LAKE & RESERVOIR ASSESSMENTS
CAPE FEAR RIVER BASIN

Carthage City Lake

Intensive Survey Unit
Water Sciences Section
Division of Water Resources
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GLOSSARY

Algae Small aquatic plants that occur as single cells, colonies, or filaments. May also be referred to as phytoplankton, although phytoplankton are a subset of algae.

Algal biovolume The volume of all living algae in a unit area at a given point in time. To determine biovolume, individual cells in a known amount of sample are counted. Cells are measured to obtain their cell volume, which is used in calculating biovolume

Algal density The density of algae based on the number of units (single cells, filaments and/or colonies) present in a milliliter of water. The severity of an algae bloom may be determined by the algal density as follows:

Mild bloom = 20,000 to 30,000 units/ml

Severe bloom = 30,000 to 100,000 units/ml

Extreme bloom = Greater than 100,000 units/ml

Algal Growth Potential Test (AGPT) A test to determine the nutrient that is the most limiting to the growth of algae in a body of water. The sample water is split such that one sub-sample is given additional nitrogen, another is given phosphorus, a third may be given a combination of nitrogen and phosphorus, and one sub-sample is not treated and acts as the control. A specific species of algae is added to each sub-sample and is allowed to grow for a given period of time. The dry weights of algae in each sub-sample and the control are then measured to determine the rate of productivity in each treatment. The treatment (nitrogen or phosphorus) with the greatest algal productivity is said to be the limiting nutrient of the sample source. If the control sample has an algal dry weight greater than 5 mg/L, the source water is considered to be unlimited for either nitrogen or phosphorus.

Centric diatom Diatoms are photosynthetic algae that have a siliceous skeleton (frustule) found in almost every aquatic environment including fresh and marine waters, as well as moist soils. Centric diatoms are circular in shape and are often found in the water column.

Chlorophyll *a* Chlorophyll *a* is an algal pigment that is used as an approximate measure of algal biomass. The concentration of chlorophyll *a* is used in the calculation of the NCTSI, and the value listed is a lake-wide average from all sampling locations.

Clinograde In productive lakes where oxygen levels drop to zero in the lower waters near the bottom, the graphed changes in oxygen from the surface to the lake bottom produces a curve known as clinograde curve.

Coccoid Round or spherical shaped cell

Conductivity This is a measure of the ability of water to conduct an electrical current. This measure increases as water becomes more mineralized. The concentrations listed are the range of values observed in surface readings from the sampling locations.

Dissolved oxygen The range of surface concentrations found at the sampling locations.

Dissolved oxygen saturation The capacity of water to absorb oxygen gas. Often expressed as a percentage, the amount of oxygen that can dissolve into water will change depending on a number of parameters, the most important being temperature. Dissolved oxygen saturation is inversely proportion to temperature, that is, as temperature increases, water's capacity for oxygen will decrease, and vice versa.

Eutrophic Describes a lake with high plant productivity and low water transparency.

Eutrophication The process of physical, chemical, and biological changes associated with nutrient, organic matter, and silt enrichment and sedimentation of a lake.

Limiting nutrient	The plant nutrient present in lowest concentration relative to need limits growth such that addition of the limiting nutrient will stimulate additional growth. In northern temperate lakes, phosphorus (P) is commonly the limiting nutrient for algal growth
Manganese	A naturally occurring metal commonly found in soils and organic matter. As a trace nutrient, manganese is essential to all forms of biological life. Manganese in lakes is released from bottom sediments and enters the water column when the oxygen concentration in the water near the lake bottom is extremely low or absent. Manganese in lake water may cause taste and odor problems in drinking water and require additional treatment of the raw water at water treatment facilities to alleviate this problem.
Mesotrophic	Describes a lake with moderate plant productivity and water transparency
NCTSI	North Carolina Trophic State Index was specifically developed for North Carolina lakes as part of the state's original Clean Lakes Classification Survey (NRCD 1982). It takes the nutrients present along with chlorophyll *a* and Secchi depth to calculate a lake's biological productivity.
Oligotrophic	Describes a lake with low plant productivity and high water transparency.
pH	The range of surface pH readings found at the sampling locations. This value is used to express the relative acidity or alkalinity of water.
Photic zone	The portion of the water column in which there is sufficient light for algal growth. DEQ considers 2 times the Secchi depth as depicting the photic zone.
Secchi depth	This is a measure of water transparency expressed in meters. This parameter is used in the calculation of the NCTSI value for the lake. The depth listed is an average value from all sampling locations in the lake.
Temperature	The range of surface temperatures found at the sampling locations.
Total Kjeldahl nitrogen	The sum of organic nitrogen and ammonia in a water body. High measurements of TKN typically results from sewage and manure discharges in water bodies.
Total organic Nitrogen (TON)	Total Organic Nitrogen (TON) can represent a major reservoir of nitrogen in aquatic systems during summer months. Similar to phosphorus, this concentration can be related to lake productivity and is used in the calculation of the NCTSI. The concentration listed is a lake-wide average from all sampling stations and is calculated by subtracting Ammonia concentrations from TKN concentrations.
Total phosphorus (TP)	Total phosphorus (TP) includes all forms of phosphorus that occur in water. This nutrient is essential for the growth of aquatic plants and is often the nutrient that limits the growth of phytoplankton. It is used to calculate the NCTSI. The concentration listed is a lake-wide average from all sampling stations.
Trophic state	This is a relative description of the biological productivity of a lake based on the calculated NCTSI value. Trophic states may range from extremely productive (Hypereutrophic) to very low productivity (Oligotrophic).
Turbidity	A measure of the ability of light to pass through a volume of water. Turbidity may be influenced by suspended sediment and/or algae in the water.
Watershed	A drainage area in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Overview

The Cape Fear River Basin is the largest river basin in the state, covering 9,149 square miles in 24 counties. There is an estimated 6,300 miles of streams and rivers in the basin confined to the Piedmont and Coastal Plain ecoregions. The Cape Fear River is formed by the confluence of the Deep and Haw Rivers at the Chatham/Lee County line. B. Everett Jordan Reservoir is the largest impoundment in the basin. Several large tributaries join the river as it flows towards the Atlantic Ocean near Southport: Upper and (Lower) Little Rivers, Rockfish Creek, Black River, South River and the Northeast Cape Fear River. The basin is characterized by urban and industrialized areas around the cities of Greensboro, High Point, Burlington, Chapel Hill, and Durham in the upper part of the watershed and around Fayetteville and Wilmington in the middle and lower part. Fort Bragg Military Reservation occupies a large area in the middle of the basin.

Thirty-two lakes were sampled in this river basin by DWR staff in 2018. Five of these lakes appear on the 2012 303(d) List of Impaired Waters (Table 1).

Table 1. Cape Fear River Basin Lakes on the 2016 303(d) List of Impaired Waters.

Lake	Location	Violation
Graham-Mebane Reservoir	From 0.3 mile upstream of NC Hwy 119 at dam at Graham-Mebane Reservoir to SR 1917	Turbidity
Graham-Mebane Reservoir	Quaker Creek Arm of Graham-Mebane Reservoir	Turbidity
Jordan Lake	Morgan Creek from Chatham County SR 1726 to New Hope Creek Arm	Turbidity Elevated pH
Jordan Lake	New Hope Creek Arm of Jordan Lake	Turbidity
Jordan Lake	Haw River 1.0 mile below US 64 to dam	Turbidity Elevated pH
Jordan Lake	Robeson Creek Arm of Jordan Lake	Turbidity Elevated pH
Buckhorn Dam Lake (Cape Fear River)	From a point 0.5 mile upstream of NC Hwy 42 to NC Hwy 42 (Sanford water supply intake)	Chlorophyll *a*
High Point Lake	From backwaters of High Point Lake to dam	Chlorophyll *a*
Sandy Creek (Sandy Creek Reservoir)	From SR 2495 to a point 0.6 mile upstream of NC Hwy 22	Chlorophyll *a*
Rocky River Reservoir	Siler City upper reservoir from 0.3 miles upstream of dam to the dam- (Turner Reservoir Critical Area).	Chlorophyll *a* *Low Dissolved Oxygen*
Greenfield Lake	Entire lake	Chlorophyll a

Following the description of the assessment methodology used for the Catawba River Basin, th ere are individual summaries for each of the lakes and a two-paged matrix that distills the information used to make the lakes use support assessments.

Assessment Methodology

For this report, data from January 1, 2014 through December 31, 2018 were reviewed. Lake monitoring and sample collection activities performed by DWR field staff are in accordance with the Intensive Survey Unit Standard Operating Procedures Manual (http://portal.ncdenr.org/c/document_library/get_file?uuid=522a90a4-b593-426f-8c11-21a35569dfd8&groupId=38364) An interactive map of the state showing the locations of lake sites sampled by DWR may be found at http://www.arcgis.com/home/webmap/viewer.html?webmap=9dbc8edafb7743a9b7ef3f6fed5c4db0&extent=-87.8069,29.9342,-71.5801,38.7611.

All lakes were sampled during the growing season from May through September. Data were assessed for excursions of the state's Class C water quality standards for chlorophyll *a*, pH, dissolved oxygen, water temperature, turbidity, and surface metals. Other parameters discussed in this report include secchi depth and percent dissolved oxygen saturation. Secchi depth provides a measure of water clarity and is used in calculating the trophic or nutrient enriched status of a lake. Percent dissolved oxygen saturation gives information on the amount of dissolved oxygen in the water column and may be increased by photosynthesis or depressed by oxygen-consuming decomposition.

For algae collection and assessment, water samples are collected from the photic zone, preserved in the field and taken concurrently with chemical and physical parameters. Samples were quantitatively analyzed to determine assemblage structure, density (units/ml) and biovolume (m^3/mm^3).

For the purpose of reporting, algal blooms were determined by the measurement of unit density (units/ml). Unit density is a quantitative measurement of the number of filaments, colonies or single celled taxa in a waterbody. Blooms are considered mild if they are between 10,000 and 20,000 units/ml. Moderate blooms are those between 20,000 and 30,000 units/ml. Severe blooms are between 30,000 and 100,000 units/ml and extreme blooms are those 100,000 units/ml or greater.

An algal group is considered dominant when it comprises 40% or more of the total unit density or total biovolume. A genus is considered dominant when it comprises 30% or more of the total unit density or total biovolume.

Quality Assurance of Field and Laboratory Lakes Data

Data collected in the field via multiparameter water quality meters are uploaded into the Labworks® Database within five days of the sampling date.

Chemistry data from the DWR Water Quality Laboratory are uploaded into Labworks®. If there are data entry mistakes, possible equipment, sampling, and/or analysis errors, these are investigated and corrected, if possible. Chemistry results received from the laboratory that are given a qualification code are entered along with the assigned laboratory code.

Information regarding the WSS Chemistry Laboratory Quality Assurance Program is available on the ISB website (https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/methods-pqls-qa).

Weather Overview for Summer 2018

Widespread rains produced the wettest May on record going back to 1895 (Figure 1). Parts of the Cape Fear River Basin saw rainfall that averaged over 200% of the norm for May. Heavy rains in the NC Coastal Plains caused flooded streets, elevated river levels.

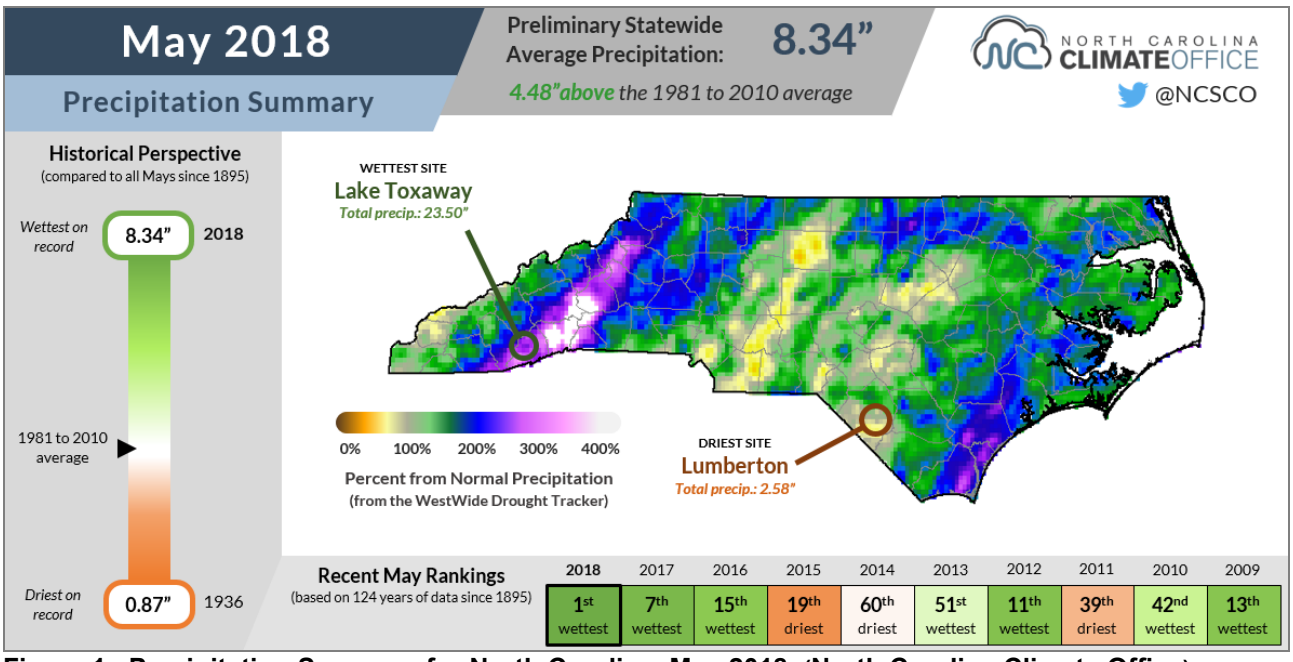


Figure 1. Precipitation Summary for North Carolina, May 2018. (North Carolina Climate Office)

May was also warmer than usual as a result of an early Bermuda high pressure system that formed off the Southeast coast and ushered warm, moist air into the state. This system contributed to continuing hot and muggy conditions in June. The first half of July was dry while the jet stream remained well to the north, allowing hot conditions to continue throughout the state. This changed as a trough in the jet stream formed over the Eastern US and storms tracked from the Ohio Valley to soak the Mountains and eastern portions of the state.

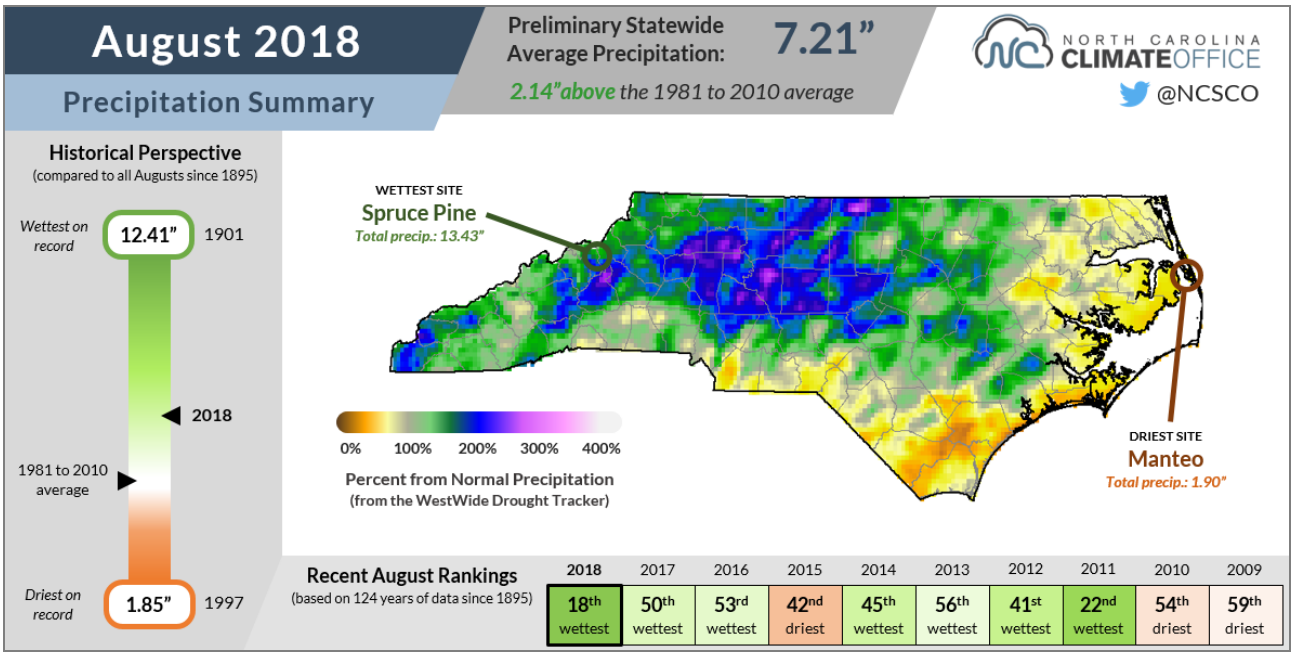


Figure 3. Precipitation Summary for North Carolina, August 2018. (North Carolina Climate Office)

Hurricane Florence made landfall near Wilmington, NC on September 12, 2018 as a Category 1 storm after having downgrading from a Category 4 storm a few days prior. The storms large diameter contributed to tropical storm-force winds extending out to approximately 150 miles from the center. A storm surge of 10.4 feet was reported from a USGS gauge on the Trent River near New Bern. Following landfall, Hurricane Florence's forward speed significantly diminished to a slow crawl. This made rainfall and flooding the greatest threats from the storm. The highest reported total rainfall was 35.93 inches observed northwest of Elizabethtown in Bladen County (https://www.cocorahs.org/state.aspx?state=nc).

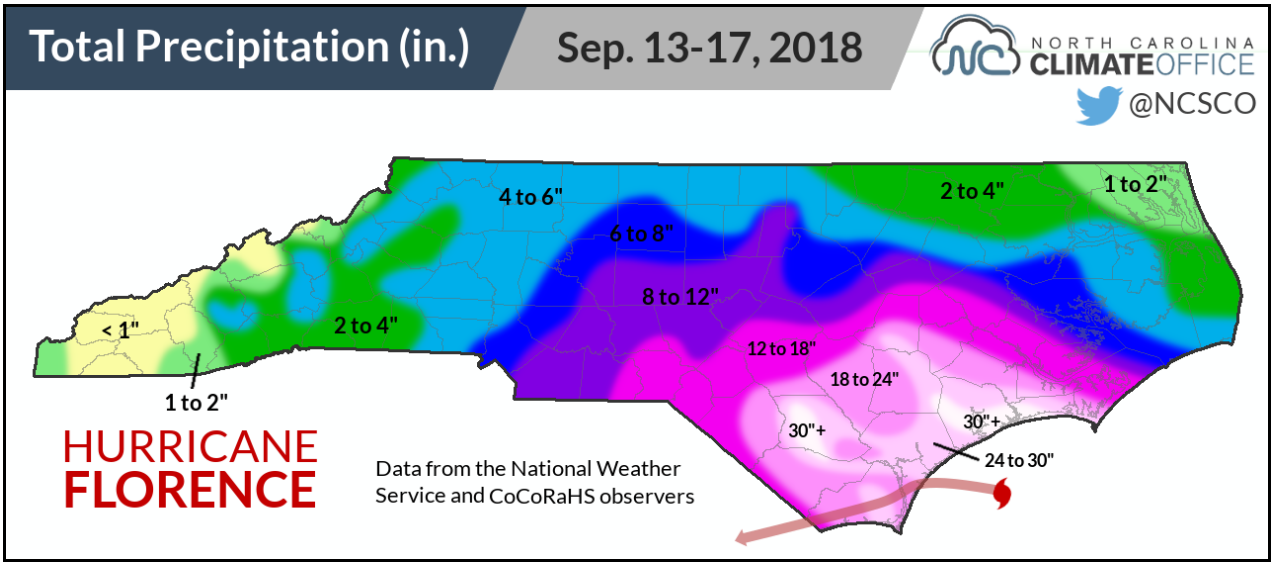


Figure 3. Total rainfall reported during Hurricane Florence (North Carolina Climate Office).

With the ground saturated from thunderstorm events prior to the hurricane, rainfall from Hurricane Florence had little place to go but the rivers, streams and low laying land depressions. The result was some rivers

along the coast cresting at new record levels which exceeded those recorded tor Hurricanes Matthew (2016) and Floyd (1999). The Cape Fear River crested at a record level of 61.4 feet at Fayetteville on September 19, 2018. This was 25 feet above the flood stage of 35 feet.
Flood damage from Hurricane Florence included the breaching of the dam at Boiling Springs Lake and inundation of parts of I-40 and I-95.

LAKE & RESERVOIR ASSESSMENTS

HUC 03030002

Reidsville Lake

Ambient Lakes Program Name	Reidsville Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	6.0	
Volume (10^6 m^3)	0.04	
Watershed Area (mi^2)	53	
Classification	WS-III NSW CA	
Stations	CPF025A	CPF002A1
Number of Times Sampled	5	5

Reidsville Lake is a water supply reservoir located on Troublesome Creek just outside of, and owned by, the City of Reidsville. The topography of the watershed is characterized by rolling hills and land use is mainly agricultural (row crop and pastures) along with residential and commercial development. Rockingham County has limited activities in the lake watershed with strict zoning laws; the reservoirs have a 100-foot buffer with a 50-foot buffer on all flowing streams. A public city park with a boat launch area is located off SR 2435.

DWR field staff monitored Reidsville Lake monthly from May through September 2018. In July, a sampling site near the dam and water intake was added to the two existing DWR sampling sites. Surface dissolved oxygen in this lake ranged from 4.9 to 9.1 mg/L and surface pH ranged from 7.1 to 8.3 s.u. (Appendix A). Secchi depths, a measurement of water clarity, ranged from 0.2 to 1.5 meters. The lowest Secchi depths were observed in August and field observations indicated and that the lake water appeared dark brown and turbid on that day and may have been attributed to heavy rains that had occurred the week before.

Total phosphorus ranged from 0.02 to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.50 to 0.85 mg/L. Ammonia ranged from <0.02 mg/L to 0.17 mg/L while nitrite plus nitrate concentrations ranged from <0.02 to 0.14 mg/L. Chlorophyll *a* values ranged from 7.5 to 28 *u*g/L, which was well below the state water quality standard of 40 *u*g/L. Reidsville Lake was determined to exhibit elevated biological productivity (eutrophic conditions) during the growing season of 2018.

Lake Hunt

Ambient Lakes Program Name	Lake Hunt		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	10.0		
Volume ($10^6 m^3$)	2.8		
Watershed Area (mi^2)	5		
Classification	WS-III B NSW		
Stations	CPF021A	CPF0022A	CPF0023A
Number of Times Sampled	5	5	5

Lake Hunt is a recreational lake located in Reidsville, North Carolina. Constructed in 1956, this reservoir is owned by the City of Reidsville. The boat launch area, however, is privately owned and access by the public is restricted. Lake Hunt was Reidsville's primary water supply until Reidsville Lake was built in 1979. An unnamed tributary of Troublesome Creek feeds Lake Hunt.

This reservoir was sampled monthly from May through September 2018. Surface dissolved oxygen ranged from 8.1 mg/L in September to 10.3 mg/L in August (Appendix A). Surface pH values were greatest in July (8.4 to 8.7 s.u.) and lowest in May (7.6 to 8.7 s.u.) Secchi depths for Lake Hunt ranged from 0.7 meter to 1.7 meters. Field notes indicated that the lake water color in June was green and that the lake appeared brown and turbid in August due to frequent rains.

Total phosphorus concentrations ranged from 0.02 to 0.05 mg/L and total Kjeldahl nitrogen ranged from 0.50 to 0.76 mg/L (Appendix A). Ammonia was consistently below the DWR water quality laboratory detection level and nitrite plus nitrate values ranged from <0.02 to 0.04 mg/L. Chlorophyll *a* values were less than the state water quality standard of 40 *u*g/L and ranged from 3.4 to 29.0 *u*g/L. Based on the calculated NCTSI scores, Lake Hunt was determined to exhibit elevated biological productivity or eutrophic conditions. This lake also demonstrated eutrophic conditions when it was previously sampled by DWR in 2008, 2011 and 2013

Lake Higgins

Ambient Lakes Program Name	Lake Higgins	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	3.5	
Volume ($10^6 m^3$)	3.0	
Watershed Area (mi^2)	11	
Classification	WS-III NSW CA	
Stations	CPFLH2	CPFLH4
Number of Times Sampled	4	4

Lake Higgins is one of three lakes used by the City of Greensboro as a water supply. An impoundment of Brush Creek, this lake drains into Lake Brandt, which, in turn, discharges into Lake Townsend. A public park operated by the City of Greensboro Parks & Recreation Department is located at Lake Higgins off Hamburg Mill Road. Recreational activities include fishing, sailing and canoeing.

Lake Higgins was sampled by DWR field staff monthly from May through August 2018. Surface dissolved oxygen in this lake ranged from 7.2 to 9.4 mg/L, with the greatest dissolved oxygen value observed at the downstream lake sampling site near the dam (CPFLH4) on July 12th (Appendix A). The percent dissolved oxygen saturation at this site was 124.0% and surface pH was 8.4 s.u. These values coincided with a chlorophyll *a* value of 31 *u*g/L, which was the greatest chlorophyll *a* value observed at this lake in 2018. Secchi depths in Lake Higgins ranged from 0.6 to 1.5 meters

Total phosphorus concentrations ranged from 0.02 to 0.04 mg/L and total Kjeldahl nitrogen values ranged from 0.46 to 0.80 mg/L (Appendix A). Ammonia was less than the DWR laboratory detection level of 0.02 mg/L while nitrite plus nitrate values ranged from <0.02 to 0.04 mg/L. Based on the calculated NCTSI scores, Lake Higgins exhibited elevated biological productivity or eutrophic conditions from May through August 2018.

Lake Brandt

Ambient Lakes Program Name	Lake Brandt		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	2.0		
Volume ($10^6 m^3$)	84.0		
Watershed Area (mi^2)	40		
Classification	WS-III NSW CA		
Stations	CPF007A1A	CPF007A4	CPF007B
Number of Times Sampled	4	4	4

Lake Brandt is one of two primary water supplies for the City of Greensboro. Reedy Fork Creek and Horsepen Creek are the main tributaries to the lake. The shoreline is forested and the watershed consists of a mixture of residential developments, pastures, row crop fields and scattered small businesses.

Lake Brandt was sampled by DWR field staff monthly from May through August 2018. Secchi depths during the summer sampling period of 2018 ranged from 0.6 to 1.3 meter (Appendix A). Surface dissolved oxygen ranged from 7.0 mg/L in May to 9.2 mg/L in August. Surface water temperatures was lowest in May (27.0 °C) and greatest in August (29.9 °C). Surface pH values ranged from 7.1 to 8.1 s.u.

Total phosphorus concentrations in Lake Brandt ranged from 0.02 to 0.04 mg/L (Appendix A). Ammonia was consistently below the DWR laboratory detection level of 0.02 mg/L at each of the three lake sampling sites and nitrite plus nitrate values ranged from <0.02 to 0.04 mg/L. Chlorophyll *a* values were less than the state water quality standard of 40 *u*g/L (range = 11 to 30 *u*g/L). Based on the calculated NCTSI scores in 2018, Lake Brandt was determined to exhibit elevated biological productivity (eutrophic conditions) from May through August.

Lake Townsend

Ambient Lakes Program Name	Lake Townsend		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	3.0		
Volume ($10^6 m^3$)	25.0		
Watershed Area (mi^2)	105		
Classification	WS-III NSW CA		
Stations	CPFLT4	CPFLT6	CPFLT8
Number of Times Sampled	4	4	4

The City of Greensboro constructed Lake Townsend in 1969 to provide drinking water for the area. This reservoir drains a watershed, which includes Lake Higgins and Lake Brandt located upstream on Reedy Fork Creek. While the mean retention time for this reservoir is unknown, it takes approximately seven to eight months for water to travel from Lake Higgins downstream to the dam at Lake Townsend. A public park operated by the City of Greensboro Parks & Recreation Department is located at this lake. Recreational activities permitted at Lake Townsend include sailing, canoeing and fishing. The immediate shoreline of Lake Townsend consists of forested areas and a golf course. The watershed is a mix of urban development, residential development, and agriculture (pastures and row crop fields).

DWR field staff sampled Lake Townsend monthly from May through August 2018. Surface dissolved oxygen ranged from 6.8 to 9.4 mg/L and surface pH values ranged from 7.2 to 8.5 s.u. (Appendix A). The Secchi depth measurements at the dam sampling site (CPFLT8) were consistently greater than the measurements at the mid-lake (CPFLT6) and upstream (CPFLT4) sampling sites. This agreed with turbidity values, which were also lowest near the dam and greatest at the upstream sampling site.

Total phosphorus in Lake Townsend ranged from <0.02 mg/L to 0.07 mg/L. Total Kjeldahl nitrogen concentrations (range = 0.29 t0 0.82 mg/L) exhibited a general upstream to downstream concentration gradient with the greatest concentrations observed at CPFLT4 and lowest near (CPFLT8). Ammonia values were consistently less than the DWR laboratory detection level while nitrite plus nitrate ranged from <0.02 mg/L to 0.04 mg/L. Chlorophyll *a* values ranged from 3.9 to 49.0 *u*g/L. Two of the 12 chlorophyll *a* measurements in 2018 (17%) were greater than the state water quality standard of 40 *u*g/L. Based on the calculated NCTSI scores for Lake Townsend in 2018, this lake was determined to exhibit elevated biological productivity (eutrophic conditions).

Lake Burlington (Stony Creek Reservoir)

Ambient Lakes Program Name	Lake Burlington (Stony Creek Res.)	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	2.0	
Volume ($10^6 m^3$)	1.5	
Watershed Area (mi^2)	110	
Classification	WS-II HWQ NSW CA	
Stations	CPFSCR2	CPFSCR4
Number of Times Sampled	4	4

Lake Burlington (also known as Stony Creek Reservoir) was built as a water supply between 1927 and 1928 by the City of Burlington. Stony Creek and Toms Creek drain the watershed, which is characterized by rolling hills.

This reservoir was monitored monthly from May through August 2018. Surface dissolved oxygen ranged from 6.8 mg/L in May to 9.7 mg/L in August (Appendix A). Surface pH values ranged from 7.0 to 8.4 s.u. Secchi depths were less than a meter at both of the lake sampling sites, ranging from 0.4 to 0.8 meter.

Total phosphorus concentrations in Lake Burlington ranged from 0.05 to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.76 to 0.94 mg/L (Appendix A). Ammonia ranged from <0.02 to 0.05 mg/L and nitrite plus nitrate ranged from <0.02 mg/L to 0.06 mg/L. The turbidity value in May at the sampling site located near the dam, CPFSC4, was 26 NTU. This value was greater than the state water quality standard of 25 NTU for lakes and reservoirs not designated as Trout Waters (Tr). Rainfall in the lake's watershed within 48 hours of sampling was greater than 0.25 inch. Chlorophyll *a* values for Lake Burlington in 2018 ranged from 24 to 60 *u*g/L. Chlorophyll *a* values in May (59 *u*g/L) and in August (60 *u*g/L) were greater than the state water quality standard of 40 *u*g/L.

Based on the calculated NCTSI scores, Lake Burlington was determined to exhibit elevated biological productivity (eutrophic conditions) in 2018. This reservoir has exhibited eutrophic conditions since it was first monitored by DWR in 1990.

Lake Cammack (Burlington Reservoir)

Ambient Lakes Program Name	Lake Cammack (Burlington Reservoir)	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	4.0	
Volume ($10^6 m^3$)	12.2	
Watershed Area (mi^2)	28	
Classification	WS-II HWQ NSW CA	
Stations	CPF0251	CPF025A
Number of Times Sampled	4	4

Lake Cammack (also known as Burlington Reservoir), an auxiliary water supply located at the confluence of Stony Creek and Toms Creek in Alamance County, is owned by the City of Burlington. The lake watershed area consists primarily of forested and agricultural land.

DWR field staff monitored Lake Cammack monthly from May through August 2018. The lowest surface dissolved oxygen value was observed at the sampling site near the dam (CPF025A) in May (7.9 mg/L) and the highest values were observed at the same sampling site in August (9.4 mg/L; Appendix A). Surface pH values ranged from 7.0 to 8.4 s.u. Secchi depths, an indicator of water clarity, ranged from 0.8 meter to 1.0 meter. Algal bloom samples were collected at both lake sampling sites in August in response to elevated surface dissolved oxygen and pH values which suggested the possibility of an algal bloom.

Total phosphorus ranged from 0.02 to 0.04 mg/L and total Kjeldahl nitrogen ranged from 0.61 to 0.80 mg/L (Appendix A). Ammonia was consistently <0.02 mg/L and nitrite plus nitrate concentrations ranged from <0.02 to 0.03 mg/L. Chlorophyll *a* values in 2018 ranged from 18 to 29 *u*g/L. Lake Cammack was determined to exhibit elevated biological productivity, or eutrophic conditions, in 2018. This trophic status has not changed since 1981 when Lake Cammack was first monitored by DWR staff.

Graham-Mebane Reservoir

Ambient Lakes Program Name	Graham-Mebane Reservoir				
Trophic Status (NC TSI)	Eutrophic				
Mean Depth (meters)	3.0				
Volume ($10^6 m^3$)	8.7				
Watershed Area (mi^2)	66				
Classification	WS-II HQW NSW CA				
Stations	CPFGMR01	CPFGMR1	CPFGMR2	CPFGMR3	CPFGMR4
Number of Times Sampled	4	4	4	4	4

Graham-Mebane Reservoir is a water supply source for the Towns of Graham and Mebane. The lake also serves as a drinking water source for the Towns of Green Level and Haw River. Construction of the dam was started in May of 1989 and full pool elevation was reached in the fall of 1992. The lake is located on Quaker and Back Creeks and encompasses the old Quaker Creek Reservoir, which had been previously monitored by DWR. The immediate shoreline is forested except for a few houses, a public school with an athletic field, and some farmland.

Graham-Mebane Reservoir was monitored by DWR field staff monthly from May through August 2018. Surface dissolved oxygen ranged from 4.9 to 9.2 mg/L and surface pH values ranged from 5.9 to 10.9 s.u. (Appendix A). Surface water temperatures ranged from 25.7°C to 32.3 °C. Secchi depths were less than a meter. Frequent rainfall, especially in the early part of the summer may have contributed to the increased turbidity of Graham-Mebane Reservoir in 2018.

Total phosphorus concentrations ranged from 0.03 to 0.12 mg/L and total Kjeldahl nitrogen ranged from 0.76 to 1.50 mg/L. Ammonia concentration ranged from <0.02 to 0.02 mg/L and nitrite plus nitrate concentrations ranged from <0.02 mg/L to 0.05 mg/L. Nutrient concentrations in Graham-Mebane Reservoir were slightly greater than those recorded from previous DWR monitoring efforts. Chlorophyll *a* values in 2018 ranged from 29 to 130 *u*g/L. Thirteen of the 20 chlorophyll *a* observations (65%) were greater than the state water quality standard of 40 *u*g/L.

Graham-Mebane Reservoir in on the 303(d) List of Impaired Waters for turbidity values greater than the state water quality standard of 25 NTU in the Quaker Creek arm (listed in 2008) and 0.3 mile upstream of the NC HWY 119 at the dam to SR 1917 (listed in 2012). In 2018, turbidity values exceeded the state water quality standard of 25 NTU for lakes and reservoirs not designated as Trout Waters (Tr) three times (15%).

Based on the calculated NCTSI scores, Graham-Mebane Reservoir was determined to have elevated biological productivity (eutrophic conditions) in June and August 2018 and was extremely productive (hypereutrophic) in May and July 2018. The mean NCTSI scores for this reservoir indicated that the overall trophic state was eutrophic.

Lake Mackintosh

Ambient Lakes Program Name	Lake Mackintosh				
Trophic Status (NC TSI)	Eutrophic				
Mean Depth (meters)	9.5				
Volume ($10^6 m^3$)	29.0				
Watershed Area (mi^2)	129				
Classification	WS-IV NSW CA				
Stations	CPF038G	CPF038H	CPF038J	CPF038L	CPF038N
Number of Times Sampled	5	5	5	5	5

Lake Mackintosh is a water supply reservoir for the City of Burlington. The lake is used for recreational purposes (fishing and boating). Located on Big Alamance Creek, Lake Mackintosh was filled in 1993. The surrounding land is comprised of pastures and farmland with a few houses. A public park and marina operated by Alamance County is located off SR 1149 (Huffman Mill Road) and Guilford County operates a small marina located on the Little Alamance Creek arm of Mackintosh Lake. Guilford County has established a no wake zone for the Little Alamance arm and boats entering this arm are restricted to electric motors.

DWR field staff sampled five lake sites monthly from May through September 2018. Surface dissolved oxygen in Lake Mackintosh ranged from 5.6 to 10.8 mg/L. Both of these values were observed at the sampling site just downstream of SR 1149 (CPF038J; Appendix A). Surface water temperatures ranged from 20.7 °C to 30.2 °C and surface pH values varied from 7.0 to 8.5 s.u. Secchi depths for Lake Mackintosh ranged from 0.5 to 2.1 meters.

In general, the greatest nutrient and chlorophyll *a* values were observed in May. Total phosphorus concentrations ranged from <0.02 to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.49 to 0.90 mg/L (Appendix A). These nutrient concentrations along with those for total organic nitrogen, ammonia and nitrite plus nitrate, were similar to those previously observed in this reservoir since it was first monitored in 1993. Chlorophyll *a* values from May through September 2018 ranged from 5.9 to 42.0 *u*g/L, which was greater than the state water quality standard of 40 *u*g/L.

Based on the calculated NCTSI scores for 2018, Lake Mackintosh was determined to exhibit elevated biological productivity, or eutrophic conditions. This reservoir has been consistently eutrophic since it was first monitored by DWR field staff in 1993.

Cane Creek Reservoir

Ambient Lakes Program Name	Cane Creek Reservoir		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	2.5		
Volume ($10^6 m^3$)	11.0		
Watershed Area (mi^2)	32		
Classification	WS-II HQW NSW CA		
Stations	CPFCCR2	CPFCCR4	CPFCCR6
Number of Times Sampled	5	5	5

Cane Creek Reservoir was built in 1989 by Orange Water and Sewer Authority (OWASA) as a water supply for the City of Chapel Hill. The majority of the watershed is forested with some agriculture. Two main tributaries entering the lake are Cane Creek and Turkey Hill Creek. A public park is located at the lake.

Cane Creek Reservoir was sampled five times from May through September 2018. Surface dissolved oxygen ranged from 6.4 to 12.7 mg/L. The greatest surface dissolved oxygen values were observed in May with all three lake sampling sites exhibiting values greater than 10.0 mg/L (Appendix A). In 2018, surface pH values ranged from 6.9 to 8.0 s.u. The greatest percent dissolved oxygen value (148.4%) occurred at the most upstream lake sampling site (CPFCCR2) in May. Secchi depths for Cane Creek Reservoir ranged from 0.5 to 1.7 meters.

Total phosphorus ranged from 0.02 to 0.05 mg/L and total Kjeldahl nitrogen ranged from 0.60 to 1.60 mg/L (Appendix A). Concentrations of ammonia were below the DWR laboratory detection level of 0.02 mg/L and nitrite plus nitrate concentrations ranged from <0.02 to 0.06 mg/L. Chlorophyll *a* values for Cane Creek Reservoir ranged from 12 to 100 *u*g/L. The greatest chlorophyll *a* values were observed in May (71 to 100 *u*g/L). These values were greater than the state water quality standard of 40 *u*g/L and comprised 25% of the DWR chlorophyll *a* observations in 2018.

Cane Creek Reservoir was determined to exhibit elevated biological productivity (eutrophic conditions) from June through September and excessive biological productivity (hypereutrophic conditions in May based on the calculated NCTSI scores. Overall, Cane Creek Reservoir was determined to be eutrophic in 2018.

University Lake

Ambient Lakes Program Name	University Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	1.5	
Volume ($10^6 m^3$)	2.6	
Watershed Area (mi^2)	29	
Classification	WS-II HQW NSW CA	
Stations	CPFUL4	CPFUL6
Number of Times Sampled	5	5

University Lake was constructed in 1932. This reservoir, which is managed by the Orange County Water and Sewer Authority (OWASA), provides drinking water for the City of Chapel Hill. Recreational fishing and boating are allowed at this lake. Major tributaries to the lake include Morgan Creek, Phils Creek, Price Creek, and Prichard Mill Creek

In 2018, University Lake was monitored monthly from May through September. Surface dissolved oxygen in this reservoir ranged from 6.4 mg/L to 11.5 mg/L and percent dissolved oxygen saturation ranged from 80.6% to 144.8% (Appendix A). Surface pH values ranged from 7.3 to 8.3 s.u. Secchi depths, a measure of water clarity, were predominantly less than one meter, indicating fair water clarity.

Total phosphorus values ranged from 0.05 to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.78 to 1.00 mg/L (Appendix A). These values were similar to nutrient concentrations previously observed in this reservoir. Chlorophyll *a* ranged from 36 to 80 *u*g/L, with values at both lake sampling sites in May and August greater than the state water quality standard of 40 *u*g/L. Sixty percent of the chlorophyll *a* value observations in 2018 exceeded the state water quality standard.

Based on calculated NCTSI scores, University Lake was determined to have exceptional biological productivity (hypereutrophic conditions) in June and July and elevated productivity or eutrophic conditions in May, August and September. This lake has exhibited eutrophic conditions since DWR monitoring began in 1990. Hypereutrophic conditions were first observed in 2003, then again in 2009 and 2013.

B. Everett Jordan Lake

Ambient Lakes Program Name	Jordan Lake								
Trophic Status (NC TSI)	Eutrophic								
Mean Depth (meters)	5.0								
Volume (10^6 m^3)	929.6								
Watershed Area (mi^2)	1689								
Classification	WS-IV B NSW CA								
Stations	CPF055C	CPF055D	CPF055E	CPF081A1C	CPF086C	CPF086F	CPF087B3	CPF087D	CPF0880A
Number of Times Sampled	4	4	4	4	4	4	4	4	4

B. Everett Jordan Reservoir (Jordan Lake) is a multipurpose reservoir constructed in Chatham County and filled in the late 1981. Major tributaries to the lake include the Haw River, New Hope Creek, and Morgan Creek. Constructed by U.S. Army Corps of Engineers for flood control, this lake is used extensively for primary and secondary recreational activities and as a water supply for several municipalities. Ninety percent of the annual inflow to the lake comes from the Haw River. This arm of the lake has an average hydraulic retention time of five days. The average hydraulic retention time of the New Hope Creek arm is 418 days. Land uses in the watershed include the municipalities of Cary, Apex, Durham and Chapel Hill. Other land uses in the watershed include forest and agricultural areas. Most of the shoreline is undeveloped and forested. Numerous NPDES permitted facilities discharge into the watershed. Nutrient enrichment, algal blooms and eutrophic conditions have been present in the lake since impoundment. The Division of Water Resources (DWR), as well as other organizations have performed extensive historical water quality sampling on Jordan Lake.

DWR field staff monitored Jordan Lake monthly from May through August 2018. Surface dissolved oxygen ranged from 5.2 to 11.4 mg/L and surface water temperatures from May through September ranged from 22.3 °C to 31.4 °C (Appendix A). Surface pH ranged from 7.1 to 9.3 s.u. Secchi depths, a measurement of water clarity, were frequently less than a meter, ranging from 0.2 to 1.3 meters.

Total phosphorus in Jordan Lake ranged from 0.03 to 0.12 mg/L and total Kjeldahl nitrogen concentrations ranged from 0.64 to 1.40 mg/L (Appendix A). Ammonia nitrogen ranged from <0.02 to 0.16 mg/L and nitrite plus nitrate ranged from <0.02 to 0.50 mg/L. Total organic nitrogen in Jordan Lake ranged from 0.63 to 1.39 mg/L. Chlorophyll *a* values ranged from 14 *u*g/L at the sampling site in the center of the Haw River Arm (CPF055D) in May to 100 *u*g/L at the sampling site upstream of the dam (CPF055E) in August. Thirteen of the 36 chlorophyll *a* samples collected from Jordan Lake in 2018 (36%) had values greater than the state water quality standard of 40 *u*g/L (Appendix A).

Jordan Lake was placed on the 303(d) List of Impaired Waters for turbidity values greater than the state water quality standard of 25 NTU and for pH values greater than the state standard of 9.0 s.u. During the sampling effort in 2018, three of the 36 turbidity observations were greater than 25 NTU. One of 36 surface pH values were greater than 9.0 s.u. in 2018. Based on the calculated NCTSI scores. Jordan Lake was determined to exhibit elevated biological productivity or eutrophic conditions in 2018. This reservoir has been eutrophic since it was first monitored by DWR in 1982.

Buckhorn Dam Lake

Ambient Lakes Program Name	Buckhorn Dam Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	
Volume ($10^6 m^3$)	2.0
Watershed Area (mi^2)	
Classification	WS-IV CA
Stations	CPFBD1
Number of Times Sampled	5

Buckhorn Dam Lake is located on the Cape Fear River, approximately 5.9 miles downstream of the confluence of the Haw and Deep Rivers and has a surface area of 460 acres. The dam, which is 1,100 feet in length and spans the width of the river, was completed in 1908. The lake was used until 1962 by a regional power production facility to regulate flows for power production. After 1962, the dam became a run-of-the-river structure and continued to provide a source of cooling water for the coal-burning power plant. Buckhorn Dam is approximately 5.8 miles downstream of the intake for the power plant. The depth of this reservoir is influenced by both precipitation runoff and water release volumes from Jordan Lake.

In 2018, DWR field staff sampled Buckhorn Dam Lake monthly from May through August. Secchi depths for this reservoir ranged from 0.5 to 0.7 meter, indicating fair water clarity. Surface dissolved oxygen ranged from 6.8 to 12.0 mg/L and surface water temperatures ranged from 17.7°C to 30.4 °C. Surface pH values were somewhat steady, ranging from 7.1 to 8.4 s.u.

Total phosphorus in Buckhorn Dam Lake ranged from 0.06 to 0.14 mg/L and total Kjeldahl nitrogen ranged from 0.74 to 1.00 mg/L. Ammonia concentrations varied from <0.02 to 0.12 mg/L and the concentrations of nitrite plus nitrate ranged from 0.11 to 0.51 mg/L. Chlorophyll *a* ranged from 5.2 to 32.0 *u*g/L. Based on the calculated NCTSI scores, Buckhorn Dam Lake was determined to exhibited elevated biological conditions (eutrophic) each month it was sampled in 2018. In 2006, this lake was placed on the 303(d) List of Impaired Waters for chlorophyll *a* values that exceed the state water quality standard.

LAKE & RESERVOIR ASSESSMENTS

HUC 03030003

High Point Lake

Ambient Lakes Program Name	High Point Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	5.0	
Volume (10^6 m^3)	4.8	
Watershed Area (mi^2)	60	
Classification	WS-IV CA	
Stations	CPF089E2	CPF089E4
Number of Times Sampled	4	4

High Point Lake (also known as City Lake), built in 1928 by the City of High Point, is used as a water supply and for recreation. Maximum depth of the lake is 33 feet (10 meters). Urban and residential areas as well as pasture and row crop farms dominate the watershed. The two arms of the lake are fed by the East Fork Deep River and the West Fork Deep River. An air injection aeration system operates in both the Deep River and West Fork Deep River arms of this lake to reduce stratification during the summer months and improve the quality of raw water removed for drinking water processing.

High Point Lake was sampled monthly from May through August 2018 by DWR field staff. Surface dissolved oxygen in this reservoir ranged from 4.7 to 9.3 mg/L and surface water temperature ranged from 22.6 °C in May downstream of the SR 1545 bridge over the Deep River arm (CPF089E2) to 29.6 °C near the dam (CPF089E4) in August (Appendix A). Surface pH values were fairly consistent, ranging from 7.3 to 7.6 s.u. Secchi depth measurements during the field sampling of this lake in 2018 ranged from 0.8 to 1.3 meters.

Nutrient concentrations in High Point Lake were similar to those previously observed in this lake. Total phosphorus in 2018 ranged from 0.03 to 0.05 mg/L and total Kjeldahl nitrogen ranged from 0.55 to 0.74 mg/L (Appendix A). Chlorophyll *a* values ranged from 12 to 40 ug/L. These values did not exceed the state water quality standard of 40 *u*g/L. Past elevated chlorophyll *a* values placed High Point Lake on the 303(d) List of Impaired Waters.

Based on the calculated NCTSI scores, High Point Lake was determined to exhibit elevated biological productivity or eutrophic conditions on each of the four sampling dates in 2018.

Oak Hollow Lake (High Point Reservoir)

Ambient Lakes Program Name	Oak Hollow Lake		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	6.5		
Volume ($10^6 m^3$)	11.0		
Watershed Area (mi^2)	55		
Classification	WS-IV CA		
Stations	CPF089D3	CPF089D4	CPF089D5
Number of Times Sampled	4	4	4

The City of High Point constructed Oak Hollow Lake (also known as High Point Reservoir) to serve as a water supply source. Boating, fishing and swimming are common activities on the lake. The lake has a maximum depth of 36 feet (11 meters). The rolling watershed is characterized by urban and residential development. Two 18-hole golf courses adjoin the lake. An air injection aeration system operates in this lake to reduce stratification during the summer months and improve the quality of raw water removed for drinking water processing.

Oak Hollow Lake was sampled monthly from May through August 2018 by DWR field staff. Secchi depths, a measurement of water clarity, ranged from 1.0 to 1.3 meters. Surface dissolved oxygen ranged from 5.0 mg/L May to 10.3 mg/L in June at the sampling site located in the West Fork Deep River arm (CPF089D3; Appendix A). The high dissolved oxygen values observed in May coincided with low surface water temperatures also recorded for that month. The greatest surface water temperature (29.2 °C) was recorded in August at the sampling site located in the West Fork Deep River arm (CPF089D3). Surface pH values ranged from 7.2 to 8.1 s.u.

Nutrient concentrations for Oak Hollow Lake were similar to those previously observed for this reservoir by DWR. Total phosphorus concentrations ranged from 0.03 to 0.04 mg/L and total Kjeldahl nitrogen ranged from 0.52 to 0.72 mg/L. Ammonia ranged from <0.02 to 0.15 mg/L and nitrite plus nitrate ranged from <0.02 to 0.09 mg/L. Chlorophyll *a* ranged from 10 to 30 *u*g/L. Based on the calculated NCTSI scores, Oak Hollow Lake was determined to exhibit elevated biological productivity (eutrophic conditions) on each of the five days it was sampled in 2018.

Randleman Reservoir

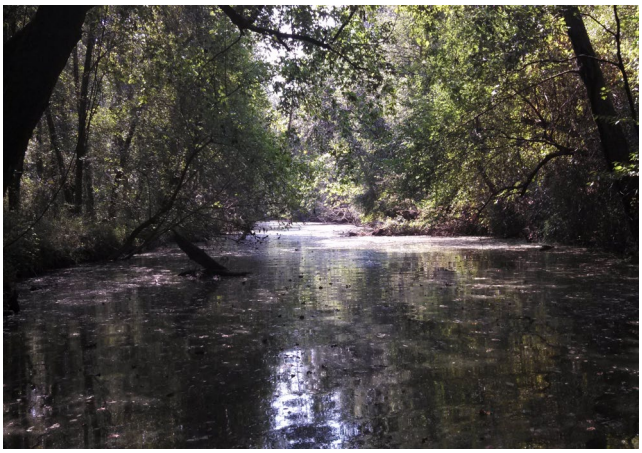
Ambient Lakes Program Name	Randleman Lake								
Trophic Status (NC TSI)	Eutrophic								
Mean Depth (meters)									
Volume ($10^6 m^3$)	115.5								
Watershed Area (mi^2)	174								
Classification	WS-IV CA								
Stations	CPFRD1	CPFRD2	CPFRD3	CPFRD4	CPFRD5	CPFRD6	CPFRD7	CPFRD8	CPFRD9
Number of Times Sampled	4	4	4	4	4	4	4	4	4

Randleman Lake is located to the south of the City of High Point on the Deep River. Construction of the dam began in 2001 and the reservoir filled in 2007. Located in Randolph and Guilford counties, this reservoir provides drinking water for North Carolina's Piedmont Triad Region and is managed by the Piedmont Triad Regional Water Authority (PTRWA). Randleman Lake will also provide public recreation for boating and fishing. Land use within the immediate watershed consists of dairy operations, forested areas and a few residences. The High Point Eastside WWTP discharge is located downstream of the Groomtown Road bridge (CPFRD1).

Six sites on Randleman Reservoir were sampled by DWR field staff monthly from May through August 2018. Secchi depths ranged from 0.7 to 1.6 meters (Appendix A). Surface dissolved oxygen ranged from 7.2 to 10.7 mg/L and surface water temperatures ranged from 25.7 °C to 31.4 °C. In July, the highest observed surface pH value (8.9 s.u.) occurred at the same sampling site which had the highest surface dissolved oxygen value (CPFRD1, which is located in the upper Deep River arm).

Total phosphorus concentrations ranged from <0.02 to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.44 to 0.81 mg/L. Total organic nitrogen ranged from 0.43 to 0.80 mg/L. Chlorophyll ***a*** values for Randleman Reservoir did not exceed the state water quality standard of 40 *u*g/L, ranging from 7.3 to 36.0 *u*g/L. Based on the calculated NCTSI scores, Randleman Reservoir was determined to exhibit elevated biological productivity (eutrophic conditions) in 2018.

Sandy Creek Reservoir



Ambient Lakes Program Name	Sandy Creek Reservoir		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	6.5		
Volume (10^6 m^3)	1.5		
Watershed Area (mi^2)	55		
Classification	WS-III CA		
Stations	CPFSC1	CPFSC2	CPFSC3
Number of Times Sampled	4	4	4

Sandy Creek Reservoir is the water supply for the Town of Ramseur. Impounded in 1978, it is fed by Big Sandy Creek and Little Sandy Creek. The watershed is moderately developed and land use is mostly characterized by forested and agricultural areas as well as urban development.

Sandy Creek Reservoir was monitored four times from May through August 2018. Secchi depths ranged from 0.6 to 1.1 meters (Appendix A). Surface dissolved oxygen (range = 6.4 to 12.3 mg/L) was generally elevated at the mid-lake sampling site (CPFSC2) and upper lake site (CPFSC3). Surface water temperatures in 2018 ranged from 21.3 °C in June to 30.1 °C in July and surface pH values ranged from 7.0 to 8.5 s.u.

Nutrient concentrations in Sandy Creek Reservoir, while being similar to those levels previously measured in this reservoir, were elevated in 2018 (Appendix A). Total phosphorus ranged from 0.03 to 0.16 mg/L and total Kjeldahl nitrogen ranged from 0.58 to 1.30 mg/L. Ammonia ranged from <0.02 to 0.08 mg/L and nitrite plus nitrate from <0.02 to 0.65 mg/L. Due to the ready availability of these nutrients, chlorophyll *a* values ranged from 1.4 to 210.0 *u*g/L. Eight of the 12 chlorophyll *a* measurements for 2018 (67%) were greater than the state water quality standard of 40 *u*g/L. A turbidity value for the upper lake site in August (34 NTU) also exceeded the state water quality standard of 25 NTU for lakes not designated as Trout Waters.

Sandy Creek Reservoir was determined to exhibit elevated biological productivity (eutrophic conditions) in May and July 2018 and excessive productivity (hypereutrophic conditions) in June and August based on the calculated NCTSI scores. The mean NCTSI score for 2018 indicated that the overall trophic state of this lake was eutrophic.

Rocky River Reservoir

Ambient Lakes Program Name	Rocky River Reservoir	
Trophic Status (NC TSI)	Hypereutrophic	
Mean Depth (meters)	5.5	
Volume ($10^6 m^3$)	1.6	
Watershed Area (mi^2)	23	
Classification	WS-III CA	
Stations	CPF1201B	CPF1201A
Number of Times Sampled	4	4

The Rocky River Reservoir is an impoundment located on the Rocky River in Chatham County and serves as a water supply for the Town of Siler City. It is located upstream of Charles L. Turner Reservoir (formerly known as the Lower Rocky River Reservoir). Public access to the lake is restricted. The watershed is primarily agricultural with some pasture immediately adjacent to the lake.

DWR staff monitored this reservoir monthly from May through August 2018. Secchi depths were less than a meter (range = 0.4 to 0.7 meter), indicating limited water clarity (Appendix A). Secchi depths of less than a meter were previously observed by DWR in 2013, 2008 and 2003. Surface dissolved oxygen in 2018 ranged from 5.7 to 10.7 mg/L and surface pH ranged from 6.7 to 7.4 s.u.

Total phosphorus ranged from 0.06 to 0.12 mg/L and total Kjeldahl nitrogen ranged from 1.1 to 1.4 mg/L (Appendix A). Nitrite plus nitrate concentrations in 2018 ranged from <0.02 to 0.30 mg/L. Ammonia values ranged from <0.02 to 0.50 mg/L. The availability of nutrients supported increased algal productivity, which resulted in chlorophyll *a* concentrations ranging from 18 to 79 *u*g/L. Four of seven chlorophyll *a* values recorded for the 2018 sampling effort (57%) were greater than the state water quality standard 0f 40 *u*g/L. Turbidity values in June through August were greater than the state water quality standard of 25 NTU.

Based on the 2018 growing season NCTSI scores, the lake trophic status for Rocky River was determined to be hypereutrophic (or exhibiting exceptionally elevated biological productivity). This reservoir was also hypereutrophic in 2003, 2008 and 2013.

Charles L. Turner Reservoir

Ambient Lakes Program Name	Charles L. Turner Reservoir					
Trophic Status (NC TSI)	Hypereutrophic					
Mean Depth (meters)	3.0					
Volume ($10^6 m^3$)	1.4					
Watershed Area (mi^2)	53					
Classification	WS-III CA					
Stations	CPFTR01	CPFTR02	CPFTR03	CPFTR04	CPFTR05	CPFTR06
Number of Times Sampled	4	4	4	4	4	4

Charles L. Turner Reservoir is an impoundment located on the Rocky River in Chatham County downstream of Rocky River Reservoir. This reservoir, which serves as a water supply for the Town of Siler City, was created in 2009 by the construction of a new dam downstream of an existing 24 acre reservoir. The Charles L. Turner Reservoir encompasses 162 acres and increases available drinking water for Siler City. The watershed is primarily agricultural with some pasture land immediately adjacent to the lake. DWR monitored this reservoir for the first time in 2013.

DWR field staff sampled this reservoir monthly from May through August 20138. Surface dissolved oxygen ranged from 3.9 mg/L at the sampling site located upstream of Ed Clapp Road (CPFTR3) in June to 10.7 mg/L at the sampling site near the dam (CPFTR1) in May (Appendix A). Surface water temperatures ranged from 23.3°C to 28.2 °C. Surface pH values in this reservoir ranged from 6.8 to 7.5 s.u. Secchi depths were less than a meter (range = 0.2 to 0.6 meter), indicating that the clarity of the water was poor to moderate.

Total phosphorus concentrations ranged from 0.09 to 0.19 mg/L and total Kjeldahl nitrogen ranged from 1.1 to 1.6 mg/L. Ammonia values ranged from <0.02 to 0.21 mg/L and nitrite plus nitrate ranged from, <0.02 to 0.30 mg/L. Total organic nitrogen ranged from 1.08 to 1.59 mg/L. In response to available nutrients in the reservoir, chlorophyll *a* values ranged from 14 to 88 *u*g/L. Of the 17 chlorophyll *a* samples from Charles L. Turner Reservoir that were analyzed, 14 samples (82%) had values greater than the state water quality standard of 40 *u*g/L.

The Region 4, EPA Laboratory on water samples collected by DWR field staff on July 10, 2018 (Table 2), conducted an Algal Growth Potential Test (AGPT). Results indicated that, at the time this lake was tested, the limiting nutrient for algal growth was nitrogen at each of the five sampling sites.

Table. 2. Algal Growth Potential Test Results for Turner Reservoir.

Algal Growth Potential Test Results

Turner Reservoir
#18-0499
July 10, 2018

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CPFTR01	3.59	28.25	3.24	Nitrogen
CPFTR02	2.39	17.40	2.67	Nitrogen
CPFTR03	1.08	11.27	0.68	Nitrogen
CPFTR05	3.05	21.97	2.44	Nitrogen
CPFTR06	2.97	25.59	2.72	Nitrogen

Freshwater AGPT using *Selenastrum capricornutum* as test alga
C+N = Control + 1.0 mg/L Nitrate-N
C+P = Control + 0.05 mg/L Phosphate-P

Based on the calculated NCTSI scores for 2018, Charles L. Turner was determined to exhibit exceptionally elevated biological productivity or hypereutrophic conditions. Low Secchi depths, along with elevated chlorophyll *a*, total phosphorus and total organic nitrogen concentrations in the lake contributed to this trophic state determination. Turner Reservoir was previously determined to be hypereutrophic in 2013 when it was previously sampled by DWR.

LAKE & RESERVOIR ASSESSMENTS

HUC 03030004

Harris Lake

Ambient Lakes Program Name	Harris Lake		
Trophic Status (NC TSI)			
Mean Depth (meters)	6.0		
Volume ($10^6 m^3$)	10.1		
Watershed Area (mi^2)	70		
Classification	WS-V		
Stations	CPF126A2	CPF126A4	CPF126A6
Number of Times Sampled	4	4	4

Harris Lake, constructed in 1983, provides cooling water for the Shearon Harris Nuclear Power Plant as well as public recreation. Harris Lake is located on Buckhorn Creek with other significant tributaries including White Oak Creek, Little White Oak Creek, Thomas Creek, and Tom Jack Creek. The lake is owned by Progress Energy, which conducts monitoring of the chemical, physical, and biological parameters in the lake.

Surface dissolved oxygen in Harris Lake ranged from 5.3 to 13.3 mg/L and surface pH ranged from 7.3 to 9.9 s.u (Appendix A). Two surface pH readings in August were greater than the state water quality standard of 9.0 s.u. Secchi depths ranged from 0.5 to 2.1 meters. Total phosphorus ranged from 0.07 to 0.14 mg/L and total Kjeldahl nitrogen ranged from 0.77 to 1.30 mg/L. Ammonia concentrations were less than the DWR laboratory detection level of 0.02 mg/L and nitrite plus nitrate ranged from <0.02 to 0.03 mg/L. Chlorophyll *a* values ranged from 15 to 120 *u*g/L. All three sampling sites exceeded the state water quality standard of 40.0 *u*g/L for chlorophyll *a* in August (25% of all chlorophyll *a* measurements in 2018).

The Region 4, EPA Laboratory on water samples collected by DWR field staff on July 16, 2018 (Table 3), conducted an Algal Growth Potential Test (AGPT). Results indicated that, at the time this lake was tested, the limiting nutrient for algal growth was nitrogen at the sampling site downstream of the confluence of White Oak and Little White Oak Creeks (CPF126A6).

Table. 3. Algal Growth Potential Test Results for Harris Lake.

Algal Growth Potential Test Results

Harris Lake
#18-0500, #18-0503
July 16, 2018

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CPF126A6	2.43	20.90	2.43	Nitrogen

Freshwater AGPT using *Selenastrum capricornutum* as test alga
C+N = Control + 1.0 mg/L Nitrate-N
C+P = Control + 0.05 mg/L Phosphate-P

Based on the calculated NCTSI scores for the growing season of 2018, Harris Lake was determined to exhibit elevated biological productivity or eutrophic conditions. This reservoir was also determined to be eutrophic in 2013, 2008 and 2003 when it was last monitored by DWR.

Old Town Reservoir

Ambient Lakes Program Name	Old Town Reservoir	
Trophic Status (NC TSI)	Mesotrophic	
Mean Depth (meters)	4.0	
Volume ($10^6 m^3$)	0.2	
Watershed Area (mi^2)	0.4	
Classification	WS-III HQW	
Stations	CPF135B	CPF135D
Number of Times Sampled	4	4

Located near Southern Pines in the Sandhills, Old Town Reservoir is an impoundment of Mill Creek. Built in 1925, this one-time water supply (discontinued in 1985) is currently open for public recreation. Maximum lake depth is 23 feet (seven meters). The lake's watershed is relatively undeveloped with the exception of a golf course.

Surface dissolved oxygen ranged from 8.0 to 10.1 mg/L. The higher dissolved oxygen values in May coincided with lower water temperatures in the lake (Appendix A). Surface pH values for Old Town Reservoir ranged from 6.6 to 7.1 s.u. Secchi depths in 2018 ranged from 1.2 to 2.6 meters, indicating good water clarity. Concentrations of total phosphorus and ammonia were below DWR laboratory detection levels in 2018. Total Kjeldahl nitrogen ranged from 0.36 to 0.49 mg/L and nitrite plus nitrate ranged from <0.02 to 0.02 mg/L. Chlorophyll *a* values ranged from 8.4 to 24.0 *u*g/L. The Region 4, EPA Laboratory on water samples collected by DWR field staff on August 22, 2018 (Table 4), conducted an Algal Growth Potential Test (AGPT). Results indicated that, at the time this lake was tested, the nitrogen and phosphorus were co-limited.

Table. 4. Algal Growth Potential Test Results for Old Town Reservoir.

Algal Growth Potential Test Results

Glenville Lake

#18-0500, #18-0503

July 16 and August 6, 2018

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CPF138B	0.81	4.37	0.66	Nitrogen

Freshwater AGPT using *Selenastrum capricornutum* as test alga

C+N = Control + 1.0 mg/L Nitrate-N

C+P = Control + 0.05 mg/L Phosphate-P

Old Town Reservoir was determined to exhibit moderate biological productivity (mesotrophic conditions) in May through August.

Carthage City Lake

Ambient Lakes Program Name	Carthage City Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	2.5
Volume ($10^6 m^3$)	0.1
Watershed Area (mi^2)	27
Classification	WS-III CA
Stations	CPF113R
Number of Times Sampled	4

Carthage City Lake is a small water supply lake for the City of Carthage in Moore County. The deepest part of the lake, approximately eight to ten feet (three meters), is located at the intake structure. The lake was impounded around 1950 and is spring fed. In dry weather conditions, water is pumped a distance of six miles from Nicks Creek to maintain an adequate water level. The watershed is moderately developed.

Water quality monitoring of this small reservoir was conducted monthly from May through August 2018. Surface dissolved oxygen ranged from 7.6 to 8.5 mg/L and surface pH ranged from 6.2 to 6.9 s.u. Due to the location of this lake in the Sandhills region of the state, the combination of mineral soils and pine trees contribute to pH values that can be lower than that of lakes in the Piedmont region. Secchi depths for Carthage City Lake ranged from 0.7 to 1.2 meters in 2018.

Total phosphorus values were lowest in May (0.03 mg/L) and greatest in August (0.06 mg/L). Total Kjeldahl nitrogen followed a similar concentration pattern (range = 0.45 to 0.79 mg/L). Ammonia values were below the DWR laboratory detection level of 0.02 mg/L and nitrite plus nitrate ranged from <0.02 to 0.04 mg/L. Chlorophyll *a* ranged from 8.8 *u*g/L in June to 48.0 *u*g/L in August. The chlorophyll *a* value in August was greater than the state water quality standard of 40.0 *u*g/L. Carthage City Lake was determined to be eutrophic (i.e., exhibiting elevated biological productivity) based on the calculated NCTSI scores in 2018.

Glenville Lake

Ambient Lakes Program Name	Glenville Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	2.5
Volume ($10^6 m^3$)	0.2
Watershed Area (mi^2)	10
Classification	WS-IV CA
Stations	CPF128B
Number of Times Sampled	4

Glenville Lake is a small, backup water supply reservoir for the City of Fayetteville. The lake is the last in a series of four impoundments of Little Cross Creek. The immediate shoreline is forested with residential development located along the western side of the lake just beyond the forest buffer (approximately 50 feet). This lake is not open to the public for recreational use.

Glenville was sampled monthly from May through August by DWR field staff. Surface dissolved oxygen in this reservoir ranged from 6.0 to 8.6 mg/L and surface water temperature ranged from 25.5 °C in May to 29.5°C in August (Appendix A). Surface percent oxygen saturation in July was 113.0%, and was suggestive of elevated algal photosynthesis. Surface pH values ranged from 6.5 to 6.9 s.u., with the highest value recorded in May.

Total phosphorus ranged from 0.03 to 0.06 mg/L and total Kjeldahl nitrogen ranged from 0.47 to 0.69 mg/L. Ammonia ranged from <0.02 to 0.02 mg/L, nitrite plus nitrate values ranged from <0.02 to 0.04 mg/L and total organic nitrogen ranged from 0.46 to 0.68 mg/L. Chlorophyll *a* values ranged from 8.8 *u*g/L in June to 48.0 *u*g/L in May. The May value for chlorophyll *a* was greater than the state water quality standard of 40 *u*g/L. The Region 4, EPA Laboratory on water samples collected by DWR field staff on July 16, 2018 (Table 5), conducted an Algal Growth Potential Test (AGPT). Results indicated that, at the time this lake was tested, the limiting nutrient for algal growth was nitrogen at the sampling site.

Table. 5. Algal Growth Potential Test Results for Glenville Lake.

Algal Growth Potential Test Results

Glenville Lake

#18-0500, #18-0503

July 16 and August 6, 2018

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CPF138B	0.81	4.37	0.66	Nitrogen

Freshwater AGPT using *Selenastrum capricornutum* as test alga

C+N = Control + 1.0 mg/L Nitrate-N

C+P = Control + 0.05 mg/L Phosphate-P

Based on the calculated NCTSI scores for 2018, Glenville Lake was determined to exhibit elevated biological productivity or eutrophic conditions.

LAKE & RESERVOIR ASSESSMENTS

HUC 03030005

Salters Lake

Ambient Lakes Program Name	Salters Lake	
Trophic Status (NC TSI)	Dystrophic	
Mean Depth (meters)	1.5	
Volume (10^6 m^3)	0.3	
Watershed Area (mi^2)	3	
Classification	C	
Stations	CPF153C	CPF153D
Number of Times Sampled	5	5

Salters Lake is a Carolina Bay Lake located within Jones Lake State Park. This natural lake is undeveloped and public access is controlled by Jones Lake State Park. The water of the lake is naturally colored by tannins, giving the lake a characteristic tea-coloration typical in dystrophic lakes. DWR staff sampled Salters Lake monthly from May through September in 2018.

Surface dissolved oxygen in Salters Lake ranged from 6.5 mg/L in September to 7.9 mg/L in May. The highest surface dissolved oxygen values coincided with the lowest surface water temperatures (22.2 °C to 22.6 °C) in May (Appendix A). Surface pH values ranged from 3.8 to 4.9, which were typical for Carolina Bay Lakes. Secchi depths in 2018 were consistently less than one meter in Salters Lake and were similar to those observed in previous sampling years

Total phosphorus concentrations in 2018 was consistently 0.02 mg/L from May through September. Total Kjeldahl nitrogen in 2018 ranged from 0.52 to 0.71 mg/L and total organic nitrogen ranged from 0.05 to 0.12 mg/L. Chlorophyll *a* values in 2018 ranged from 2 to 18 *u*g/L, which was well below the state water quality standard of 40 *u*g/L.

No violations of state water quality standards were observed in 2018 and Salters Lake continued to support its designated uses. An NCTSI score was not generated due to the dystrophic nature of this lake.

Jones Lake

Ambient Lakes Program Name	Jones Lake	
Trophic Status (NC TSI)	Dystrophic	
Mean Depth (meters)	1.0	
Volume ($10^6 m^3$)	0.1	
Watershed Area (mi^2)	2	
Classification	B	
Stations	CPF1552A	CPF1553A
Number of Times Sampled	5	5

Jones Lake is a small, shallow, natural lake situated in the flat swampy terrain of Jones Lake State Park. Like other Carolina Bay Lakes, Jones receives almost no overland inputs of water, relying instead on precipitation and groundwater for recharge. Jones Lake is classified as dystrophic due to naturally occurring acidic water which has a dark coloration due to dissolved organic material (tannin-stained). A public park with a swimming area is located on the southeastern shoreline of this lake. DWR field staff sampled Jones Lake five times in 2018.

Surface dissolved oxygen in Jones Lake ranged from 5.8 mg/L in July to 8.2 mg/L in May (Appendix A). Surface water temperatures were lowest in May (22.3 mg/L) and greatest in August (30.1 mg/L). Jones lake is typically acidic, and pH values for 2018 ranged from 3.9 to 4.8. Secchi depths were greatest in May and lowest in August (range = 0.3 to 0.8 meter)

In 2018, total phosphorus ranged from <0.02 to 0.04 mg/L and total Kjeldahl nitrogen ranged from 0.63 to 0.77 mg/L. Chlorophyll *a* values were greatest in September (42 *u*g/L) and exceed the state water quality standard of 40 *u*g/L. This was the highest chlorophyll *a* value recorded for Jones Lake by DWR.

In 2018 Jones Lake continued to meet its designated uses. Due to the dystrophic nature of this lake, the NCTSI score could not be accurately calculated.

White Lake

Ambient Lakes Program Name	White Lake		
Trophic Status (NC TSI)	Mesotrophic		
Mean Depth (meters)	2.9		
Volume ($10^6 m^3$)	9.5		
Watershed Area (mi^2)			
Classification	B		
Stations	CPF155A	CPF155B	CPF155C
Number of Times Sampled	5	5	5

White Lake is an unusual Carolina Bay Lake in that the water of this lake is clear rather than tea-colored. The clarity of the lake water is attributed to numerous springs at the bottom of the lake that bring water into the lake such that water input is not as dominated by shallow (near surface and organic) groundwater inflow as is the case with other Carolina Bay Lakes. As part of the Singletary Lake State Park, White Lake provides recreational opportunities such as swimming and boating. The shoreline of the lake is developed for residential and some commercial uses.

DWR field staff monitored White Lake monthly from May through August 2018. Surface dissolved oxygen ranged from 6.5 to 10.2 mg/L and surface pH ranged from 5.8 to 8.5 s.u. (Appendix A). The pH values for on May 3rd were the highest values recorded by DWR in 2018. A few days after this sampling trip, the Town of White Lake applied alum to the lake to reduce total phosphorus and, consequently, increased algal growth. Following this application, pH values in White Lake ranged from 5.8 to 6.9 s.u. Historically, White Lake had exhibited the lower pH values typical of Carolina Bay Lakes. Secchi depths in 2018 ranged from 0.4 meter, lake-wide on May 3rd to 2.2 meters in June.

Total phosphorus concentrations in White Lake ranged from <0.02 to 0.06 mg/L and total Kjeldahl nitrogen ranged from 1.40 mg/L in May to 0.56 mg/L in July. Ammonia was less than the DWR laboratory detection level of 0.02 mg/L and nitrite plus nitrate ranged from <0.02 to 0.02 mg/L. Chlorophyll *a* values ranged from 2.9 to 25.0 *u*g/L with the values observed at the three lake sampling sites on May 3rd the greatest lake-wide values recorded for 2018 ambient lake monitoring season.

The Region 4, EPA Laboratory on water samples collected by DWR field staff on August 22, 2018 (Table 6), conducted an Algal Growth Potential Test (AGPT). Results indicated that, at the time this lake was tested, phosphorus and nitrogen were co-limiting at the sampling site located at the southern end of the lake (CPF155A) while phosphorus was the limiting nutrient and the mid-lake (CPF155B) and northern end of the lake (CPF155C).

Table. 6. Algal Growth Potential Test Results for White Lake

Algal Growth Potential Test Results

White Lake
#18-0501
August 22, 2018

Station	Maximum Standing Crop, Dry Weight (mg/L)				Limiting Nutrient
	Control	C+N	C+P	C+N+P	
CPF155A	0.32	0.33	0.31	22.82	Co-Limited
CPF155B	0.07	0.07	4.66	NA	Phosphorus
CPF155C	0.10	0.10	10.81	NA	Phosphorus

Freshwater AGPT using *Selenastrum capricornutum* as test alga
C+N = Control + 1.0 mg/L Nitrate-N
C+P = Control + 0.05 mg/L Phosphate-P
C+N+P = Control + 1.0 mg/L Nitrate-N + 0.05 mg/L Phosphate-P

The calculated NCTSI scores for White Lake in June through September 2018 indicated that the lake at that time was exhibiting moderate biological productivity or mesotrophic conditions. In May, the NCTSI score indicated that the lake trophic state was eutrophic, (exhibiting elevated biological productivity). Overall, White Lake was classified as mesotrophic for 2018.

Greenfield Lake

Ambient Lakes Program Name	Greenfield Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	1.5	
Volume ($10^6 m^3$)	0.1	
Watershed Area (mi^2)	3	
Classification	C SW	
Stations	CPF211B	CPF211C
Number of Times Sampled	4	4

Originally a cypress swamp, Greenfield Lake was impounded in 1750 to provide water for milling and irrigation of the Greenfields Plantation, which surrounded it. Greenfield Lake is now owned by the City of Wilmington, which encompasses the lake and its watershed. This lake is swampy and cypress-filled, with a maximum depth of 12 feet (four meters). The lake is the central feature of Greenfield Lake Park, which is also managed by the City of Wilmington.

DWR field staff sampled Greenfield Lake monthly from May through August 2018. Secchi depths ranged from 0.6 meter in May to 1.1 meters on August 28th (Appendix A). Field notes for May described the lake water as clear and brown (tannic). Surface dissolved oxygen ranged from 6.5 to 10.0 mg/L, with the highest reading observed for both sampling sites on August 7th. Surface percent dissolved oxygen on August 7th ranged from 106.9% to 128.6%. Surface water temperature in Greenfield Lake ranged from 26.0 °C to 31.5 °C and surface pH values ranged from 6.8 to 8.8 s.u. Surface conductivity measurements in Greenfield Lake ranged from 70 to 231 *u*mhos/cm on August 28th.

Total phosphorus concentrations in 2018 ranged from 0.08 to 0.18 mg/L and total Kjeldahl nitrogen ranged from 0.60 to 1.60 mg/L (Appendix A). The concentrations of ammonia ranged from <0.02 to 0.27 mg/L and nitrite plus nitrate ranged from <0.02 to 0.11 mg/L. In response to the availability of phosphorus and nitrogen, algal productivity in Greenfield Lake was elevated as suggested by the chlorophyll *a* values in May and August 7th, which were greater than the state water quality standard of 40 *u*g/L.

Based on calculated NCTSI scores, Greenfield Lake demonstrated elevated biological productivity (eutrophic conditions) in June and August. In May, biological productivity was exceptionally elevated (hypereutrophic conditions). Overall, the trophic status for Greenfield Lake in 2018 was eutrophic.

Sutton Lake

Ambient Lakes Program Name	Sutton Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	1.9	
Volume ($10^6 m^3$)	8.6	
Watershed Area (mi^2)		
Classification	C SW	
Stations	CPFSL1	CPFSL2
Number of Times Sampled	4	4

Sutton Lake is a 1099 acre cooling reservoir constructed in 1972 to provide condenser cooling water to the coal-fired Sutton Steam Electric Plant. The lake consists of a 3.8 km central main dike that bisects the lake and six wing dikes that maximize water circulation and increase the power plant cooling efficiency. This lake is open to the public for recreational fishing. An NC Wildlife Boat ramp is located off of US 421 on Sutton Lake Road. Aquatic vegetation growth in Sutton Lake is controlled by the use of introduced triploid grass carp.

DWR field staff sampled Sutton Lake in May through August 2018. Secchi depths were greater than a meter, ranging from 1.1 to 2.6 meters (Appendix A). Surface dissolved oxygen ranged from 6.7 to 8.0 mg/L and surface water temperatures ranged from 27.9 °C to 33.5 °C (Appendix A). Surface pH values in Sutton Lake ranged from 7.3 to 7.7 s.u. Surface conductivity ranged from 183 to 237 *u*mhos/cm.

Total phosphorus concentrations in Sutton Lake ranged from 0.03 to 0.04 mg/L and total Kjeldahl nitrogen ranged from 0.50 to 0.66 mg/L (Appendix A). Ammonia concentrations ranged from <0.02 to 0.02 mg/L and nitrite plus nitrate ranged from <0.02 to 0.07 mg/L. Chlorophyll *a* values were low, ranging from 3.4 to 9.1 *u*g/L. Turbidity ranged from <1.0 to 4.3 NTU.

Based on the calculated NCTSI scores, Sutton Lake was moderately productive on August 7th and exhibited elevated biological productivity in May and June and on August 28th. Overall, the trophic state of this lake was determined to be eutrophic.

Boiling Springs Lake

Ambient Lakes Program Name	Boiling Springs Lake		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	3.0		
Volume ($10^6 m^3$)	3.8		
Watershed Area (mi^2)	10		
Classification	B SW		
Stations	CPFBSL2	CPFBSL4	CPFBSL6
Number of Times Sampled	4	4	4

Boiling Springs Lake, a coastal black water man-made lake located in eastern Brunswick County, is owned by the Town of Boiling Springs. This lake was impounded in 1961. Land use upstream of the lake is mostly forested and residential. The lake is used for fishing and boating and is fed by several springs.

DWR field staff sampled Boiling Springs Lake monthly from May through August 2018. Surface dissolved oxygen ranged from 4.2 mg/L in August to 7.0 mg/L in May (Appendix A). Surface water temperatures ranged from 26.1 °C to 32.6 °C. Field observations by staff indicated that the water of this lake was dark or tannic. Secchi depths were less than a meter and ranged from 0.2 to 0.5. Surface pH values for Boiling Springs Lake ranged from, 4.4 to 6.1 s.u.

Total phosphorus was 0.02 mg/L and total Kjeldahl nitrogen ranged from 0.60 to 0.98 mg/L. Ammonia concentrations ranged from <0.02 to 0.05 mg/L while nitrite plus nitrate ranged from 0.02 to 0.09 mg/L. Chlorophyll *a* values were low and ranged from 1.1 to 4.9 *u*g/L. Based on data collected in 2018, Boiling Springs Lake appeared to be meeting its designated uses. This lake is dystrophic and the NCTSI scores could not be accurately calculated due to the naturally dark, tannic waters.

On September 17, 2018, Hurricane Florence made landfall along the coastline of North Carolina. Excessive rainfall from this storm resulted in the breaching of the earthen dam of Boiling Springs Lake (Figure 4), resulting in dewatering of Boiling Springs Lake.

Figure 4. Aerial view of the Boiling Springs Lake Breach) Caused by Hurricane Florence flooding, September 17, 2018. (Brunswick County Sheriff's Department)

LAKE & RESERVOIR ASSESSMENTS

HUC 03030006

Bay Tree Lake

Ambient Lakes Program Name	Bay Tree Lake	
Trophic Status (NC TSI)	Dystrophic	
Mean Depth (meters)	1.0	
Volume ($10^6 m^3$)	0.6	
Watershed Area (mi^2)	4	
Classification	C SW	
Stations	CPF155G	CPF155I
Number of Times Sampled	5	5

Bay Tree Lake (also called Black Lake) is a shallow, natural lake located near Elizabethtown, North Carolina. Typical of Carolina Bay Lakes, Bay Tree Lake receives no significant overland inflows. The surrounding land is flat and composed of wetlands, upland forests and a network of drainage canals built on its northern and eastern shores. A private gated residential community is located along the northern and northeastern shoreline of the lake and access to the lake is not open to the general public.

Bay Tree Lake was sampled monthly from May through September 2018 by DWR field staff. Secchi depths ranged from 0.8 to 2.1 meters (Appendix A). Surface dissolved oxygen ranged from 7.0 to 7.9 mg/L and surface pH ranged from 4.4 to 4.7 s.u. The low pH values of this lake are due to natural conditions and are a characteristic of Carolina Bay Lakes.

Total phosphorus and ammonia for Bay Tree Lake ranged from <0.02 to 0.02 mg/L and total Kjeldahl nitrogen ranged from 0.20 to 0.34 mg/L (Appendix A). Nitrite plus nitrate values in this lake ranged from <0.02 to 0.09 mg/L and total organic nitrogen ranged from 0.19 to 0.33 mg/L. Chlorophyll *a* ranged from 1.8 to 20.0 *u*g/L.

Based on data collected in 2018, Bay Tree Lake appears to be meeting its designated uses. This lake is dystrophic and the NCTSI scores could not be accurately calculated due to the naturally dark, tannic waters.

Singletary Lake

Ambient Lakes Program Name	Singletary Lake		
Trophic Status (NC TSI)	Dystrophic		
Mean Depth (meters)	1.5		
Volume ($10^6 m^3$)	0.4		
Watershed Area (mi^2)	1		
Classification	B SW		
Stations	CPF176D	CPF176E	CPF176F
Number of Times Sampled	5	5	5

Singletary Lake is a large Carolina Bay Lake located within Singletary Lake Group Camp State Park and is used for public swimming, boating and fishing. This lake is a naturally acidic and dark colored shallow lake common within the southeastern part of North Carolina. The surrounding terrain is flat and swampy with almost no overland water inputs.

DWR field staff monitored Singletary Lake monthly from May through September 2018. Surface pH was low, ranging from 4.1 to 4.3 s.u., which is typical for this lake (Appendix A). Surface water temperatures ranged from 26.9 °C in May to 33.8 °C in July and surface dissolved oxygen ranged from 6.8 to 8.0 mg/L. Secchi depths were less than a meter (range = 0.3 to 0.5 meters). Staff field observations described the lake water as appearing tannic (i.e., brown or tea-colored).

Total phosphorus concentrations ranged from 0.03 to 0.04 mg/L and total Kjeldahl nitrogen ranged from 0.56 to 0.74 mg/L. Ammonia nitrogen in Singletary Lake ranged from <0.02 to 0.05 mg/L and nitrite plus nitrate ranged from <0.02 to 0.13 mg/L. Chlorophyll *a* values in Singletary Lake ranged from 4.5 to 34.0 *u*g/L. Based on data collected in 2018, Singletary Lake appears to be meeting its designated uses. This lake is dystrophic and the NCTSI scores could not be accurately calculated due to the naturally dark, tannic waters.

Cabin Lake

Ambient Lakes Program Name	Cabin Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	4.0	
Volume ($10^6 m^3$)		
Watershed Area (mi^2)	2	
Classification	B SW	
Stations	CPFCL2	CPFCL4
Number of Times Sampled	5	5

Cabin Lake is a part of the Cabin Lake Recreational Park, which is owned by Duplin County. Located between the towns of Kenansville and Beulaville, the lake was formed from the damming of Cabin Creek in 1993. Land use within the watershed consists of farmlands forests and animal operations. Swimming and boating with electric motors is permitted at this lake.

This lake was monitored four times from May through September 2018. Two sites were sampled on each monitoring visit; one site located near the dam (CPFCL4) and the other near the middle of the lake (CPFCL2). Surface dissolved oxygen ranged from 4.8 to 9.5 mg/L and surface water temperature ranged from 21.0 °C to 31.2 °C (Appendix A). Surface pH ranged from 5.2 to 6.6 s.u. Secchi depths were less than a meter at both sampling sites in 2018.

Total phosphorus in Cabin Lake ranged from 0.08 to 0.18 mg/L and total Kjeldahl nitrogen ranged from 0.73 to 1.20 mg/L. The concentration of ammonia ranged from <0.02 to 0.08 mg/L and nitrite plus nitrate ranged from <0.02 to 0.38 mg/L. In response to the availability of nutrients in Cabin Lake, chlorophyll *a*, an indicator of algal productivity, ranged from 3.2 to 61.0 *u*g/L. Chlorophyll *a* values at one of the two sites sampled in August was greater than the state water quality standard of 40 *u*g/L.

Based on calculated NCTSI scores for 2018, Cabin Lake was determined to have elevated biological productivity (eutrophic conditions) in May and September and exceptionally elevated biological productivity (hypereutrophic conditions) in June, July and August. Overall, the trophic status of Cabin Lake was found to be at the high end of eutrophic, bordering hypereutrophic (mean NCTSI score = 4.9).

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

		SURFACE PHYSICAL DATA							PHOTIC ZONE DATA											
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
HUC 03030002																				
REIDSVILLE LAKE	September 6, 2018	CPF0025A	8.3	31.0	8.3	58	0.8	113.5%	0.03	0.69	<0.02	<0.02	0.70	0.68	0.02	20.0	62	<6.2	6.1	
	September 6, 2018	CPF002A1	8.4	30.0	8.3	57	0.8	113.1%	0.03	0.67	<0.02	<0.02	0.68	0.66	0.02	22.0	50	<6.2	4.2	
	September 6, 2018	CPF002A2	4.9	29.2	7.0	56	0.8	65.4%	0.03	0.62	0.06	0.06	0.68	0.56	0.12	15.0	56	<6.2	4.9	21.0
	August 6, 2018	CPF0025A	7.7	28.7	7.0	54	0.7	101.4%	0.08	0.85	<0.02	0.12	0.97	0.84	0.13	28.0	81	16.0	45.0	
	August 6, 2018	CPF002A1	8.1	27.6	7.2	63	0.4	104.7%	0.05	0.65	<0.02	0.05	0.70	0.64	0.06	24.0	69	10.0	23.0	
	August 6, 2018	CPF002A2	5.7	28.1	8.1	54	0.2	73.8%	0.07	0.77	0.04	0.14	0.91	0.73	0.18	18.0	81	14.0	45.0	17.0
	July 12, 2018	CPF0025A	8.5	29.6	8.1	80	0.9	114.0%	0.03	0.56	<0.02	0.03	0.59	0.55	0.04	21.0	67	<6.2	6.2	
	July 12, 2018	CPF002A1	7.2	29.8	7.3	81	1.5	96.0%	0.02	0.53	0.07	0.06	0.59	0.46	0.13	14.0	53	<6.2	3.5	
	July 12, 2018	CPF002A2	4.8	29.1	7.1	82	1.0	63.0%	0.02	0.56	0.17	0.07	0.63	0.39	0.24	7.5	59	<6.2	3.2	32.0
	June 19, 2018	CPF0025A	8.5	30.4	7.7	77	1.2	115.3%	0.03	0.56	<0.02	<0.02	0.57	0.55	0.02	15.0	130	6.2	6.2	
	June 19, 2018	CPF002A1	7.5	30.3	7.6	76	1.3	101.6%	0.02	0.54	0.04	<0.02	0.55	0.50	0.05	13.0	52	<6.2	4.3	23.0
	May 15, 2018	CPF0025A	9.1	26.5	7.5	75	1.3	115.1%	0.02	0.51	<0.02	0.04	0.55	0.50	0.05	20.0	81	<6.2	5.4	
	May 15, 2018	CPF002A1	9.0	26.2	7.8	72	1.3	113.9%	0.02	0.50	<0.02	0.01	0.51	0.49	0.02	17.0	59	<6.2	4.6	21.0
LAKE HUNT	September 6, 2018	CPF0021A	8.4	30.0	8.3	57	1.0	113.1%	0.04	0.70	<0.02	<0.02	0.71	0.69	0.02	24.0	52	<12.0	6.6	
	September 6, 2018	CPF0022A	8.5	29.1	8.3	56	1.0	112.2%	0.03	0.66	<0.02	<0.02	0.67	0.65	0.02	16.0	62	<6.2	3.8	
	September 6, 2018	CPF0023A	8.1	29.6	8.4	54	1.0	108.7%	0.03	0.62	<0.02	<0.02	0.63	0.61	0.02	12.0	51	<6.2	3.9	18.0
	August 6, 2018	CPF0021A	10.3	29.8	8.7	60	1.2	138.5%	0.05	0.76	<0.02	0.04	0.80	0.75	0.05	29.0	44	<12.0	13.0	
	August 6, 2018	CPF0022A	9.5	29.8	8.2	60		127.0%	0.04	0.72	<0.02	0.03	0.75	0.71	0.04	26.0	51	8.8	12.0	
	August 6, 2018	CPF0023A	9.5	29.9	7.6	59	0.7	128.1%	0.03	0.65	<0.02	0.03	0.68	0.64	0.04	20.0	66	8.2	11.0	15.0
	July 12, 2018	CPF0021A	9.0	29.4	8.4	69	0.8	120.7%	0.03	0.70	<0.02	0.03	0.73	0.69	0.04	24.0	52	<12.0	7.2	
	July 12, 2018	CPF0022A	9.0	29.8	8.6	69	1.0	121.2%	0.02	0.64	<0.02	0.03	0.67	0.63	0.04	17.0	94	<6.2	4.5	
	July 12, 2018	CPF0023A	8.9	30.0	8.7	69	1.0	119.6%	0.02	0.65	<0.02	0.03	0.68	0.64	0.04	16.0	52	<6.2	4.3	17.0
	June 19, 2018	CPF0021A	8.9	30.5	8.3	67	0.7	122.0%	0.03	0.65	<0.02	<0.02	0.66	0.64	0.02	12.0	54	<12.0	7.2	
	June 19, 2018	CPF0022A	8.7	30.5	8.1	67	1.0	118.4%	0.02	0.58	<0.02	<0.02	0.59	0.57	0.02	7.1	57	<6.2	4.0	
	June 19, 2018	CPF0023A	8.5	30.7	8.5	66	1.1	116.5%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	3.4	43	<6.2	4.4	17.0
	May 15, 2018	CPF0021A	9.2	27.1	7.6	65	1.3	118.4%	0.03	0.55	<0.02	<0.02	0.56	0.54	0.02	13.0	58	7.0	5.1	
	May 15, 2018	CPF0022A	9.1	27.0	7.8	63	1.4	117.4%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	12.0	57	<6.2	4.0	
	May 15, 2018	CPF0023A	9.1	26.5	8.0	64	1.7	115.4%	0.02	0.50	<0.02	<0.02	0.51	0.49	0.02	12.0	54	<6.2	3.6	18.0
LAKE HIGGINS	August 16, 2018	CPFLH2	8.8	27.7	7.3	90	1.5	111.9%	0.04	0.59	<0.02	0.03	0.62	0.58	0.04	22.0	62	<6.2	4.7	
	August 16, 2018	CPFLH4	7.7	28.3	7.1	89	1.1	98.9%	0.03	0.63	<0.02	0.03	0.66	0.62	0.04	19.0	55	<6.2	3.4	22.0
	July 12, 2018	CPFLH2	7.2	36.4	7.6	17	0.8	106.0%	0.04	0.80	<0.02	0.04	0.84	0.79	0.05	31.0	88	7.2	8.1	
	July 12, 2018	CPFLH4	9.4	29.8	8.4	116	0.8	124.0%	0.03	0.67	<0.02	0.03	0.70	0.66	0.04	23.0	79	<6.2	4.8	30.0
	June 28, 2018	CPFLH2		28.2	7.0	115	0.6		0.04	0.74	<0.02	0.04	0.78	0.73	0.05	30.0	160	<12.0	8.8	
	June 28, 2018	CPFLH4		28.6	6.7	113	0.8		0.04	0.70	<0.02	0.04	0.74	0.69	0.05	24.0	120	<6.2	6.2	30.0
	May 31, 2018	CPFLH2	7.6	27.1	7.4	114	0.9	95.6%	0.04	0.51	<0.02	<0.02	0.52	0.50	0.02	25.0	82	7.2	6.6	
	May 31, 2018	CPFLH4	7.8	27.2	7.5	111	1.1	98.3%	0.02	0.46	<0.02	<0.02	0.47	0.45	0.02	14.0	78	<6.2	4.4	25.0
LAKE BRANDT	August 16, 2018	CPF007A1A	9.2	29.0	8.1	85	1.3	119.7%	0.04	0.68	<0.02	0.03	0.71	0.67	0.04	19.0	52	<12.0	5.3	
	August 16, 2018	CPF007A4	8.6	29.9		52	0.8	113.6%	0.04	0.70	<0.02	0.03	0.73	0.69	0.04	20.0	56	<6.2	5.5	
	August 16, 2018	CPF007B					0.7		0.04	0.69	<0.02	0.03	0.72	0.68	0.04	21.0	56	<6.2	5.3	23.0
	July 12, 2018	CPF007A1A	8.5	29.7	8.3	132	0.7	111.9%	0.03	0.65	<0.02	0.04	0.69	0.64	0.05	17.0	95	<6.2	5.6	
	July 12, 2018	CPF007A4	8.0	29.8	8.2	132	0.6	105.5%	0.04	0.54	<0.02	0.03	0.57	0.53	0.04	21.0	84	<6.2	6.5	
	July 12, 2018	CPF007B	7.5	29.2	7.5	124	0.7	97.9%	0.03	0.55	<0.02	0.04	0.59	0.54	0.05	19.0	78	6.5	7.1	37.0
	June 28, 2018	CPF007A1A		28.6	6.7	121	0.8		0.03	0.54	<0.02	0.04	0.58	0.53	0.05	28.0	82	7.0	5.7	
	June 28, 2018	CPF007A4		28.9	6.7	121	0.9		0.03	0.55	<0.02	0.04	0.59	0.54	0.05	30.0	250	<6.2	5.9	
	June 28, 2018	CPF007B		28.6	7.1	121	0.8		0.03	0.51	<0.02	0.04	0.55	0.50	0.05	24.0	93	<6.2	5.4	14.0
	May 31, 2018	CPF007A1A	7.4	27.6	7.6	118	1.0	93.9%	0.02	0.37	<0.02	<0.02	0.38	0.36	0.02	11.0	70	<12.0	4.6	
	May 31, 2018	CPF007A4	7.0	26.9	7.8	123	1.0	87.7%	0.02	0.39	<0.02	<0.02	0.40	0.38	0.02	12.0	72	<6.2	5.5	
	May 31, 2018	CPF007B	7.1	27.0	7.5	123	0.8	89.1%	0.02	0.40	<0.02	<0.02	0.41	0.39	0.02	11.0	80	6.5	5.7	34.0
LAKE TOWNSEND	August 16, 2018	CPFLT4	9.1	31.1	8.5	101	0.7	122.7%	0.04	0.65	<0.02	0.04	0.69	0.64	0.05	23.0	69	<12.0	9.5	
	August 16, 2018	CPFLT6	9.0	30.7	8.3	107	1.1	120.5%	0.02	0.51	<0.02	0.03	0.54	0.50	0.04	16.0	52	<6.2	3.6	
	August 16, 2018	CPFLT8	9.4	28.8	8.4	116	1.6	121.8%	0.02	0.47	<0.02	0.03	0.50	0.46	0.04	13.0	54	<6.2	3.2	30.0
	July 12, 2018	CPFLT4	6.8	28.4	7.5	117	0.3	87.5%	0.07	0.82	<0.02	<0.02	0.83	0.81	0.02	49.0	85	14.0	16.0	
	July 12, 2018	CPFLT6	7.3	28.7	7.4	114	1.0	94.4%	0.03	0.49	<0.02	0.03	0.52	0.48	0.04	21.0	83	<6.2	5.6	
	July 12, 2018	CPFLT8	7.1	28.5	7.3	112	1.5	91.5%	<0.02	0.36	<0.02	<0.02	0.37	0.35	0.02	8.4	57	<12.0	2.2	29.0
	June 28, 2018	CPFLT4		29.1	7.2	116	0.4		0.06	0.66	<0.02	0.04	0.70	0.65	0.05	49.0	71	14.0	15.0	
	June 28, 2018	CPFLT6		29.7	7.3	112	1.1		0.02	0.41	<0.02	<0.02	0.42	0.40	0.02	15.0	72	<6.2	4.4	
	June 28, 2018	CPFLT8		29.6	7.2	110	1.8		<0.02	0.32	<0.02	<0.02	0.33	0.31	0.02	6.7	74	<6.2	1.7	30.0
	May 31, 2018	CPFLT4	7.3	29.3	7.6	119	0.8	95.4%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	14.0	78	8.8	8.3	
	May 31, 2018	CPFLT6	7.1	27.7	7.8	115	1.1	90.3%	0.02	0.35	<0.02	<0.02	0.36	0.34	0.02	7.2	63	<6.2	3.9	
	May 31, 2018	CPFLT8	7.4	27.6	7.9	109	2.2	93.9%	<0.02	0.29	<0.02	<0.02	0.30	0.28	0.02	3.9	58	<6.2	1.9	27.0
LAKE BURLINGTON (STONY CREEK RESERVOIR)	August 29, 2018	CPFSCR2	9.7	28.4	7.3	78	0.4	126.9%	0.06	0.86	<0.02	<0.02	0.87	0.85	0.02	36.0	67	8.0	12.0	
	August 29, 2018	CPFSCR4	9.2	27.3	7.6	71	0.5	117.4%	0.05	0.76	<0.02	<0.02	0.77	0.75	0.02	24.0	80	8.0	7.9	27.0
	July 10, 2018	CPFSCR2	8.7	28.7	7.0	100	0.5	114.0%	0.06	0.82	<0.02	0.03	0.85	0.81	0.04	35.0	100	10.0	11.0	
	July 10, 2018	CPFSCR4	7.7	28.6	7.7	103	0.6	101.3%	0.05	0.94	<0.02	0.04	0.98	0.93	0.05	60.0	110	9.5	9.1	37.0
	June 21, 2018	CPFSCR2	9.4	32.2	8.4	100	0.5	131.6%	0.07	0.88	<0.02	<0.02	0.89	0.87	0.02	39.0	110	12.0	13.0	
	June 21, 2018	CPFSCR4	8.8	33.0	7.6	97	0.8	126.0%	0.05	0.77	<0.02	<0.02	0.78	0.76	0.02	39.0	93	7.0	7.3	35.0
	May 30, 2018	CPFSCR2	9.6	25.4	7.4	78	0.5	118.5%	0.07	0.84	<0.02	<0.02	0.85	0.83	0.02	59.0	97	14.0	20.0	
	May 30, 2018	CPFSCR4	6.8	25.2	7.0	82	0.5	83.6%	0.08	0.80	0.05	0.06	0.86	0.75	0.11	26.0	110	16.0	26.0	35.0
LAKE CAMMACK (BURLINGTON RESERVOIR)	August 29, 2018	CPF0251A	9.3	29.5	8.4	78	0.8	123.9%	0.03	0.79	<0.02	<0.02	0.80	0.78	0.02	18.0	120	<12.0	4.0	
	August 29, 2018	CPF025A	9.4	28.0	8.2	77	0.8	121.2%	0.03	0.76	<0.02	<0.02	0.77	0.75	0.02	20.0	84	<6.2	4.6	27.0
	July 10, 2018	CPF0251A	8.7	26.2	7.3	83	0.9	109.4%	0.02	0.75	<0.02	0.03	0.78	0.74	0.04	24.0	70	<6.2	5.3	
	July 10, 2018	CPF025A	8.8	27.6	7.8	85	1.0	113.6%	0.02	0.76	<0.02	0.03	0.79	0.75	0.04	23.0	78	<6.2	5.4	31.0
	June 21, 2018	CPF0251A	8.1	31.9	8.4	85	0.8	113.5%	0.03	0.80	<0.02	<0.02	0.81	0.79	0.02	24.0	85	<12.0	5.9	
	June 21, 2018	CPF025A	8.2	30.9	7.8	85	1.0	113.2%	0.03	0.76	<0.02	<0.02	0.77	0.75	0.02	18.0	85	<6.2	5.7	31.0
	May 30, 2018	CPF0251A	8.1	26.2	7.2	79	0.9	101.3%	0.03	0.61	<0.02	<0.02	0.62	0.60	0.02	29.0	66	<12.0	5.6	
	May 30, 2018	CPF025A	7.9	26.4	7.2	76	1.0	99.6%	0.04	0.72	<0.02	<0.02	0.73	0.71	0.02	28.0	140	<6.2	6.2	30.0

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
GRAHAM-MEBANE RESERVOIR	August 27, 2018	CPFGMR1	9.1	28.9	8.5	75	0.6	119.9%	0.03	0.77	<0.02	<0.02	0.78	0.76	0.02	29.0	83	10.0	8.3	
	August 27, 2018	CPFGMR2	9.8	29.2	8.7	81	0.6	128.7%	0.06	0.97	<0.02	<0.02	0.98	0.96	0.02	50.0	94	12.0	12.0	
	August 27, 2018	CPFGMR3	9.5	29.3	8.7	78	0.7	125.3%	0.04	0.82	<0.02	<0.02	0.83	0.81	0.02	48.0	81	9.8	10.0	
	August 27, 2018	CPFGMR4	9.2	29.2	8.6	77	0.7	121.9%	0.03	0.83	<0.02	<0.02	0.84	0.82	0.02	36.0	77	8.0	8.2	27.0
	August 27, 2018	CPFGMROA	8.4	28.2	7.0	76	0.5	109.2%	0.09	1.10	<0.02	<0.02	1.11	1.09	0.02	30.0	140	52.0	30.0	
	July 5, 2018	CPFGMR1	8.6	31.9	8.1	84	0.4	118.7%	0.03	1.10	<0.02	0.04	1.14	1.09	0.05	41.0	80	8.5	10.0	
	July 5, 2018	CPFGMR2	9.0	31.8	8.7	98	0.3	124.0%	0.09	1.40	<0.02	0.04	1.44	1.39	0.05	72.0	120	14.0	21.0	
	July 5, 2018	CPFGMR3	9.2	31.0	8.1	88	0.3	124.8%	0.04	1.20	<0.02	0.05	1.25	1.19	0.06	55.0	79	9.2	12.0	
	July 5, 2018	CPFGMR4	9.0	32.3	8.6	85	0.5	125.0%	0.03	1.10	<0.02	0.03	1.13	1.09	0.04	42.0	130	8.5	10.0	27.0
	July 5, 2018	CPFGMROA	6.2	29.4	6.6	88	0.2	81.1%	0.12	1.50	<0.02	0.03	1.53	1.49	0.04	80.0	110	30.0	35.0	
	June 7, 2018	CPFGMR1	7.4	27.4	7.1	78	0.9	94.9%	0.04	0.76	<0.02	<0.02	0.77	0.75	0.02	41.0	76	<12.0	5.8	
	June 7, 2018	CPFGMR2	7.4	27.1	6.7	88	0.6	94.1%	0.07	0.89	<0.02	<0.02	0.90	0.88	0.02	31.0	96	10.0	13.0	
	June 7, 2018	CPFGMR3	5.9	26.9	6.8	82	0.8	74.9%	0.05	0.77	<0.02	<0.02	0.78	0.76	0.02	40.0	92	7.2	8.5	
	June 7, 2018	CPFGMR4	7.2	27.4	6.9	78	0.9	91.7%	0.04	0.69	<0.02	0.02	0.71	0.68	0.03	18.0	83	<6.2	5.3	26.0
	June 7, 2018	CPFGMROA	7.5	25.9	7.1	83	0.4	93.1%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	68.0	130	35.0	22.0	
	May 21, 2018	CPFGMR1	9.3	25.8	7.0	78	0.4	115.5%	0.06	0.88	<0.02	0.02	0.90	0.87	0.03	60.0	98	12.0	17.0	
	May 21, 2018	CPFGMR2	10.5	26.0	7.0	70	0.3	131.1%	0.12	1.10	<0.02	0.08	1.18	1.09	0.09	78.0	94	19.0	33.0	
	May 21, 2018	CPFGMR3	10.9	27.1	7.9	80	0.5	138.5%	0.08	0.91	<0.02	<0.02	0.92	0.90	0.02	78.0	68	10.0	15.0	
	May 21, 2018	CPFGMR4	9.0	25.7	6.9	79	0.5	111.5%	0.05	0.83	<0.02	<0.02	0.84	0.82	0.02	51.0	64	10.0	15.0	26.0
	May 21, 2018	CPFGMROA	8.6	26.3	6.9	72	0.3	107.7%	0.11	1.10	0.02	0.03	1.13	1.08	0.05	36.0	100	25.0	31.0	
LAKE MACKINTOSH	September 11, 2018	CPF038F	6.6	27.4	7.0	122	1.1	83.9%	0.04	0.65	<0.02	0.02	0.67	0.64	0.03	28.0	94	<12.0	5.6	
	September 11, 2018	CPF038G	6.6	28.0	7.0	112	1.2	85.5%	0.03	0.64	<0.02	<0.02	0.65	0.63	0.02	20.0	76	<6.2	4.5	
	September 11, 2018	CPF038H	7.1	27.7	7.1	111	1.3	91.9%	0.03	0.59	<0.02	<0.02	0.60	0.58	0.02	26.0	93	<6.2	4.0	
	September 11, 2018	CPF038J	5.9	27.3	7.0	104	1.3	75.9%	0.02	0.53	<0.02	<0.02	0.54	0.52	0.02	17.0	89	<6.2	2.7	
	September 11, 2018	CPF038L	7.1	27.3	7.1	100	1.3	90.3%	0.02	0.55	<0.02	<0.02	0.56	0.54	0.02	24.0	85	<6.2	2.8	
	September 11, 2018	CPF038N	7.2	27.3	7.5	100	1.5	92.4%	0.02	0.57	0.03	<0.02	0.58	0.54	0.04	21.0	91	<6.2	3.2	33.0
	August 15, 2018	CPF038F	9.6	29.5	8.1	117	1.5	128.0%	0.04	0.69	<0.02	0.02	0.71	0.68	0.03	30.0	100	<6.2	4.8	
	August 15, 2018	CPF038G	9.4	29.6	8.1	107	1.0	124.7%	0.04	0.72	<0.02	<0.02	0.73	0.71	0.02	30.0	76	<6.2	4.7	
	August 15, 2018	CPF038H	8.8	29.7	7.7	111	1.8	117.7%	0.04	0.68	<0.02	0.05	0.73	0.67	0.06	25.0	100	<6.2	5.6	
	August 15, 2018	CPF038J	8.0	29.5	7.5	107	1.7	106.1%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	11.0	71	<6.2	3.2	
	August 15, 2018	CPF038L	7.9	29.6	7.6	108	2.0	105.1%	0.03	0.55	<0.02	<0.02	0.56	0.54	0.02	14.0	130	<6.2	3.6	
	August 15, 2018	CPF038N	7.9	29.3	7.3	107	2.0	104.2%	0.02	0.54	<0.02	<0.02	0.55	0.53	0.02	19.0	85	<6.2	3.3	32.0
	July 17, 2018	CPF038F	8.4	29.3	7.4	132	1.3	111.5%	0.03	0.61	<0.02	0.04	0.65	0.60	0.05	17.0	82	<6.2	3.6	
	July 17, 2018	CPF038G	8.5	30.2	8.2	128	1.3	115.3%	0.03	0.57	<0.02	0.03	0.60	0.56	0.04	18.0	100	<6.2	4.0	
	July 17, 2018	CPF038H	7.8	29.5	7.4	125	1.6	104.4%	0.02	0.52	<0.02	0.04	0.56	0.51	0.05	8.4	92	<6.2	2.5	
	July 17, 2018	CPF038J	7.8	29.1	7.5	115	2.1	104.0%	0.02	0.52	<0.02	0.03	0.55	0.51	0.04	8.3	83	<6.2	2.8	
	July 17, 2018	CPF038L	7.8	29.1	7.7	115	2.0	104.0%	<0.02	0.49	<0.02	0.03	0.52	0.48	0.04	7.0	68	<6.2	2.2	
	July 17, 2018	CPF038N	7.7	29.6	8.0	114	2.0	102.8%	<0.02	0.51	<0.02	0.03	0.54	0.50	0.04	5.9	75	<6.2	2.2	35.0
	June 14, 2018	CPF038F	9.0	28.6	8.1	132	0.8	117.6%	0.04	0.64	<0.02	<0.02	0.65	0.63	0.02	24.0	89	<12.0	4.6	
	June 14, 2018	CPF038G	9.3	28.6	8.5	119	0.8	121.9%	0.04	0.64	<0.02	<0.02	0.65	0.63	0.02	23.0	97	<6.2	5.7	
	June 14, 2018	CPF038H	8.5	28.0	8.1	120	0.8	110.4%	0.03	0.62	<0.02	<0.02	0.63	0.61	0.02	18.0	84	<6.2	4.1	
	June 14, 2018	CPF038J	7.9	27.7	7.7	110	0.8	101.8%	0.02	0.62	<0.02	<0.02	0.63	0.61	0.02	18.0	81	<6.2	3.7	
	June 14, 2018	CPF038L	8.1	27.3	7.9	109	0.8	103.4%	0.02	0.61	<0.02	<0.02	0.62	0.60	0.02	14.0	79	<6.2	3.6	
	June 14, 2018	CPF038N	7.9	27.6	7.9	109	0.8	101.3%	0.03	0.61	<0.02	<0.02	0.62	0.60	0.02	14.0	75	<6.2	3.8	34.0
	May 3, 2018	CPF038F	10.5	22.8	7.5	95	0.5	122.9%	0.07	0.82	<0.02	0.16	0.98	0.81	0.17	38.0	98	18.0	20.0	
	May 3, 2018	CPF038G	9.6	22.0	7.5	76	0.5	110.8%	0.08	0.90	<0.02	0.14	1.04	0.89	0.15	35.0	90	12.0	22.0	
	May 3, 2018	CPF038H	9.2	20.7	7.5	81	0.7	103.2%	0.07	0.76	<0.02	0.13	0.89	0.75	0.14	19.0	91	10.0	22.0	
	May 3, 2018	CPF038J	11.2	21.8	8.1	104	0.7	129.1%	0.06	0.80	<0.02	0.05	0.85	0.79	0.06	42.0	81	8.8	11.0	
	May 3, 2018	CPF038L	10.7	20.9	8.0	120	0.6	120.9%	0.05	0.61	<0.02	0.08	0.69	0.60	0.09	14.0	114	<6.2	5.2	
	May 3, 2018	CPF038N	10.3	21.4	8.1	120	1.2	117.2%	0.03	0.58	<0.02	0.08	0.66	0.57	0.09	18.0	196	<6.2	5.2	36.0
CANE CREEK RESERVOIR	September 10, 2018	CPFCCR2	6.4	27.1	7.3	78	1.0	82.1%	0.03	0.76	<0.02	<0.02	0.77	0.75	0.02	37.0	61	6.8	4.8	
	September 10, 2018	CPFCCR4	7.9	27.7	7.9	77	1.0	102.2%	0.02	0.72	<0.02	<0.02	0.73	0.71	0.02	17.0	140	<6.2	3.5	
	September 10, 2018	CPFCCR6	8.0	26.8	7.7	77	1.5	101.2%	0.02	0.71	<0.02	<0.02	0.72	0.70	0.02	24.0	60	<6.2	3.9	27.0
	August 16, 2018	CPFCCR2	8.5	30.5	7.6	80	1.4	114.5%	0.03	0.68	<0.02	<0.02	0.69	0.67	0.02	13.0	82	<6.2	4.1	
	August 16, 2018	CPFCCR4	9.0	30.1	7.8	79	1.6	120.4%	0.02	0.68	<0.02	<0.02	0.69	0.67	0.02	13.0	82	<6.2	3.5	
	August 16, 2018	CPFCCR6	9.2	30.0	8.0	80	1.6	122.8%	0.02	0.68	<0.02	<0.02	0.69	0.67	0.02	14.0	140	<6.2	3.3	24.0
	July 18, 2018	CPFCCR2	8.1	30.0	7.8	80	1.2	108.6%	0.02	0.65	<0.02	0.03	0.68	0.64	0.04	12.0	74	<6.2	4.9	
	July 18, 2018	CPFCCR4	8.3	29.5	7.7	80	1.7	110.1%	0.02	0.62	<0.02	0.03	0.65	0.61	0.04	13.0	69	<12.0	5.4	
	July 18, 2018	CPFCCR6	8.1	29.1	7.5	79	1.7	107.4%	0.02	0.60	<0.02	0.04	0.64	0.59	0.05	10.0	79	<6.2	3.8	24.0
	June 14, 2018	CPFCCR2	8.3	28.8	7.6	76	0.9	109.5%	0.04	0.77	<0.02	<0.02	0.78	0.76	0.02	25.0	70	<6.2	5.9	
	June 14, 2018	CPFCCR4	8.5	27.8	7.1	78	1.0	110.2%	0.02	0.71	<0.02	0.06	0.77	0.70	0.07	17.0	66	25.0	5.4	
	June 14, 2018	CPFCCR6	8.8	25.9	6.9	80	1.0	110.4%	0.03	0.63	<0.02	0.02	0.65	0.62	0.03	12.0	42	<6.2	4.3	24.0
	May 3, 2018	CPFCCR2	12.6	23.0		76	0.5	148.4%	0.05	1.50	<0.02	<0.02	1.51	1.49	0.02	100.0	41	13.0	17.0	
	May 3, 2018	CPFCCR4	12.7	21.0		76	0.5	143.2%	0.05	1.60	<0.02	<0.02	1.61	1.59	0.02	98.0	75	13.0	16.0	
	May 3, 2018	CPFCCR6	11.5	18.4		73	0.8	123.6%	0.04	1.20	<0.02	0.04	1.24	1.19	0.05	71.0	59	9.5	9.7	23.0
UNIVERSITY LAKE	September 10, 2018	CPFUL4	8.1	27.0	7.6	89	0.5	102.3%	0.08	1.00	<0.02	<0.02	1.01	0.99	0.02	58.0	83	15.0	16.0	
	September 10, 2018	CPFUL6	6.4	27.0	7.3	84	0.6	80.6%	0.05	0.85	<0.02	<0.02	0.86	0.84	0.02	36.0	80	9.0	11.0	30.0
	August 16, 2018	CPFUL4	11.1	29.1	7,5	105	0.6	144.8%	0.07	0.93	<0.02	<0.02	0.94	0.92	0.02	61.0	120	10.0	12.0	
	August 16, 2018	CPFUL6	10.6	30.8	8.3	100	0.8	142.4%	0.06	0.86	<0.02	<0.02	0.87	0.85	0.02	58.0	100	7,2	7.9	31.0
	July 18, 2018	CPFUL4	7.7	29.8	7.4	112	0.7	101.8%	0.05	0.97	<0.02	0.03	1.00	0.96	0.04	41.0	110	12.0	10.0	
	July 18, 2018	CPFUL6	8.5	30.0	8.0	112	0.8	113.5%	0.05	0.95	<0.02	0.03	0.98	0.94	0.04	37.0	99	10.0	9.0	35.0
	June 14, 2018	CPFUL4	8.8	27.2	7.8	106	0.5	111.9%	0.06	0.81	<0.02	<0.02	0.82	0.80	0.02	80.0	62	12.0	13.0	
	June 14, 2018	CPFUL6	9.1	27.9	7.8	104	0.6	117.7%	0.05	0.78	<0.02	<0.02	0.79	0.77	0.02	44.0	63	<12.0	8.0	33.0
	May 3, 2018	CPFUL4	11.3	23.4		94	0.7	132.6%	0.06	0.80	<0.02	<0.02	0.81	0.79	0.02	37.0	113	11.0	9.3	
	May 3, 2018	CPFUL6	11.5	23.5		92	1.1	135.5%	0.05	0.80	<0.02	<0.02	0.81	0.79	0.02	39.0	119	7.5	5.9	26.0
JORDAN LAKE	August 9, 2018	CPF055C	9.2	29.4	8.5	82	0.3	121.3%	0.11	0.96	0.01	0.20	1.16	0.95	0.21	43.0	110	<12.0	28.0	
	August 9, 2018	CPF055D	9.2	29.2	8.4	80	0.2	120.1%	0.10	0.92	0.01	0.22	1.14	0.91	0.23	39.0	97	13.0	28.0	
	August 9, 2018	CPF055E	11.4	30.1	9.3	121	0.3	152.3%	0.12	1.40	0.01	0.04	1.44	1.39	0.05	100.0	120	10.0	13.0	
	August 9, 2018	CPF081A1C	7.2	29.2	7.9	156	0.2	94.5%	0.08	1.10	0.01	0.04	1.14	1.09	0.05	52.0	130	13.0	16.0	
	August 9, 2018	CPF086C	7.8	29.1	8.5	163	0.2	101.6%	0.08	1.20	0.01	0.03	1.23	1.19	0.04	53.0	120	12.0	13.0	
	August 9, 2018	CPF086F	6.5	28.8	7.6	144	0.4	85.2%	0.06	0.98	0.01	0.03	1.01	0.97	0.04	54.0	120	9.8	10.0	
	August 9, 2018	CPF087B3	7.4	29.2	8.1	171	0.5	171.0%	0.04	0.82	0.01	0.03	0.85	0.81	0.04	42.0	120	8.0	5.1	
	August 9, 2018	CPF087D	6.8	29.1	7.8	174	0.6	89.6%	0.03	0.74	0.02	0.05	0.79	0.72	0.07	31.0	120	<6.2	5.1	
	August 9, 2018	CPF0880A	8.5	29.1	8.5	181	0.7	111.2%	0.05	0.92	0.01	0.07	0.99	0.91	0.08	46.0	120	<6.2	6.0	

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
JORDAN LAKE	July 11, 2018	CPF055C	8.7	31.4	8.0	224	0.9	118.5%	0.04	0.87	<0.02	0.03	0.90	0.86	0.04	32.0	150	<12.0	3.4	
	July 11, 2018	CPF055D	9.6	31.1	8.6	203	1.1	129.6%	0.04	0.77	<0.02	0.03	0.80	0.76	0.04	22.0	130	<6.2	3.0	
	July 11, 2018	CPF055E	9.6	29.7	7.7	209	1.2	128.7%	0.04	0.78	<0.02	0.03	0.81	0.77	0.04	25.0	120	<6.2	3.4	
	July 11, 2018	CPF081A1C	10.1	29.0	8.3	188	0.4	131.6%	0.09	1.10	<0.02	0.04	1.14	1.09	0.05	46.0	140	17.0	16.0	
	July 11, 2018	CPF086C	9.0	28.6	8.7	201	0.5	117.2%	0.07	1.00	<0.02	0.03	1.03	0.99	0.04	43.0	140	14.0	12.0	
	July 11, 2018	CPF086F	11.0	30.0	8.8	198	0.5	145.8%	0.07	1.10	<0.02	0.03	1.13	1.09	0.04	37.0	140	7.8	9.4	
	July 11, 2018	CPF087B3	9.7	30.2	8.8	189	0.8	128.7%	0.04	0.83	<0.02	0.03	0.86	0.82	0.04	34.0	110.0	<6.2	5.2	
	July 11, 2018	CPF087D	9.6	30.4	8.2	182	0.9	127.9%	0.04	0.81	<0.02	0.03	0.84	0.80	0.04	26.0	110	<6.2	5.0	
	July 11, 2018	CPF0880A	8.7	30.8	8.0	190	1.3	117.2%	0.03	0.64	<0.02	0.03	0.67	0.63	0.04	32.0	120	<6.2	3.4	
	June 13, 2018	CPF055C	7.4	28.6	8.2	175	0.8	95.3%	0.07	0.94	0.09	0.31	1.25	0.85	0.40	29.0	110	<6.2	4.6	
	June 13, 2018	CPF055D	7.9	29.5	8.7	163	0.9	104.0%	0.05	0.83	0.08	0.18	1.01	0.75	0.26	31.0	120	<6.2	3.4	
	June 13, 2018	CPF055E	8.2	28.4	8.8	163	0.9	105.6%	0.06	0.92	0.06	0.09	1.01	0.86	0.15	38.0	110	<6.2	4.5	
	June 13, 2018	CPF081A1C	5.2	27.1	7.2	174	0.3	66.0%	0.06	0.94	0.12	<0.02	0.95	0.82	0.13	28.0	110	12.0	13.0	
	June 13, 2018	CPF086C	5.2	27.4	7.2	178	0.7	65.5%	0.06	0.90	0.16	0.02	0.92	0.74	0.18	20.0	140	14.0	15.0	
	June 13, 2018	CPF086F	6.2	27.3	7.3	174	0.8	78.6%	0.07	0.96	0.10	<0.02	0.97	0.86	0.11	47.0	110	9.2	8.1	
	June 13, 2018	CPF087B3	6.6	27.0	7.4	49	1.0	83.5%	0.04	0.80	0.04	<0.02	0.81	0.76	0.05	31.0	79	<12.0	4.4	
	June 13, 2018	CPF087D	6.8	27.5	7.5	182	0.9	85.8%	0.04	0.73	0.02	<0.02	0.74	0.71	0.03	25.0	120	<6.2	4.8	
	June 13, 2018	CPF0880A	7.6	27.5	8.1	184	1.0	96.2%	0.04	0.75	<0.02	<0.02	0.76	0.74	0.02	27.0	120	<6.2	4.9	
	May 9, 2018	CPF055C	8.8	23.8	7.8	157	0.8	104.4%	0.06	0.70	0.03	0.50	1.20	0.67	0.53	18.0		<6.2	7.2	
	May 9, 2018	CPF055D	9.1	24.5	7.9	149	0.8	109.6%	0.05	0.70	0.03	0.34	1.04	0.67	0.37	14.0	112	<6.2	7.1	
	May 9, 2018	CPF055E	9.3	23.7	7.9	156	0.7	110.1%	0.06	0.84	0.03	0.28	1.12	0.81	0.31	15.0	112	7.0	8.7	
	May 9, 2018	CPF081A1C	7.6	22.7	7.1	171	0.2	87.4%	0.11	1.40	0.08	0.04	1.44	1.32	0.12	41.0	121	26.0	30.0	
	May 9, 2018	CPF086C	7.5	22.7	7.4	175	0.2	87.4%	0.08	1.20	0.14	0.04	1.24	1.06	0.18	45.0	141	17.0	23.0	
	May 9, 2018	CPF086F	8.3	23.0	7.4	171	0.2	96.2%	0.10	1.20	0.11	0.04	1.24	1.09	0.15	28.0		15.0	22.0	
	May 9, 2018	CPF087B3	7.9	22.3	7.5	189	0.5	90.2%	0.06	1.10	0.15	0.07	1.17	0.95	0.22	47.0	135	<12.0	13.0	
	May 9, 2018	CPF087D	8.3	22.7	7.6	193	0.7	96.1%	0.06	1.10	0.13	0.07	1.17	0.97	0.20	36.0	133	6.5	10.0	
	May 9, 2018	CPF0880A	9.3	22.4	7.8	192	0.6	106.9%	0.05	0.95	0.07	0.16	1.11	0.88	0.23	31.0			9.1	
BUCKHORN DAM LAKE	August 28, 2018	CPFBDL1	6.8	27.9	7.2	141	0.5	86.4%	0.11	0.84	0.12	0.45	1.29	0.72	0.57	10.0	110	9.2	13.0	34.0
	August 28, 2018	CPFBDL2	8.1	28.4	7.4	131	0.6	103.6%	0.12	0.88	0.12	0.51	1.39	0.76	0.63	12.0	110	8.8	14.0	
	July 16, 2018	CPFBDL1	9.7	30.1	8.0	211	0.7	129.0%	0.06	0.84	<0.02	0.11	0.95	0.83	0.12	32.0	120	<6.2	6.4	38.0
	July 16, 2018	CPFBDL2	9.7	30.4	7.6	202	0.7	129.1%	0.07	0.83	0.03	0.12	0.95	0.80	0.15	20.0	120	<6.2	6.6	
	June 11, 2018	CPFBDL1	12.0	29.6	8.4	146	0.6	158.6%	0.14	1.00	0.02	0.49	1.49	0.98	0.51	28.0	100	7.0	9.4	35.0
	June 11, 2018	CPFBDL2	10.4	29.2	8.3	143	0.7	136.5%	0.13	0.96	0.07	0.51	1.47	0.89	0.58	20.0	110	7.5	9.1	
	May 1, 2018	CPFBDL1	9.5	17.7	7.1	123	0.6	99.2%	0.10	0.80	0.08	0.45	1.25	0.72	0.53	5.2	116	14.0	23.0	29.0
	May 1, 2018	CPFBDL2	9.3	17.8	7.2	119	0.5	97.2%	0.10	0.74	0.08	0.45	1.19	0.66	1.27	5.2	120	16.0	24.0	
HUC 03030003																				
HIGH POINT CITY LAKE	August 22, 2018	CPF089E2	8.8	29.3	7.5	103	1.0	117.5%	0.04	0.69	<0.02	0.02	0.71	0.68	0.03	40.0	62	<6.2	3.8	
	August 22, 2018	CPF089E4	5.2	29.6	7.5	99	0.8	69.6%	0.05	0.69	0.12	0.07	0.76	0.57	0.19	21.0	86	8.0	9.4	30.0
	July 30, 2018	CPF089E2	8.2	28.0	7.3	131	1.1	107.3%	0.03	0.57	<0.02	0.04	0.61	0.56	0.05	29.0	98	<6.2	4.1	
	July 30, 2018	CPF089E4	4.7	27.9	7.4	133	0.8	60.8%	0.04	0.66	0.09	0.06	0.72	0.57	0.15	20.0	110	6.7	6.5	38.0
	June 12, 2018	CPF089E2	6.4	24.7	7.6	140	1.0	78.3%	0.03	0.74	0.08	0.02	0.76	0.66	0.10	13.0	90	8.0	6.9	
	June 12, 2018	CPF089E4	7.6	24.7	7.4		0.8	92.4%	0.04	0.74	0.12	0.03	0.77	0.62	0.15	18.0	91	9.0	9.4	38.0
	May 10, 2018	CPF089E2	9.3	22.6	7.5	152	1.3	109.9%	0.03	0.55	<0.02	0.07	0.62	0.54	0.08	13.0	102	<6.2	3.9	
	May 10, 2018	CPF089E4	7.1	22.7	7.6	145	1.2	84.5%	0.03	0.59	0.06	0.07	0.66	0.53	0.13	12.0		6.2	5.8	39.0
OAK HOLLOW LAKE	August 22, 2018	CPF089D3	7.3	29.2	7.5	106	1.0	98.1%	0.03	0.62	0.02	<0.02	0.63	0.60	0.03	30.0	76	<12.0	5.3	
	August 22, 2018	CPF089D4	6.3	28.8	7.2	106	1.0	83.8%	0.04	0.65	0.09	<0.02	0.66	0.56	0.10	23.0	76	<6.2	5.2	
	August 22, 2018	CPF089D5	5.3	28.4	7.3	106	1.0	70.4%	0.04	0.72	0.15	0.02	0.74	0.57	0.17	18.0	77	9.2	6.1	30.0
	July 30, 2018	CPF089D3	7.4	28.2	7.6	124	1.3	97.2%	0.03	0.53	<0.02	0.04	0.57	0.52	0.05	24.0	96	<12.0	4.2	
	July 30, 2018	CPF089D4	8.6	28.9	8.1	125	1.0	114.5%	0.03	0.58	<0.02	0.04	0.62	0.57	0.05	40.0	83	<6.2	4.4	
	July 30, 2018	CPF089D5	6.1	28.2	7.6	125	1.0	80.0%	0.03	0.62	0.09	0.05	0.67	0.53	0.14	23.0	98	7.0	5.3	35.0
	June 12, 2018	CPF089D3	5.0	26.8	7.3	123	1.3	63.7%	0.03	0.52	0.02	<0.02	0.53	0.50	0.03	17.0	80	<12.0	4.4	
	June 12, 2018	CPF089D4	8.6	24.1	7.2	124	1.0	104.4%	0.04	0.56	<0.02	<0.02	0.57	0.55	0.02	20.0	88	7.0	5.0	
	June 12, 2018	CPF089D5	5.9	24.6	7.3	125	1.1	72.0%	0.04	0.61	0.08	0.02	0.63	0.53	0.10	14.0	84	6.2	11.0	
	May 10, 2018	CPF089D3	10.3	21.4	7.7	126	1.1	119.5%	0.03	0.60	<0.02	0.02	0.62	0.59	0.03	16.0		<6.2	5.4	
	May 10, 2018	CPF089D4	9.6	22.1	7.7	126	1.0	113.0%	0.04	0.63	0.02	0.02	0.65	0.61	0.04		98	6.8	6.4	
	May 10, 2018	CPF089D5	8.3	20.6	7.6	114	1.1	95.0%	0.04	0.62	0.05	0.03	0.65	0.57	0.08	10.0	93	6.5	7.9	31.0
RANDLEMAN LAKE	August 14, 2018	CPFRD1	7.6	29.1	7.6	107	0.8	100.8%	0.06	0.81	<0.02	0.03	0.84	0.80	0.04	30.0	94	<6.2	5.7	
	August 14, 2018	CPFRD2	8.7	29.6	8.8	148	1.0	117.3%	0.05	0.77	<0.02	<0.02	0.78	0.76	0.02	29.0	130	<6.2	4.6	
	August 14, 2018	CPFRD3	7.6	27.9	8.1	151	0.9	99.3%	0.04	0.68	<0.02	<0.02	0.69	0.67	0.02	20.0	130	<6.2	3.9	
	August 14, 2018	CPFRD4	8.0	30.3	8.7	204	1.0	108.2%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	16.0	120	<12.0	4.0	
	August 14, 2018	CPFRD5	8.5	30.2	8.6	177	0.9	114.7%	0.03	0.64	<0.02	<0.02	0.65	0.63	0.02	17.0	120	<6.2	3.6	
	August 14, 2018	CPFRD6	7.2	29.9	8.4	200	1.2	97..6%	0.02	0.62	<0.02	<0.02	0.63	0.61	0.02	20.0	130	<6.2	3.8	
	August 14, 2018	CPFRD7	7.9	30.5	8.6	201	1.0	107.2%	0.02	0.59	<0.02	<0.02	0.60	0.58	0.02	14.0	130	<6.2	4.0	
	August 14, 2018	CPFRD8	7.7	30.9	8.4	204	1.0	106.2%	0.02	0.54	<0.02	<0.02	0.55	0.53	0.02	11.0	130	<6.2	3.9	41.0
	August 14, 2018	CPFRD9	7.8	31.4	8.5	203	1.0	107.7%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	11.0	130	<6.2	4.2	
	July 10, 2018	CPFRD1	10.7	29.1	8.9	264	0.7	142.6%	0.05	0.81	<0.02	<0.02	0.82	0.80	0.02	36.0	160	<6.2	4.4	
	July 10, 2018	CPFRD2	8.5	28.4	8.3	260	0.9	111.8%	0.04	0.72	<0.02	<0.02	0.73	0.71	0.02	21.0	160	<6.2	3.8	
	July 10, 2018	CPFRD3	8.1	28.6	8.3	237	1.1	107.3%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	13.0	140	<6.2	3.9	
	July 10, 2018	CPFRD4	7.0	27.1	7.7	215	1.1	89.2%	0.02	0.52	<0.02	<0.02	0.53	0.51	0.02	9.8	160	<6.2	3.4	43.0
	July 10, 2018	CPFRD5	7.8	28.5	8.0	206	1.1	102.0%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	22.0	130	<12.0	3.1	
	July 10, 2018	CPFRD6	8.1	28.4	8.5	216	1.2	106.8%								10.0	130	<6.2	2.9	
	July 10, 2018	CPFRD7	7.8	28.1	8.3	221	1.4	102.5%	0.02	0.46	<0.02	<0.02	0.47	0.45	0.02	8.1	130	<6.2	2.8	
	July 10, 2018	CPFRD8	7.8	28.2	8.2	222	1.6	102.0%	<0.02	0.44	<0.02	<0.02	0.45	0.43	0.02	7.4	200	<6.2	3.5	
	July 10, 2018	CPFRD9	7.8	28.0	8.1	222	1.2	101.6%	<0.02	0.46	<0.02	<0.02	0.47	0.45	0.02	7.3	120	<6.2	3.1	
	June 12, 2018	CPFRD1	5.8	26.8	7.3	85	0.7	73.6%	0.08	0.80	0.04	0.03	0.83	0.76	0.07	23.0	120	10.0	8.5	
	June 12, 2018	CPFRD2	7.7	27.1	8.0	203	1.0	98.0%	0.06	0.73	<0.02	<0.02	0.74	0.72	0.02	29.0	120	<6.2	4.4	
	June 12, 2018	CPFRD3	7.7	26.6	7.8	214	0.9	97.7%	0.04	0.62	<0.02	<0.02	0.63	0.61	0.02	11.0	130	<6.2	4.6	
	June 12, 2018	CPFRD4	7.0	27.1	7.7	215	1.0	89.2%	0.03	0.62	<0.02	<0.02	0.63	0.61	0.02	18.0	130	6.2	5.7	
	June 12, 2018	CPFRD5	7.4	26.7	7.6	211	0.9	93.9%	0.03	0.64	<0.02	<0.02	0.65	0.63	0.02	13.0	130	<6.2	5.9	
	June 12, 2018	CPFRD6	7.3	27.1	7.9	216	1.0	93.8%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	12.0	130	<12.0	4.9	
	June 12, 2018	CPFRD7	7.2	26.9	7.8	223	1.0	91.4%	0.02	0.59	<0.02	<0.02	0.60	0.58	0.02	15.0	140	<6.2	5.8	
	June 12, 2018	CPFRD8	7.3	27.1	7.9	219	1.0	93.2%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	9.6	120	<6.2	5.4	44.0
	June 12, 2018	CPFRD9	7.4	26.5	7.5	220	1.0	93.3%	0.02	0.56	<0.02	<0.02	0.57	0.55	0.02	7.9	88	<6.2	5.3	

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
RANDLEMAN LAKE	May 31, 2018	CPFRD1	10.6	28.3	8.8	175	0.8	139.3%	0.06	0.74	<0.02	<0.02	0.75	0.73	0.02	27.0	110	7.5	5.3	
	May 31, 2018	CPFRD2	8.8	27.1	8.3	197	1.0	113.3%	0.05	0.70	<0.02	<0.02	0.71	0.69	0.02	21.0	120	6.2	4.5	
	May 31, 2018	CPFRD3	8.7	26.7	8.2	213	0.9	110.6%	0.04	0.67	<0.02	<0.02	0.68	0.66	0.02	22.0	130	<12.0	5.2	
	May 31, 2018	CPFRD4	7.7	26.1	7.9	217	1.1	97.6%	0.02	0.60	<0.02	<0.02	0.61	0.59	0.02	15.0	120	<6.2	4.5	
	May 31, 2018	CPFRD5	8.4	27.0	8.4	202	0.8	108.3%	0.03	0.65	<0.02	<0.02	0.66	0.64	0.02	16.0	120	<6.2	6.5	
	May 31, 2018	CPFRD6	8.7	26.8	8.5	215	0.9	111.9%	0.03	0.66	<0.02	<0.02	0.67	0.65	0.02	18.0		<6.2	4.7	
	May 31, 2018	CPFRD7	8.3	25.9	8.5	220	1.0	104.5%	0.02	0.59	<0.02	<0.02	0.60	0.58	0.02	15.0	130	<6.2	4.1	
	May 31, 2018	CPFRD8	8.0	25.7	8.3	219	1.0	100.0%	0.02	0.62	<0.02	<0.02	0.63	0.61	0.02	14.0	130	<6.2	3.9	42.0
	May 31, 2018	CPFRD9	8.2	26.3	8.0	218	1.0	103.4%	0.03	0.61	<0.02	<0.02	0.62	0.60	0.02	15.0	120	<6.2	4.3	
SANDY CREEK RESERVOIR	August 22, 2018	CPFSC1	9.3	25.9	7.9	88	0.4	116.6%	0.11	1.10	<0.02	0.09	1.19	1.09	0.10	65.0	100	15.0	20.0	32.0
	August 22, 2018	CPFSC2	10.5	26.4	8.1	88	0.4	132.8%	0.12	1.20	<0.02	<0.02	1.21	1.19	0.02	73.0	110	17.0	21.0	
	August 22, 2018	CPFSC3	8.3	25.4	7.5	88	0.3	103.1%	0.16	1.30	0.02	0.19	1.49	1.28	0.21	43.0	110	21.0	34.0	
	July 30, 2018	CPFSC1	9.8	29.0	7.8	126	1.1	128.9%	0.03	0.61	<0.02	0.03	0.64	0.60	0.04	26.0	110	<6.2	3.1	43.0
	July 30, 2018	CPFSC2	9.7	30.1	8.5	125	1.4	129.9%	0.04	0.67	<0.02	0.04	0.71	0.66	0.05	35.0	110	<6.2	3.8	
	July 30, 2018	CPFSC3	7.8	27.6	7.7	125	0.9	100.7%	0.08	0.74	0.04	0.10	0.84	0.70	0.14	45.0	170	7.2	7.6	
	June 12, 2018	CPFSC1	9.7	24.5	7.8	118	1.10	117.0%	0.06	0.92	<0.02	0.10	1.02	0.91	0.11	77.0	88	<6.2	4.1	38.0
	June 12, 2018	CPFSC2	9.3	21.3	7.0	119	0.90	107.2%	0.08	0.99	<0.02	0.25	1.24	0.98	0.26	84.0	90	<6.2	6.1	
	June 12, 2018	CPFSC3	6.4	21.5	7.1	137	0.60	72.9%	0.19	1.30	0.08	0.50	1.80	1.22	0.58	210.0	110	13.0		
	May 10, 2018	CPFSC1	11.0	24.8	8.2	94	1.0	133.8%	0.06	0.82	0.02	0.30	1.12	0.80	0.32	44.0	85	<6.2	5.2	20.0
	May 10, 2018	CPFSC2	12.3	22.0	7.9	102	1.0	142.7%	0.05	0.73	<0.02	0.23	0.96	0.72	0.24	26.0	84	<6.2	4.1	
	May 10, 2018	CPFSC3	6.8	23.1	7.7	118	1.0	80.1%	0.07	0.58	0.08	0.65	1.23	0.50	0.73	1.4	98	7.2	9.5	
ROCKY RIVER RESERVOIR	August 14, 2018	CPF1201A	8.9	28.1	7.2	87	0.5	115.9%	0.12	1.40	<0.02	<0.02	1.41	1.39	0.02	79.0	84	10.0	8.7	31.0
	August 14, 2018	CPF1201B	10.2	28.1	7.4	88	0.4	133.2%	0.13	1.40	<0.02	<0.02	1.41	1.39	0.02	72.0	92	8.8	9.2	
	July 10, 2018	CPF1201A	8.7	29.0	7.0	106	0.6	115.3%	0.06	1.10	<0.02	0.03	1.13	1.09	0.04	32.0	91	8.3	8.2	35.0
	July 10, 2018	CPF1201B	9.3	28.8	7.4	107	0.6	122.0%	0.07	1.10	<0.02	0.03	1.13	1.09	0.04	43.0	100	10.0	9.5	
	June 13, 2018	CPF1201A	6.1	25.6	6.7	96	0.7	76.9%	0.08	1.10	<0.02	<0.02	1.11	1.09	0.02	31.0	98	7.0	7.9	32.0
	June 13, 2018	CPF1201B	5.7	25.6	7.0	100	0.6	70.7%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	60.0	120	10.0	9.2	
	May 7, 2018	CPF1201A	10.7	23.8	7.0	76	0.4	129.1%	0.11	1.20	<0.02	0.25	1.45	1.19	0.26		148	<12.0	11.0	25.0
	May 7, 2018	CPF1201B	9.2	23.5	7.3	79	0.5	110.1%	0.12	1.20	0.05	0.30	1.50	1.15	0.35	18.0	85	8.8	11.0	
CHARLES L. TURNER RES.	August 14, 2018	CPFTR1	6.5	27.3	7.2	87	0.5	83.9%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	75.0	81	9.5	24.0	28.0
	August 14, 2018	CPFTR2	7.3	28.2	7.3	86	0.4	94.2%	0.10	1.30	<0.02	<0.02	1.31	1.29	0.02	58.0	110	11.0	12.0	
	August 14, 2018	CPRTR3	8.8	27.8	7.3	89	0.4	113.7%	0.13	1.40	<0.02	<0.02	1.41	1.39	0.02	56.0	110	12.0	3.5	
	August 14, 2018	CPFTR5	7.6	28.0	7.3	88	0.3	98.1%	0.19	1.60	<0.02	<0.02	1.61	1.59	0.02	57.0	97	29.0	3.6	
	August 14, 2018	CPFTR6	6.7	27.7	7.3	90	0.4	86.9%	0.12	1.30	<0.02	0.30	1.33	1.29	0.04	47.0	97	<12.0	3.5	
	July 10, 2018	CPFTR1	7.5	27.7	6.8	95	0.3	97.3%	0.12	1.60	<0.02	0.03	1.63	1.59	0.04	88.0	97	15.0	18.0	34.0
	July 10, 2018	CPFTR2	8.1	28.0	7.0	96	0.4	104.6%	0.10	1.30	<0.02	0.04	1.34	1.29	0.05	54.0	130	14.0	17.0	
	July 10, 2018	CPRTR3	8.2	27.6	6.9	99	0.3	105.6%	0.12	1.40	<0.02	0.03	1.43	1.39	0.04	63.0	100	20.0	25.0	
	July 10, 2018	CPFTR5	7.3	27.1	6.9	101	0.2	93.7%	0.13	1.40	<0.02	0.03	1.43	1.39	0.04	52.0	120	28.0	30.0	
	July 10, 2018	CPFTR6	7.8	27.0	6.9	103	0.3	99.7%	0.13	1.40	<0.02	0.03	1.43	1.39	0.04	62.0	100	22.0	28.0	
	June 13, 2018	CPFTR1	5.7	26.9	6.9	88	0.6	72.5%	0.09	1.20	<0.02	<0.02	1.21	1.19	0.02	45.0	82	9.2	8.7	32.0
	June 13, 2018	CPFTR2	5.0	26.4	7.0	89	0.6	89.0%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	48.0	96	9.8	10.0	
	June 13, 2018	CPRTR3	3.9	26.1	7.0	92	0.6	48.6%	0.11	1.30	0.05	<0.02	1.31	1.25	0.06	44.0	100	9.8	11.0	
	June 13, 2018	CPFTR5	4.5	25.4	7.2	97	0.5	55.3%	0.16	1.40	0.07	0.04	1.44	1.33	0.11	55.0	130	36.0	18.0	
	June 13, 2018	CPFTR6	4.0	25.3	7.5	97	0.6	49.3%	0.12	1.20	0.12	0.08	1.28	1.08	0.20	30.0	90	11.0	12.0	
	May 7, 2018	CPFTR1	10.7	24.4	7.0	77	0.5	130.7%	0.09	1.10	<0.02	0.19	1.29	1.09	0.20	32.0	98	9.2	8.2	25.0
	May 7, 2018	CPFTR2	8.8	23.3	6.9	78	0.5	104.2%	0.10	1.20	0.05	0.18	1.38	1.15	0.23		115	12.0	11.0	
	May 7, 2018	CPRTR3	8.5	23.5	6.9	79	0.5	101.8%	0.12	1.20	0.10	0.20	1.40	1.10	0.30		90	15.0	9.5	
	May 7, 2018	CPFTR5	9.5	23.5	7.0	82	0.5	113.9%	0.14	1.40	0.09	0.20	1.60	1.31	0.29		106	14.0	15.0	
	May 7, 2018	CPFTR6	6.9	23.7	7.2	78	0.5	82.8%	0.13	1.30	0.21	0.29	1.59	1.09	0.50	14.0	110	7.5	9.8	
HUC 03030004																				
HARRIS LAKE	August 28, 2018	CPF126A2	13.3	29.6	9.9	180	0.6	175.0%	0.14	1.30	<0.02	<0.02	1.31	1.29	0.02	120.0	68	<12.0	8.8	
	August 28, 2018	CPF126A4	13.2	29.2	9.7	191	1.0	171.4%	0.10	0.98	<0.02	<0.02	0.99	0.97	0.02	52.0	110	6.8	4.7	
	August 28, 2018	CPF126A6	5.3	28.0	7.6	177	0.8	68.0%	0.12	1.00	<0.02	<0.02	1.01	0.99	0.02	72.0	120	7.5	5.0	
	July 16, 2018	CPF126A2	8.3	29.1	8.0	187	0.7	109.0%	0.08	0.98	<0.02	0.03	1.01	0.97	0.04	31.0	70	7.2	7.1	
	July 16, 2018	CPF126A4	9.0	29.0	8.8	195	0.5	117.8%	0.09	1.10	<0.02	0.03	1.13	1.09	0.04	40.0	130	6.2	6.6	
	July 16, 2018	CPF126A6	7.1	28.4	7.6	192	0.8	91.7%	0.09	0.99	<0.02	0.03	1.02	0.98	0.04	34.0	120	<6.2	5.3	
	June 11, 2018	CPF126A2	7.3	28.1	8.4	111	0.7	95.2%	0.08	0.93	<0.02	<0.02	0.94	0.92	0.02	32.0	110	7.0	6.6	
	June 11, 2018	CPF126A4	9.9	29.4	9.1	188	0.8	131.4%	0.07	1.00	<0.02	<0.02	1.01	0.99	0.02	33.0	120	<6.2	6.1	
	June 11, 2018	CPF126A6	9.7	29.2	8.8	183	0.8	128.1%	0.08	1.00	<0.02	<0.02	1.01	0.99	0.02	26.0	120	<6.2	6.3	
	May 1, 2018	CPF126A2	10.1	20.6	7.4	170	1.3	111.5%	0.07	0.81	<0.02	<0.02	0.82	0.80	0.02	17.0	122	<12.0	3.8	
	May 1, 2018	CPF126A4	10.3	19.9	7.3	176	2.1	112.5%	0.07	0.83	<0.02	<0.02	0.84	0.82	0.02	15.0	128	<6.2	3.6	
	May 1, 2018	CPF126A6	9.9	21.2	7.3	172	1.3	110.9%	0.07	0.77	<0.02	<0.02	0.78	0.76	0.02	18.0	122	<6.2	3.6	
OLD TOWN RESERVOIR	August 6, 2018	CPF135B	8.0	29.0	6.6	8	1.5	104.5%	<0.02	0.49	<0.02	0.04	0.53	0.48	0.05	18.0	29	<6.2	2.9	
	August 6, 2018	CPF135D	8.1	29.3	6.8	29	1.6	106.7%	<0.02	0.44	<0.02	0.05	0.49	0.43	0.06	22.0	48	<6.2	2.6	8.9
	July 11, 2018	CPF135B	8.2	28.5	7.2	34	1.8	106.1%	<0.02	0.49	<0.02	0.04	0.53	0.48	0.05	24.0	44	<12.0	2.7	
	July 11, 2018	CPF135D	8.2	28.9	6.6	34	1.7	107.5%	<0.02	0.41	<0.02	0.03	0.44	0.40	0.04	22.0	<25.0	<6.2	2.2	8.9
	June 6, 2018	CPF135B	8.4	28.9	6.8	34	1.2	111.1%	<0.02	0.43	<0.02	<0.02	0.44	0.42	0.02	8.6	26	<6.2	1.9	
	June 6, 2018	CPF135D	8.5	29.0	6.8	34	1.8	112.3%	<0.02	0.45	<0.02	<0.02	0.46	0.44	0.02	10.0	25	<6.2	2.3	9.0
	May 2, 2018	CPF135B	10.0	20.3	7.1	34	2.4	110.8%	<0.02	0.38	<0.02	0.20	0.58	0.37	0.21	7.8	38	<6.2	1.6	
	May 2, 2018	CPF135D	10.1	20.3	6.7	34	2.6	111.4%	<0.02	0.36	<0.02	0.20	0.56	0.35	0.21	8.4	32	<6.2	1.7	9.7
CARTHAGE CITY LAKE	August 6, 2018	CPF113R	8.5	30.5	6.6	45	0.7	113.9%	0.06	0.79	<0.02	0.03	0.82	0.78	0.04	20.0	26	13.0	6.3	13.0
	July 11, 2018	CPF113R	7.6	29.3	6.4	38	0.7	101.0%	0.03	0.67	<0.02	0.04	0.71	0.66	0.05	16.0	67	<6.2	4.1	8.9
	June 6, 2018	CPF113R	8.4	30.0	6.9	40	1.0	113.5%	0.03	0.63	<0.02	<0.02	0.64	0.62	0.02	32.0	38	<12.0	4.5	10.0
	May 2, 2018	CPF113R	8.4	21.3	6.2	42	1.2	94.9%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	11.0	50	<6.2	4.6	9.7
GLENVILLE LAKE	August 6, 2013	CPF138B	7.9	29.5	6.5	29	0.6	102.7%	0.04	0.56	0.02	0.04	0.60	0.54	0.06	24.0	110	<6.2	7.8	13.0
	July 11, 2018	CPF138B	8.6	29.4	6.5	49	0.7	113.2%	0.04	0.69	<0.02	0.03	0.72	0.68	0.04	21.0	60	<6.2	5.3	13.0
	June 6, 2018	CPF138B	6.0	27.7	6.8	46	0.8	77.0%	0.03	0.47	<0.02	<0.02	0.48	0.46	0.02	8.8	31	<6.2	2.3	12.0
	May 17, 2018	CPF138B	6.4	25.5	6.9	54	0.9	78.0%	0.06	0.66	<0.02	<0.02	0.67	0.65	0.02	48.0	46	6.5	3.6	13.0
HUC 03030005																				
SALTERS LAKE	September 11, 2018	CPF153C	6.5	30.1	4.2	49	0.5	85.7%	0.02	0.56	<0.02	0.04	0.60	0.55	0.05	10.0	50	<6.2	6.6	
	September 11, 2018	CPF153D	6.7	29.7	4.2	47	0.5	87.9%	0.02	0.52	<0.02	0.05	0.57	0.51	0.06	6.1	73	<6.2	6.2	
	August 15, 2018	CPF153C	7.1	29.9	4.5	50	0.3	93.0%	0.02	0.61	0.03	0.07	0.68	0.58	0.10	13.0	44	<6.2	6.3	
	August 15, 2018	CPF153D	6.8	31.1	3.9	49	0.4	91.3%	0.02	0.58	0.03	0.06	0.64	0.55	0.09	13.0	190	<12.0	6.8	
	July 9, 2018	CPF153C	6.8	27.6	3.8	49	0.3	85.9%	0.02	0.63	0.03	0.09	0.72	0.60	0.12	6.2	60	<12.0	8.6	

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
	July 9, 2018	CPF153D	6.9	27.8	3.8	49	0.4	87.5%	0.02	0.61	0.03	0.09	0.70	0.58	0.12	6.3	34	<6.2	9.3	
	June 4, 2018	CPF153C	7.1	29.5	3.8	51	0.3	92.8%	0.02	0.66	<0.02	0.07	0.73	0.65	0.08	18.0	38	<6.2	6.7	
	June 4, 2018	CPF153D	7.2	29.7	3.9	50	0.4	95.3%	0.02	0.57	<0.02	0.06	0.63	0.56	0.07	11.0	40	<6.2	6.5	
	May 8, 2018	CPF153C	7.7	22.2	4.9	48	0.3	87.5%	0.02	0.66	0.04	0.03	0.69	0.62	0.07	2.0	120	<6.2	10.0	
	May 8, 2018	CPF153D	7.9	22.6	4.1	48	0.3	91.2%	0.02	0.71	0.04	0.02	0.73	0.67	0.06	2.3	105	<6.2	10.0	
JONES LAKE	September 11, 2018	CPF1552A	7.0	29.3	4.3	48	0.4	91.0%	0.02	0.77	<0.02	0.06	0.83	0.76	0.07	42.0	63	<6.2	4.0	
	September 11, 2018	CPF1553A	6.6	29.6	4.2	48	0.4	86.9%	0.02	0.63	<0.02	0.10	0.73	0.62	0.11	4.8	53	<6.2	3.0	
	August 15, 2018	CPF1552A	6.1	29.7	4.2	48	0.3	80.0%	<0.02	0.70	0.09	0.06	0.76	0.61	0.15	2.6	50	<6.2	2.8	
	August 15, 2018	CPF1553A	6.2	30.1	3.9	49	0.3	82.5%	0.02	0.75	0.08	0.06	0.81	0.67	0.14	12.0	53	<6.2	2.9	
	July 9, 2018	CPF1552A	5.8	26.9	4.8	47	0.4	71.5%	0.02	0.77	0.06	0.04	0.81	0.71	0.10	3.4	88	<6.2	5.2	
	July 9, 2018	CPF1553A	6.0	26.2	4.0	47	0.4	73.9%	0.02	0.76	0.06	0.03	0.79	0.70	0.09	3.0	41	<6.2	4.6	
	June 4, 2018	CPF1552A	6.1	29.3	3.9	51	0.4	80.3%	0.02	0.69	0.07	0.08	0.77	0.62	0.15	2.0	50	<6.2	2.7	
	June 4, 2018	CPF1553A	6.6	29.5	3.9	50	0.4	87.4%	0.04	0.68	0.06	0.08	0.76	0.62	0.14	2.8	50	<6.2	2.6	
	May 8, 2018	CPF1552A	8.0	23.5	4.1	50	0.4	94.2%	0.02	0.69	<0.02	0.09	0.78	0.68	0.10	12.0		<6.2	3.7	
	May 8, 2018	CPF1553A	8.2	22.3	4.2	50	0.8	93.6%	0.02	0.67	<0.02	0.08	0.75	0.66	0.09	15.0	61	<6.2	4.0	
WHITE LAKE	August 13, 2018	CPF155A	6.9	29.8	6.8	71	2.0	91.0%	<0.02	0.65	<0.02	<0.02	0.66	0.64	0.02	16.0	85	< 6.2	10.0	
	August 13, 2018	CPF155B	7.6	29.9	6.8	71	1.3	100.4%	<0.02	0.65	<0.02	<0.02	0.66	0.64	0.02	15.0	89	<6.2	12.0	
	August 13, 2018	CPF155C	7.5	30.2	6.9	72	1.3	99.6%	<0.02	0.62	<0.02	<0.02	0.63	0.61	0.02	16.0	77	<6.2	13.0	
	July 12, 2018	CPF155A	6.9	29.0	6.4	73	1.5	89.7%	0.02	0.66	<0.02	<0.02	0.67	0.65	0.02	4.4	80	<6.2	2.8	
	July 12, 2018	CPF155B	7.4	28.8	5.8	72	1.5	95.9%	<0.02	0.64	<0.02	<0.02	0.65	0.63	0.02	4.3	55	<6.2	2.7	
	July 12, 2018	CPF155C	7.4	29.4	5.9	72	1.5	96.9%	<0.02	0.56	<0.02	<0.02	0.57	0.55	0.02	3.7	80	<6.2	2.6	
	June 14, 2018	CPF155A	6.5	27.2	6.2	78	1.9	81.9%	0.02	0.67	<0.02	<0.02	0.68	0.66	0.02	3.3	60	<6.2	2.1	
	June 14, 2018	CPF155B	6.6	27.3	6.2	77	2.1	83.3%	0.02	0.67	<0.02	<0.02	0.68	0.66	0.02	2.9	88	<6.2	2.2	
	June 14, 2018	CPF155C	6.6	27.7	6.3	77	2.2	83.9%	0.02	0.61	<0.02	<0.02	0.62	0.60	0.02	3.8	100	<12.0	2.2	
	May 3, 2018	CPF155A	9.9	22.6	8.5	47	0.4	114.9%	0.06	1.40	<0.02	<0.02	1.41	1.39	0.02	24.0	111	24.0	6.8	
	May 3, 2018	CPF155B	9.8	22.2	8.4	46	0.4	112.3%	0.06	1.33	<0.02	0.02	1.35	1.32	0.03	25.0	95	28.0	6.4	
	May 3, 2018	CPF155C	10.2	22.6	7.9	46	0.4	118.2%	0.06	1.40	<0.02	0.02	1.42	1.39	0.03	22.0	84	29.0	6.6	
GREENFIELD LAKE	August 28, 2018	CPF211B	8.1	29.8	7.5	70	0.9	106.1%	0.08	0.65	<0.02	<0.02	0.66	0.64	0.02	29.0	150	6.2	3.8	
	August 28, 2018	CPF211C	7.5	31.4	7.5	231	1.1	100.0%	0.10	0.75	<0.02	<0.02	0.76	0.74	0.02	25.0	93	12.0	3.9	
	August 7, 2018	CPF211B	10.0	29.0	6.9	161	0.8	128.6%	0.09	0.84	0.03	0.10	0.94	0.81	0.13	40.0	150	<12.0	4.4	
	August 7, 2018	CPF211C	8.2	29.5	6.9	146	0.7	106.9%	0.12	1.10	<0.02	0.03	1.13	1.09	0.04	48.0	140	13.0	5.8	
	June 25, 2018	CPF211B	6.5	31.2	7.2	192	0.7	86.9%	0.10	0.60	<0.02	<0.02	0.61	0.59	0.02	24.0	140	7.8	4.7	
	June 25, 2018	CPF211C	6.7	31.5	7.3	179	0.7	91.1%	0.12	0.81	<0.02	<0.02	0.82	0.80	0.02	20.0	170	44.0	5.9	
	May 22, 2018	CPF211B	6.7	26.0	6.8	128	1.1	82.5%	0.11	0.87	0.27	0.11	0.98	0.60	0.38	10.0	86	<12.0	4.7	
	May 22, 2018	CPF211C	8.7	26.8	8.8	158	0.6	108.2%	0.18	1.60	0.18	<0.02	1.61	1.42	0.19	62.0	110	22.0	10.0	
SUTTON LAKE	August 28, 2018	CPFSL1	6.7	32.8	7.4	183	1.6	92.5%	0.04	0.65	<0.02	<0.02	0.66	0.64	0.02	9.1	120	<12.0	2.1	
	August 28, 2018	CPFSL2	6.7	33.5	7.4	202	2.3	93.0%	0.04	0.60	<0.02	<0.02	0.61	0.59	0.02	5.6	140	<6.2	1.4	
	August 7, 2018	CPFSL1	7.8	33.3	7.7	192	2.0	107.8%	0.03	0.54	<0.02	0.04	0.58	0.53	0.05	6.6	140	<6.2	1.0	
	August 7, 2018	CPFSL2	7.1	32.9	7.3	197	2.6	97.5%	0.03	0.56	0.02	0.04	0.60	0.54	0.06	3.4	150	<6.2	<1.0	
	June 25, 2018	CPFSL1	7.2	33.7	7.4	226	2.0	101.0%	0.04	0.62	<0.02	<0.02	0.63	0.61	0.02	7.0	140	7.2	4.3	
	June 25, 2018	CPFSL2	7.2	32.8	7.6	222	1.6	99.7%	0.03	0.50	<0.02	<0.02	0.51	0.49	0.02	8.5	140	<12.0	1.3	
	May 22, 2018	CPFSL1	8.0	28.2	7.4	237	1.1	101.2%	0.04	0.66	<0.02	0.07	0.73	0.65	0.08	5.5	150	<12.0	2.0	
	May 22, 2018	CPFSL2	8.0	27.9	7.6	236	1.5	101.0%	0.03	0.60	0.02	0.07	0.67	0.58	0.09	4.4	150	<6.2	2,3	
BOILING SPRINGS LAKE	August 28, 2018	CPFBSL2	4.2	29.1	5.3	42	0.2	54.8%	0.02	0.98	0.05	0.05	1.03	0.93	0.10	1.8	120	<6.2	3.0	
	August 28, 2018	CPFBSL4	5.7	30.1	5.4	42	0.2	74.6%	0.02	0.95	0.04	0.04	0.99	0.91	0.08	3.6	130	<6.2	2.1	
	August 28, 2018	CPFBSL6	5.8	32.6	5.4	42	0.2	79.2%	0.02	0.91	0.04	0.04	0.95	0.87	0.08	4.7	130	<6.2	2.0	
	August 7, 2018	CPFBSL2	5.7	28.4	4.4	40	0.2	73.3%	0.02	0.91	0.03	0.05	0.96	0.88	0.08	1.4	120	<6.2	2.3	
	August 7, 2018	CPFBSL4	5.9	29.4	4.9	38	0.2	76.7%	0.02	0.83	0.02	0.06	0.89	0.81	0.08	4.4	120	<6.2	2.1	
	August 7, 2018	CPFBSL6	5.9	30.3	4.8	41	0.2	77.9%	0.02	0.88	<0.02	0.06	0.94	0.87	0.07	4.9	130	<6.2	2.0	
	June 25, 2018	CPFBSL2	4.9	29.9	5.4	53	0.2	64.6%	0.02	0.82	0.05	0.09	0.91	0.77	0.14	1.1	200	<6.2	2.7	
	June 25, 2018	CPFBSL4	5.6	30.3	5.6	54	0.2	74.7%	0.02	0.84	0.05	0.06	0.90	0.79	0.11	2.4	200	<6.2	2.3	
	June 25, 2018	CPFBSL6	5.8	31.6	5.6	53	0.2	79.1%	0.02	0.78	0.05	0.05	0.83	0.73	0.10	2.7	120	<6.2	2.2	
	May 22, 2018	CPFBSL2	6.5	24.3	4.2	58	0.2	76.9%	0.02	0.96	<0.02	0.02	0.98	0.95	0.03	1.4	110	<6.2	6.0	
	May 22, 2018	CPFBSL4	6.9	26.2	6.0	59	0.5	85.1%	0.02	0.64	<0.02	0.05	0.69	0.63	0.06	3.6	90	<6.2	2.9	
	May 22, 2018	CPFBSL6	7.0	26.1	6.1	61	0.4	85.7%	0.02	0.60	<0.02	0.06	0.66	0.59	0.07	3.0	87	<6.2	2.7	
HUC 03030006																				
BAY TREE LAKE	September 11, 2018	CPF155G	7.0	30.2	4.5	59	1.8	92.7%	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	2.6	38	<12.0	<1.0	
	September 11, 2018	CPF155I	7.2	29.7	4.5	59	2.1	94.3%	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	2.8	43	<6.2	<1.0	
	August 22, 2018	CPF155G	7.2	29.0	4.6	56	0.8	93.7%	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	1.8	31	<6.2	<1.0	
	August 22, 2018	CPF155I	7.2	29.1	4.6	51	1.6	94.1%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	2.3	25	<6.2	<1.0	
	July 23, 2018	CPF155G	7.5	27.7	4.5	59	1.1	95.7%	<0.02	0.26	<0.02	0.03	0.29	0.25	0.04	7.2	30	<12.0	1.5	
	July 23, 2018	CPF155I	7.6	27.9	4.7	55	1.1	97.6%	0.02	0.33	<0.02	0.03	0.36	0.32	0.04	13.0	34	<6.2	1.5	
	June 27, 2018	CPF155G	7.9	29.7	4.5	64	1.0	103.1%	0.02	0.29	<0.02	<0.02	0.30	0.28	0.02	20.0	32	<6.2	2.6	
	June 27, 2018	CPF155I	7.7	29.6	4.4	64	1.0	101.5%	0.02	0.34	<0.02	<0.02	0.35	0.33	0.02	19.0	45	<6.2	2.2	
	May 24, 2018	CPF155G	7.7	27.0	4.6	68	1.5	96.0%	0.02	0.21	0.02	0.09	0.30	0.19	0.11	1.8	40	<6.2	1.5	
	May 24, 2018	CPF155I	7.9	26.7	4.6	67	1.5	97.5%	0.02	0.22	0.02	0.08	0.30	0.20	0.10	2.3	34	<6.2	1.9	
LAKE SINGLETARY	September 11, 2018	CPF176D	6.8	31.0	4.1	51	0.3	91.5%	0.03	0.74	<0.02	0.02	0.76	0.73	0.03	16.0	98	<6.2	8.7	
	September 11, 2018	CPF176E	7.0	31.2	4.1	51	0.3	94.2%	0.03	0.73	<0.02	<0.02	0.74	0.72	0.02	18.0	64	<6.2	7.8	
	September 11, 2018	CPF176F	6.8	32.3	4.1	50	0.4	93.8%	0.03	0.64	0.02	0.02	0.66	0.62	0.04	7.6	65	<6.2	7.6	
LAKE SINGLETARY	August 22, 2018	CPF176D	7.3	30.4	4.3	49	0.5	96.9%	0.03	0.69	<0.02	<0.02	0.70	0.68	0.02	9.5	54	<6.2	8.2	
	August 22, 2018	CPF176E	7.3	30.2	4.2	52	0.3	97.4%	0.03	0.66	<0.02	<0.02	0.67	0.65	0.02	8.1	56	<6.2	8.1	
	August 22, 2018	CPF176F	7.3	30.5	4.3	49	0.3	97.3%	0.03	0.64	0.02	<0.02	0.65	0.62	0.03	9.0	58	<6.2	8.8	
	July 23, 2018	CPF176D	7.4	29.3	4.3	50	0.3	96.4%	0.03	0.65	0.04	0.13	0.78	0.61	0.17	10.0	54	<6.2	9.0	
	July 23, 2018	CPF176E	7.3	29.4	4.2	51	0.3	95.8%	0.04	0.66	0.04	0.13	0.79	0.62	0.17	10.0	55	<6.2	8.6	
	July 23, 2018	CPF176F	7.2	28.8	4.2	26	0.3	93.3%	0.03	0.62	0.05	0.13	0.75	0.57	0.18	34.0	58	<6.2	8.5	

Appendix A - Cape Fear River Basin Data
January 1, 2014 Through December 31, 2018

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent DO SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
	June 27, 2018	CPF176D	7.3	30.4	4.1	55	0.4	97.3%	0.04	0.61	<0.02	0.12	0.73	0.60	0.13	8.7	65	<6.2	8.5	
	June 27, 2018	CPF176E	7.5	31.5	4.1	55	0.4	102.0%	0.04	0.66	<0.02	0.12	0.78	0.65	0.13	16.0	60	<6.2	8.7	
	June 27, 2018	CPF176F	7.7	33.8	4.2	54	0.3	108.1%	0.04	0.67	<0.02	0.11	0.78	0.66	0.12	12.0	54	<6.2	8.5	
	May 24, 2018	CPF176D	7.7	27.0	4.3	52	0.4	96.4%	0.04	0.59	0.05	0.12	0.71	0.54	0.17	4.6	48	<6.2	9.2	
	May 24, 2018	CPF176E	7.5	27.0	4.3	53	0.4	94.2%	0.04	0.56	0.05	0.12	0.68	0.51	0.17	4.5	46	<6.2	9.0	
	May 24, 2018	CPF176F	8.0	26.9	4.3	52	0.4	100.1%	0.04	0.56	0.05	0.12	0.68	0.51	0.17	4.8	43	<6.2	9.0	
HUC 03030007																				
CABIN LAKE	September 11, 2018	CPFCL2	5.7	31.2	6.4	71	0.5	77.0%	0.09	1.10	<0.02	<0.02	1.11	1.09	0.02	31.0	120	<6.2	2.9	
	September 11, 2018	CPFCL4	7.2	31.1	6.6	70	0.6	96.7%	0.10	1.00	<0.02	<0.02	1.01	0.99	0.02	22.0	110	<6.2	3.2	
	August 15, 2018	CPFCL2	9.2	30.9	5.6	64	0.4	123.7%	0.14	1.20	<0.02	<0.02	1.21	1.19	0.02	61.0	120	6.5	3.1	
	August 15, 2018	CPFCL4	9.5	31.1	5.8	62	0.4	128.0%	0.17	1.20	<0.02	<0.02	1.21	1.19	0.02	37.0	120	<6.2	4.2	
	July 9, 2018	CPFCL2	4.8	27.1	5.2	66	0.5	59.9%	0.12	1.00	0.08	0.03	1.03	0.92	0.11	11.0	82	<6.2	7.8	
	July 9, 2018	CPFCL4	6.4	27.8	5.7	66	0.5	80.8%	0.15	1.10	0.03	0.03	1.13	1.07	0.06	35.0	79	7.8	6.9	
	June 4, 2018	CPFCL2	6.1	21.3	6.6	71	0.4	68.4%	0.18	0.98	0.07	0.21	1.19	0.91	0.28	11.0	94	<6.2	8.0	
	June 4, 2018	CPFCL4	7.3	21.0	6.1	71	0.4	81.3%	0.15	0.93	0.02	0.14	1.07	0.91	0.16	28.0	120	<6.2	4.8	
	May 8, 2018	CPFCL2	6.1	21.3	6.6	71	0.4	68.4%	0.08	0.77	0.04	0.38	1.15	0.73	0.42	3.2	76	<6.2	4.1	
	May 8, 2018	CPFCL4	7.3	21.0	6.1	71	0.5	81.3%	0.08	0.73	0.04	0.37	1.10	0.69	0.41		78	<6.2	3.1	