

Catawba-Wateree Hydroelectric Relicensing Process Draft Terrestrial Resource Committee Report

Terrestrial Resource Committee

1.0 Purpose

This Resource Committee Report is the bridge by which Catawba-Wateree (C-W) Relicensing study results are delivered to the relicensing stakeholder teams (NC and SC State Relicensing Teams and Advisory Groups) for their use and consideration as they negotiate to develop the Agreement-In-Principle (AIP). It has been prepared by the Catawba-Wateree Relicensing Terrestrial Resource Committee and supplements the detailed study reports available at:

<http://www.dukepower.com/comments/lakes/cw/library/plans/>.

The purpose of this report is to:

- 1) consolidate and summarize key study findings,
- 2) merge the findings of the six terrestrial resource-related studies into a coordinated resource assessment
- 3) identify relationships with other resource areas (e.g., aquatics and SMP), and
- 4) provide the Resource Committee's assessment of potential resource protection, mitigation and enhancement (PM&E) opportunities supported by study findings.

1.1 Terrestrial RC Members

The following individuals are active members of the terrestrial resource committee:

- Chris Goudreau-NCWRC
- Todd Ewing-NCWRC
- Dick Christie-SCDNR
- Ron Ahle-SCDNR
- Jeff Witt-SCDNR
- Tony Bebber-SCDPRT
- Mark Cantrell-USFWS
- Steve Johnson-Duke Power
- Gene Vaughan-Duke Power
- Scott Fletcher –Devine Tarbell & Associates, Inc.

2.0 Contents

This Terrestrial Resource Committee Report includes:

- For each study within this Resource Committee's overview:
 - A brief summary of each study's purpose(s)
 - A brief summary of the methods/procedure used for each study
 - A brief summary of the Key Findings for each study
- At the Resource Committee level, a coordinated resource assessment of any potential PM&E opportunities that are supported by the study findings.

3.0 Study Summary – Purpose, Methods and Findings

3.1 Wetland Mapping and Characterization (Terrestrial 01)

3.1.1 Study Purpose

This wetland study provides information on the location, areal extent, plant species composition and structure, classification and characterization, and relative condition of the existing wetland areas within the Project boundary and zone of operational influence. The purpose of this study is to: 1). Identify and map the wetland areas within the FERC Project boundaries and zone of

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operational influence which includes the area from upstream of Lake James downstream to the Wateree River/Congaree River confluence; 2). Classify and characterize wetland communities including plant species composition and structure; 3). Qualify the relationship between existing wetland distribution and structure with the current operating regime; 4). Assess the effects of project-related current and any proposed hydropower operations (e.g., fluctuations and drawdowns) on the mapped wetland areas and extrapolate to the body of water in question; and 5). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.1.2 Study Methodology

Based on preliminary wetland maps, a field survey was conducted to verify the wetland mapping within Project boundaries and the estimated zone of downstream and lateral project influence (i.e., out of bank flooding). Approximately 25 percent of the aerial photographs for each development were ground-truthed and sub-sampled. This 25 percent included a representation (e.g., different slopes, topographic situations, communities) of all wetland types found within the Project area. This 25 percent sample equates to approximately 345 wetlands surveyed. The surveyed wetlands also included areas recommended by the agencies such as water willow beds along Lake Wateree and Lake Wylie. Wetland areas identified on the original NWI maps will be verified and/or rectified through review of 2004 aerial photograph interpretation (e.g., revise maps based on recently converted wetland areas).

Using the preliminary wetland map, field assessments were conducted to classify and characterize the 25 percent sub-sets of the wetland communities. The assessment included percent cover, hydrologic indicators, and principle functions and values. Information collected followed the 1987 Army Corps of Engineers (USCOE) wetland delineation method (Environmental Laboratory 1987). To accomplish this field effort, vegetation transects and sample plots were established in representative areas associated with the mapped wetland locations. To accomplish this field effort, vegetation transects and sample plots were established in representative areas associated with the mapped wetland locations.

3.1.3 Key Findings and Results

- A field survey through use of vegetation transects and sample plots was conducted to verify the wetland mapping within Project boundaries and the estimated zone of downstream and lateral influence (i.e., out of bank flooding). 25-35 percent of the aerial photographs for each development was ground-truthed and sub-sampled. This sample included a representation (e.g., different slopes, topographic situations, communities) of all wetland types found within the Project area. This sample equates to approximately 410 wetlands surveyed.
- The wetland resources associated with the Project are representative of Southeastern reservoir and riverine environments in terms of wetland types (e.g., emergent and scrub-shrub), vegetation (e.g., sedges, water willow), juxtaposition (e.g., fringe and coves), and principal functions and values (e.g., wildlife habitat, shoreline stabilization).
- The total wetland acreage by Project development is as follows:

Development	Number of Wetlands	Acres
<i>Lake James</i>	40	234.0
<i>Bridgewater Regulated Reach</i>	59	251.0
<i>Catawba Bypassed Reach</i>	18	73.0
<i>Lake Rhodhiss</i>	36	158.0

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<i>Lake Hickory</i>	34	47.0
<i>Lookout Shoals Lake</i>	18	89.0
<i>Lake Norman</i>	221	635.0
<i>Mountain Island Lake</i>	140	506.0
<i>Lake Wylie</i>	356	737.0
<i>Wylie Regulated River Reach</i>	76	119.0
<i>Fishing Creek Lake</i>	167	283.0
<i>Great Falls Lake</i>	28	81.0
<i>Cedar Creek Lake</i>	22	39.0
<i>Wateree Lake</i>	911	1,876.0
<i>Wateree River</i>	797	69,715.0
Grand Total	2361	74,668.7

Lake James

- The range of water levels directly related to project operations in Lake James is such that the hydrology for the adjacent wetlands is not adversely affected. There are typically minimal lake level fluctuations during the growing season (i.e. May – October).

Catawba River Bypassed Reach

- This reach of old river channel was altered by project constructions and operations of Lake James. The reach generally appears to be an area of excellent wildlife habitat (several large beaver flowages) and good community vigor

Catawba River (Bridgewater Regulated River Reach)

- The majority of the wetlands, including the forested wetlands, receive seasonal to periodic inundation. Signs of the recent 2004 hurricane-related flooding were evident (e.g., silt and debris deposition), but the wetlands and other natural communities appeared to be generally healthy.

Lake Rhodhiss

- The range of water levels, in Lake Rhodhiss is such that the hydrology for the adjacent wetlands is not adversely affected. There are no planned lake level fluctuations during the growing season (i.e. May – October).
- Lake Rhodhiss target elevations are a constant 97 feet throughout the year. The most notable impact overall is sediment loading due to disturbances (not related to Project operations) upstream on the Lake Rhodhiss tributaries. This sediment has in some instances buried the emergent component of wetland resources. In some instances, sediment deposition has created areas of emergent and scrub-shrub wetlands, especially at tributary confluences.

Lake Hickory

- The range of water levels, (i.e. directly related to project operations) of Lake Hickory seems such that the hydrology for the reservoir-dependent wetlands is not adversely affected. Lake Hickory target elevations are a flat 97 feet throughout the year. There are no planned lake level fluctuations during the growing season (i.e. May – October).

Lookout Shoals Lake

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- The range of water levels, (i.e. directly related to project operations) of Lookout Shoals Lake does not significantly affect these wetlands or their functions. There are no planned lake level fluctuations during the growing season (i.e. May – October).

Lake Norman

- Several of the forested wetlands had been cleared and/or filled due to land development activities, particularly residential construction, unrelated to project operations.
- The range of water levels, (i.e. directly related to project operations) of Lake Norman is such that the hydrology for the adjacent wetlands is not adversely affected. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole.

Mountain Island Lake

- The range of water levels, (i.e. directly related to project operations) in Mountain Island Lake is such that the hydrology for the adjacent wetlands is not adversely affected during the growing season. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole.

Lake Wylie

- The range of water levels, (i.e. directly related to project operations) in Lake Wylie is such that the hydrology for the adjacent wetlands is not adversely affected during the growing season. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole. However, land use practices on adjacent private property has had a negative effect on wetland resources through large amounts of sedimentation associated with tributary streams being deposited in confluence wetland locations.
- The water willow beds located along the shoreline of Lake Wylie would be the most directly affected wetland resource by water level fluctuations during the growing season. Long duration changes in lake levels (higher or lower) would negatively affect this species. Higher water levels would inundate this resource and lower water levels would allow this resource to undergo desiccation and eliminate important fish and macroinvertebrate habitat. However, the water-willow beds present in Lake Wylie have developed under the current operating regime, and appear to be stable and vigorous in growth. Unless changes in water levels, during the growing season, occur through modified project operations it is not anticipated that any severe and negative impacts to this resource would occur.

Catawba River (Wylie Regulated Reach)

- The range of water levels, (i.e. directly related to project operations) in this section of the Catawba River is such that the hydrology for the adjacent wetlands is not adversely affected. There are neither excessive nor insufficient flow levels to greatly impact the structure or function of the identified and existing wetland communities as a whole.

Fishing Creek Reservoir

- The range of water levels, (i.e. directly related to project operations) in Fishing Creek is such that the hydrology for the adjacent wetlands is not adversely affected. There are neither excessive nor insufficient lake levels to greatly impact the structure or function of

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the wetland communities as a whole. There are no planned lake level fluctuations during the growing season (i.e. May – October). However in some instances, due to prolonged inundation during the growing season a limited number of scrub/shrub wetlands appear to be transitioning to emergent wetlands. The most obvious impact to wetland resources appears to be large amounts of trash and other rafted debris accumulated in cove areas.

- The water willow beds located along the shoreline of Fishing Creek Reservoir would be the most directly affected wetland resource by water level fluctuations during the growing season. Long duration changes in lake levels (higher or lower) would negatively affect this species. Higher water levels would inundate this resource and lower water levels would allow this resource to undergo desiccation and eliminate important fish and macroinvertebrate habitat. However, the water-willow beds present in Fishing Creek Reservoir have developed under the current operating regime, and appear to be stable and vigorous in growth. Unless changes in water levels, during the growing season, occur through modified project operations it is not anticipated that any severe and negative impacts to this resource would occur.

Great Falls-Dearborn Reservoir

- The range of water levels, (i.e. directly related to project operations) in Great Falls – Dearborn Reservoir is such that the hydrology for the adjacent wetlands is not adversely affected. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole.

Cedar Creek Reservoir

- The range of water levels, (i.e. directly related to project operations) in Cedar Creek Reservoir is such that the hydrology for the adjacent wetlands is not adversely affected. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole.
- The water willow beds located along the shoreline of Cedar Creek Reservoir would be the most directly affected wetland resource by water level fluctuations during the growing season. Long duration changes in lake levels (higher or lower) would negatively affect this species. Higher water levels would inundate this resource and lower water levels would allow this resource to undergo desiccation and eliminate important fish and macroinvertebrate habitat. However, the water-willow beds present in Cedar Creek Reservoir have developed under the current operating regime, and appear to be stable and vigorous in growth. Unless changes in water levels, during the growing season, occur through modified project operations it is not anticipated that any severe and negative impacts to this resource would occur.

Lake Wateree

- The range of water levels, (i.e. directly related to project operations) in Lake Wateree is such that the hydrology for the adjacent wetlands is not adversely affected. There are no planned lake level fluctuations during the growing season (i.e. May – October). There are neither excessive nor insufficient lake levels to greatly impact the structure or function of the wetland communities as a whole.
- The water willow beds located along the shoreline of Lake Wateree would be the most directly affected wetland resource by water level fluctuations during the growing season. Long duration changes in lake levels (higher or lower) would negatively affect this species. Higher water levels would inundate this resource and lower water levels would allow this

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resource to undergo desiccation and eliminate important fish and macroinvertebrate habitat. However, the water-willow beds present in Lake Wateree have developed under the current operating regime, and appear to be stable and vigorous in growth. Unless changes in water levels, during the growing season, occur through modified project operations it is not anticipated that any severe and negative impacts to this resource would occur.

Wateree River

- Generally the wetland communities were found to be vigorous in growth. In the forested wetlands, tree crowns in the canopy did not show any unusually extensive dead wood, nor were there large numbers of snags.
- The range of water levels, (i.e. directly related to project operations) in the Wateree River is such that the hydrology for the adjacent scrub-shrub and forested wetlands is not adversely affected. There are neither excessive nor insufficient flows in the river to impact the structure or function of the wetland communities.

High Value Wetlands

Ten areas have been selected as high value wetland areas. High value wetlands are wetlands that provide or contribute directly to the maintenance and support of exceptional value natural resources. These areas have been selected based on important wetland functions (e.g., wildlife habitat, nutrient retention, aquatic habitat, unique/heritage), wetland hydrology, wetland vegetation and interspersions, and value as wildlife habitat. These selected areas include: organize by river mile delineate and project boundary zone of influence

- **Wateree River Hardwood Bottomlands (RM 0.0-66.0)** – This wetland complex includes a vast area of several thousand acres in Kershaw, Richland and Sumter counties. The bottomlands, in the extreme lower portion of the Wateree River are contiguous with the Congaree National Park.
- **Great Falls Bypassed Reach-Long Bypass (RM-GF 1.0-2.0)** – These bottomland wetlands total approximately 60 acres and consist primarily of forested and wet shoal communities.
- **Cane Creek Confluence Area (RM 112.5)** – This wetland complex, including an upland buffer (405 acres), totals 527 acres near the confluence of Cane Creek. Areas of forested wetland (92 acres), scrub/shrub wetland (16 acres), emergent (9 acres), and unconsolidated bottom (4 acres) wetland types are included in this area.
- **Big Allison Creek Cove Area (RM 146.0)** – This wetland complex in the back of the Big Allison Creek Cove Area of Lake Wylie totals 71 acres, including an upland buffer (48 acres). Areas of forested (22 acres), scrub/shrub (4 acres) and emergent wetland types are included in this area.
- **Paw Creek Cove Area (RM 162.0)** – This wetland complex in the back of the Paw Creek Cove Area of Lake Wylie totals 118 acres, including an upland buffer (62 acres). Areas of forested (51 acres), scrub/shrub (3 acres) and emergent (2 acres) wetland types are included in this area.
- **Reed's Creek Cove Area (RM 199.1)** - This wetland area in the back of the Reed's Creek Cove Area of Lake Norman totals 21 acres, including an upland buffer (11 acres). Areas of forested (4 acres), scrub/shrub and emergent (6.0 acres) wetland types are included in this area.
- **John's River Area (RM 261.5)** – This wetland complex, including an upland buffer (59 acres), totals 124 acres near the confluence of the John's River and the Catawba River. Areas of forested (63 acres) and scrub/shrub (2 acres) wetland types are included in this area.

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- **Warrior Fork Area (RM 264.0)** – This wetland complex, including an upland buffer (97 acres), totals 115 acres near the confluence of the Warrior Fork and the Catawba river. Areas of forested wetland (18 acres) with some emergent and scrub/shrub inclusions are included in this area.
- **Catawba River Bypassed Reach (RM 283.3)** – This wetland area includes the majority of the Catawba River Bypassed Reach and totals 167 acres, including an upland buffer (117 acres). Areas of forested (43 acres) and scrub/shrub (7.0 acres) wetlands with some emergent wetland inclusions are included in this area.
- **Lake James/Catawba River Confluence Area (RM 294.5)** – This wetland complex, including an upland buffer (54 acres) totals 126 acres near the confluence of the Catawba River and Lake James. Areas of forested (59 acres) and scrub/shrub (14 acres) wetland types are included in this area.

3.2 Floodplain Vegetation Assessment (Terrestrial 02)

3.2.2 Study Purpose

This floodplain study provides information on the location and distribution, vegetative species composition and structure, classification, and relative condition of the existing floodplain communities within the zone of operational influence along the river reaches (including the Catawba Bypassed Reach, Catawba River below Bridgewater, the regulated reach below Lake Wylie and the Wateree River). The objectives of this botanical study are to: 1). Identify and delineate the floodplain areas within the zone of operational influence of the river reaches; 2). Classify and characterize the vegetative species composition and structure of the floodplain areas within the zone of operational influence of the river reaches; 3). Qualify and quantify the relationship between floodplain vegetation and existing hydroperiods; 4). Assess the effects of project-related current and any proposed hydropower operations (e.g., river fluctuations and stage changes) and connectivity on the designated floodplain areas; and 5). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.2.3 Study Methodology

Initial determination of overall floodplain areas was conducted through the use of existing information such as the FEMA 100-year floodplain maps, USGS 7.5 minute quadrangles, NWI maps, soil surveys for Burke, Alexander, Catawba, and Mecklenburg counties in North Carolina, and York, Lancaster, Kershaw, Chester, Fairfield, Richland, and Sumter counties in South Carolina, through the use of recent aerial photography, and through use of the relicensing RMS and Cheops model and entered into the GIS. Field surveys were conducted to more accurately delimit the zone of operational influence within the floodplain. These surveys assessed the zone of operational influence within Project boundaries and also the estimated zone of downstream and lateral influence (i.e., out of bank flooding).

The calibrated hydrodynamic computer model (River Modeling System, v4, Hauser, 2003) was used in the Wateree River floodplain to determine the extent, frequency, magnitude, and duration of inundation and the relation to project operations. This information was used along with the digital elevation model (DEM) based aerial photography (2 foot contours) and the GIS overlay maps. The impact analysis is presented in both graphic and tabular form

3.2.4 Key Findings and Results

(additional results to be provided upon completion of the floodplain GIS analysis)

- Wateree flows and project operations can affect floodplain inundation patterns both related to and independent of Congaree River flows

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- Congaree River flows of approximately 9,000 cfs are needed for overbank flooding in the lower 2.0 miles of the Wateree River
- The Southern Railroad line (RM 9.5) and the Seaboard Coast Railroad line (RM 15.0) bisect the Wateree floodplain. The elevated causeways associated with these railroads form a barrier to inundation and lateral sheet flows.

3.3 Great Falls Botanical Study (Terrestrial 03)

3.3.1 Study Purpose

This botanical study provides information on the vegetative composition and structure, and the distribution and relative condition of the existing vegetative communities associated with the Great Falls Bypass. The objectives of this botanical study are to: 1). Classify and characterize the existing vegetative composition and structure of the Bypass area; 2). Assess the effects of Project-related hydropower operations areas on the vegetative communities within the Bypass area; and 3). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.3.2 Study Methodology

Through the use of existing reports and other information such as the FEMA floodplain maps, USGS 7.5 minute quadrangles, NWI maps, soil surveys and aerial photography, the vegetative communities within the Bypass area were mapped and characterized. This information and the Project boundary information was transferred and digitized into the Geographic Information System (GIS) community maps were prepared.

Field assessments were conducted to determine the species composition, structure, and distribution of Bypass vegetative communities. The distribution and juxtaposition of vegetative communities were assessed. A determination of any inundation phenology (season inundated), duration (percentage of time inundated), magnitude (extent or depth in which inundated), and frequency (number of inundation times per unit time) was also conducted in this task with the objective of determining and predicting water surface elevations for the current discharges in association with the vegetation community requirements.

3.3.3 Key Findings and Results

- Plant species recorded from the Great Falls Bypassed Reaches include total of 300 recorded species based on 2001 and 2004 field surveys.
- 29% of the 300 species from the Bypassed Reaches were exotics or invasives (native species invading disturbed areas).
- Several species rarely seen outside of the Coastal Plain were found in the wetlands of the Bypassed Reaches. The shrub or small tree ti-ti—normally found in Coastal Plain organic bogs and bays—was scattered along woodland edges and on rock seepages along the lower reaches of both of the Bypassed Reaches. Cypress-swamp sedge, also normally found in Coastal Plain swamps, occurred in floodplain forests and in pools. American bulrush or three-square, previously known only from brackish marshes in the Outer Coastal Plain, was found in a small colony in the Long Bypassed Reach. Mosquito-fern and pond pennywort, both rare outside of the Outer Coastal Plain in South Carolina, were found in pools at both Bypassed Reaches.
- Nine plant communities were identified in an attempt to typify the vegetation of the Bypassed Reaches. These areas are listed by relative importance in terms of natural communities:
 - **Wet Natural Shoals.** This is a relatively high quality, natural “shoals” community of Piedmont rivers. Of the nine natural communities found in the study area, this is

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the most unique habitat type. It only occurs where a reliable supply of fast-flowing water is present most of the year. At the Bypassed Reaches, this community is widely scattered and not particularly well-developed. The indicator species for this vegetation type are water willow and rocky shoals spider lily.

- **Marshes.** Along the margins of pools and on the backwaters of beaver ponds, marshes are often present. This community has been created, in part, by the current conditions. However, this community is probably a natural component of this area. A variety of grasses, sedges, and herbaceous species are present here with no species that is dominant throughout the study area.
 - **Floodplain Forest.** The floodplain forests are generally typical of Piedmont floodplain and levee forest. This is a high quality, natural community in this area. Sweet gum and red maple were the dominant canopy trees. Other important canopy trees in the floodplain forest type were water oak, green ash, sycamore, river birch, and American elm. Giant cane and river oaks were the most dominant species in the shrub and herb layers, except where Chinese privet had invaded the forest.
 - **Bogs and Seepages.** A few small bogs and seepage areas were found along the margins of the shoals, generally draining water from the adjoining uplands into the shoals. This is a high quality, natural community found in this area.
 - **Shoals Forest.** An interesting, possibly unique, community has become established in the central portion of the shoals of the Long Bypassed Reach. This community was established by the current hydrologic conditions within the bypassed reach. Here, eastern red cedar is dominant on dry shoals and boulder piles. Because this community does not really look like a floodplain or an upland community, the author uses “Shoals Forest” to describe the type.
 - **Uplands.** A variety of upland community types occur along the margins of the study area. Because the major focus here was the wetland communities, the upland communities are grouped together as one type. Mixed hardwood, pine-mixed hardwood, and xeric pine Virginia pine and shortleaf pine stands are present within this type.
 - **Rocky Bluffs.** Several dry cliffs and bluffs at which outcrops of Great Falls granite are exposed occur along the margins of the study area. Here, Virginia pine thickets, sparkleberry glades, and open rock faces are found. Just west of the Short Bypassed Reach, below the Headworks, a scattered boulder pile with individual boulders up to 30 feet tall is found.
 - **Pools and Open Water.** The “Pools and Open Water” plant community is generally found in the slow-flowing or stagnant portions of the shoals. This community has been created by the current conditions of the bypassed reach. A few beaver ponds are present in the Bypassed Reaches, some of them quite large.
 - **Mud Flats and Shorelines.** The mud flats and shorelines are the areas where exotics and invasives attain greatest dominance. Again, this community is defined by the current conditions.
- The rocky shoals spider-lily (SC Listed National Concern) is the only listed plant species that was found in the study area, and it was found only at the Long Bypassed Reach. One new population is associated with wash-down from Landsford Canal.
 - The future of the Catawba River shoals community at Great Falls depends upon the quantity of water that regularly pours through its two channels. It does seem reasonable to assume that the periods of greatest stress to whitewater shoal plant species occurs from mid- to late summer when, for a short seasonal period, little or no water may pass through the shoals.

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3.4 RTE Species and Habitat Survey (Terrestrial 04)

3.4.1 Study Purpose

The objectives of this RTE plant and wildlife study are to: 1). Document the occurrence of RTE species within the Project area; 2). Assess the potential effects of Project-related current and proposed hydropower operations areas on the species and critical habitats; and 3). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.4.2 Study Methodology

Prepare list of known or potentially occurring rare, threatened, and endangered (RTE) species, based on existing information and literature, as well as the preferred/critical habitats, habitat suitability index models, and the specific breeding/flowering periods. Based on this list, an inventory and characterization was conducted of known and potentially occurring terrestrial RTE plant and wildlife populations and habitats. An impact analysis associated with current and any reasonable future water regimes on the RTE resources within the Project area was also conducted.

3.4.3 Key Findings and Results

Botanical: From this review, a list of about 150 state- and federally-listed plant species and their habitats was compiled. Searches were conducted for all species for which there was habitat within the Project study area.

- Two federally-listed species—Schweinitz’s sunflower and dwarf-flowered heartleaf; and twelve state-listed species were encountered. It was determined that only the sunflower (Mountain Island Bypassed Reach) and four state-listed species—shoals spider-lily (Landsford Canal, Great Falls Bypassed Reach), Canada moonseed, ovate-leaved catchfly, dwarf-flowered heartleaf (Lake James dam sites), and prairie trillium actually occurred within the boundaries of the Project study area. One population of each of these species was found in the Project study area.

Current population of Schweinitz’s sunflower has become established due project construction and operation and is currently the subject of a rare species management plan. This bypassed area is subject to periodic spills and flooding. This population has persisted through these events.

Reptiles and Amphibians: Thirteen species of RTE amphibians and reptiles potentially occurred within the Project area based on existing literature and database searches. Of these species, the bog turtle that is considered threatened by the federal government. The only listed species reported during the survey was the bog turtle (three individuals) trapped at the Bristol Creek area in Burke County northeast of Lake Rhodhiss and not in the project area. Six additional sites were also surveyed in 2004 and 2005, without success, for the gopher frog, mud turtle, and spotted turtle.

Birds: Twenty-two species of RTE birds occurred or potentially occur within the Project area. These include two federally endangered species, the wood stork and the red-cockaded woodpecker; and one federally threatened species, the bald eagle. There are also two North Carolina endangered species, the Bewick’s wren, and peregrine falcon, in addition to one state threatened species the bald eagle. There are five South Carolina state listed endangered species including the peregrine falcon, American swallow-tailed kite, bald eagle, red-cockaded woodpecker, and wood stork. South Carolina state listed threatened species include the least tern. Suitable habitat for most of these species is limited within the Project boundary or zone of influence. Several of the species are transitory in the project area during migration (e.g., peregrine falcon and least tern).

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- During the 2004 and 2005 surveys, nine of the listed species were documented. These observations include three species observed during the migratory periods (and not breeding period): brown creeper (NC Significantly Rare), hermit thrush (NC Significantly Rare), and sharp-shinned hawk (NC Significantly Rare); six species recorded during the breeding season: bald eagle, little blue heron (SC Species of Concern), Mississippi kite (SC Species of Concern), red-headed woodpecker (SC Species of Concern), Swainson's warbler (SC Species of Concern), and the wood stork (Federally endangered).
 - Bald eagles are frequently observed throughout the Project area and the Wateree River. A fairly large, seasonal concentration of both adults and juveniles use the Wateree Dam tailrace as foraging habitat. There are 16 known nest sites within the Project area or within two miles of the Project area. Based on a Spring 2005 survey, five of 16 sites were active in 2005.
 - The wood storks were observed foraging adjacent to the Wateree River, near the Wateree River and Congaree River confluence (i.e., one mile north of the Bates Bridge Access Area along Highway 601.

Mammals: Of 22 species of mammals or endemic subspecies of widely distributed mammal species that might occur in the Catawba-Wateree Project area that are listed by federal and state (North and South Carolina) management agencies, only the southeastern myotis, silver-haired bat, and hoary bat were documented in the Catawba-Wateree Project area.

- Four RTE bat species (eastern small-footed myotis, northern long-eared myotis, silver-haired bat, and hoary bat) likely occur in the Bridgewater Development, at least seasonally, although none have yet been documented from within or adjacent to the development boundaries. Sampling for these species have been conducted in suitable habitat in spring 2005. The eastern woodrat also might inhabit the Bridgewater Development, and ground truthing for its characteristic stick nests will be conducted in suitable habitat in spring 2005. Three RTE bat species (southeastern myotis, northern yellow bat, and Rafinesque's big-eared bat) likely occur at the southern end of the Catawba-Wateree Project area in the vicinity of the Wateree Development.

3.5 Breeding and Migratory Bird Survey (Terrestrial 05)

3.5.1 Study Purpose

This study provides baseline information on avian species composition and distribution, and habitat characteristics of the existing avian communities associated with the Project area. The objectives of this avian study are to: 1). Characterize the existing breeding, resident, and migratory bird communities of the Project area; 2). Assess any effects of current and any proposed Project-related hydropower operations on the breeding and migratory species and communities; and 3). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.5.2 Study Methodology

A list has been prepared, based on existing literature, of the avian species known or potentially occurring in the Project area, as well as their preferred habitats. Field surveys were conducted to determine the composition and distribution of avian species in the Project area. Surveys for avian resources were conducted through use of standard point counts along established transects. Each station was visited at least during the spring migration period (early March through late May); twice during the breeding period (early June through late June); and six times during the fall migration and wintering period (mid August through mid January). A total of 69 points surveyed during spring migration (2 surveys), breeding (2), fall migration (2), and wintering (2) from Wateree River to Lake James headwaters (move to methods). The current condition of avian communities was assessed through the habitat structure, species composition and distribution, use

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of specific habitats (e.g., Wateree tailrace), evidence of disturbance (e.g., fluctuation), and presence of representative or indicator species.

3.5.3 Key Findings and Results

- We observed 147 bird species during the surveys.
- We observed 22,905 birds with an average per visit of 2,863.
- The highest species abundance and richness was during the breeding, migratory, and wintering periods in the Piedmont/Coastal Plain bottomland and alluvial forests (i.e., Great Falls Bypassed Reach, Wateree River floodplain, Lake James alluvial area, Mountain Island alluvial area) and tailrace habitats (e.g. Wateree and Fishing Creek tailrace).
- Certain species of ground nesting and waterfowl species are found in the floodplain and wetland habitats. A list of representative species include the wood duck, mallard, prothonotary warbler, Swainson's warbler, black and white warbler, ovenbird, Louisiana waterthrush, common yellowthroat, eastern towhee, Carolina wren, song sparrow, and red-winged blackbird.
- Tailwater releases or rises in reservoir levels could have a negative effect during nesting, breeding/egg laying, and fledging periods on local ground, shrub and low cavity nesting bird species including waterfowl. The nesting period for these typical ground, shrub and low cavity nesting species and is from February to April.
- The Wateree tailrace is an important foraging habitat during generation. Observations made during the 2005 avian study, show that both the great blue heron and great egret utilize the tailrace area as foraging habitat but do not utilize this habitat during periods of no generation.

3.6 Great Falls Bypass Wildlife Survey (Terrestrial 06)

3.6.1 Study Purpose

This study provides baseline information on the species composition and distribution, habitat characteristics, and relative condition of the existing wildlife communities associated with the Great Falls bypassed reach. The objectives of this wildlife study are to: 1). Characterize through existing information and survey the existing wildlife communities of the Great Falls bypass; 2). Assess the effects of Project-related hydropower operations areas on these wildlife communities; and 3). Provide information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

3.6.2 Study Methodology

Through of existing information wildlife habitats within the bypass area were mapped. This information and the Project boundary information was transferred and digitized into the Geographic Information System (GIS) and community maps were prepared. Based on existing literature and discussions with area SCDNR/SCPRT biologists, a list of the wildlife species known or potentially occurring in or near the Great Falls Bypass area was prepared. Field surveys, using standard survey methodologies (e.g., point counts for birds) were conducted for birds, mammals, and reptiles/amphibians to determine the composition and distribution of wildlife species in the bypass area. The effects of Project operations, both the current and any reasonable future water regimes, on the wildlife resources within the bypassed area were also determined.

3.6.3 Key Findings and Results

Herpetiles: Area sampled 3 to 6 days per month from March through June 2004 and then 2 additional days during September. 16 anurans (frogs), 17 salamanders, 8 turtles, 9 lizards, and 32

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snake species potentially occurred within the study area. 12 anurans, 6 salamander, 7 turtles, 6 lizards, and 11 snake species documented in field. In general, species requiring wetlands for breeding or for foraging were relatively abundant within the study area. These species include many amphibians such as marbled salamanders, Fowler's toads, green treefrogs and leopard frogs. Vernal pool areas, which are high quality amphibian breeding habitat, are common throughout the survey area. No RTE species documented during field survey.

Birds: Area surveyed twice during the breeding season, twice during both spring and fall migratory periods, and once during the winter season. Bird species richness and abundance is similar to other regional southeastern areas. No RTE bird species were documented in the Bypassed Reaches. The unusual Shoals Forest had one of the lowest species richness.. The habitat combination is located mainly within the Great Falls Bypassed Reach. This habitat combination also had one of the lowest species abundance average.

Mammals: The mammalian fauna of the Great Falls-Dearborn Development is typical of that observed throughout the Piedmont physiographic province of the Carolinas. Most of these are common species. Most species were in the upland forests adjacent to the river levee. The fewest species were found in the rocky river bottom habitat, although this habitat appeared to be important for foraging bats and larger mammals. No RTE species were documented within the Great Falls Bypassed Reach.

4.0 Resource Assessment

4.1 Wetland Mapping and Characterization (Terrestrial 01)

4.1.1 Overall Condition of the Resource

In this section, the relative condition and any trends of the resource are provided. The status of the resource as well as the stability of the resource is discussed.

The wetland resources associated with the Project are representative of Southeastern reservoir and riverine environments in terms of wetland types (e.g., scrub/shrub), vegetation (e.g., sedges, woolgrass, water willow), juxtaposition (e.g., fringe and coves), and principal functions and values (e.g., wildlife habitat, shoreline stabilization). In the reservoir environments, scrub/shrub, forested and emergent wetlands are found in shoreline fringe and cove areas and have principal functions such as shoreline stabilization, aquatic habitat, wildlife habitat, and sediment retention. The riverine associated wetlands are commonly bottomland hardwood communities (e.g., red maple, green ash, sycamore, and river birch with scrub and emergent components. There have been losses of riparian wetlands due to project construction and operation. However, several reservoirs (Lake James, Lake Rhodhiss, Lake Wylie) and riverine segments (Wateree River, Johns River) have associated high quality or exemplary wetlands. These wetlands have been listed as high quality due to criteria such as principal functions and values, size, location, and reference. Certain wetland types (i.e., water willow beds and Coastal Plain bottomland forest are only found in specific segments of the project area.

There are periods when the wetland functions associated with the reservoir environments are affected by lower lake levels and lack of wetland inundation. These lower lake levels can limit the extent of specific wetland plant species such as water arum, lizardtail, pickerelweed, and arrowhead.

The proposed target lake levels for each reservoir will minimize water level fluctuations and thus, benefit the wetland communities by minimizing the loss of wetland functions. However, the

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long-term stability of these wetland communities is threatened in some areas by continued development, sedimentation, and other issues such as trash accumulation.

4.1.2 Assessment of Resource Improvement Options

This section includes a list of resource improvement options that address the preceding problems/causes as directly as possible. These resource improvement options represent a menu of initiatives for consideration by the State Relicensing Teams and the Regional Advisory Groups as they negotiate the Agree-in-Principle (AIP). It is not necessary or expected for all of these initiatives to be included in the AIP. Also, other initiatives in combination with or in lieu of the options listed in this report may be included in the AIP.

The following table summarizes the proposed resource improvement options associated with the Terrestrial 01 report.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
1	In association with the proposed Normal Target Lake Elevation, drawdown each reservoir an additional one to three feet every fourth year during the growing season (reservoir specific)	0	Per CHEOPS
2	From the recommended high value wetland list, purchase and preserve specific wetland parcels and associated upland buffers	To Be Negotiated	To Be Determined
3	Maintain higher reservoir levels during growing season to enhance fringe wetlands (e.g. 98 feet) (move to No. 2)	0	Per CHEOPS
4	Protect, enhance and restore specific wetlands including riverine areas	To Be Negotiated	To Be Determined
6	Monitor and track trends in wetland development in relation to project operation and within the project boundary	To Be Negotiated	To Be Determined

4.2 Floodplain Vegetation (Terrestrial 02)

4.2.1 Overall Condition of the Resource

In this section, the relative condition and any trends of the resource are provided. The status of the resource as well as the stability of the resource is discussed.

TO BE PROVIDED IN ASSOCIATION WITH THE GIS ANALYSIS

4.2.2 Assessment of Resource Improvement Options

This section includes a list of resource improvement options that address the preceding problems/causes as directly as possible.

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The following table is preliminary since a portion of the floodplain analysis is not yet complete. This table summarizes the proposed resource improvement options associated with the Terrestrial 02 report.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
7	Alternative flow operations for enhancing/restoring the Wateree River floodplain hydrology and functions	0	Per CHEOPS
8	Alternative operations to reduce lower Wateree River bank erosion	0	Per CHEOPS
10	Provide floodplain habitat enhancement and restoration measures (non-operational) at specific areas along the lower Wateree River	To Be Negotiated	To Be Determined

4.3 Great Falls Botanical Study (Terrestrial 03)

4.3.1 Overall Condition of the Resource

The botanical communities within the Bypassed Reaches are diverse and in dynamic equilibrium. The current bypassed reach conditions do not reflect a “representative” shoal habitat due to the dewatered conditions during certain times of the year. The Wet Shoals natural community, which is inhabited by water willow and rocky shoals spider lily, undergoes periods of hydrologic stress (mid to late summer). This stress is a factor of lack of hydrology during that period. Dewatering of the Bypassed Reaches has also resulted in invasive and exotic wetland flora and several unique communities such as the shoals forest and open water pools. The long-term stability of the Wet Shoals community, will continue to decline due to the spread of invasive and exotic plant species and the associated dewatered condition.

4.3.2 Assessment of Resource Improvement Options

The following table summarizes the proposed resource improvement options associated with the Terrestrial 03 report. Additional information concerning the options is discussed below the table.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
11	Initiate a seasonally variable flow regime through the shoals	To Be Provided	Per CHEOPS
12	Initiate Wet Shoals habitat research and restoration of the Rocky shoals spider lily and other Wet Shoals associate species	\$40,000 estimate	N/A
13	Restore habitat alterations (e.g., Camp Creek channel restoration)	To Be Negotiated	To Be Determined
14	Initiate vegetation	To Be Negotiated	To Be Negotiated

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	management plan to control invasive and exotic plants		
15	Provide riparian corridor protection along the long and short Bypassed Reaches	To Be Negotiated	To Be Determined

4.4 RTE Species and Habitat (Terrestrial 04)

4.4.1 Overall Condition of the Resource

RTE species, by their definition, are a scarce resource. For most of the species, their status is declining due to regional habitat loss and other factors. Several species such as the bald eagle and Schweinitz’s sunflower are increasing in number due to successful protection programs, management programs, and habitat restoration.

The most common RTE species documented in the project area is the bald eagle. This raptor is found nesting on several reservoirs such as Lake James, Lake Wylie, and Lake Wateree. The species is also nesting along the Wateree River and commonly forages in relatively large numbers within/along the Wateree hydro tailrace. The wood stork is found in the Coastal Plain area of South Carolina in the vicinity of the Wateree River. No storks were documented during the relicensing studies, although they were observed foraging along the adjacent Highway 601 near Bates Bridge.

The Wet Shoals community at the Great Falls Bypassed Reach (one of two areas in the project area, which is inhabited by the rocky shoals spider lily, undergoes periods of hydrologic stress (mid to late summer). This stress is a factor of lack of hydrology during that period. Dewatering of the Bypassed Reaches has also resulted in invasive and exotic wetland flora and several unique communities such as the shoals forest and open water pools. The remaining population of spider lilies within the project area, Landsford Canal State Park, can benefit from flow regime modification. Dwarf-flowered heartleaf population near the Lake James dam sites appears to be stable and can benefit from a specific management plan.

4.4.2 Assessment of Resource Improvement Options

The following table summarizes the proposed resource improvement options associated with the Terrestrial 04 report. Additional information concerning the options is discussed below the table.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
16	Duke will continue the management and protection plan concerning the Schweinitz’s sunflower at the Mountain Island Bypassed Reach	0	0
17	Initiate a dwarf-flowered heartleaf protection and management plan for the recently documented populations near the Lake James dams	To Be Negotiated	To Be Determined

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18	Initiate a seasonally variable flow regime through the Great Falls Bypassed Reach for the Rocky Shoals Spider Lily.	Cost of flow delivery devices to be estimated	Annual O&M to be estimated. Lost generation per CHEOPS
19	Initiate a continuous minimum flow through Landsford Canal and a seasonally variable flow for the Rocky Shoals Spider Lily.	Cost of flow delivery devices to be estimated	Annual O&M to be estimated. Lost generation per CHEOPS
20	Initiate a conservation easement or modify the project boundary at the Wateree tailrace to protect valuable wading bird, bald eagle, and songbird habitat	To Be Negotiated	To Be Determined
22	Acquire and manage the XX acre Bristol Creek wetland property for the bog turtle.	To Be Negotiated	To Be Determined
23	Initiate a bald eagle nest site protection and management plan for all bald eagle nest sites within the Project Boundary	To Be Negotiated	To Be Determined
24	Support USFWS Whooping crane management plan	To Be Negotiated	To Be Determined
25	Initiate alternative flow operations for enhancing the Wateree River floodplain foraging habitat for the wood stork	To Be Negotiated	Per CHEOPS

NOTE: *Allowing a minimum monthly flow of water through the Great Falls Long Bypassed Reach during the growing season may allow bulbs of the Rocky shoals spider-lily washed down from Landsford Canal to persist and thrive at Great Falls long bypassed reach. A continuous minimum flow at the Great Falls long bypassed reach will allow for enhancement and possible restoration of the spider-lily.

4.5 Bird Breeding and Migratory Survey (Terrestrial 05)

4.5.1 Overall Condition of the Resource

The avian communities within the project are diverse and appear stable. The species and species abundance documented during the study is representative of regional and southeastern communities. Several bird species are experiencing decline. These declines are especially noticeable in Neotropical Migrants such as warblers, thrushes, and vireos. These birds are primarily associated with floodplains, bottomlands and riparian corridors within the study area.

Large contiguous tracts of forest land, such as the Wateree floodplain, provides excellent avian breeding, migratory stop-over, and wintering habitat. The Wateree tailrace provides a high value foraging habitat for a variety of wading and neotropical species. Localized impacts to certain bird

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groups (ground nesting) occur periodically due to operational discharges during high water events.

4.5.2 Assessment of Resource Improvement Options

The following table summarizes the proposed resource improvement options associated with the Terrestrial 05 report. Additional information concerning the options is discussed below the table.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
26	Initiate purchase and protection of important bird habitats such as bottomlands, tailraces, and riparian corridors	To Be Negotiated	To Be Determined
27	In association with the proposed Normal Target Lake Elevation, drawdown each reservoir an additional one to three feet every fourth year during the growing	0	Per CHEOPS
28	Initiate bird habitat enhancement measures. These enhancements include nest box installation in the bottomlands and riparian areas (e.g., wood ducks, prothonotary warbler, screech owl)	To Be Negotiated	To Be Determined
29	Initiate Wateree River flow enhancements to benefit bird habitat (i.e., Wateree tailrace, Mickle Island etc)	To Be Negotiated	To Be Determined
30	Initiate native wetland and riparian plant enhancement and management program Bird habitat enhancements include wetland plantings and management	To Be Negotiated	To Be Determined
31	Establish wildlife viewing areas at specific sites such as Wateree River tailrace, Great Falls Bypassed Reach, Cane Creek, Warriors Fork, Johns River, and Catawba Bypassed Reach)	To Be Negotiated	To Be Determined
32	Continue Duke Power management of the Lake Norman Heron Island heron rookery	To Be Negotiated	To Be Determined

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4.6 Great Falls Wildlife Survey (Terrestrial 06)

4.6.1 Overall Condition of the Resource

Based on the 2004-2005 field surveys, the wildlife resources associated with the Great Falls Bypassed Reaches are typical (species richness and abundance) of southeastern and lower SC Piedmont habitats. It is expected that the wildlife communities would remain relatively stable unless the area undergoes site disturbance or other habitat altering change.

4.6.2 Assessment of Resource Improvement Options

This section includes a list of resource improvement options that address the preceding problems/causes as directly as possible.

The following table summarizes the proposed resource improvement options associated with the Terrestrial 06 report.

Option No.	Option Description	Initial Cost Estimate	Annual Cost Estimate
33	Initiate a seasonally variable flow regime through the Great Falls Bypassed Reach. This option will provide specific hydrologic habitat conditions for certain amphibians, reptiles, birds and mammals	Cost of flow delivery devices to be estimated	Annual O&M to be estimated. Generation loss per CHEOPS
34	Initiate specific wetland and associated riparian corridor purchase and protection in the Great Falls Bypassed Reach area	To Be Negotiated	To Be Determined