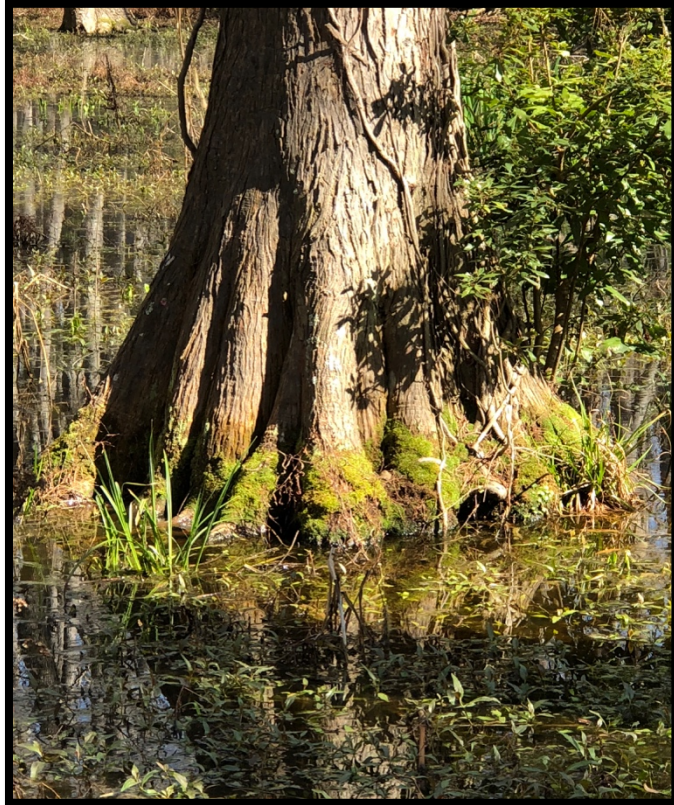


HILTON HEAD PLANTATION RECYCLED WATER PROJECT

**Hilton Head Public Service District
Hilton Head Island, South Carolina**

2016-2017

BIENNIAL BIOLOGICAL MONITORING REPORT



March, 2018

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 2016-2017. This sustainable water reuse program has been in operation for the Hilton Head Public Service District (HHPSD) 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, 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 measurements 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 Conservancy (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 lacustrine, 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 lacustrine, 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 and October 2016.

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

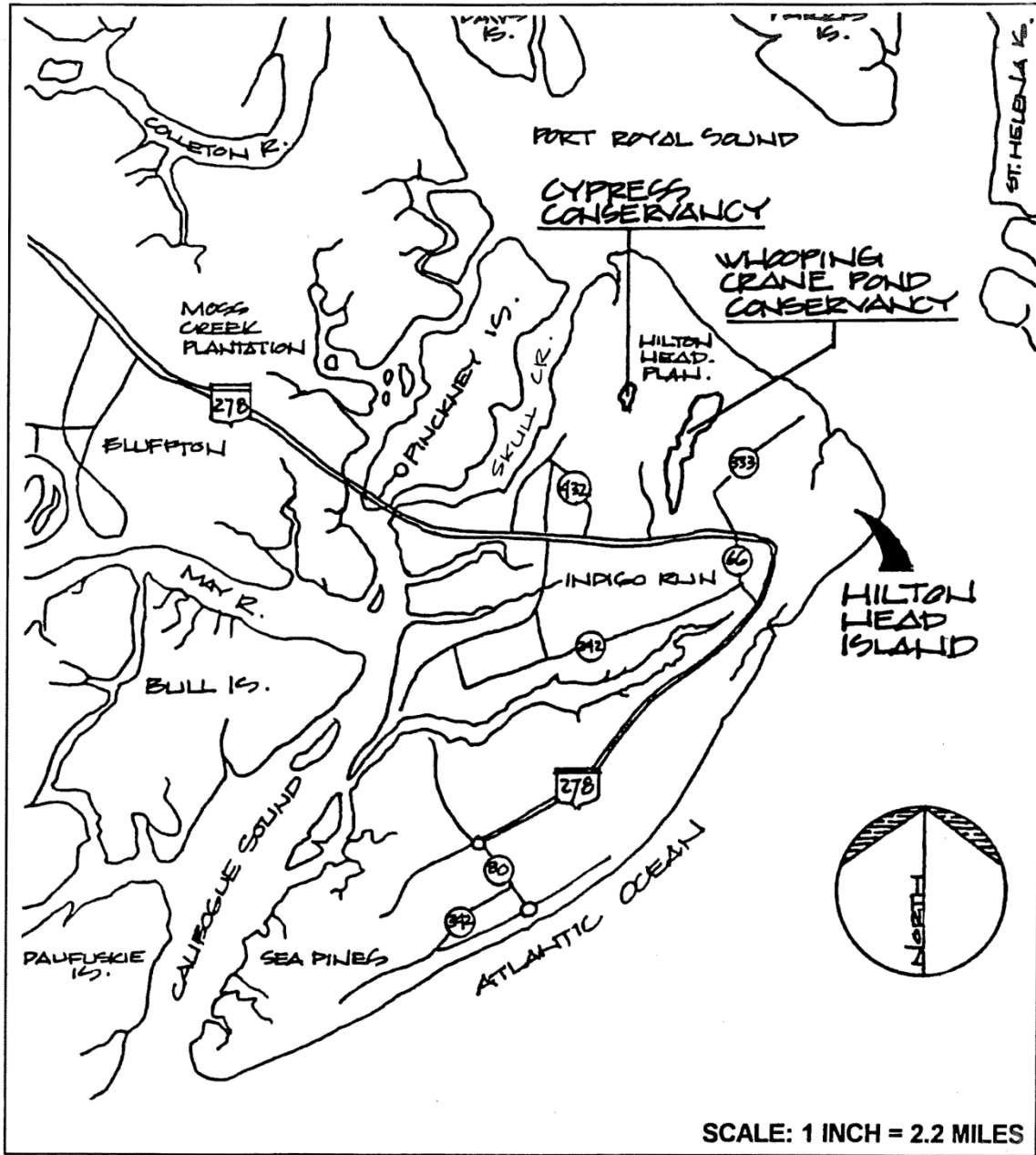


Figure 2-2.
Site Map: Cypress Conservancy

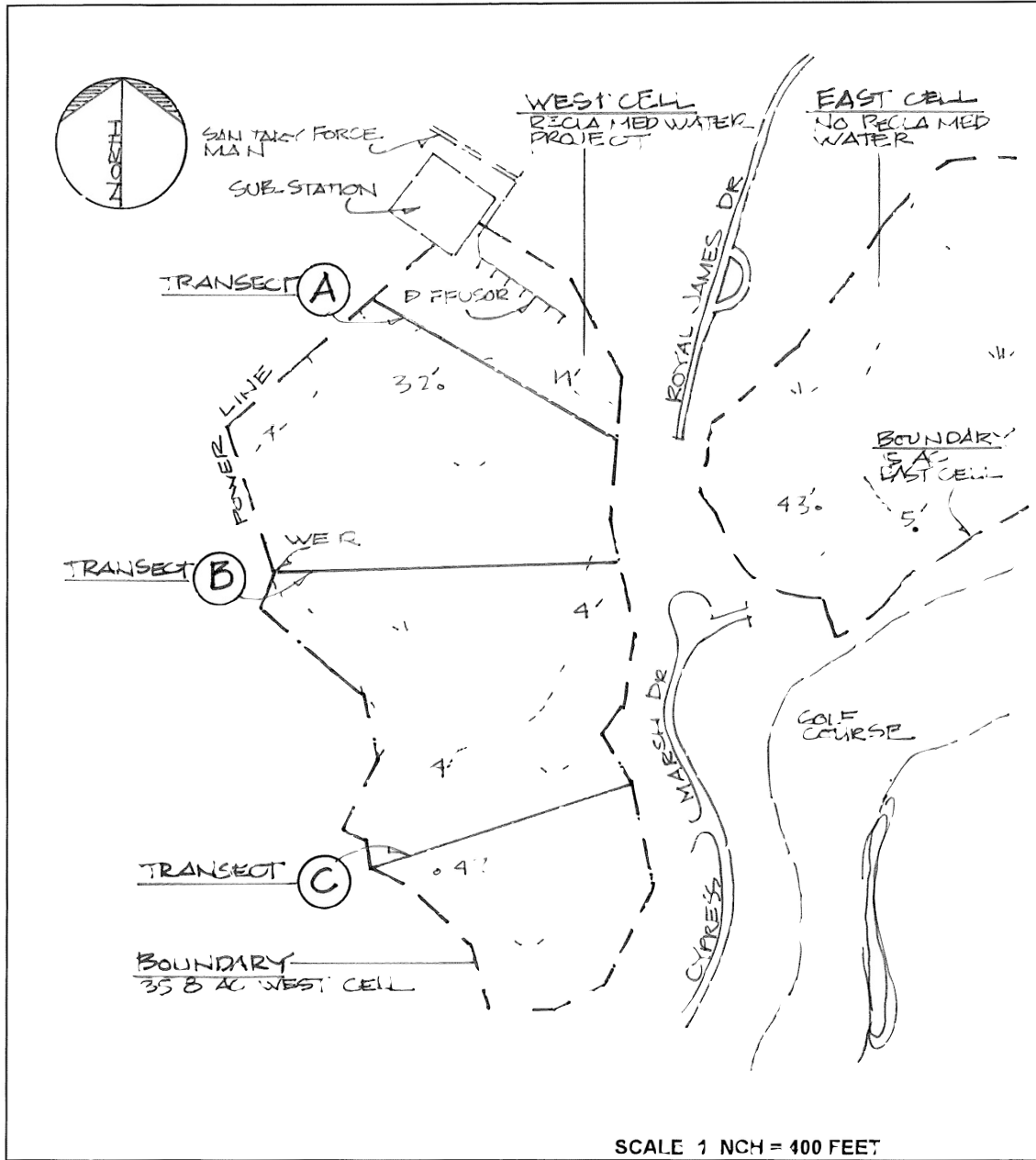
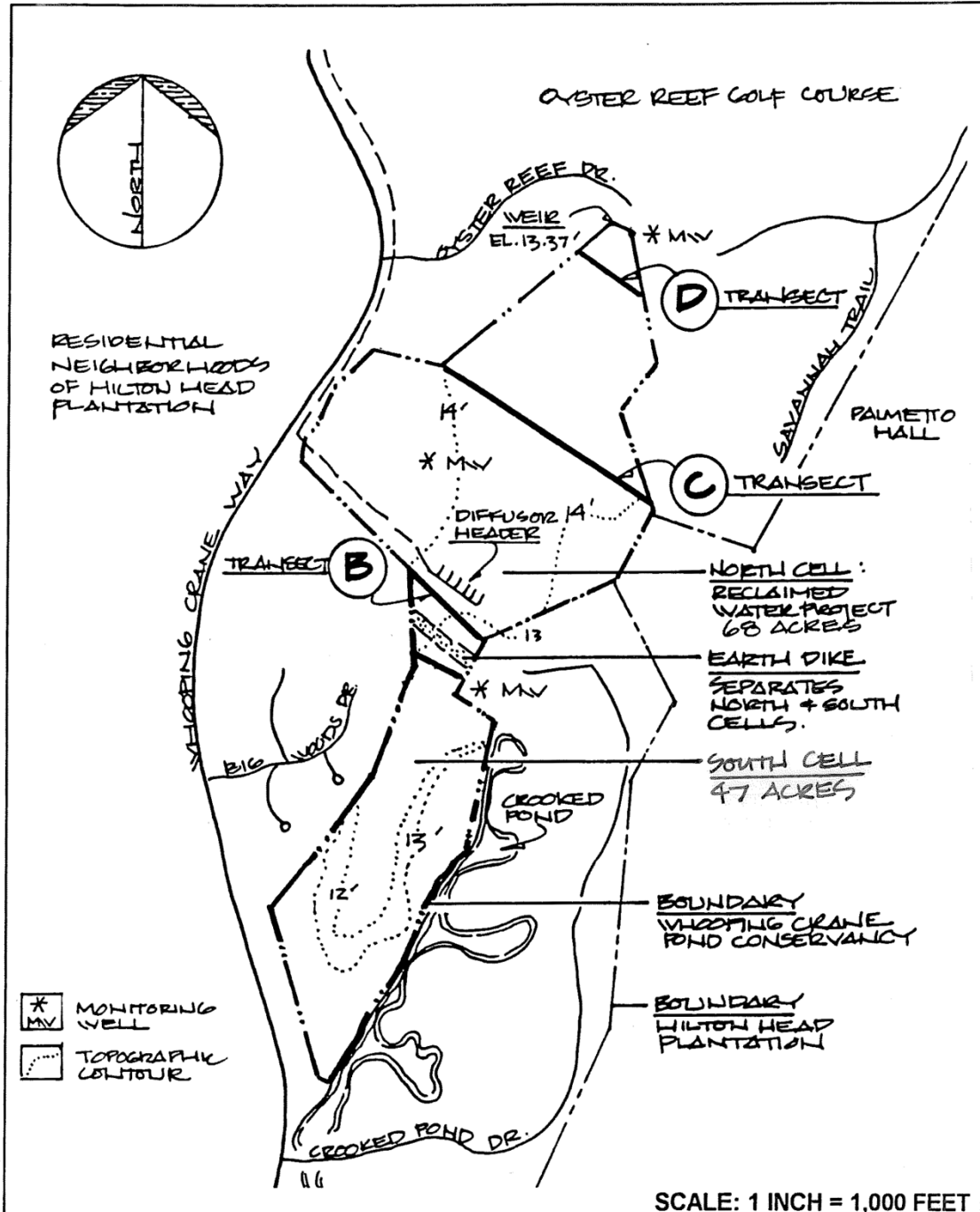


Figure 2-3.
Site Map: Whooping Crane Conservancy



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 2016 and 2017.

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 HHPSD, 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 2016-2017 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
2016-2017
Hilton Head Plantation RW Project
Hilton Head Island, SC
NPDES Permit No. SC 0046191 (10-24-05)
Cypress Conservancy and Whooping Crane Conservancy Wetlands
2016-2017 Conditions Compared with the Baseline Year 1998

Parameter A.
Hydroperiod

A-1. Total Loading. RW and rain compared to the Baseline and 40-year average rainfall (Hydroperiod).

The 40-year average rainfall, or “hydroperiod” for Hilton Head Island is 51 inches per year (acre-inches). This is the Baseline against which to compare the sum of annual RW loading plus rainfall in inches as recorded by HHPSD.

In 2016-2017 Hilton Head Public Service District recorded 110.4 inches of rainfall, or 55.2 inches per annum over the two-year span. This amount of rain was 7% higher than the hydroperiod 50-year average of 51.4 inches annually. This difference falls within the historic range of variability.

A-2. Recycled Water Loading. Water loading for this period averaged 81.7 additional acre-inches per year in the wetlands. This supplemental influent sustained a pond-full water level in each wetland.

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 7 inches in Cypress Conservancy and 10 inches in Whooping Crane Conservancy. The Whooping Crane Conservancy is the lowest of the two wetlands. Hence, it is the deepest and largest biologically active wetland.

A-4. Flooding observed. Perimeter soils around Whooping Crane Conservancy were saturated but there was no standing water.

A-5. Distribution of Water in the Wetlands. Surface water was observed throughout 100 percent of each wetland. This continues the trend seen since October, 2015.

Parameter B. Canopy Species

B-1. Basal Area of Trees. The basal area of trees in Whooping Crane and Cypress wetlands declined by an estimated 20%. This decline is predominately due to the loss of young hardwood and pines along the periphery of the wetlands. Peripheral trees include: sweetgum, red maple, water oak and loblolly pines. These trees were felled in the north-facing sector of the wetlands because they were most exposed to the storm winds from Hurricane Matthew in October, 2016. These trees acted as a sacrificial buffer, but the interior swamp forest lost very few trees.

B-2. Density of Canopy Trees. The decline of canopy species in the Cypress and Whooping Crane wetlands was estimated at 5%. As stated above, the old growth hardwoods were most resilient in the face of the hurricane-force winds. Trees that were felled were mostly secondary trees exposed on the perimeter of the wetland and growing under larger trees. The giants of the wetland are native swamp blackgums and several rare bald cypress trees. They have survived many storms, including Hurricane Matthew.

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 0-100 point valuation is useful for tracking maturation or degradation of species in the RW wetlands. The Cypress Conservancy ranks a 60-point assessment because it is a maturing community yet constrained by impacts such as drought, tree-fall and the regular dry-down requirement, which has led to marked windfall of semi-mature trees. Whooping Crane Conservancy ranks 95 points because it is at peak maturity and biodiversity. It continues to be significantly resilient against natural impacts such as drought, flood and wind, and has no dry-down restriction.

Parameter C. Shrub and Groundcover Species

C-1. Species Diversity. The diversity of species did not change in this recent period of biennial monitoring. The Hurricane had no impact on groundcover vegetation, including dominance, density and importance value. Whooping Crane Conservancy is the largest and deepest of the wetlands. This condition allows for a high population of groundcover but restricts species diversity due to the depth of water. Species with highest importance value were: duckweed, marsh pennywort, sedge species, and lizard's tail. Cypress Conservancy species diversity included: marsh marigold, lizard's tail, duckweed, marsh pennywort, sedge species and blueflag iris. A relatively new aspect of groundcover: the local niches where fallen trees opened up new areas on the ground to sunlight and open water for new growth.

C-2. Total Cover of Dominant Species. Total cover of the water and/or ground surface was 60% in Cypress Conservancy and 100% in Whooping Crane Conservancy. The different cover totals reflect the difference in size, topography, depth and RW loading between the two wetlands--in particular the dry down affect in Cypress.

Parameter D.
Nuisance Plant Species

During monitoring of the Cypress and Whooping Crane Conservancy 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. In past years we reported that Chinese tallow-tree (*Sapium sebiferum*), an invasive-exotic tree species had been growing in the perimeter areas of the wetlands. In recent monitoring we did not see tallow trees in either wetland.

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 in this canopy strata was impacted by hurricane force winds, leading to blowdown of trees and alteration of surface water flow by limbs, branches and stacks of tree trunks. This impact occurred predominantly in the north edge of Cypress Conservancy.

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

The shrub and groundcover vegetation has remained resilient and diverse in spite of Hurricane Matthew and dry down periods. In fact, the hurricane supplied surplus water to offset the dry down in Cypress swamp. In Whooping Crane Conservancy the 100% coverage by water enabled diverse plant life to sustain and expand, producing productive

habitat for fish and wildlife. Shrub and groundcover sustained growth throughout the monitoring period and did not decline in the wetlands at a rate exceeding the threshold of concern. We predict continued new growth and expansion of this stratum.

Parameter G.

Natural Causes

In 2016-2017, natural causes did not exceed the threshold of concern for the wetland strata. The RW operations did not add to flooding or any degradation of the wetlands. The Cypress and Whooping Crane Conservancies are highly functional and resilient. They have recovered at a normal rate since the hurricane.

Parameter H.

Benthic Macro-Invertebrates

The population of benthic macro-invertebrates is very similar to past years. Species diversity was also similar, however, the areas of blow-down from the 2016 hurricane provide abundant cover for macro-invertebrates including borers that consume deadwood. If the population of borers expands, this could cause some reduction of wetland trees. At this time, we have not seen indications of borers in the wetland forest.

Parameter I. Fish The high level of water observed in the wetlands provided ample habitat for fish species. However, the diversity of fish species is limited by the overall small acreage of the wetlands. We did observe wading birds hunting fish in the shoals of both wetlands.

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 Conservancy or Whooping Crane Conservancy

include, but are not limited to, 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: American chaff-seed and pond spice. During the most recent monitoring we did not observe any of these listed species.

Parameter K.

No Discharge Period in RW Projects

In 2016, a dry-down period did not occur in Cypress Conservancy. In 2017 there was a dry-down period between January and November. Nevertheless, Cypress Conservancy was inundated with a variable depth of water. Whooping Crane Conservancy has no dry-down period and has been continually pond-full.

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. The monitoring took place in 2016-2017 in the dormant and growing seasons. Monitoring protocol followed specifications in the NPDES Permit documents.

Conclusions

1. The foremost incidents affecting the biology of the Hilton Head Plantation RW Projects were surface water rise and blow down of trees primarily on the north-northwest end of the wetlands. This impact was most evident in Cypress Conservancy.

Recommendations

2. Whooping Crane Conservancy was highly resilient to Hurricane Matthew and other climatic conditions. We observed no lasting impacts in any strata of the wetland. The absence of dry down in Whooping Crane has protected this swamp-forest from the blow-down experienced in Cypress Conservancy.

3. The Cypress Conservancy that has been subject to recurring dry-down for decades, experienced a higher loss of trees and moderate blockage of waterflow from blow-down. The decades of dry-down has exposed this wetland to a higher level of tree-fall, primarily due to desiccated soil and storm-wind.

1. Continue the monitoring program to assure the most affective management of recycled water in the wetlands.

2. Continue to share monitoring results with authorities in Hilton Head Plantation and provide understandable information to community residents.

3. As part of ongoing public relations, include critical information about benefits of the RW programs which buffer storm-wind, provide water storage to minimize flooding, and enhance wildlife.

4. In coordination with SC DHEC establish a pilot program to eliminate dry-down, and instead, allow managed, regular flow into Cypress Conservancy. We believe that this would reduce tree fall in the wetland.

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	<i>Utricularia inflata</i>
Frog's Bit	<i>Limnobium spongia</i>
Gallberry	<i>Ilex glabra</i>
Giant Plume Grass	<i>Erianthus giganteus</i>
Giant Reed	<i>Phragmites australis</i>
Grape Fern	<i>Botrychium sp.</i>
Grass-leaved Sagittaria	<i>Sagittaria graminea</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>
Mosquito Fern	<i>Azolla caroliniana</i>
Netted Chainfern	<i>Woodwardia areolata</i>

<u>Common Name</u>	<u>Scientific Name</u>
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Palmetto	<i>Sabal palmetto</i>
Pickerelweed	<i>Pontederia cordata</i>
Persimmon	<i>Diospyros virginiana</i>
Poison Ivy	<i>Toxicodendron radicans</i>
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</i> sp.
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</i> sp.
Water Net	<i>Hydrodicton</i> sp.
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 sp.</i>

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	Pseudracis 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	<i>Corvus brachyrhynchos</i>
Common Grackle	<i>Quiscalus quiscula</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Eastern Phoebe	<i>ayornis phoebe</i>
Gray Catbird	<i>Dumetella carolinensis</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Casmerodius albus</i>
Green-backed Heron	<i>Butorides striatus</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Osprey	<i>Panodiun haliaetus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmusi</i>
Snowy Egret	<i>Egretta thula</i>
Tufted Titmouse	<i>Parus bicolor</i>
Turkey Vulture	<i>Cathartes aura</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Wood Duck	<i>Aix sponsa</i>
White Ibis	<i>Eudocimus albus</i>

Fish: 1 Species

Eastern Mosquitofish	<i>Gambusia affinis</i>
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Mammals: 4 Species

Bobcat

Eastern Gray Squirrel

Raccoon

White-tailed Deer

hiltonensis

Felis rufus

Sciurus carolinensis

Procyon lotor

Odocoileus virginianus

Reptiles: 5 Species

American Alligator

Five-lined Skink

Green Anole

Southern Black Racer

Eastern Cottonmouth

Alligator mississippiensi

Eumeces fasciatus

Anolis carolinensis carolinensis

Coluber constrictus priapus

Agkistrodon piscovorus-piscovorus

Macro-Invertebrates

Arachnids: 16 Species

Black and Yellow Argiope Spider

Brown Daddy-long-legs

Carolina Wolf Spider

Comb-footed Spider

Chigger (Harvestmite)

Dwarf Spider

Forest Wolf Spider

Argiope aurantia

Phalangium opilio

Lycosa carolinensis

Anelosimus studiosus

Trombicula sp.

Ostearius melonopyius

Lycosa gulosa

Golden Silk Spider
Jumping Spider
Mabel Orchard Spider
Sheetweb Spider
Six-spotted Fishing Spider
Thin-legged Wolf Spider
Water Mite
Water Spider
White Micranthena Spider

Nephila clavipes
Metaphidippus galathen
Leucauge mabelae
Linyphiinnia sp.
Dolomedes triton
Pardosa sp.
Hygrobates sp.
Argyronera aquatica
Micranthena mitrata

Copepods: 2 Species

Calanoid Copepod	Copepoda sp.
Diaptomus Copepod	Diaptomus sp.

Crustaceans: 2 Species

Isopod	Asellus sp.
Scud	Hyaella 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	Phalngium opiolo
Chironomid midge	Chironomid sp.
Common Water Strider	Gerris remigis
Crane Fly	Tipula sp.

Creeping Water Bug	<i>Pelocoris</i> sp.
Deerfly	<i>Chrysops</i> sp.
Earwig	<i>Foricula</i> sp.
Elmid Beetle	<i>Stenelnis lateralis</i>
Field Cricket	<i>Gryllus pennsylvanicus</i>
Fire Ant	<i>Solenopsis gominata</i>
Golden Salt marsh Mosquito	<i>Aedes sollicitans</i>
Green Clearwing Dragonfly	<i>Erythemis simplicicollis</i>
Green Darner Dragonfly	<i>Ajax junius</i>
Green Midge	<i>Tanytarsus</i> sp.
Green Water Strider	<i>Gerris</i> sp.
Katydid	<i>Pseudophyllinae</i> sp.
Marsh Fly	<i>Tetanocera</i> sp.
Mydas Fly	<i>Mydas clavatus</i>
Mud Dauber Wasp	<i>Sceliphron caementarium</i>
Leaf Beetle	<i>Donacia</i> sp.
Leafhopper	<i>Cicallid</i> sp.
Long-legged Fly	<i>Dolichoplus longipennis</i>
Love Bug	<i>Plecia neartica</i>
Nessus Sphinx Moth	<i>Amphion nessus</i>
Northern Katydid	<i>Pterophylla camefolia</i>
Palamedes Swallowtail Butterfly	<i>Pterourus palamedes</i>
Periodical Cicada	<i>Magicicada</i> sp.
Planthopper	<i>Delphacid</i> sp.
Scarab Beetle	<i>Scarabaedid</i> sp.
Southern House Mosquito	<i>Culex pipiens quinquefasciatus</i>
Small Whirligig Beetle	<i>Gyrinus</i> sp.

Southern Spread-wing Damselfly	<i>Lestes australis</i>
Summer Mosquito	<i>Aedes atlanticus</i>
Tree-hole Mosquito	<i>Aedes triseriatus</i>
Water Boatman	<i>Corixa</i> sp.
Water Lily Leaf Beetle	<i>Donacid</i> sp.
Water Strider – Broad-shouldered	<i>Microvelia borealis</i>
Water Strider	<i>Gerris marginatus</i>
Water Treader	<i>Mesovelia mulsanti</i>
White Fly	<i>Aleyrodid</i> sp.
Widow Dragonfly	<i>Libellula lucoasa</i>
Yellow Jacket	<i>Vespula</i> sp.

Isoptera: 1 Species

Eastern Subterranean Termite	<i>Reticulitermes flavipes</i>
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Mollusca: 1 Species

Hairy Wheel Snail	<i>Gyraulus hirsutus</i>
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Tadpole Shrimp: 1 Species

Tadpole Shrimp	<i>Triops longicaudatus</i>
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Water Fleas: 1 Species

Water Flea	<i>Daphnia pulex</i>
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Total: 116 Species

WHOOPING CRANE CONSERVANCY

Common Name: _____

Scientific Name: _____

VERTEBRATES

Amphibians: 0 Species

Birds: 37 Species

American Black Duck

Anas rubripes

American Coot

Fulica americana

American Robin

Turdus migratorius

Anhinga

Anhinga anhinga

Bald Eagle

Haliaeetus leucocephalus

Black-crowned Night Heron

Nycticorax violacea

Blue Jay

Cyanocitta cristata

Carolina Chickadee

Parus carolinensis

Carolina Wren

Thyrothorus ludovicianus

Cedar Waxwing

Bombycilla cedrorum

Common Crow

Corvus brachyrhynchos

Common Grackle

Quiscalus quiscula

Common Yellow-shafted Flicker

Colaptes auratus

Eastern Bluebird

Sialia sialis

Great Blue Heron

Ardea herodias

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

Parus bicolor

Turkey Vulture

Cathartes aura

Yellow-billed Cuckoo

Coccyzuz americanus

Yellow-rumped Warbler

Dendroica coronata

Wood Duck

Aix sponsa

Wood Stork

Mycteria americana

White Ibis

Eudocimus albus

Fish: 1 Species

Eastern Mosquitofish

Gambusia affinis

Mammals: 4 Species

Eastern Gray Squirrel

Sciurus carolinensis

Raccoon

Procyon lotor

River Otter

Lutra canadensis

White-tailed Deer

Odocoileus virginianus-

hiltonensis

Reptiles: 4 Species

American Alligator

Alligator

mississippiensis

Eastern Cottonmouth
piscovorus

Green Anole

Yellow-bellied Slider
scriptai

Agkistrodon piscivorus-

Anolis carolinensis carolinensis

Chrysemys scripta

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.

Hygrobates sp.

Crustaceans: 4 Species

Scud

Scud

Sow Bug

Gammarus fasciatus

Hyalella asteca

Oniscus asellus

Water Flea

Daphnia pulex

Insects: 35 Species

American Dagger Moth

Aconicta americana

Black Carpenter Ant

Camponotus

pennsylvanicus

Black Fly

Simulium sp.

Black Salt marsh Mosquito

Aedes taeniorhynchus

Citrine Forktail Damselfly

Ischnura hastata

Chironomid Midge

Chironomid sp.

Condylostylid Long-legged Fly

Condylostylid sp.

Common Water Strider

Gerris remigis

Crawling Water Beetle

Peltodytes lengi

Deerfly

Chrysops sp.

Eastern Malaria Mosquito

Aedes quadrimaculatus

Eastern Tent Moth

Malicosma americanum

Field Cricket

Gryllus pennsylvanicus

Green Clearwing Dragonfly

Erythemis simplicollis

Green Darner Dragonfly

Anax junius

Green Midge

Tanytarsus sp.

House Fly

Musca domestica

Leaf Beetle

Donacia sp.

Lightning Bug

Lampyrid sp.

Marsh Fly

Tetanocera sp.

Meadow Grasshopper

Convuphalinae sp.

Net-winged Damselfly

Pale Bluet Dragonfly

Periodical Cicada

Plant Bug

Planthopper

Red Skimmer Dragonfly

Shore Fly

Southern House Mosquito

quinquefasciatus

Spotless Nine-spotted Ladybug

franciscana

Swift Long-winged Skimmer

Thrip

Water Scorpion

Water Strider – Broad-shouldered

Whirligig Beetle

Argia sp.

Enallagma hastata

Magicycida sp.

Mirid sp.

Delphacid sp.

Libellula saturata

Ephyridid sp.

Culex pipiens

Coccinella novemnota

Pachydiplax longipennis

Thysanoptera sp.

Ranatra sp.

Microvelia borealis

Dineutes americanus

Isoptera: 1 Species

Eastern Subterranean Termite

Reticulitermes flavipes

Worms: 2 Species

Earthworm

Lumbricus terrestris.

Flatworm

Dugesia tigrina

Mollusks: 3 Species

Hairy Wheel Snail

Gyraulus hirsutus

Little Pond Snail

Amnicola limnosa

Winkle Snail

Viviparus intertextus

Total: 100 Species

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