

RECYCLED WATER

Biennial Biological Monitoring Report

2014 - 2015

CYPRESS CONSERVANCY

WHOOPING CRANE CONSERVANCY

WETLAND PROJECTS

Hilton Head Public Service District

Hilton Head Island, South Carolina

MARCH 2016



Ballantine

ENVIRONMENTAL RESOURCES

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1. Introduction

This Biennial Report analyzes results from biological monitoring of Recycled Water (RW) projects in the *Cypress Conservancy* wetland (“Cypress”) and *Whooping Crane Conservancy* (“Whooping Crane”) wetlands in the Hilton Head Plantation community, Hilton Head Island, South Carolina, during the two-year period 2014-2015. This sustainable water reuse program has been in operation for the Hilton Head Public Service District since 1986, and was first monitored under the SC Department of Health and Environmental Control National Pollution Elimination Discharge Permit (SCDHEC/NPDES) in 1998, the Baseline year in this report. RW was called “Reclaimed Water” in prior monitoring reports. RW (advanced-treated domestic dechlorinated effluent) is processed and distributed by Hilton Head Public Service District in two, large freshwater wetlands -- Cypress Conservancy and Whooping Crane Conservancy -- to (1) provide additional uptake and filtration of water and nutrients; (2) eliminate discharges to other waters, such as tidal streams; and (3) enhance the natural hydrology and ecological conditions of the receiving wetlands.

Since the Baseline Year, Ballantine Environmental Resources (BER) has conducted scientific measurement and reporting for the “Growing Season” (February 15-November 15) and “Dormant Season” (November 16-February 14). In compliance with the SCDHEC NPDES permit for this RW project, our monitoring has reported data for the overall ecological condition, hydrology, vegetation, wildlife, and any other factors that impact the RW Project. The Conclusions and Recommendations assess the status of the wetlands and provide recommendations for operational modifications, if applicable.

2. Site Description

2.1. HILTON HEAD PLANTATION RECYCLED WATER PROJECTS

The RW projects are located on northern Hilton Head Island, in southern Beaufort County, South Carolina. Both the Cypress and Whooping Crane wetlands are found within a 1.2 square mile area in the central-eastern section of Hilton Head Plantation, a nearly 4,000 acre residential community developed in 1972 (Figure 2-1).

2.2. CYPRESS CONSERVANCY

Cypress Conservancy is the last large stand of pond cypress and bald cypress trees on Hilton Head Island. It is part of the watershed draining into Skull Creek, a tidal waterway between Hilton Head Island and Pinckney Island National Wildlife Refuge. This freshwater wetland consists of two cells encompassing 50.8 acres (Figure 2-2). The western cell (35.8 acres) is a mixed forested, intermittently flooded system that contains the bottomland hardwoods, bald and pond cypress trees. The average elevation is 14 feet above mean sea level (MSL). RW is discharged into this project wetland. Here, one inch of water equals 1 million gallons. The eastern cell (15 acres) receives no RW. This broad-leaved forested, saturated system has an average elevation of 15 feet MSL, and supports mixed pines, bottomland hardwoods, a declining stand of bald and pond cypress trees, and an active winter burrow colony for alligators.

2.3. WHOOPING CRANE CONSERVANCY

Whooping Crane (Figure 2-3), formerly called “Whooping Crane Pond,” is the island’s largest and most ancient wetland basin (formed in the Pleistocene Epoch— 10,000 to 1.8 million years ago). Its water drains into Port Royal Sound and Broad Creek, via Hilton Head Plantation’s storm-water retention/detention system. Port Royal Sound is a large ocean estuary. Broad Creek is an incompletely drained tidal inlet, adjoining Calibogue Sound. Whooping Crane is a palustrine, forested (old-growth and second-growth hardwoods) and emergent, permanently flooded system. Its average elevation is 13 feet MSL. Whooping Crane’s 68-acre northern cell receives recycled water. In this wetland, one inch of water equals 1.85 million gallons of water. The southern cell (47.0 acres) is a palustrine, forested (second growth hardwood) and emergent, seasonally flooded system. An average of 12.5 feet MSL, this cell does not currently receive regular RW flow. This area is comprised of bottomland hardwoods and intermittent shrub-growth. It is also an active winter burrow complex for alligators. This cell serves as an overflow basin during high stormwater events, such as occurred in October 2015.

Figure 2-1.
Vicinity Map
Cypress Conservancy & Whooping Crane Conservancy
Hilton Head Island, South Carolina

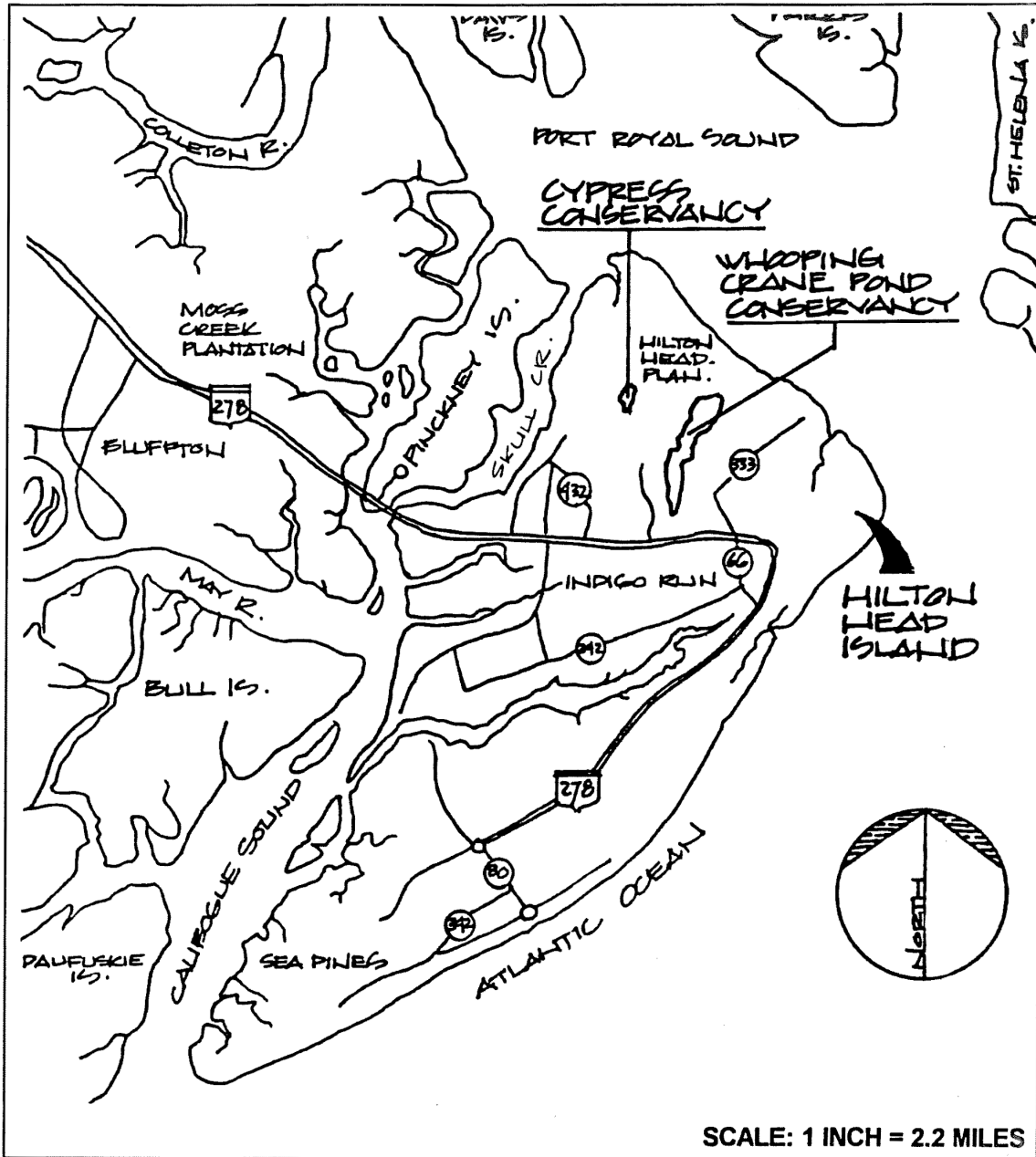


Figure 2-2.
Site Map: Cypress Conservancy

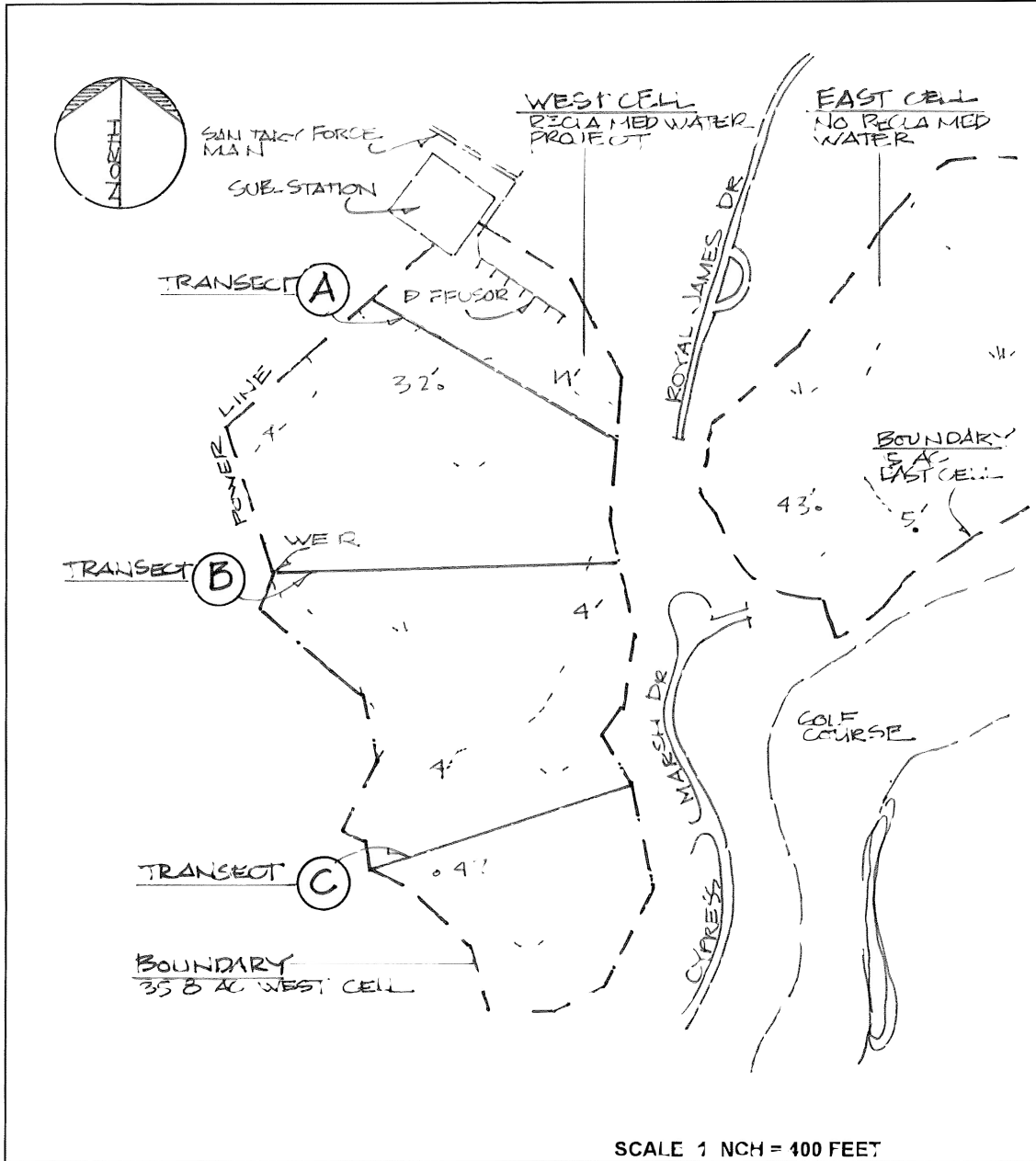
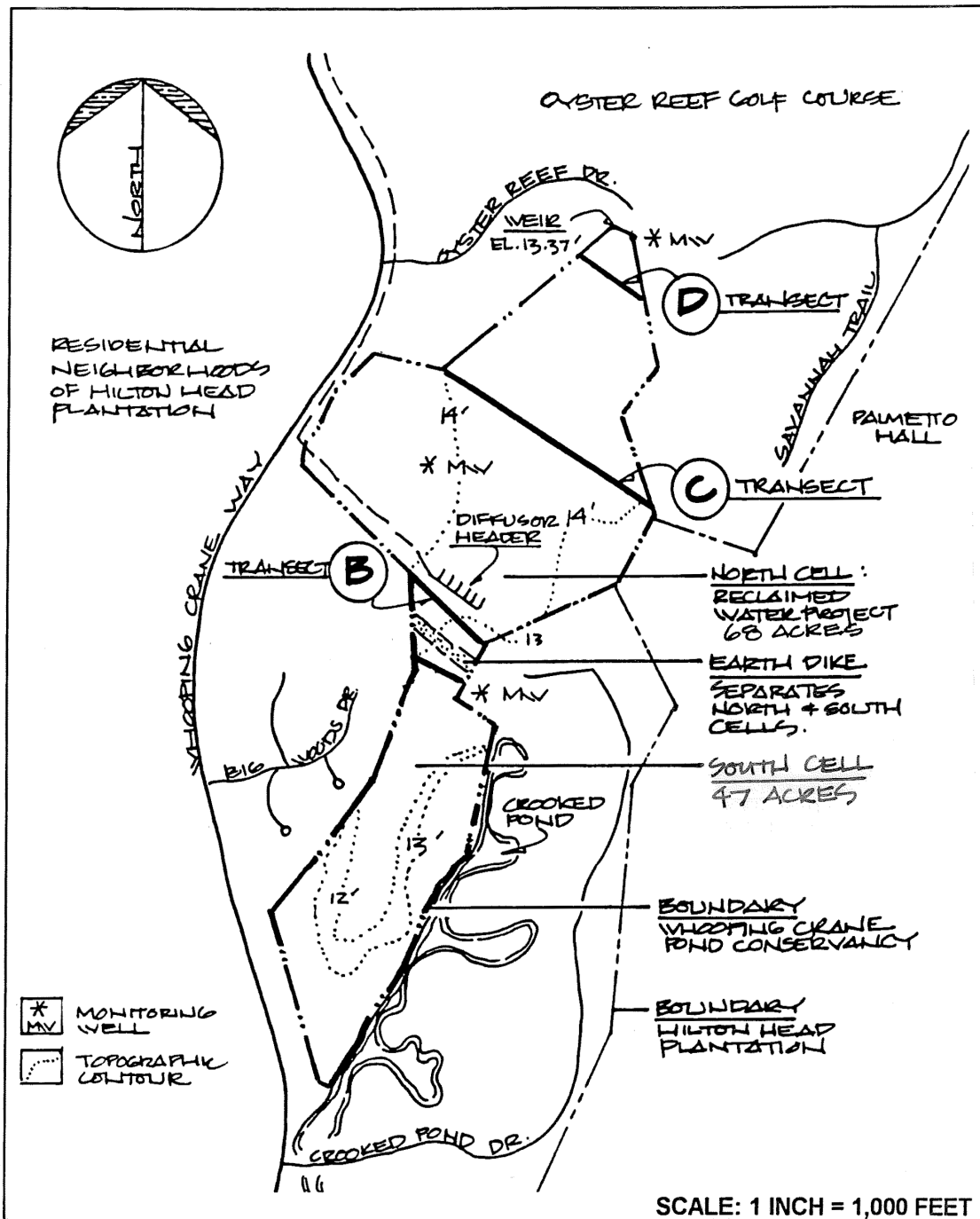


Figure 2-3.
 Site Map: Whooping Crane Conservancy



3. Methodology

3.1. MONITORING SCHEDULE

As stipulated by the NPDES Permit No.SC0046191, amended October 24, 2005), BER monitored the project wetlands semiannually in 2014 and 2015. We monitored in the first week of May (“growing season”) and the third week of November (“dormant season”) of 2014 and 2015.

3.2. SCIENTIFIC PROTOCOL

Since the Baseline we have used the line-intercept method of data collection. In the Cypress and Whooping Crane projects we maintain three line-transects spanning the width of each wetland. Permanent sampling quadrats are established at equidistant points (intercepts) on the transects. Figures 2-2 and 2-3 show the location of monitoring transects in the project wetlands.

Our collected field data includes:

- **Water depth** measured at each quadrat.
- **Vegetation** measured at each quadrat. We recorded the diversity, dominance, and density of canopy species in cen-acre (1/100 acre) quadrats. In the shrub and ground-cover stratum (“shrub/ground-cover”), we measured species diversity, dominance, and density in mil-acre (1/1,000 acre) quadrats.
- **Wildlife:** We identified macro-invertebrates in quadrats and along transects. We recorded fish species identified visually or by netting in appropriate habitats at stations. We also identified indicator vertebrates visually or physically (by vocalizations, “sign,” tracks, or trails).
- **Significant impacts:** We documented wetland impacts from natural causes. Such impacts include drought, tropical and other storms, plant disease, invasive species, and wildlife activity. Man-induced impacts (e.g., trash dumping, mowing, vandalism) were also noted.

A detailed description of monitoring methods and calculations is provided in the 1996 and 1997 Annual Biological Monitoring Reports for the Cypress and Whooping Crane recycled water projects.

3.3. REPORTS

The current NPDES permit requires biennial reports. However, as needed by Hilton Head PSD, BER provides updates, memos, and outreach publications about the two recycled water projects. This current *Biennial Biological Monitoring Report* compares data collected in the growing and dormant seasons of 2014-2015 with conditions in the 1998 Baseline. Results are organized according to NPDES Parameters. We submit all reports to the Hilton Head PSD, which forwards the information to SCDHEC and other stakeholders.

4. Monitoring Results by NPDES Parameters 2014-2015

Hilton Head Plantation RW Project
Hilton Head Island, SC
NPDES Permit No. SC 0046191 (10-24-05)
SCDHEC Monitoring Parameters
Cypress Conservancy and Whooping Crane Conservancy Wetlands
2014-2015 Conditions Compared with the Baseline Year 1998

Parameter A. Hydroperiod

Monitoring data in this report covers the 2-year period from January 1, 2014 through December 31, 2015. Monitoring findings are compared to conditions in the baseline year 1998. Monitoring protocol complied with methodology required by the SCDHEC in the NPDES Permit No. SC0046191, amended October 24, 2005. The totals of RW loading and rainfall were compiled by Hilton Head Public Service District.

A-1. Total Loading. RW and rain compared to the Baseline and 40-year average rainfall (Hydroperiod). In 2014-2015 Hilton Head Public Service District recorded 124 inches of rainfall, or 62.4 inches per annum over the two year span. This amount of rain was 27% higher than the hydroperiod 50-year average of 51.4 inches inches annually.

A-2. Recycled Water Loading. Water loading for this period averaged 62.3 additional inches per year in the wetlands. The supplement of RW enhanced wetland biology and also led to higher than average water levels in the wetlands. Above-average rainfall in October 2015, associated with a tropical storm, added additional rain into the wetlands.

A-3. Depth of Surface Water. We sampled water depth in equidistant monitoring stations in the wetlands. Averaged between the growing and dormant season, the depth of

surface water was 9 inches in Cypress Conservancy and 18 inches in Whooping Crane Conservancy. The Whooping Crane Conservancy is the lowest elevation of the two wetlands. Hence, it is the deepest and most biologically active wetland.

A-4. Flooding observed. During monitoring in November 2015, following a recent tropical storm which caused significant flooding in central and coastal South Carolina, we observed surface water flowing over the causeway-trail separating the two cells of this wetland, and pouring into the large southern basin of Whooping Crane Conservancy. This moderate flooding was associated with heavy rain in the October storm. What is unique about this event is that the Whooping Crane basin was large enough to accept flood water and store it without overflowing to adjacent upland and properties. But in our 40 years experience in this wetland we have never seen floodwater flowing into this wetland at such a rapid pace.

A-5. Distribution of Water in the Wetlands. Surface water was distributed through 100 percent of Whooping Crane Conservancy and Cypress Conservancy. This prevalence of stormwater flooding in the wetlands has not been seen for two decades.

Parameter B. Canopy Species

B-1. Basal Area of Trees. The basal area of permanently tagged trees increased significantly in each wetland. Basal area in Cypress—a mix of swamp blackgum and specimen bald and pond cypress trees, has increased by 177% since the Baseline. In the deeper and more mature Whooping Crane project total basal area of dominant hardwoods has increased 90%. Swamp blackgum is the predominant species—virtually 100% cover—swamp blackgum trees continued to increase basal area 80% since the Baseline. In each wetland, sustainable growth has occurred with minimal mortality of trees from weather or disease.

B-2. Density of Canopy Trees. The average density of mature trees has remained stable for the past two decades in Cypress Conservancy—an estimated 1,420 trees in the monitoring field since the Baseline. The average mortality rate has been less than 3%—always in pines or sapling hardwoods, following windstorms or drought.

In the Whooping Crane Conservancy the mortality rate is even lower. We observed NO mortality of native dominant hardwoods, or successional species such as red maple. A small percent of density loss occurred in clustered invasive pines and invasive Chinese tallow-trees growing on the periphery of the Conservancy. This decline was not a negative impact in this mature old-growth forest.

B-3. Importance Value of Canopy Species. Importance value is the sum of dominance, density, frequency and wildlife habitat opportunity for species in an ecological community. This 100-point valuation is useful for tracking maturation or degradation of species in the RW wetlands. Cypress ranks a 65-point assessment because it is a maturing community and suffers few impacts other than drought, tree-fall and the regular dry-down requirement, which has led to marked windfall of semi-mature trees. Whooping Crane ranks 90 points because it is at peak maturity and biodiversity. It is

significantly resilient against natural impacts such as drought, flood, and wind storms, and has no dry-down restriction.



Specimen Bald Cypress in Cypress Conservancy has withstood fire, drought and dry-down.

Parameter C. Shrub and Groundcover

C-1. Species Diversity. The diversity of species did not change in this recent period of biennial monitoring. Whooping Crane sustained 10 long-lived shrub and groundcover species on the perimeter of the wetlands and in shoals. Cypress, the shallower wetland, supported an average 9 dominant species in the monitoring field. Whooping Crane Conservancy, a more diverse landscape, supported 13 species of shrubs and groundcover. The species count changed less than 10 percent, per wetland, since the Baseline. The most common and dense species in the wetlands were: duckweed, marsh pennywort, mixed sedges, and lizard's tail.

C-2. Total Cover of Dominant Species. Total cover of the water and/or ground surface was 65% in Cypress and 85% in Whooping Crane. The different cover totals reflect the distinct landscapes in size, topography and RW loading between the two wetlands.



Fetterbush withstands high and low water changes, such as drought and flood.

Parameter D. Nuisance Plant Species

During monitoring of the Cypress and Whooping Crane wetlands we did not observe any Federally or South Carolina listed “nuisance species” (invasive, exotic, parasitic, or toxic species) in the project wetlands. It is probable that higher surface water in the wetlands controlled the invasion or spread of other such nuisance species. However, we did take note of one species that qualifies as a nuisance. Chinese tallow-tree (*Sapium sebiferum*) is an invasive-exotic tree species that is colonizing shallow wetlands throughout the Southern Coastal Plain. We have noted the invasion of this species in eastern Whooping Crane and the western perimeter of Cypress. It currently inhabits approximately 5% of the wetlands. Mitigation to stall the spread of this species focuses on maintaining a high enough surface water level with recycled water.

Parameter E.
Exceeding the Threshold of Concern
for a Parameter: Canopy

This monitoring parameter describes changes in canopy species—mature trees in the wetland. The change in species dominance in the wetland is measured by relative dominance (calculated by basal area, change in density, and/or loss due to natural causes). In the most recent monitoring period the canopy strata was very stable, exhibiting no die-off, blowdown, disease or other impacts in Cypress or Whooping Crane.

Parameter F. Exceeding the Threshold of Concern for a Parameter: Shrub and Groundcover

Cypress and Whooping Crane are remarkably diverse, resilient swamp communities. The infusion of Recycled Water has provided a dense, defensive habitat buffer that protects the growing biodiversity of wildlife and vegetation upstream. Currently, these communities are vitally productive and do not exceed any Threshold of Concern for a Parameter. The shrub and groundcover stratum is a stable, natural system that continues to mature, adding food and shelter for wetland wildlife.



Yellow-bellied Slider, a common predator in the Project wetlands.

Parameter G. Natural Causes

The sole natural cause that impacted the RW Wetlands was the above-average rainfall in October 2015. For the RW Wetlands described above, the primary effects were: (1) rising ground and surface water in tributaries, (2) inflow of water from adjacent land into the swamp, and (3) an increase in wetland water levels of approximately 18 inches. The wetlands did not expand boundaries significantly or cause widespread flooding or loss of wildlife habitat in the local community of Hilton Head Plantation. However, this storm event did show the limits of RW wetlands to mitigate significant flooding.



Whooping Crane Conservancy Transect B. Flood waters were flowing over a dike and into the swamp.

Parameter H. Benthic Macro-Invertebrates

During recent monitoring we observed no new macro-invertebrate species in the RW wetlands. The higher water level and mild flooding obscured the water column and covered much of the perimeter of the wetlands, where benthic macro-invertebrate species are most common. Due to this circumstance, however, we expect to find significantly more aquatic invertebrates in the 2016 monitoring cycle.

Parameter I. Fish

Fish species such as the common mosquito-fish (*Gambusia affinis*) were prevalent in both Whooping Crane and Cypress. The water levels were higher than average in both systems due to a surplus of rainfall. This species is an indicator that the wetlands provide diverse habitat opportunities, such as insect prey and cover vegetation for small fish species.

Parameter J.

Endangered, Threatened and Rare Species

In the course of monitoring we have identified a wide variety of wildlife, including past endangered species. Currently, candidate species listed for South Carolina, and that may occur in the Cypress or Whooping Crane include, but are not limited to, American chaff-seed, Bachman's Warbler, Bicknell's Thrush, Carolina heel spitter, Eastern wood stork, Edisto Crayfish, gopher tortoise, Henslow's Sparrow, and Kirtland's wood Warbler. These species did not occur in the most recent monitoring. Additional listed vegetation species for South Carolina include pond spice. Note: During the most recent monitoring we did not observe any of these listed species.

Parameter K.

No Discharge Period in RW Projects

The current NPDES Permit protocol requires a “No Discharge Period” (also called “dry-down”) for 125 consecutive days in Cypress Conservancy. The intent is to create a dormant, low-water condition in the wetland. This permit rule is still in effect. Although elimination of RW flow fails to provide the benefits of surplus water, the Cypress Conservancy has maintained steady biological activity as a mesic (partially wet) biological community—functional, but less productive than the wide, deep basin of Whooping Crane Conservancy.

Conclusions and Recommendations

This report has summarized the monitoring results in the Recycled Water projects in the Cypress Conservancy and Whooping Crane Conservancy in Hilton Head Plantation, Hilton Head Island, SC. Monitoring took place in 2014-2015 in the dormant and growing seasons. Monitoring protocol followed specifications in the NPDES Permit documents.

Conclusions

1. The foremost incident affecting the biology of the Hilton Head Plantation RW Project was flooding in October 2015. This event led to surface water overflow into the wetlands. But the Cypress Conservancy and Whooping Crane Conservancy wetlands did not flood dry land or residential property in the community.
2. Whooping Crane Conservancy remains the most biologically diverse site in the Hilton Head Plantation RW Project.
3. The Cypress Conservancy has accommodated the impacts of dry-down over the years, but at the cost of lower biological diversity and higher-than average tree-fall.

Recommendations

1. Continue the monitoring program to assure conservation and best management practices for the valuable RW wetlands.
2. Develop more educational programs about Recycled Water and the value of wetlands ... especially for mitigating the impacts of climate change.
3. Develop new research in the RW wetlands to advance understanding and development of the resilient RW technology.
4. Invite partners in research, such as the University of South Carolina local campus to develop new research programs in the RW wetlands.

6. Glossary

Adsorption Accumulation of liquids or solids on the surface of leaves.

Basal Area The cross-sectional area of a tree trunk measured in square inches or square feet at 4.5 feet above ground.

Biennial A duration of two years.

Bottomland A low terrain that contains freshwater or a high water table.

Colonial Wading Birds Herons, egrets and ibises and other long-legged water birds that nest in dense communities called “rookeries.”

Cover The degree to which above-ground portions of vegetation cover the ground surface. Also called areal cover.

Cypress Bald cypress and pond cypress are long-living, cone-bearing members of the Redwood Family. Cypress Conservancy is the only large stand of native cypress trees on Hilton Head Island.

Dominance The measure of a plant species compared with other species, based on areal cover (groundcover) and caliper inches converted to basal area (trees).

Density The number of individuals of a species per unit area.

Dry-down A mandated period in which no recycled water flows into a wetland.

Drought A period of abnormally low rainfall that affects growing or living conditions.

Ecological Succession The process in which communities of plant and animal species in a particular area are replaced over time by a series of different and more complex communities.

Endangered Species A species of plant or animal that is in danger of going extinct.

Emergent Plant A plant with its lower part underwater and its upper part, usually leaves and flowers, above the water surface.

Evapotranspiration The process in which water is changed into vapor by atmospheric pressure, wind, humidity, solar radiation, and released through plant leaves and bark.

Frequency The distribution of individuals of a plant species in an area.

Growing Season The portion of the year that is frost-free.

Habitat A place where a plant or animal lives. A productive habitat provides sufficient food, cover and water.

Hardwood A broad-leaved tree such blackgum, red maple, or sweet gum.

Hydrology The properties, distribution and circulation of water.

Hydroperiod The average annual cycle of rainfall of a location.

Importance Value The relative influence of a plant species in a plant community, obtained by summing relative dominance, density and frequency.

Indicator Species A species that indicates whether an ecosystem is vibrant or degrading.

Keystone Species A species that affects other species in a community.

Macro-Invertebrate An animal species lacking a backbone and which can be seen without the aid of optical magnification.

Neotropical The geographic region including Central and South America.

NPDES National Pollution Discharge System permit under the Clean Water Act.

Palustrine A freshwater community.

Recycled Water Advanced-treated domestic water discharged into wetlands to restore ecological functions, values, wildlife habitat, and human recreation opportunities. Formerly named “reclaimed water.”

Surface Plant A species of vegetation that keeps leaves above the surface of the water.

Wetland An area that is inundated or saturated by surface or ground water at a frequency and duration to support vegetation adapted to saturated or flooded soil.

7. Wetland Vegetation

Inventory of Plant Species: 1990-Present

CYPRESS CONSERVANCY

<u>Common Name</u>	<u>Scientific Name</u>
American Pondweed	Potamogeton nodosus
Bald Cypress	Taxodium distichum
Blackgum	Nyssa biflora
Broomsedge Bluestem	Andropogon virginicus
Bur Marigold	Bidens laevis
Button Bush	Cephalanthus occidentalis
Carolina Willow	Salix caroliniana
Centella	Centella asiatica
Cinnamon Fern	Osmunda cinnamomea
Climbing Hempweed	Mikania scandens
Chara	Chara sp.
Cushion Moss	Leucobryum glaucum
Creeping Primrose	Ludwigia palustris
Dog Fennel	Eupatorium compositifolium
Duckweed	Lemna minor
Duckweed	Lemna vadiiviana
Dwarf Palmetto	Sabal minor
False Nettle	Boehmeria cylindrica
Fanwort	Cabomba caroliniana
Fetterbush	Lyonia lucida
Floating Bladderwort	Utricularia inflata
Frog's Bit	Limnobium spongia
Gallberry	Ilex glabra
Giant Plume Grass	Erianthus giganteus
Giant Reed	Phragmites australis
Grape Fern	Botrychium sp.
Grass-leaved Sagittaria	Sagittaria graminea
Highbush Blueberry	Vaccinium corymbosum
Lizard Tail	Saururus cernuus
Loblolly Pine	Pinus taeda
Maidencane	Panicum hemitomon
Marsh Pennywort	Hydrocotyle umbellata
Mosquito Fern	Azolla caroliniana
Netted Chainfern	Woodwardia areolata

<u>Common Name</u>	<u>Scientific Name</u>
Palmetto	Sabal palmetto
Pickernelweed	Pontederia cordata
Persimmon	Diospyros virginiana
Poison Ivy	Toxicodendron radicans

Pond Pine	<i>Pinus serotina</i>
Primrose Willow	<i>Ludwigia peruviana</i>
Red Bay	<i>Persea borbonia</i>
Red Bay/Swamp Red Bay	<i>Persea palustris</i>
Red Maple	<i>Acer rubrum</i>
Red-root	<i>Lachnanthes caroliniana</i>
Royal Fern	<i>Osmunda regalis</i>
Sawgrass	<i>Cladium jamaicense</i>
Saw Palmetto	<i>Serenoa repens</i>
Shade Mudflower	<i>Micranthemum umbrosum</i>
Soft Rush	<i>Juncus effusus</i>
Southern Blueflag Iris	<i>Iris versicolor</i>
Spanish Moss	<i>Tillandsia usneoides</i>
Sphagnum Moss	<i>Sphagnum sp.</i>
Spike Rush	<i>Eleocharis tuberculosa</i>
Swamp Dewberry	<i>Rubus hispidus</i>
Swamp Knotweed	<i>Polygonum hydropiperoides</i>
Sweet Gum	<i>Liquidambar styraciflua</i>
Switch Grass Panicum	<i>Panicum virgatum</i>
Three-Way Sedge	<i>Dulichium arundinaceum</i>
Virginia Chainfern	<i>Woodwardia virginica</i>
Walter's Sedge	<i>Carex walteri</i>
Water Milfoil	<i>Myriophyllum sp.</i>
Water Net	<i>Hydrodictyon sp.</i>
Water Pennywort	<i>Hydrocotyle ranunculoides</i>
Water Pepper	<i>Polygonum hydropiperoides</i>
Water Smartweed	<i>Polygonum amphibium</i>
Waxmyrtle	<i>Myrica cerifera</i>
Wingstem	<i>Verbesina occidentalis</i>
Wolffia (Water Meal)	<i>Wolffia punctata</i>
Yellow Cyperus	<i>Cyperus flavescens</i>

Total: 69 Species

WHOOPING CRANE CONSERVANCY

<u>Common Name</u>	<u>Scientific Name</u>
Baggy Knees Grass	<i>Sacciolepis strata</i>
Bamboo Vine	<i>Smilax laurifolia</i>
Black-Gum	<i>Nyssa biflora</i>
Black Gum	<i>Nyssa sylvatica biflora</i>
Blue-green Algae	<i>Lyngbya sp.</i>
Bracken Fern	<i>Pteridium aquilinum</i>
Broomsedge Bluestem	<i>Andropogon virginicus</i>
Bur marigold	<i>Bidens laevis</i>
Button Bush	<i>Cephalanthus occidentalis</i>
Carolina Willow	<i>Salix caroliniana</i>
Cattail (Tall)	<i>Typha latifolia</i>
Chinese Tallowtree	<i>Sapium sebifera</i>
Cinnamon Fern	<i>Osmunda cinnamomea</i>
Clethra	<i>Clethra alnifolia</i>
Climbing Hempweed	<i>Mikania scandens</i>
Cross Vine	<i>Bignonia capreolata</i>
Cushion Moss	<i>Leucobryum glaucum</i>
Dahoon Holly	<i>Ilex cassine</i>
Dense-flower Smartweed	<i>Polygonum densiflorum</i>
Duckmeat	<i>Spirodela punctata</i>
Duck Potato	<i>Sagittaria latifolia</i>
Duckweed	<i>Lemna vadiiviana</i>
False Nettle	<i>Boehmeria cylindrica</i>
Fanwort	<i>Cabomba caroliniana</i>
Fetterbush	<i>Lyonia lucida</i>
Flatsedge	<i>Cyperus flavescens</i>
Floating Bladderwort	<i>Utricularia inflata</i>
Frog's Bit	<i>Limnobium spongia</i>
Gallberry	<i>Ilex glabra</i>
Giant Cane	<i>Arundinaria gigantea</i>
Giant Plume Grass	<i>Erianthus gigantea</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>
Lizard Tail	<i>Saururus cernuus</i>
Loblolly Pine	<i>Pinus taeda</i>
Maidencane	<i>Panicum hemitomon</i>
Marsh Pennywort	<i>Hydrocotyle umbellata</i>
Milkweed (Swamp)	<i>Asclepias incarnata</i>
Mosquito Fern	<i>Azolla caroliniana</i>
Netted Chainfern	<i>Woodwardia areolata</i>
Persimmon	<i>Diospyros virginiana</i>
Pickerelweed	<i>Pontederia cordata</i>
Plume Grass	<i>Setaria magna</i>
Poison Ivy	<i>Toxicodendron radicans</i>
Red Maple	<i>Acer rubrum</i>
Red Bay	<i>Persea borbonia</i>

Red-root	<i>Lachnanthes caroliniana</i>
Royal Fern	<i>Osmunda regalis</i>
Saw Palmetto	<i>Serenoa repens</i>
Sawgrass	<i>Cladium jamaicense</i>
Sedge sp.	<i>Carex</i> sp.
Shade Mudflower	<i>Micranthemum umbrosum</i>
Smartweed (Dense-flower)	<i>Polygonum densiflorum</i>
Soft Rush	<i>Juncus effusus</i>
Southern Blueflag Iris	<i>Iris versicolor</i>
Spanish Moss	<i>Tillandsia usneoides</i>
Swamp Dewberry	<i>Rubus hispidus</i>
Swamp Knotweed	<i>Polygonum hydropiperoides</i>
Sweet Gum	<i>Liquidambar styraciflua</i>
Switch Grass Panicum	<i>Panicum virgatum</i>
Three-Way Sedge	<i>Dulichium arundinaceum</i>
Virginia Chainfern	<i>Woodwardia virginica</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>
Walter's Sedge	<i>Carex walteri</i>
Water Milfoil	<i>Myriophyllum</i> sp.
Water Milfoil - Cut leaf	<i>Myriophyllum pinnatum</i>
Water Net Algae	<i>Hydrodictyon</i> sp.
Water Lily - Fragrant	<i>Nymphaea odorata</i>
Water Pennywort	<i>Hydrocotyle ranunculoides</i>
Water Spider Orchid	<i>Habenaria repens</i>
Water Starwort	<i>Callitriche heterophylla</i>
Water Tupelo	<i>Nyssa aquatica</i>
Waxmyrtle	<i>Myrica cerifera</i>
Wingstem	<i>Verbesina occidentalis</i>
Winged Sumac	<i>Rhus copallina</i>
Wolffia (Water Meal)	<i>Wolffia punctata</i>

Total: 75 Species

8. Wetland Wildlife

Inventory of Observed Animal Species: 1990-Present

CYPRESS CONSERVANCY

Common Name:

Scientific Name:

VERTEBRATES

Amphibians: 4 Species

Green Treefrog

Hyla cinerea

Southern Dusky Salamander

Desmognathus auriculatus

Southern Chorus Frog

Pseudacris nigrata

Southern Leopard Frog

Rana sphenoccephala

Birds: 29 Species

American Black Duck

Anas rubripes

American Robin

Turdus migratorius

Barred Owl

trix varia

Blue Jay

Cyanocitta cristata

Carolina Chickadee

Parus carolinensis

Carolina Wren

Thyrothorus ludovicianus

Chuck-Will's Widow

Caprimulgus carolinensis

Common Crow

Corvus brachyrhynchos

Common Grackle

Quiscalus quiscula

Downy Woodpecker

Picoides pubescens

Eastern Phoebe

ayornis phoebe

Gray Catbird

Dumetella carolinensis

Great Blue Heron

Ardea herodias

Great Egret

Casmerodius albus

Green-backed Heron

Butorides striatus

Northern Cardinal

Cardinalis cardinalis

Osprey

Panodiun haliaetus

Pileated Woodpecker

Dryocopus pileatus

Red-bellied Woodpecker

Melanerpes carolinus

Red-shouldered Hawk

Buteo lineatus

Red-tailed Hawk

Buteo jamaicensis

Rufous-sided Towhee

Pipilo erythrophthalmusi

Snowy Egret

Egretta thula

Tufted Titmouse

Parus bicolor

Turkey Vulture

Cathartes aura

Yellow-bellied Sapsucker

Sphyrapicus varius

Yellow-rumped Warbler

Dendroica coronata

Wood Duck

Aix sponsa

White Ibis

Eudocimus albus

Fish: 1 Species

Eastern Mosquitofish

Gambusia affinis

Mammals: 4 Species

Bobcat

Felis rufus

Eastern Gray Squirrel

Sciurus carolinensis

Raccoon

Procyon lotor

White-tailed Deer

Odocoileus virginianus hiltonensis

Reptiles: 5 Species

American Alligator

Alligator mississippiensis

Five-lined Skink

Eumeces fasciatus

Green Anole

Anolis carolinensis carolinensis

Southern Black Racer

Coluber constrictus priapus

Eastern Cottonmouth

Agkistrodon piscivorus-piscivorus

Macro-InvertebrateS

Arachnids: 16 Species

Black and Yellow Argiope Spider

Argiope aurantia

Brown Daddy-long-legs

Phalangium opilio

Carolina Wolf Spider

Lycosa carolinensis

Comb-footed Spider

Anelosimus studiosus

Chigger (Harvestmite)

Trombicula sp.

Dwarf Spider

Ostearius melonopyius

Forest Wolf Spider

Lycosa gulosa

Golden Silk Spider

Nephila clavipes

Jumping Spider

Metaphidippus galathen

Mabel Orchard Spider

Leucauge mabelae

Sheetweb Spider

Linyphiinnia sp.

Six-spotted Fishing Spider

Dolomedes triton

Thin-legged Wolf Spider

Pardosa sp.

Water Mite

Hygrobates sp.

Water Spider

Argyronera aquatica

White Micranthena Spider

Micranthena mitrata

Copepods: 2 Species

Calanoid Copepod	Copepoda sp.
Diaptomus Copepod	Diaptomus sp.

Crustaceans: 2 Species

Isopod	Asellus sp.
Scud	Hyalella azteca

Diplopods: 2 Species

Millipede	Sirobolid sp.
Millipede	Platydesmid sp.

Insects: 46 Species

American Dagger Moth	Acronicta americana
Angular-winged Katydid	Microcentrum retinerve
Black-faced Skimmer Dragonfly	Libellul cyanea
Black Salt marsh Mosquito	Aedes taeniorynchus
Broad-shouldered Water Strider	Microvelia borealis
Brown Daddy-long-legs	Phalangium opio
Chironomid midge	Chironomid sp.
Common Water Strider	Gerris remigis
Crane Fly	Tipula sp.
Creeping Water Bug	Pelocoris sp.
Deerfly	Chrysops sp.
Earwig	Foricula sp.
Elmid Beetle	Stenelms lateralis
Field Cricket	Gryllus pennsylvanicus
Fire Ant	Solenopsis gominata
Golden Salt marsh Mosquito	Aedes sollicitans
Green Clearwing Dragonfly	Erythemis simplicicollis
Green Darner Dragonfly	Ajax junius
Green Midge	Tanytarsus sp.
Green Water Strider	Gerris sp.
Katydid	Pseudophyllinae sp.
Marsh Fly	Tetanocera sp.
Mydas Fly	Mydas clavatus
Mud Dauber Wasp	Sceliphron caementarium
Leaf Beetle	Donacia sp.
Leafhopper	Cicallid sp.
Long-legged Fly	Dolichopus longipennis
Love Bug	Plecia neartica
Nessus Sphinx Moth	Amphion nessus
Northern Katydid	Pterophylla camefolia
Palamedes Swallowtail Butterfly	Pterourus palamedes

Periodical Cicada
Planthopper
Scarab Beetle
Southern House Mosquito
Small Whirligig Beetle
Southern Spread-wing Damselfly
Summer Mosquito
Tree-hole Mosquito
Water Boatman
Water Lily Leaf Beetle
Water Strider – Broad-shouldered
Water Strider
Water Treader
White Fly
Widow Dragonfly
Yellow Jacket

Magiccicada sp.
Delphacid sp.
Scarabaedid sp.
Culex pipiens quinquefasciatus
Gyrinus sp.
Lestes australis
Aedes atlanticus
Aedes triseriatus
Corixa sp.
Donacid sp.
Microvelia borealis
Gerris marginatus
Mesovelia mulsanti
Aleyrodid sp.
Libellula lucoasa
Vespula sp.

Isoptera: 1 Species

Eastern Subterranean Termite

Reticulitermes flavipes

Mollusca: 1 Species

Hairy Wheel Snail

Gyraulus hirsutus

Tadpole Shrimp: 1 Species

Tadpole Shrimp

Triops longicaudatus

Water Fleas: 1 Species

Water Flea

Daphnia pulex

Total: 116 Species

WHOOPING CRANE CONSERVANCY

Common Name: _____

Scientific Name: _____

VERTEBRATES

Amphibians: 0 Species

Birds: 37 Species

American Black Duck	<i>Anas rubripes</i>
American Coot	<i>Fulica americana</i>
American Robin	<i>Turdus migratorius</i>
Anhinga	<i>Anhinga anhinga</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Black-crowned Night Heron	<i>Nycticorax violacea</i>
Blue Jay	<i>Cyanocitta cristata</i>
Carolina Chickadee	<i>Parus carolinensis</i>
Carolina Wren	<i>Thyrothorus ludovicianus</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Common Crow	<i>Corvus brachyrhynchos</i>
Common Grackle	<i>Quiscalus quiscula</i>
Common Yellow-shafted Flicker	<i>Colaptes auratus</i>
Eastern Bluebird	<i>Sialia sialis</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Great Egret	<i>Casmerodius albus</i>
Great Horned Owl	<i>Bubo virginianus</i>
Green-backed Heron	<i>Butorides striatus</i>
Moorhen (Common Gallinule)	<i>Gallinula chloropus</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Osprey	<i>Panodiun haliaetus</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmusi</i>
Snowy Egret	<i>Egretta thula</i>

Tufted Titmouse
Turkey Vulture
Yellow-billed Cuckoo
Yellow-rumped Warbler
Wood Duck
Wood Stork
White Ibis

Parus bicolor
Cathartes aura
Coccyzus americanus
Dendroica coronata
Aix sponsa
Mycteria americana
Eudocimus albus

Fish: 1 Species

Eastern Mosquitofish

Gambusia affinis

Mammals: 4 Species

Eastern Gray Squirrel
Raccoon
River Otter
White-tailed Deer

Sciurus carolinensis
Procyon lotor
Lutra canadensis
Odocoileus virginianus-hiltonensis

Reptiles: 4 Species

American Alligator
Eastern Cottonmouth
Green Anole
Yellow-bellied Slider

Alligator mississippiensis
Agkistrodon piscivorus-piscovorus
Anolis carolinensis carolinensis
Chrysemys scripta scriptai

Macro-Invertebrates

Arachnids: 9 Species

American Dog Tick
Forest Wolf Spider
Dwarf Spider
Golden Silk Spider
Pirate Wolf Spider
Red Freshwater Mite
Six-spotted Fishing Spider
Wasp Spider
Water Mite

Dermacento variabilis
Lycosa gulosa
Mycriphantinae sp.
Nephila clavipes
Pirata piraticus
Limnocharus americana
Dolomedes triton
Halcti sp.
Hygrobatas sp.

Crustaceans: 4 Species

Scud
Scud
Sow Bug
Water Flea

Gammarus fasciatus
Hyalella asteca
Oniscus asellus
Daphnia pulex

Insects: 35 Species

American Dagger Moth
Black Carpenter Ant
Black Fly
Black Salt marsh Mosquito
Citrine Forktail Damselfly
Chironomid Midge
Condylostylid Long-legged Fly
Common Water Strider
Crawling Water Beetle
Deerfly
Eastern Malaria Mosquito
Eastern Tent Moth
Field Cricket
Green Clearwing Dragonfly
Green Darner Dragonfly
Green Midge
House Fly
Leaf Beetle
Lightning Bug
Marsh Fly
Meadow Grasshopper
Net-winged Damselfly
Pale Bluet Dragonfly
Periodical Cicada
Plant Bug
Planthopper
Red Skimmer Dragonfly
Shore Fly
Southern House Mosquito
Spotless Nine-spotted Ladybug
Swift Long-winged Skimmer
Thrip
Water Scorpion
Water Strider – Broad-shouldered
Whirligig Beetle

Aconicta americana
Camponotus pennsylvanicus
Simulium sp.
Aedes taenorrhynchus
Ischnura hastata
Chironomid sp.
Condylostylid sp.
Gerris remigis
Peltodytes lengi
Chrysops sp.
Aedes quidrimaculatus
Malicosma americanum
Gryllus pennsylvanicus
Erythemis simplicollis
Anax junius
Tanytarsus sp.
Musca domestica
Donacia sp.
Lampyrid sp.
Tetanocera sp.
Convuphalinae sp.
Argia sp.
Enallagma hastata
Magiciidada sp.
Mirid sp.
Delphacid sp.
Libellula saturata
Ephyrdid sp.
Culex pipiens quinquefasciatus
Coccinella novemnota franciscana
Pachydiplax longipennis
Thysanoptera sp.
Ranatra sp.
Microvelia borealis
Dineutes americanas

Isoptera: 1 Species

Eastern Subterranean Termite

Reticulitermes flavipes

Worms: 2 Species

Earthworm
Flatworm

Lumbricus terrestris.
Dugesia tigrina

Mollusks: 3 Species

Hairy Wheel Snail
Little Pond Snail
Winkle Snail

Gyraulus hirsutus
Amnicola limnosa
Viviparus intertextus

Total: 100 Species

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