately April 24 to May 17 and ending from June 5 to July 3 during the years from 1995 through 2002. These temperatures occurred in the Wateree River beginning from approximately April 18 to May 17 and ending from June 3 to July 3 during the years from 1996 through 2003. Sampling times in 2004 will depend on measured water temperatures.

Highfin carpsucker surveys will occur in late spring to early summer. Specific water temperature data during spawning are not available.

Final reporting will be completed by June, 2005.

IV. Sampling Plan

Fish communities, will be evaluated according to the following plan:

- a) Bypass reaches will be evaluated according to the following plan:
 - 1) The Catawba River below Lake James is a free flowing stream and will be sampled in summer by IBI procedures upstream of SR 1233, Burke County, NC.
 - 2) The Paddy Creek bypass is a small stream impacted by beaver impoundments. To the extent practicable the stream segment will be qualitatively sampled by backpack electrofishing techniques to determine fish species composition.
 - 3) The Mt. Island bypass includes a small unnamed stream on the east side of the bypass channel. To the extent practicable the stream segment will be qualitatively sampled by backpack electrofishing techniques to determine fish species composition.
 - 4) The Fishing Creek bypass consists of a stream segment and isolated pools. To the extent practicable the stream segment will be qualitatively sampled by backpack electrofishing techniques to determine fish species composition. The isolated pools will be sampled by rotenone in both spring and summer to determine fish species composition.
- b) Riverine reaches will be evaluated according to the following plan:
 - 1) Riverine reaches below Bridgewater and Wylie Hydros will not be sampled. Data from the NCWRC will be used to evaluate the reach below the Bridgewater Hydro and the M.S. thesis of Robert Andrew DeWitt (Clemson University, 1998) will provide data on the fish community below the Wylie Hydro.
 - 2) The riverine reach below the Oxford Hydro will be sampled at three locations: the immediate tailrace of the dam (west of Hwy 16), approximately two km downstream of the Oxford Hydro, and approximately 4.4 km downstream of the Oxford Hydro (in the vicinity of the Island Creek confluence where the river makes a bend to the south). Each location will be sampled in spring and summer by small boat electrofishing procedures; the only exception being that we will count, but not net, large species of little concern (e.g., longnose gar and common carp.).

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- 3) The riverine reach below the Wateree Hydro will be sampled at five locations: the immediate tailrace of the dam, in the vicinity of the gravel bar and shoal upstream of the Hwy 1 & 601 access area (approximately 7.5 km above Hwy 1 & 601), in the vicinity of the gravel bar just upstream of I-20 (approximately 4.0 km below Hwy 1 & 601), in the vicinity of Colonels Creek and the Hwy 76 & 378 bridge crossing, and just upstream of the confluence with the Congaree in the vicinity of the Little River tributary. Each location will be sampled in spring and summer by large boat electrofishing procedures; the only exception being that we will count, but not net, large species of little concern (e.g., longnose gar, gizzard shad, common carp, and grass carp).
- c) Tailrace areas and a downstream location, as specified below, will be evaluated in both spring and summer by large boat electrofishing procedures; the only exception being that we will count, but not net, large species of little concern (e.g., longnose gar and common carp). The specific locations to be sampled include:
 - 1) Rhodhiss Hydro tailrace and a location approximately 1.4 km downstream in Lake Hickory (upstream of the Hwy 321 bridge),
 - 2) Lookout Shoals Hydro tailrace and a location approximately 1.6 km downstream in Lake Norman (upstream of the Interstate 40 bridge),
 - 3) Cowans Ford Hydro tailrace and a location approximately 5.7 km downstream in Mt. Island Lake (upstream of the Johnson Creek confluence),
 - 4) Mountain Island Hydro tailrace (to include the lower end of the associated bypassed reach) and a location approximately 3.4 km downstream in Lake Wylie (upstream of the Hwy 27 bridge),
 - 5) Fishing Creek Hydro tailrace and a location approximately 0.8 km downstream in Great Falls Reservoir (upstream of the confluence with Fishing Creek),
 - 6) Great Falls/Dearborn Hydro tailrace and a location approximately 2.2 km downstream in Stumpy Pond (in the vicinity of the southernmost tip of Dearborn (a.k.a. Big) Island), and
 - 7) Rocky Creek/Cedar Creek Hydro tailrace and a location approximately 1.6 km downstream in Wateree Lake (in the vicinity of McDowell Island).
- d) Wadeable portions of major tributaries upstream of the project boundary will be sampled during summer with backpack electrofishing and IBI analysis methods. Additionally, any freshwater mussel shells, crayfish, and snails encountered during sampling will be collected to supplement information for Aquatics 06 and 07. The specific locations to be sampled include:
 - 1) Catawba River in the Lake James headwaters upstream of the 221 Bypass, McDowell County, NC. USGS data indicate that this area may be wadeable during dry summers but inaccessible during wet summers. High summer flows will necessitate waiting for a more reasonable flow regime, selection of a more upstream location, or, lastly, the abandonment of this location.
 - 2) Warriors Fork upstream of Bost Rd. (SR 1440), Burke County, NC. USGS data indicate that this area may be wadeable during dry summers but inaccessible during wet summers. High summer flows will necessitate waiting for a more reasonable flow regime, selection of a more upstream location, or, lastly, the abandonment of this location.
 - 3) Johns River upstream of Corpening Bridge Rd. (SR 1438), Burke County, NC. USGS data indicate that this area may be wadeable during dry summers but inaccessible during wet summers. High summer flows will necessitate waiting for a more reasonable flow regime, selection of a more upstream location, or, lastly, the abandonment of this location.
 - 4) Lower Little River in the area of Friendship Church Road (downstream of NC Hwy 16), Alexander County, NC. This region of the Lower Little River may be unwadeable due to depth and will be investigated. If an area can't be located downstream of Hwy 16 then we will use the latest NCDWQ stream IBI data.
 - 5) Balls Creek upstream of Brown Chapel Rd, Catawba County, NC.
 - 6) Long Creek in the area of Creston Circle (off of NC Hwy 27), Mecklenburg County, NC.
 - 7) Six Mile Creek upstream of SR 161 (off of SC Hwy 521) Lancaster County, SC.

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- 8) Waxhaw Creek upstream of SR 29, Lancaster County, SC.
- 9) Cane Creek upstream of SC Hwy Business 9, Lancaster County, SC.
- 10) Fishing Creek upstream of SR 77, Chester County, SC.
- 11) Big Wateree Creek upstream of SR 20, Fairfield County, SC.
- 12) Grannies Quarter Creek Upstream of SC Hwy 97, Kershaw County, SC.

Surveys for robust and Carolina redhorses will be conducted during spawning season at selected locations within the Catawba-Wateree project area such as shoals, gravel bars and adjacent pools. We will concentrate on gravel bars where other suckers have been found to spawn as robust redhorse in other river systems have similar habitat preferences. Though little is known about Carolina redhorse spawning, we will use similar logic to search for that species. Information from other river systems indicate that robust redhorse will typically be the last sucker species to spawn on a given gravel bar. Highfin carpsuckers surveys will occur during spawning season in the vicinity of deeper gravel bars and nearby habitats.

- a) Identified gravels bars below the Wylie Hydro include several in the vicinity of Fewell Island. This location will be sampled with small boat electrofishing procedures. We will attempt to net all catostomids but only retain the species of interest.
- b) Identified gravel bars below the Wateree Hydro include the lower end of the shoal that lies upstream of the Hwy 1 & 601 access area (approximately 7.5 km above Hwy 1 & 601) in Camden and the large mid-channel gravel bar just upstream of I-20 (approximately 4.0 km below Hwy 1 & 601). Each location will be sampled with large boat electrofishing procedures. We will attempt to net all catostomids but only retain the species of interest.
- c) To the extent practicable, sampling will be coordinated with personnel from the SCDNR and SCE&G and other members of the Robust Redhorse Conservation Committee.

V. Specific Sampling Procedures

- a) Backpack electrofishing and IBI analysis techniques – Methods employed will be those outlined in the North Carolina Division of Water Quality, Environmental Sciences Branch, Biological Assessment Unit's Stream Fish Community Assessment & Fish Tissue standard operating procedure (NCDENR 2001). These procedures have been used in the past by SCDNR biologists (Ahle and Jobsis 1996) and are still employed (Ron Ahle, SCDNR, personal communication). This procedure can be found at the following internet address: <http://www.esb.enr.state.nc.us/BAUwww/IBI%20Methods%202001.pdf> . Additional Duke Power Standard Operating Procedures will include FSH-1.00, Preparing to go to the field; FSH-151.01, Use of fisheries digital thermometers; FSH-163.00, Calibration and use of the YSI model 55 handheld dissolved oxygen system; FSH-251.02 Backpack or tote barge electrofishing; FSH-360.00, Fisheries data entry procedure; and 3210.1, Operating procedure for the Hydrolab water quality analyzers.

Additional specific details particular to our use of this sampling procedure include, but are not limited to, the use of two Smith-Root Model 15 C or D backpack electrofishing units with Honda generators, output waveform with a frequency of 60 Hz and a 6 ms pulse width, the use of two backpacks and six people per stream sample, two passes of a 183 m (600 ft) stream section, and measurement of temperature (°C), dissolved oxygen concentration (mg/L), and conductivity (µS/cm). All fish of appropriate length will be identified; examined for disease, fin erosion, lesions, and tumors; measured for total length (mm); and released alive (unless taxonomic identity is in question). Fish of questionable identity will be preserved in 10% formalin (Fisher Fresh) and returned to the laboratory for identification.

- b) Large boat electrofishing – Methods employed will be those outlined in the following Duke Power Standard Operating Procedures: FSH-1.00, Preparing to go to the field; FSH-151.01, Use of fisheries digital thermometers; FSH-163.00, Calibration and use of the YSI model 55 handheld

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dissolved oxygen system; FSH-250.03 Boat mounted electrofishing; and FSH-360.00, Fisheries data entry procedure.

Additional specific details particular to our use of this sampling procedure include, but are not limited to, the use of two Smith-Root Model SR18 18ft electrofishing boats with Honda generators and 5.0 GPP control boxes, 120DC pulses per second, two netters per boat, and measurement of temperature (°C) and dissolved oxygen concentration (mg/L). All representative habitats in the sample area will be shocked and a minimum of 1800 seconds (30 min) of pedal time expended per location. Attempts will be made to net all fish. Captured fish will be identified, measured for total length (mm), and released (unless taxonomic identity is in question). Fish of questionable identity will be preserved on ice or in 10% formalin (Fisher Fresh) and returned to the laboratory for identification.

- c) Small boat electrofishing - Methods employed will be those outlined in the following Duke Power Standard Operating Procedures: FSH-1.00, Preparing to go to the field; FSH-151.01, Use of fisheries digital thermometers; FSH-163.00, Calibration and use of the YSI model 55 handheld dissolved oxygen system; FSH-250.03 Boat mounted electrofishing; and FSH-360.00, Fisheries data entry procedure.

Additional specific details particular to our use of this sampling procedure include, but are not limited to, the use of two Duracraft 14ft electrofishing boats with Honda generators and 3.5 GPP control boxes, 120DC pulses per second, one netter per boat, and measurement of temperature (°C) and dissolved oxygen concentration (mg/L). All representative habitats in the sample area will be shocked and a minimum of 1800 seconds (30 min) of pedal time expended per area. Attempts will be made to net all fish. Captured fish will be identified, measured for total length (mm), and released (unless taxonomic identity is in question). Fish of questionable identity will be preserved on ice or in 10% formalin (Fisher Fresh) and returned to the laboratory for identification.

VI. Analysis Methods

Supplemental fish community survey data will be analyzed according to the method by which it was collected. All stream samples collected by IBI methods will be evaluated according to procedures outlined in North Carolina Division of Water Quality's Stream Fish Community Assessment & Fish Tissue standard operating procedure (NCDENR 2001). Results will be compared to historic data from the same stream location or a nearby location in the same stream. Large and small boat electrofishing data will be computed as Catch per Unit Effort (CPUE) standardized to one hour of effort and compared. Species lists will be generated for all sampling locations.

Survey data for robust and Carolina redhorses and highfin carpsuckers will be evaluated for the presence or absence of the representative species. Additionally, CPUE data will be calculated where appropriate.

VII. Summary Report

The results of this study will be used to evaluate the status of fish communities in areas affected by project operations. Additionally, the catostomid survey will be used to determine the presence of robust redhorse, Carolina redhorse, and highfin carpsuckers in the Catawba - Wateree project area. Comparisons will be made, where applicable, to fish community data from recent and historic collections (Cope 1870, Randall 1957, Anonymous 1961, Louder 1964(a) and (b), Fish 1968, Nash 1973, Nash et al. 1987, Crane et al. 1990, Nash et al. 1990, Menhinick 1991, Christie 1995, Menhinick and Braswell 1997, DeWitt 1998, and NCDENR 2003). A final report will be completed by June of 2005.

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VIII. Study Participants

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IX. List of Attachments

X. List of References

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