

LAKE & RESERVOIR ASSESSMENTS YADKIN-PEE DEE RIVER BASIN



Winston Lake

Intensive Survey Branch
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TABLE OF CONTENTS

TABLE OF CONTENTS2

GLOSSARY4

OVERVIEW6

ASSESSMENT METHODOLOGY6

QUALITY ASSURANCE OF FIELD AND LABORATORY LAKES DATA7

WEATHER OVERVIEW FOR SUMMER 2016.....8

ASSESSMENT BY 8-DIGIT HUC

HUC 03040101

 Kerr Scott Reservoir 9

 Lake Hampton 10

 Salem Lake 12

HUC 03040103

 High Rock Lake 13

 Lake Thom-A-Lex 15

 Tuckertown Reservoir 16

 Badin Lake 18

 Falls Lake 19

 Lake Reese 20

 Lake Bunch 21

 Back Creek Lake 22

HUC 03040104

 Lake Tillery 23

 Blewett Falls Lake 24

HUC 03040105

 Kannapolis Lake..... 25

 Lake Fisher 26

 Lake Concord 27

 Lake Monroe 28

 Lake Lee 29

 Lake Twitty (Lake Stewart) 30

 Coddle Creek Reservoir (Lake Howell) 31

HUC 03040201

 Roberdel Lake 33

 Rockingham City Lake..... 34

 Wadesboro City Pond..... 35

 Hamlet City Lake 36

 Water Lake 37

TABLES

Table 1. Yadkin-Pee Dee Lakes on the USEPA 2020 303(d) List of Impaired Waters 6
Table 2. Algal Growth Potential Test Results for Lake Hampton, August 27, 2021. 11
Table 3. Algal Growth Potential Test Results for Tuckertown Reservoir, July 26, 2021 17
Table 4. Algal Growth Potential Test Results for Coddle Creek Reservoir, July 7, 2021 32

APPENDIX A. Yadkin-Pee Dee River Basin Lakes Data
January 1, 2017 through December 31, 2021 A-1

APPENDIX B. Yadkin-Pee Dee Lakes Phytoplankton
Analysis for 2021..... B-1

APPENDIX C Ecological Implications of Dominant Lake Algal Groups..... C-1

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.
Cocoid	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 <i>a</i> 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 Yadkin-Pee Dee River Basin covers 7,213 square miles within 21 counties in North Carolina in the mountain and piedmont regions. It is the second largest basin in the state. The river basin originates on the eastern slope of the Blue Ridge Mountains in Caldwell and Wilkes counties. The Yadkin River flows northeast for approximately 100 miles before turning southeast and joining with the Uwharrie River to form the Pee Dee River. The Pee Dee River continues southeast across the North Carolina-South Carolina state line into South Carolina and to Winyah Bay.

Twenty-five reservoirs were sampled in the Yadkin-Pee Dee River Basin between January 2017 and December 2021.

Following the description of the assessment methodology used for the Yadkin-Pee Dee River Basin, there are individual summaries for each of the lakes and Appendix A, a matrix that presents the information used to make the lakes use support assessments.

Thirteen lakes in the Yadkin-Pee Dee River Basin are on the USEPA's 2020 303(d) List of Impaired Waters (Table 1). A statewide fish consumption advisory from the North Carolina Department of Health and Human Resources, Division of Public Health is in place due to mercury contamination (<https://epi.dph.ncdhhs.gov/oeefish/advisories.html>). Fish such as blackfish (bowfin), largemouth bass and chained pickerel (jack fish) have been found to have high mercury levels. High Rock Lake, Tuckertown Reservoir, Badin Lake, Falls Lake and Lake Tillery are listed for a fish consumption advisory related to PCB present in catfish.

Table 1. Yadkin-Pee Dee Lakes on the USEPA 2020 303(d) List of Impaired Waters

LAKE	303(d) Issue(s)
W. Kerr Scott Lake	Chla > 40 ug/L
High Rock Lake	pH > 9.0 s.u., Chla > 40 ug/L, Turbidity > 25 NTU
Tuckertown Reservoir	Chla > 40 ug/L, pH > 9.0 s.u.
Badin Lake	Chla > 40 ug/L, pH > 9.0 s.u.
Lake Thom-A-Lex	Chla > 40 ug/L
Lake Tillery	pH > 9.0 s.u.
Lake Lee	Water Temp > 32 C, DO < 4.0 mg/L, Chla > 40 ug/L
Lake Monroe	Water Temp > 32 C, pH > 9.0 s.u., Chla > 40 ug/L
Lake Twitty (Stewart)	Chla > 40 ug/L
Coddle Creek Reservoir	pH > 9.0 s.u.
Lake Concord	Chla > 40 ug/L
Blewett Falls Lake	Chla > 40 ug/L
Hamlet City Lake	DO < 4.0 mg/L

Assessment Methodology

For this report, data from January 1, 2017 through December 31, 2021 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&groupld=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). Results of algae analysis for the lakes sampled in the Yadkin-Pee Dee River Basin are provided in Appendix B. Brief discussions on the ecological implications of each dominant lake algal group is provided in Appendix C.

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://DWR.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/methods-pqls-qa>).

Weather Overview for Summer 2021

Limited rainfall resulted in one of the driest Mays in recent years. The National Centers for Environmental Information (NCEI) rated the month at the state's 13th driest Mays since 1895. Preliminary rainfall totals for the state was 2.19 inches, or just 55% of the long-term state average rainfall for May. A cold front crossed the state during the Memorial Day weekend and brought hit-or-miss rainfall. The statewide average temperature was 65.9°F which was seasonable for May.

While May, statewide, was dry, June turned out to be the 20th wettest out of the past 127 years with an average state measurement of 6.04 inches of rain. However, the rain fall pattern across the state exhibited extremes from east to west. The first two weeks of June had heavy rains across the eastern half of the state. More rain came to the eastern North Carolina in the form of the tropical storm strength remnants of Hurricane Claudette on June 20-21. The northwestern Yadkin-Pee Dee River Basin missed most of the June rainfall while the southern portion of the river basin received a normal June rainfall. The statewide average temperature in June was 73.6°F, which was seasonable for June.

Seasonable summer temperatures continued through July, with a statewide average at 76.8°F. Tropical Storm Elsa tracked through the Coastal Plain region of the state on July 8, 2021. Dry conditions continued in the southern Yadkin-Pee Dee River Basin in July. The warmest weather of the summer arrived in August with the statewide temperature average for the month at 77.8°F. The statewide precipitation for August was 5.94 inches. Mixed rainfall conditions occurred within the Yadkin-Pee Dee River Basin associated with sporadic rain storms typical of summertime conditions within the Piedmont of the state.

September was slightly warmer than usual, with three weeks of warm weather followed by a late month cooldown. The state average temperature for this month was 71.0°F. September was generally dry with the statewide average precipitation at 2.99 inches, or the 39th driest September since 1895. Rain returned on September 21st due to a cold front from the west and a stalled boundary to the south. Three to six inches of rain fell across the central and northern Piedmont, including parts of the Yadkin-Pee Dee River Basin.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040101

Kerr Scott Reservoir



Ambient Lakes Program Name	Kerr Scott Reservoir		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	12.0		
Volume ($10^6 m^3$)	189.00		
Watershed Area (mi^2)	347.5		
Classification	WS-IV B Tr		
Stations	YAD007A	YAD008	YAD008A
Number of Times Sampled	5	5	5

Construction of W. Kerr Scott Reservoir (Kerr Scott Reservoir) took place between 1960 and 1962. The project was open for public use in 1963. Located in the foothills of the Blue Ridge Mountains, this reservoir is within the Mountain ecoregion of the state. The US Army Corps of Engineers manages the operation of the W. Kerr Scott Reservoir Dam.

Kerr Scott Reservoir was monitored monthly from May through September by DWR field staff. Secchi depths ranged from one to 1.0 to 2.0 meters and surface dissolved oxygen values ranged from 7.8 to 9.7 mg/L (Appendix A). Surface pH measurements ranged from 7.2 to 9.0 s.u. and surface conductivity in the reservoir ranged from 35 to 43 μ mhos/cm.

Total phosphorus ranged from <0.02 to 0.03 mg/L. NH_3 values were consistently below the DWR laboratory detection level of <0.02 mg/L while NO_2+NO_3 ranged from <0.02 to 0.08 mg/L. Chlorophyll a in Kerr Scott reservoir ranged from 10 to 21 μ g/L. Turbidity ranged from 1.9 to 4.4 NTUs.

Based on the calculated NCTSI score, W. Kerr Scott Reservoir was determined to exhibit very low biological productivity or oligotrophic conditions in May. Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Historically, this reservoir has ranged from oligotrophic (low biological productivity) to eutrophic (elevated biological productivity) since monitoring began by DWR staff in 1981.

Lake Hampton



<i>Ambient Lakes Program Name</i>	Lake Hampton	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>		
<i>Volume (10⁶ m³)</i>		
<i>Watershed Area (mi²)</i>		
<i>Classification</i>	WS-III CA	
<i>Stations</i>	YADLH01	YADLH04
<i>Number of Times Sampled</i>	5	5

Lake Hampton, located on South Deep Creek, is a 140 acre lake constructed in 2009 to 2010. The lake provide flood control and public recreation. As part of the Yadkin Memorial Park at Hamptonville, this reservoir is used for public fishing, kayaking and canoeing. In October 2011, Lake Hampton was stocked with 90,000 fish which included brim, bass and catfish by the NC Wildlife Service. Lake Hampton was also designed to be a future water supply and is classified as WS-III.

This lake was monitored by DWR field staff monthly from May through September 2021. Secchi depths in Lake Hampton ranged from 0.5 to 1.1 meters and surface dissolved oxygen ranged from 8.6 to 10.4 mg/L (Appendix A). Surface pH values ranged from 7.3 to 9.7 s.u., with two measurements (20%) greater than the state water quality standard of 9.0 s.u. Surface conductivity in this lake ranged from 59 to 72 μ mhos/cm.

Total phosphorus ranged from 0.03 to 0.05 mg/L and NH₃ concentrations were consistently below the DWR laboratory detection limit of <0.02 mg/L. Turbidity in Lake Hampton ranged from 4.0 to 9.7 NTUs. Water samples collected on August 27, 2021 from each of the two lake sampling sites were sent to the EPA Region IV chemistry laboratory in Athens, GA for an Algal Growth Potential Test. The results of that test determined that nuisance algal growth in Lake Hampton was limited by the concentration of phosphorus (Table 2).

Table 2. Algal Growth Potential Test Results for Lake Hampton, August 27, 2021.

Algal Growth Potential Test Results

Lake Hampton

August 27, 2021

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
YADLH01	0.68	0.34	1.11	Phosphorus
YADLH04	0.60	0.34	1.13	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

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined.

Salem Lake



<i>Ambient Lakes Program Name</i>	Salem Lake		
<i>Trophic Status (NC TSI)</i>	No Score		
<i>Mean Depth (meters)</i>	5.5		
<i>Volume (10⁶ m³)</i>	4.40		
<i>Watershed Area (mi²)</i>	26.0		
<i>Classification</i>	WS-III CA		
<i>Stations</i>	YAD077A	YAD077B	YAD077C
<i>Number of Times Sampled</i>	4	4	4

Salem Lake is located in the municipality of Winston-Salem. Constructed in 1919, this small reservoir serves as the water supply source for the city. Salem Lake provides water to eastern and southeastern Winston-Salem in addition to serving as a reserve water basin for the Yadkin River.

Salem Lake was sampled monthly from May through September by DWR field staff. Secchi depths in 2021 ranged from 0.7 to 1.0 meter and surface dissolved oxygen concentrations ranged from 6.6 to 10.2 mg/L (Appendix A). Surface pH values in this lake ranged from 6.8 to 8.4 s.u. and surface conductivity ranged from 45 to 97 μ mhos/cm.

Total phosphorus in Salem Lake ranged from <0.02 to 0.03 mg/L. NH₃ values ranged from <0.02 to 0.09 mg/L while NO₂+NO₃ ranged from <0.02 to 0.42 mg/L. Chlorophyll a concentrations for July and August ranged from 22 to 42 μ g/L, with the latter value greater than the state water quality standard of 40 μ g/L. Turbidity in the lake ranged from 3.4 to 8.0 NTUs.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Historically, Salem Lake has exhibited eutrophic conditions since it was first monitored by DWQ in 1981, with the exception of 1983 and July 2001 and July 2002 when the NCTSI scores indicated that biological productivity was moderate (mesotrophic conditions).

LAKE & RESERVOIR ASSESSMENTS

HUC 03040102

High Rock Lake



Ambient Lakes Program Name		High Rock Lake						
Trophic Status (NC TSI)	No Score							
Mean Depth (meters)	4.9							
Volume ($10^6 m^3$)	314.0							
Watershed Area (mi^2)	3975.3							
Classification	WS-IV B CA, B, WS-V							
Stations	YADHRL051	YAD152A	YAD152C	YAD156A	YAD169A	YAD169B	YAD169E	YAD169F
Number of Times Sampled	5	5	5	5	5	5	5	5

High Rock Lake, built in 1927, is in the Yadkin River chain of lakes located between W. Kerr Scott and Tuckertown Reservoirs. The lake's primary uses are hydroelectric power generation, water supply and public recreation. The surrounding watershed is composed of agricultural, forested, and urban areas. The lake receives drainage waters from nearby major urban areas including Winston-Salem, Salisbury, Lexington, and High Point. The immediate lakeside perimeter is highly developed with new homes under construction. Lake levels are highly variable in response to a nearly constant release rate needed for energy production and an inconsistent inflow. The soils in the watershed are described as reddish and brown in color, highly erodible, and have contributed to high sedimentation, which has filled in the upper section of the lake to the degree that some areas are no longer navigable by boat. High Rock Lake is currently under a fish consumption advisory for polychlorinated biphenyls (PCBs) in catfish (<https://epi.dph.ncdhhs.gov/oeefish/advisories.html>).

Surface dissolved oxygen values ranged from 6.6 mg/L to 12.3 mg/L in 2021 (Appendix A). The surface pH values ranged from 6.4 s.u. in September to 9.4 s.u. in May. Of the 40 surface pH observations made in 2021, 11 (27.5%) were greater than the state water quality standard of not more than 9.0 s.u. Surface conductivity ranged from 72 to 100 μ mhos/cm. Secchi depths, a measurement of water clarity and light penetration into the lake, ranged from 0.2 to 1.4 meters.

Nutrient concentrations in High Rock Lake were similar to those previously observed from previous DWR monitoring efforts. Total phosphorus in 2021 ranged from 0.03 to 0.15 mg/L and NH₃ ranged from <0.02 to 0.07 mg/L. The concentrations of NO₂+NO₃ ranged from 0.16 to 1.08 mg/L. Chlorophyll *a* values ranged from 1.5 to 65.0 µg/L. Of 28 observations for chlorophyll *a* recorded in 2021, 13 (46.4%) were greater than the state water quality standard of 40.0 µg/L.

Based on the calculated NCTSI score, High Rock Lake was determined to exhibit elevated biological productivity or eutrophic conditions in May. Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined.

This reservoir has previously been found to be eutrophic since monitoring by DWR began in 1981, with the exception of July, August and September 2011 when NCTSI scores indicated that the reservoir was exhibiting extremely elevated biological productivity (hypereutrophic conditions). High Rock Lake is currently on the 2020 303(d) List of Impaired Waters for elevated chlorophyll *a*, pH and turbidity values, which agrees with the monitoring results obtained for 2021 (https://files.nc.gov/ncdeq/Water%20Quality/Planning/TMDL/303d/2020/NC_2020_Category5_303dlist.pdf).

Lake Thom-A-Lex



Ambient Lakes Program Name	Lake Thom-A-Lex	
Trophic Status (NC TSI)	No Score	
Mean Depth (meters)		
Volume ($10^6 m^3$)	7.80	
Watershed Area (mi^2)	39.4	
Classification	WS-III CA	
Stations	YAD160B	YAD1611A
Number of Times Sampled	5	5

Lake Thom-A-Lex is located near the Cities of Lexington and Thomasville and was built in 1957 as a drinking water supply for these two cities. The watershed draining to the lake is primarily composed of commercial and urban areas. An aeration unit in the lower end of the reservoir operates to reduce lake stratification and improve the quality of the raw drinking water.

Lake Thom-A-Lex was monitored by DWR field staff monthly, from May through September 2021. Secchi depths ranged from 0.4 to 1.2 meters and surface dissolved oxygen measurements ranged from 5.5 to 11.1 mg/L (Appendix A). Surface pH values ranged from 7.3 to 9.4 s.u. and surface conductivity ranged from 65 to 140 μ mhos/cm.

Total phosphorus concentrations ranged from 0.04 to 0.07 mg/L in Lake Thom-A-Lex. NH_3 ranged from <0.02 to 0.03 mg/L and NO_2+NO_3 values were consistently below the DWR laboratory detection limit of <0.02 mg/L. Chlorophyll *a* in August and September ranged from 30 to 49 μ g/L and of these four chlorophyll *a* values, two (50%) were greater than the state water quality standard of 40 μ g/L. Turbidity in Lake Thom-A-Lex ranged from 3.6 to 14.0 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Lake Thom-A-Lex has previously been determined to be eutrophic since it was first monitored by DWR staff in 1981.

Tuckertown Reservoir



Ambient Lakes Program Name	Tuckertown Reservoir	
Trophic Status (NC TSI)	No Score	
Mean Depth (meters)	10.0	
Volume (10 ⁶ m ³)	298.00	
Watershed Area (mi ²)	4080.3	
Classification	WS-IV B CA	
Stations	YAD172C	YAD1780A
Number of Times Sampled	5	5

Tuckertown Reservoir is a run-of-the-river reservoir located between High Rock Lake and Badin Lake on the Yadkin River. This lake's primary uses are hydroelectric power generation and public recreation. The watershed surrounding this lake is composed of forested, agricultural and urban areas.

This reservoir was monitored monthly by DWR field staff from May through September 2021. Surface dissolved oxygen concentrations ranged from 6.9 to 12.6 mg/L and surface pH ranged from 7.1 to 9.6 s.u. (Appendix A). Of the ten surface pH observations made in 2021, three (30%) were greater than the state water quality standard of 9.0 s.u. Surface conductivity ranged from 41 to 88 μ mhos/cm. Secchi depths in Tuckertown Reservoir ranged from 0.5 to 1.4 meters.

Total phosphorus concentrations ranged from 0.04 to 0.08 mg/L. The concentration of NH₃ ranged from <0.02 to 0.21 mg/L while NO₂+NO₃ values ranged from 0.21 to 0.56 mg/L. Water samples collected on July 26, 2021 from each of the two lake sampling sites were sent to the EPA Region IV chemistry laboratory in Athens, GA for an Algal Growth Potential Test. The results of that test determined that sufficient nutrients are present in Tuckertown Reservoir to support nuisance algal growth, i.e., control values were greater than 5.0 mg/L dry weight (Table 3).

Table 3. Algal Growth Potential Test Results for Tuckertown Reservoir, July 26, 2021.

Algal Growth Potential Test Results

Tuckertown Reservoir
July 26, 2021

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
YAD172C	16.81	24.66	18.47	Nitrogen
YAD1780A	11.69	10.19	14.98	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

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Tuckertown Reservoir has previously been determined to be very biologically productive or eutrophic since it was first monitored by DWR staff in 1982.

Badin Lake



Ambient Lakes Program Name	Badin Lake			
Trophic Status (NC TSI)	No Score			
Mean Depth (meters)	14.0			
Volume ($10^6 m^3$)	344.00			
Watershed Area (mi^2)	4168.0			
Classification	WS-IV B CA			
Stations	YAD178E	YAD178E	YAD178F	YAD178F1
Number of Times Sampled	5	5	5	5

Badin Lake is located on the Yadkin River and is a chain lake downstream from Tuckertown Reservoir. The lake was filled in 1917 and is used for hydroelectric power generation, recreation and water supply. The watershed is primarily rural with some agricultural land use. Badin Lake is under a fish consumption for polychlorinated biphenyls (PCBs) and mercury in catfish and largemouth bass taken from the lake. (<http://epi.publichealth.nc.gov/oeep/programs/fish.html>).

This reservoir was monitored monthly from May through September by DWR field staff in 2021. The secchi depths recorded during these sampling trips ranged from 1.0 to 2.0 meters (Appendix A). Surface dissolved oxygen concentrations ranged from 4.7 to 12.0 mg/L and surface pH values ranged from 6.7 to 9.4 s.u. Of the 20 surface pH measurements made in 2021, 8 (40%) were greater than the state water quality standard of 9.0 s.u. Surface conductivity values in this lake ranged from 31 to 91 μ mhos/cm.

Total phosphorus concentrations ranged from <0.02 to 0.04 mg/L. The concentration of NH_3 ranged from <0.02 to 0.05 mg/L and NO_2+NO_3 ranged from 0.06 to 0.52 mg/L. Chlorophyll a values in July, August and September ranged from 4 to 30 μ g/L. Turbidity values in Badin Lake were low, ranging from 1.5 to 3.8 NTUs.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Based on previous sampling efforts, Badin Lake has been determined to be predominantly eutrophic since it was first monitored by DWR staff in 1981.

Falls Lake



<i>Ambient Lakes Program Name</i>	Falls Lake	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>	10.0	
<i>Volume (10⁶ m³)</i>	177.00	
<i>Watershed Area (mi²)</i>	2552.0	
<i>Classification</i>	WS-IV B CA	
<i>Stations</i>	YAD178F3	YAD178F5
<i>Number of Times Sampled</i>	5	5

Falls Lake is a small run-of-the-river impoundment located between Badin Lake and Lake Tillery on the Yadkin River. The major inflow to Falls Lake is from the discharge of Badin Lake into the Yadkin River. The topography of the watershed is hilly with forests and some agriculture. Falls Lake is currently under a fish consumption for polychlorinated biphenyls (PCBs) in catfish (<http://epi.publichealth.nc.gov/oeep/programs/fish.html>).

Falls Lake was monitored monthly from May through September, 2021. Secchi depths ranged from 1.7 to 2.5 meters (Appendix A). Surface dissolved oxygen concentrations ranged from 6.4 to 8.9 mg/L and surface pH ranged from 6.5 to 7.7 s.u. Surface conductivity values in Falls Lake ranged from 76 to 82 μ mhos/cm.

Total phosphorus values ranged from <0.02 to 0.03 mg/L and NH₃ ranged from 0.02 to 0.05 mg/L. Nitrite plus nitrate ranged from 0.36 to 0.58 mg/L. Chlorophyll *a* values were low and ranged from 3.9 to 11.0 μ g/L. Turbidity values were also low, ranging from 1.9 to 3.2 NTUs.

Issues with chlorophyll *a* and nutrient analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Based on previous monitoring efforts, Falls Lake has exhibited predominantly moderate biological productivity or mesotrophic conditions since it was first monitored by DWR staff in 1981.

Lake Reese



Ambient Lakes Program Name	Lake Reese		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	5.0		
Volume ($10^6 m^3$)	0.91		
Watershed Area (mi^2)	100.0		
Classification	WS-III CA		
Stations	YAD077A	YAD077B	YAD077C
Number of Times Sampled	5	5	5

In 1983, the City of Asheboro impounded the Uwharrie River to form Lake Reese, a water supply that is also used for recreation. The lake is only used for drinking water after the water level of the primary water supply (Back Creek Lake) drops three feet below normal.

Lake Reese was monitored monthly from May through September 2021 by DWR field staff. Surface dissolved oxygen concentrations ranged from 6.2 to 11.3 mg/L and surface pH values ranged from 7.1 to 8.9 s.u. (Appendix A). Surface conductivities in this reservoir ranged from 86 to 114 μ mhos/cm. Lake secchi depths in 2021 ranged from 0.3 meter in September to 1.1 meters in May.

Total phosphorus concentrations in Lake Reese ranged from 0.02 to 0.06 mg/L. NH_3 and NO_2+NO_3 concentrations were consistently below the DWR laboratory detection limit of <0.02 mg/L. Chlorophyll *a* values ranged from 18 to 49 μ g/L. This latter value was greater than the state water quality standard of 40 μ g/L for chlorophyll *a*. Turbidity in Lake Reese ranged from 4.5 to 10.0 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Previous monitoring efforts by DWR, which began in 1989, indicated that this reservoir has predominantly exhibited elevated biological productivity or eutrophic conditions.

Lake Bunch



<i>Ambient Lakes Program Name</i>	Lake Bunch
<i>Trophic Status (NC TSI)</i>	No Score
<i>Mean Depth (meters)</i>	3.0
<i>Volume (10⁶ m³)</i>	0.04
<i>Watershed Area (mi²)</i>	2.3
<i>Classification</i>	WS-II HQW CA
<i>Stations</i>	YAD181G
<i>Number of Times Sampled</i>	5

Lake Bunch was built by the City of Asheboro for use as a water supply reservoir in 1932. The lake is located on the west side of Asheboro on an unnamed tributary to Cedar Fork, upstream of Back Creek Lake. Lake Bunch is closed to the public.

This small reservoir was monitored by DWR staff monthly from May through September 2021. Secchi depths, a measurement of water clarity, ranged from 2.1 to 3.3 meters (Appendix A). Surface dissolved oxygen ranged from 7.8 mg/L in July to 10.1 mg/L in May and June. Surface pH values were fairly consistent and ranged from 7.5 to 7.9 s.u., and surface conductivity in Lake Bunch ranged from 82 to 87 $\mu\text{mhos/cm}$.

Total phosphorus ranged from <0.02 to 0.02 mg/L and NO₂+NO₃ ranged from <0.02 to 0.07 mg/L. Total Kjeldahl nitrogen in both May and June was 0.35 mg/L and NH₃ was <0.02 mg/L. Chlorophyll a in Lake Bunch for July through September ranged from 12 to 31 $\mu\text{g/L}$.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Historically, the trophic state of Lake Bunch has ranged from very low biological productivity (oligotrophic conditions) to moderate biological productivity (mesotrophic conditions) since monitoring by DWR began in 1989.

Back Creek Lake



Ambient Lakes Program Name	Back Creek Lake		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	4.0		
Volume ($10^6 m^3$)	5.00		
Watershed Area (mi^2)	15.7		
Classification	WS-II HQW CA		
Stations	YAD181J	YAD181K	YAD181L
Number of Times Sampled	5	5	5

Back Creek Lake (also called Lake Lucas) is the primary water supply for the City of Asheboro. The reservoir is part of a public park where fishing, boating, and swimming are permitted. The rolling, 15.7 square-mile watershed is drained by Back Creek and Greenes Branch. Approximately half of the drainage area is wooded and most of the remainder is agricultural. Hypolimnetic aerators have been installed near the water intake structure to improve the quality of the water before it is withdrawn for treatment.

Back Creek Lake was monitored monthly by DWR staff from May through September 2021. Secchi depths ranged from 0.7 to 1.5 meters and surface dissolved oxygen concentrations ranged from 7.5 to 10.4 mg/L (Appendix A). Surface pH values ranged from 7.1 to 8.6 s.u. and surface conductivity ranged from 82 to 96 μ mhos/cm.

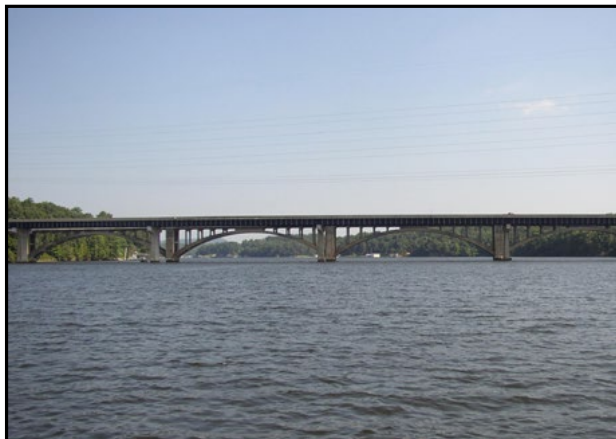
Total phosphorus ranged from 0.03 to 0.07 mg/L while both NH_3 and NO_2+NO_3 were below the DWR laboratory detection level of <0.02 mg/L. Total inorganic nitrogen was consistently 0.02 mg/L in 2021. Chlorophyll *a* concentrations from July through September ranged from 19 to 40 μ g/L. Turbidity values ranged from 2.9 to 7.6 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Historically, the trophic state of this lake has been determined to be eutrophic since monitoring by DWR began in 1989.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040104

Lake Tillery



Ambient Lakes Program Name		Lake Tillery			
Trophic Status (NC TSI)	No Score				
Mean Depth (meters)	9.7				
Volume ($10^6 m^3$)	207.00				
Watershed Area (mi^2)	4668.0				
Classification	WS-IV B CA				
Stations	YAD1815A	YAD189	YAD189B	YAD189C	
Number of Times Sampled	5	5	5	5	

Lake Tillery was constructed in 1928 and is currently used for hydroelectric power and recreational purposes. It is one of the lower lakes within the Yadkin River chain, located between Falls Lake and Blewett Falls Lake. The surrounding watershed is comprised of rolling hills with a combination of mostly forest and agriculture. Lake Tillery is under a fish consumption for polychlorinated biphenyls (PCBs) in catfish (<http://epi.publichealth.nc.gov/oeep/programs/fish.html>).

Lake Tillery was sampled by DWR once monthly from May and through September 2021 for a total of five sampling events. Secchi depths ranged from 1.0 to 2.8 meters, indicating that the clarity of the water in Lake Tillery on the days it was sampled was good (Appendix A). Surface dissolved oxygen ranged from 6.8 to 11.3 mg/L. Surface pH values ranged from 6.4 to 8.9 s.u. and surface conductivity ranged from 76 to 81 μ mhos/cm. Lake Tillery is currently on the 2020 303(d) List of Impaired Waters for elevated pH (values greater than 9.0 s.u.) previously observed in this lake (https://files.nc.gov/ncdeq/Water%20Quality/Planning/TMDL/303d/2020/NC_2020_Category5_303dlist.pdf).

Total phosphorus ranged from <0.02 to 0.03 mg/L and NH_3 ranged from <0.02 to 0.04 mg/L. Concentrations of NO_2+NO_3 ranged from 0.16 to 0.39 mg/L. Chlorophyll *a* values from June through September ranged from 4.3 to 20.0 μ g/L. Turbidity values in Lake Tillery ranged from 1.7 to 4.9 NTUs in 2021.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Historically, the trophic state of this reservoir has varied from very low biological productivity (oligotrophic conditions) to eutrophic conditions since 1981 when monitoring was first conducted by DWR staff.

Blewett Falls Lake



Ambient Lakes Program Name	Blewett Falls Lake
<i>Trophic Status (NC TSI)</i>	No Score
<i>Mean Depth (meters)</i>	3.3
<i>Volume (10⁶ m³)</i>	120.00
<i>Watershed Area (mi²)</i>	6866.0
<i>Classification</i>	WS-IV B CA
<i>Stations</i>	YAD260B
<i>Number of Times Sampled</i>	5

Blewett Falls Lake is a run-of-the-river reservoir located on the Yadkin River. It is the lowermost reservoir of the Yadkin-Pee Dee Chain of Lakes, a series of reservoirs constructed on the Yadkin River.

Secchi depths ranged from 0.5 to 0.7 meter (Appendix A). Surface dissolved oxygen ranged from 7.5 mg/L in September to 11.3 mg/L in July. Surface pH values ranged from 6.7 to 9.0 s.u. and surface conductivity ranged from 82 to 120 μ mhos/cm.

Total phosphorus values ranged from 0.05 to 0.18 mg/L and NH₃ ranged from <0.02 to 0.03 mg/L. The concentration of NO₂+NO₃ ranged from 0.14 to 0.68 mg/L. Chlorophyll a values ranged from 12 to 28 μ g/L and lake water turbidity ranged from 7.9 to 17.0 NTUs.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Previous lake monitoring efforts have determined that Blewett Falls Lake has been predominantly eutrophic or very biologically productive since it was first monitored by DWR staff in 1981.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040105

Kannapolis Lake



<i>Ambient Lakes Program Name</i>	Kannapolis Lake	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>	5.0	
<i>Volume (10⁶ m³)</i>	5.20	
<i>Watershed Area (mi²)</i>	11.0	
<i>Classification</i>	WS-III CA	
<i>Stations</i>	YAD207A	YAD207C
<i>Number of Times Sampled</i>	5	5

Kannapolis Lake is the water supply source for the City of Kannapolis and access to the lake is not available to the public. Kannapolis Lake was sampled monthly from May through September by DWR staff.

This reservoir was monitored monthly from May through September 2021 by DWR field staff. Secchi depth ranged from 0.8 to 1.5 meters (Appendix A). Surface dissolved oxygen in 2021 ranged from 6.6 to 9.8 mg/L and surface pH ranged from 7.2 to 9.0 s.u. Surface conductivity ranged from 41 to 93 μ mhos/cm.

Total phosphorus concentrations in Kannapolis Lake ranged from <0.02 to 0.05 mg/L and NH₃ ranged from <0.02 to 0.02 mg/L. The values for NO₂+NO₃ ranged from <0.02 mg/L to 0.58 mg/L. Chlorophyll *a* values for this reservoir ranged from 5.7 μ g/L in May to 36.0 μ g/L in September. Turbidity values were low and ranged from 1.9 to 7.0 NTUs.

Based on the calculated NCTSI score, Kannapolis Lake was determined to exhibit elevated biological productivity or eutrophic conditions in May. Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Kannapolis Lake has historically been determined to have moderate (mesotrophic) to eutrophic productivity based on the NCTSI scores which were recorded beginning in 1989 when DWR staff began monitoring efforts for this lake.

Lake Fisher



Ambient Lakes Program Name	Lake Fisher		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	4.7		
Volume ($10^6 m^3$)	3.20		
Watershed Area (mi^2)	0.8		
Classification	WS-IV CA		
Stations	YAD215R	YAD215T	YAD216A
Number of Times Sampled	3	4	4

Located north of the City of Concord, Lake Fisher is the primary water supply source for the city. This lake is also part of a city park that is open to the public for fishing and boating (<http://www.concordnc.gov/Departments/Parks-Recreation/Facilities/Lake-Fisher>).

Lake Fisher was monitored monthly in May and June and twice in August 2021. Only the lower two lake sampling sites were monitored on August 30th due to low water levels in the reservoir which made sampling of the uppermost lake site (YAD215R) impossible. In 2021, secchi depths in this reservoir ranged from 0.3 to 1.2 meters. Surface dissolved oxygen ranged from 6.1 to 9.3 mg/L and surface pH values ranged from 7.1 to 8.6 s.u. Surface conductivity in Lake Fisher ranged from 114 to 179 μ mhos/cm.

Total phosphorus ranged from 0.03 to 0.10 mg/L and NH_3 values ranged from <0.02 to 0.10 mg/L. The values for NO_2+NO_3 ranged from <0.02 to 0.22 mg/L. Chlorophyll *a* values in Lake Fisher ranged from 6.9 to 30.0 μ g/L. Turbidity in this reservoir ranged from 3.6 to 26.0 NTUs, with the later value, which occurred at the upper end of Lake Fisher in May, exceeded the state water quality standard of 25 NTUs for a lake or reservoir.

Based on the calculated NCTSI score, Lake Fisher was determined to exhibit elevated biological productivity or eutrophic conditions in May. Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through August to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Based on previous DWR monitoring efforts, this reservoir has been determined to be consistently eutrophic since it was first monitored by DWR staff in 1989.

Lake Concord



Ambient Lakes Program Name	Lake Concord		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	3.7		
Volume ($10^6 m^3$)	1.29		
Watershed Area (mi^2)	3.9		
Classification	WS-IV CA		
Stations	YAD216C	YAD216E	YAD216G
Number of Times Sampled	5	5	5

Lake Concord is a secondary water supply reservoir for the City of Concord. This lake was constructed in the 1930s and public access is prohibited. The drainage area surrounding this lake consists of the urban area associated with the City of Concord. There are also many houses along the immediate shoreline.

Lake Concord was sampled monthly from May through September by DWR field staff. Secchi depths in this reservoir ranged from 0.4 to 1.3 meters and surface dissolved oxygen ranged from 8.8 to 10.5 mg/L (Appendix A). Surface pH values ranged from 7.5 to 8.8 s.u. and surface conductivity ranged from 82 to 119 μ mhos/cm.

Total phosphorus in Lake Concord ranged from 0.03 to 0.06 mg/L. Concentrations of NH_3 ranged from <0.02 to 0.03 mg/L while NO_2+NO_3 ranged from <0.02 to 0.32 mg/L. Of the nine chlorophyll *a* measurements recorded for 2021, values ranged from 26 to 65 μ g/L, with the latter value (11%) greater than the state water quality standard of 40 μ g/L. Turbidity for Lake Concord ranged from 3.7 to 15.0 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of Lake Concord in 2021 could not be accurately determined. Based on previous DWR monitoring efforts, this reservoir has been determined to consistently demonstrated eutrophic conditions since it was first monitored by DWR staff in 1989.

Lake Monroe



Ambient Lakes Program Name	Lake Monroe	
Trophic Status (NC TSI)	No Score	
Mean Depth (meters)	5.0	
Volume ($10^6 m^3$)	0.95	
Watershed Area (mi^2)	9.5	
Classification	WS-IV CA	
Stations	YAD232F	YAD232D
Number of Times Sampled	4	5

Lake Monroe, a secondary water supply reservoir built in 1955 for the City of Monroe, provides opportunities for public fishing and boating. The drainage area surrounding this lake consists of a mixture of urban and residential areas, with many houses and a cow pasture located on the immediate shoreline. Poultry operations are also located within the lake's watershed.

DWR field staff monitored Lake Monroe five times in 2021. In September, only one of the two lake sampling sites was sampled due to shallow water levels in the lake which made access by boat to the upper lake sampling site (YAD232D) impossible. Secchi depths in the reservoir ranged from 0.4 to 0.7 meter and the surface dissolved oxygen levels ranged from 6.6 to 19.4 mg/L (Appendix A). Surface pH values ranged from 6.6 to 10.4 s.u. Of the nine surface pH measurements made in 2021, five (56%) were greater than the state water quality standard of > 9.0 s.u. Surface conductivity in this lake ranged from 102 to 158 $\mu mhos/cm$.

Total phosphorus ranged from 0.09 to 0.23 mg/L and NH_3 ranged from <0.02 to 0.06 mg/L. The concentrations of NO_2+NO_3 were consistently below the DWR laboratory detection level of <0.02 mg/L. Only two chlorophyll *a* measurements were accurately determined by the DWR laboratory, one of which (98 $\mu g/L$ at the sampling site near the dam in September) was greater than the state water quality standard of 40 $\mu g/L$. Lake turbidity values ranged from 4.7 to 8.5 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Historically, this lake's NCTSI scores have indicated that the trophic state has alternated between eutrophic and hypereutrophic since DWR monitoring began in 1989. Lake Monroe is listed in the 2020 303(d) List of Impaired Waters for elevated pH values and chlorophyll *a*.

Lake Lee



Ambient Lakes Program Name	Lake Lee		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	1.5		
Volume (10⁶ m³)	9.50		
Watershed Area (mi²)	51.4		
Classification	WS-IV CA		
Stations	YAD232C	YAD232H	YAD233
Number of Times Sampled	5	5	5

Lake Lee is a small reservoir located within the municipality of Monroe. Constructed in 1927, this lake serves as an emergency or back-up water supply source for Monroe. Water from Lake Monroe flows into Lake Lee, and water from Lake Lee is pumped into a tributary of Lake Twitty (Lake Stewart) during periods of low flow.

Lake Lee was monitored five times in 2021 by DWR field staff. Secchi depths in this lake ranged from 0.2 to 0.7 meter and surface dissolved oxygen concentrations ranged from 5.3 to 12.8 mg/L. Surface pH values ranged from 6.7 to 9.5 s.u., with three of the 15 observations (20%) greater than the state water quality standard of >9.0 s.u. Surface conductivities in Lake Lee ranged from 97 to 148 μ mhos/cm.

Total phosphorus in Lake Lee ranged from 0.16 to 0.36 mg/L and NH₃ ranged from <0.02 to 0.47 mg/L. The values for NO₂+NO₃ ranged from <0.02 to 0.15 mg/L. Only two chlorophyll *a* measurements in September 2021 (73 and 75 μ g/L) were accurately determined by the DWR laboratory, both of which were greater than the state water quality standard of 40 μ g/L. Turbidity values in Lake Lee ranged from 10 to 21 NTUs.

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Historically, Lake Lee's NCTSI scores have indicated that the trophic state of this reservoir has alternated between eutrophic and hypereutrophic since DWR monitoring began in 1989. Lake Lee is listed in the 2020 303(d) List of Impaired Waters for low dissolved oxygen values and elevated chlorophyll *a*.

Lake Twitty (Lake Stewart)



Ambient Lakes Program Name	Lake Twitty (Stewart)		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	10.0		
Volume ($10^6 m^3$)	7.6		
Watershed Area (mi^2)	36.0		
Classification	WS-III CA		
Stations	YAD235F	YAD235D	YAD236
Number of Times Sampled	5	5	5

Lake Twitty (also called Lake Stewart) was impounded in 1972. Owned and operated by the City of Monroe, this reservoir is a water supply source for Monroe and is open to the public for recreation. Stewart Creek and Chinkapin Creek are the main tributaries to Lake Twitty. Land in the mainly flat upstream drainage area is forested and agricultural. A hypolimnetic aeration system is in operation at the lower end near the dam to improve the quality of raw drinking water drawn from this lake.

In 2021, secchi depths in Lake Twitty ranged from 0.5 to 0.9 meter and surface dissolved oxygen concentrations ranged from 4.0 to 11.2 mg/L (Appendix A). Surface pH values ranged from 6.7 to 9.3 s.u. with three of the 15 observations (20%) greater than the state water quality standard of >9.0 s.u. Surface conductivity in this reservoir ranged from 62 to 132 μ mhos/cm.

Total phosphorus concentrations ranged from 0.07 to 0.11 mg/L. The values for NH_3 ranged from <0.02 to 0.13 mg/L while NO_2+NO_3 ranged from <0.02 to 0.51 mg/L. Chlorophyll a values ranged from 23 to 52 μ g/L. Of six values for chlorophyll a recorded for Lake Twitty in 2021, two (33%) were greater than the state water quality standard of 40 μ g/L. Turbidity in this reservoir ranged from 5.1 to 8.8 NTUs.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Historically, the trophic state of Lake Twitty has varied between eutrophic and hypereutrophic since 1989 when monitoring by DWR began.

Coddle Creek Reservoir (Lake Howell)



Ambient Lakes Program Name	Coddle Creek Reservoir		
Trophic Status (NC TSI)	No Score		
Mean Depth (meters)	2.0		
Volume ($10^6 m^3$)	18.90		
Watershed Area (mi^2)	47.0		
Classification	WS-II HQW		
Stations	YADCCR01	YADCCR02	YADCCR03
Number of Times Sampled	5	5	5

This reservoir, constructed in 1993 as a water supply source for the Cities of Concord and Kannapolis, does not have public access. Coddle Creek Reservoir (Lake Howell) is owned, operated and maintained by the Water and Sewer Authority of Cabarrus County.

Surface dissolved oxygen in Coddle Creek Reservoir ranged from 7.9 to 12.7 mg/L and surface pH values ranged from 7.8 to 9.6 s.u. Out of the 15 surface pH observations, four (27%) were greater than the state water quality standard of >9.0 s.u. Surface conductivity ranged from 53 to 106 μ mhos/cm. Secchi depths ranged from 0.4 to 1.8 meters in 2021.

Total phosphorus concentrations ranged from <0.02 to 0.05 mg/L. The values for NH_3 ranged from <0.02 to 0.05 mg/L and NO_2+NO_3 ranged from <0.02 to 0.04 mg/L. Chlorophyll a concentrations in Coddle Creek Reservoir from July through September ranged from 29 to 41 μ g/L, with the latter value greater than the state water quality standard of 40 μ g/L. Turbidity ranged from 3.0 to 25.0 NTUs.

Water samples collected on July 7, 2021 was sent to the EPA Region IV chemistry laboratory in Athens, GA for an Algal Growth Potential Test. The purpose of this test is to determine which nutrient limits the potential growth of nuisance algae in the lake. Results of this test determined that nuisance algal growth in Coddle Creek Reservoir was limited by the nutrient, phosphorus (Table 4).

Table 4. Algal Growth Potential Test Results for Coddle Creek Reservoir, July 7, 2021.

Algal Growth Potential Test Results

Coddle Creek Reservoir

July 7, 2021

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
YADCCR01	0.33	0.42	2.32	Phosphorus
YADCCR02	1.03	1.30	3.11	Phosphorus
YADCCR03	0.28	0.42	3.02	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

Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake in 2021. Historically, this reservoir has been predominantly eutrophic since monitoring by DWR staff began in 2006.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040201

Roberdel Lake



<i>Ambient Lakes Program Name</i>	Roberdel Lake	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>	2.5	
<i>Volume (10⁶ m³)</i>	10.00	
<i>Watershed Area (mi²)</i>	140.2	
<i>Classification</i>	WS-III CA	
<i>Stations</i>	YAD262E	YAD263
<i>Number of Times Sampled</i>	5	5

Roberdel Lake, located near the City of Rockingham, is a water supply reservoir originally built as a millpond in the 1930's. Hitchcock Creek is the main tributary to this lake. The watershed has a mixture of forested and urban areas, which includes houses along the shore.

Surface dissolved oxygen concentrations ranged from 5.9 to 8.2 mg/L (Appendix A) and surface pH values ranged from 5.2 to 6.7 s.u. Of the ten surface pH values recorded in 2021, two (20%) were less than the state water quality standard of 6.0 s.u. for pH. Surface conductivity in Roberdel Lake ranged from 28 to 30 μ mhos/cm and secchi depths ranged from 0.7 to 1.0 meter.

Total phosphorus ranged from 0.03 to 0.04 mg/L and NH₃ ranged from <0.02 to 0.04 mg/L. The concentrations of NO₂+NO₃ ranged from <0.02 to 0.46 mg/L. Chlorophyll a values ranged from 4.9 to 47.0 μ g/L, with this latter value greater than the state water quality standard of 40 μ g/L.

The trophic state index for Roberdel Lake was determined to be very biologically productive or eutrophic in May. Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. This reservoir has ranged from mesotrophic to eutrophic since 1981 when it was first monitored by DWR staff.

Rockingham City Lake



<i>Ambient Lakes Program Name</i>	Rockingham City Lake
<i>Trophic Status (NC TSI)</i>	No Score
<i>Mean Depth (meters)</i>	0.7
<i>Volume (10⁶ m³)</i>	0.02
<i>Watershed Area (mi²)</i>	20.1
<i>Classification</i>	WS-III CA
<i>Stations</i>	YAD265C
<i>Number of Times Sampled</i>	5

Rockingham City Lake is a secondary water supply reservoir for the City of Rockingham. The lake provides approximately one-third of the total water supply for the City. Observed land uses in the watershed include forested areas, agricultural areas consisting of crop production, and slight residential and urban development.

The secchi depths of Rockingham City Lake in 2021 ranged from 0.6 to 0.8 meter, suggesting poor water clarity for this lake (Appendix A). The surface dissolved oxygen values ranged from 0.6 to 3.7 mg/L and all five surface oxygen observations were less than the state water quality standard of 4.0 mg/L for an instantaneous reading. Surface pH ranged from 4.9 to 6.2 s.u. with four of the five pH observations (80%) below the state water quality standard of 6.0 s.u. for pH. Surface conductivities ranged from 24 to 30 μ mhos/cm.

Total phosphorus ranged from <0.02 to 0.04 mg/L. Both NH₃ and NO₂+NO₃ were consistently less than the DWR laboratory detection level of <0.02 mg/L. Chlorophyll *a* ranged from 2.8 to 13.0 μ g/L and turbidity ranged from 1.3 to 4.2 NTUs.

The trophic state of Rockingham City Lake in May was determined to be very biologically productive or eutrophic based on the calculated NCTSI score. Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Rockingham City Lake was determined to be oligotrophic when it was first monitored by DWR field staff in 1992 and eutrophic in when it was sampled again in 2011.

Wadesboro City Pond



Ambient Lakes Program Name	Wadesboro City Pond	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>	2.5	
<i>Volume (10⁶ m³)</i>	0.1	
<i>Watershed Area (mi²)</i>	8.9	
<i>Classification</i>	WS-II HWQ CA	
<i>Stations</i>	YAD275H	YAD275J
<i>Number of Times Sampled</i>	5	5

Wadesboro City Pond, built in 1938, is a water supply source and recreational lake for the City of Wadesboro. The watershed consists of a mixture of forested and agricultural areas.

DWR field staff monitored Wadesboro City Pond monthly from May through September, 2021. Secchi depths ranged from 0.7 to 1.0 meter and surface dissolved oxygen ranged from 6.1 to 10.8 mg/L (Appendix A). Surface pH values ranged from 6.6 to 9.4 s.u. Of the ten surface pH measurements made in 2021, two (20%) were greater than the state water quality standard of 9.0 s.u. Surface conductivities ranged from 62 to 67 μ mhos/cm.

Total phosphorus in Wadesboro City Pond ranged from 0.03 to 0.06 mg/L. The concentration of NH₃ ranged from <0.02 to 0.04 mg/L and NO₂+NO₃ values were consistently below the DWR laboratory detection level of <0.02 mg/L. Chlorophyll a ranged from 14 to 33 μ g/L and turbidity ranged from 4.8 to 14.0 NTUs.

Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from May through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Based on previous DWR monitoring efforts which began in 1989, this small reservoir has been determined to exhibit elevated biological productivity or eutrophic conditions based on the calculated NCTSI scores.

Hamlet City Lake



<i>Ambient Lakes Program Name</i>	<i>Hamlet City Lake</i>	
<i>Trophic Status (NC TSI)</i>	No Score	
<i>Mean Depth (meters)</i>	1.0	
<i>Volume (10⁶ m³)</i>	0.04	
<i>Watershed Area (mi²)</i>	2.0	
<i>Classification</i>	C	
<i>Stations</i>	YAD282A	YAD283
<i>Number of Times Sampled</i>	5	5

Hamlet City Lake is a small, shallow lake located in the Town of Hamlet. This lake is used for recreational fishing and boating and is part of a town park. Water lilies were observed along the shoreline and the upper end of the lake along with submerged macrophytes.

This small reservoir was monitored monthly from May through September 2021 by DWR field staff. Secchi depths in Hamlet City Lake ranged from 0.6 to 1.2 meters (Appendix A). Surface dissolved oxygen concentrations ranged from 2.4 to 7.0 mg/L with the two surface measurements (20%) observed in August below the state water quality standard of 4.0 mg/L for an instantaneous dissolved oxygen reading. Surface pH values ranged from 5.6 to 7.1 s.u. and surface conductivity ranged from 39 to 44 μ mhos/cm.

Total phosphorus in Hamlet City Lake ranged from <0.02 to 0.03 mg/L. Both NH₃ and NO₂+NO₂ concentrations were consistently below the DWR laboratory detection level of <0.02 mg/L. Chlorophyll *a* values ranged from 3.4 to 22.0 μ g/L and turbidity ranged from 2.1 to 13.0 NTUs.

The trophic state of Hamlet City Lake in May was determined to be exhibit moderate biological productivity or mesotrophic conditions based on the calculated NCTSI score. Issues with nutrient and chlorophyll *a* analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined.

Water Lake



Ambient Lakes Program Name	Water Lake	
Trophic Status (NC TSI)	No Score	
Mean Depth (meters)	3.0	
Volume (10 ⁶ m ³)	0.06	
Watershed Area (mi ²)	3.1	
Classification	WS-II HQW CA	
Stations	YAD280C	YAD280E
Number of Times Sampled	5	5

Water Lake is the main water supply reservoir for the City of Hamlet with Marks Creek as its primary tributary. There is no public access to the lake and its watershed is primarily undisturbed forest. The submerged aquatic macrophyte Water Bulrush (*Scirpus subterminalis*) was observed by DWR staff throughout the upper end of the lake along with fragrant water lily (*Nuphar odorata*).

Surface dissolved oxygen in Water Lake ranged from 3.7 to 8.1 mg/L, with the former value (10%) below the state water quality standard of 4.0 mg/L for an instantaneous dissolved oxygen reading. Surface pH values ranged from 5.5 to 7.0 s.u. and surface conductivity ranged from 45 to 57 μ mhos/cm. Secchi depths ranged from 1.0 to 2.7 meters.

Total phosphorus in Water Lake was consistently less than the DWR laboratory detection level of <0.02 mg/L. Concentrations of NH₃ ranged from <0.02 to 0.07 mg/L and NO₂+NO₃ ranged from 0.21 to 0.66 mg/L. Values for chlorophyll a ranged from 1.2 to 8.8 μ g/L and turbidity ranged from <1.0 to 2.7 NTUs.

The trophic state of Water Lake in May was determined to be exhibit low biological productivity or oligotrophic conditions based on the calculated NCTSI score. Issues with nutrient and chlorophyll a analysis by the DWR Chemistry Laboratory prevented the NCTSI scores for this lake from June through September to be calculated, and the overall trophic state of this reservoir in 2021 could not be accurately determined. Based on previous sampling efforts by DWR since 1989, this lake was found to have varied between low productivity (oligotrophic conditions) and elevated productivity (eutrophic conditions).

Appendix A - Yadkin-Pee Dee River Basin Lakes Data January 1, 2016 through December 31, 2021

Lake	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										Total Solids Suspended mg/L	Turbidity NTU	Total Hardnes mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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				
KERR SCOTT RESERVOIR	September 15, 2021	YAD007A	9.3	25.8	7.6	42	1.4	118.2%	<0.02		<0.02	<0.02			0.02	13.0	44		2.2		
	September 15, 2021	YAD008	9.4	26.6	8.1	42	1.3	121.3%	<0.02		<0.02	<0.02			0.02	15.0	44		1.9		
	September 15, 2021	YAD008A	8.9	27.0	7.9	41	1.5	115.5%	<0.02		<0.02	<0.02			0.02	13.0	43		2.0	11.0	
	August 10, 2021	YAD007A	9.0	26.4	8.7	44	1.6	115.6%	<0.02		<0.02	<0.02			0.02	14.0	42	<6.2	2.5		
	August 10, 2021	YAD008	7.8	27.9	8.0	43	1.6	102.4%	<0.02		<0.02	<0.02			0.02	12.0	38	<6.2	2.6		
	August 10, 2021	YAD008A	8.5	28.6	8.1	42	1.6	112.9%	<0.02		<0.02	<0.02			0.02	10.0	40	<6.2	2.2	11.0	
	July 26, 2021	YAD007A	9.6	29.2	9.0	42	1.1	130.1%	<0.02		<0.02	<0.02			0.02	17.0	42	<6.2	3.0		
	July 26, 2021	YAD008	9.2	28.6	8.6	43	1.4	123.2%	<0.02		<0.02	<0.02			0.02	18.0	41	<6.2	3.0		
	July 26, 2021	YAD008A	9.3	30.2	9.0	42	1.3	127.4%	<0.02		<0.02	<0.02			0.02	17.0	41	<6.2	2.4	9.0	
	June 23, 2021	YAD007A	9.5	26.1	8.7	40	1.0	121.1%	0.03		<0.02	<0.02			0.02	18.0	45	<6.2	4.4		
	June 23, 2021	YAD008	9.7	25.9	8.8	40	1.0	122.6%	0.02		<0.02	<0.02			0.02	21.0	44	<6.2	4.4		
	June 23, 2021	YAD008A	9.6	26.3	8.7	41	1.1	122.7%	0.02		<0.02	<0.02			0.02	19.0	44	<6.2	3.9	15.0	
	May 18, 2021	YAD007A	9.4	21.4	7.3		1.7	108.4%	<0.02	<0.30	<0.02	0.06	0.21	0.14	0.07	13.0	38	<6.2	2.8		
	May 18, 2021	YAD008	9.2	21.8	7.2	36	1.7	107.4%	<0.02	<0.30	<0.02	0.07	0.22	0.14	0.08	11.0	39	<6.2	2.2		
	May 18, 2021	YAD008A	8.7	21.5	7.6	35	2.0	100.9%	<0.02	<0.30	<0.02	0.08	0.23	0.14	0.09	12.0	35	<6.2	2.0	32.0	
HAMPTON LAKE	September 15, 2021	YADLH01	10.2	29.1	8.8	66	0.7	137.0%	0.03		<0.02	<0.02			0.02		59		6.0		
	September 15, 2021	YADLH04	9.5	28.9	8.1	62	0.6	126.7%	0.03		<0.02	<0.02			0.02		59		6.9		
	August 10, 2021	YADLH01	8.6	30.9	8.9	67	0.6	117.6%	0.03		<0.02	<0.02			0.02	32.0	52	<6.2	7.1		
	August 10, 2021	YADLH04	9.9	31.2	8.6	68	0.5	136.6%	0.03		<0.02	<0.02			0.02	33.0	53	<6.2	9.7		
	July 14, 2021	YADLH01	10.4	29.2	9.7	72	0.6	137.9%	0.04		<0.02	0.06			0.07		54	7.8	5.7		
	July 14, 2021	YADLH04	9.9	28.1	9.0	68	0.6	129.5%	0.05		<0.02	0.19			0.20		55	<12.0	8.1		
	June 23, 2021	YADLH01	10.2	27.5	9.4	71	0.8	131.8%	0.04		<0.02	0.48			0.49		58	<6.2	5.8		
	June 23, 2021	YADLH04	10.0	27.9	8.7	66	0.6	130.1%	0.05		<0.02	0.61			0.62		63	11.0	9.2		
	May 18, 2021	YADLH01	10.3	21.0	8.7	59	1.1	116.9%	0.03	0.53	<0.02	1.10	1.63	0.52	1.11		53	<6.2	4.0		
	May 18, 2021	YADLH04	9.7	20.7	7.3	61	0.6	110.0%	0.05	0.56	<0.02	1.10	1.66	0.55	1.11		60	7.8	9.0		
SALEM LAKE	August 5, 2021	YAD077A	8.2	27.2	7.5	97	0.8	105.1%	0.03		<0.02	<0.02			0.02	26.0		6.2	6.4		
	August 5, 2021	YAD077B	8.6	26.5	7.1	96	0.9	109.0%	0.03		<0.02	<0.02			0.02	24.0		<6.2	5.1		
	August 5, 2021	YAD077C	6.6	27.9	7.5	96	0.7	86.3%	0.02		0.09	0.05			0.14	22.0		<6.2	5.0	30.0	
	July 7, 2021	YAD077A	9.6	28.5	8.4	48	0.8	127.1%	0.03		<0.02	0.04			0.05	42.0	72		6.6		
	July 7, 2021	YAD077B	8.8	27.5	7.2	95	0.9	114.2%	0.03		<0.02	0.12			0.13	37.0	69		6.1		
	July 7, 2021	YAD077C	7.1	27.9	7.9	45	0.8	92.5%	0.03		0.04	0.20			0.24	27.0	66		8.0	26.0	
	June 9, 2021	YAD077A	7.9	30.5	7.6	93	1.0	107.4%	0.03	0.42	<0.02	0.20	0.62	0.41	0.21		74	<6.2	5.7		
	June 9, 2021	YAD077B	7.0	32.7	7.6	91	0.9	98.6%	0.02	0.36	<0.02	0.23	0.59	0.35	0.24		74	<6.2	5.6		
	June 9, 2021	YAD077C	6.6	28.6	7.7	93	0.8	86.7%	0.03	0.40	0.08	0.26	0.66	0.32	0.34		74	<6.2	7.0	29.0	
	May 19, 2021	YAD077A	10.2	20.8	7.1	91	0.9	115.0%	0.02	0.36	<0.02	0.40	0.76	0.35	0.41		70	<6.2	3.6		
May 19, 2021	YAD077B	9.6	21.4	7.3	88	0.8	110.1%	0.02	0.36	<0.02	0.38	0.74	0.35	0.39		67	<12.0	3.4			
May 19, 2021	YAD077C	8.8	20.7	6.8	86	1.0	99.7%	<0.02	0.32	<0.02	0.42	0.74	0.31	0.43		69	<6.2	3.5	28.0		
HIGH ROCK LAKE	September 13, 2021	YADHRL051	8.3	25.0	6.6	81	0.3	102.0%	0.14		<0.02	0.56			0.57	64.0	92		38.0		
	September 13, 2021	YAD152A	11.3	26.4	8.8	85	0.8	141.6%	0.07		<0.02	0.24			0.25		72	7.0	8.9		
	September 13, 2021	YAD152C	11.0	26.9	8.7	85	0.8	139.8%	0.06		<0.02	0.20			0.21		69		6.0		
	September 13, 2021	YAD156A	10.1	26.9	8.3	84	0.8	128.1%	0.05		<0.02	0.24			0.25		65		4.1		
	September 13, 2021	YAD169A	11.3	28.0	8.8	84	0.8	146.6%	0.04		<0.02	0.16			0.17	46.0	69		3.9		
	September 13, 2021	YAD169B	9.0	27.2	6.7	83	0.9	114.4%	0.05		<0.02	0.26			0.27	36.0	67		4.2		
	September 13, 2021	YAD169E	6.9	26.9	6.4	81	1.0	87.1%	0.03		0.06	0.25			0.31	22.0	66		3.4		
	September 13, 2021	YAD169F	6.6	27.1	6.6	80	1.0	90.2%	0.04		0.07	0.30			0.37	24.0	69		4.0	22.0	
	August 11, 2021	YADHRL051	11.1	28.8	9.0	96	0.4	145.9%	0.11		<0.02	0.41			0.42	50.0	86	12.0	15.0		
	August 11, 2021	YAD152A	10.3	28.9	9.0	90	0.8	136.0%	0.08		<0.02	0.39			0.40	46.0	76	7.0	6.9		
	August 11, 2021	YAD152C	10.4	29.3	9.1	87	0.8	138.3%	0.05		<0.02	0.23			0.24	41.0	70	<6.2	4.5		
	August 11, 2021	YAD156A	10.1	28.9	9.0	87	0.8	132.7%	0.06		<0.02	0.29			0.30	45.0	74	<6.2	4.7		
	August 11, 2021	YAD169A	11.0	30.3	9.2	87	1.0	147.9%	0.04		<0.02	0.15			0.16		71	<6.2	4.1		
	August 11, 2021	YAD169B	10.7	29.3	9.2	86	0.9	141.2%	0.05		<0.02	0.20			0.21		68	<6.2	3.2		
	August 11, 2021	YAD169E	8.8	28.9	8.4	82	1.2	115.8%	0.05		<0.02	0.24			0.25	65.0	69	<6.2	3.7		
	August 11, 2021	YAD169F	10.5	29.4	9.1	86	1.0	139.5%	0.05		<0.02	0.24			0.25	49.0	68	<6.2	3.4	23.0	
	July 13, 2021	YADHRL051	8.2	27.7	7.1	86	0.4	104.7%	0.12		<0.02	0.83			0.84	1.5	87	22.0	24.0		
	July 13, 2021	YAD152A	9.6	28.3	8.3	89	0.5	124.5%	0.10		<0.02	0.66			0.67	32.0	80	11.0	14.0		
	July 13, 2021	YAD152C	9.1	29.1	8.6	88	0.7	119.2%	0.08		<0.02	0.47			0.48	46.0	79	7.5	8.6		
	July 13, 2021	YAD156A	9.8	29.2	8.4	90	0.7	129.1%	0.08		<0.02	0.56			0.57	46.0	77	7.8	7.4		
July 13, 2021	YAD169A	8.4	29.8	8.0	88	1.0	111.6%	0.05		<0.02	0.25			0.26	43.0	75	<6.2	4.6			
July 13, 2021	YAD169B	9.1	29.2	8.8	85	0.9	119.4%	0.05		<0.02	0.31			0.32	34.0	64	<6.2	3.7			
July 13, 2021	YAD169E	8.5	28.8	8.2	84	1.0	111.2%	0.05		<0.02	0.31			0.32	46.0	68		3.7			
July 13, 2021	YAD169F	9.0	28.7	8.4	84	1.0	117.7%	0.05		<0.02	0.34			0.35	33.0	68	<12.0	3.8	24.0		

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2016 through December 31, 2021

Lake	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										Solids Total mg/L	Solids Suspended mg/L	Turbidity NTU	Total Hardnes mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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						
HIGH ROCK LAKE	June 15, 2021	YADHRL051	7.2	24.7	6.9	72	0.2	88.6%	0.12	0.39	0.07	1.08	1.47	0.32	1.15			17.0	40.0			
	June 15, 2021	YAD152A	12.1	21.6	9.2	85	0.6	138.3%	0.07	0.56	<0.02	0.61	1.17	0.55	0.62		77	<12.0	13.0			
	June 15, 2021	YAD152C	9.5	27.9	8.7	82	1.0	123.8%	0.05	0.56	0.02	0.42	0.98	0.54	0.44		71	<6.2	4.9			
	June 15, 2021	YAD156A	11.5	21.6	9.1	83	1.0	131.8%	0.05	0.48	<0.02	0.39	0.87	0.47	0.40		65	<6.2	4.7			
	June 15, 2021	YAD169A	10.4	28.5	9.0	84	1.1	137.9%	0.04	0.47	<0.02	0.21	0.68	0.46	0.22		68	<6.2	4.1			
	June 15, 2021	YAD169B	11.0	28.2	9.1	84	1.0	144.2%	0.04	0.51	<0.02	0.31	0.82	0.50	0.32		70	<6.2	3.5			
	June 15, 2021	YAD169E	10.8	21.8	8.7	75	1.2	124.2%	0.04	0.50	<0.02	0.26	0.76	0.49	0.27	31.0	74	<6.2	4.0			
	June 15, 2021	YAD169F	9.8	28.5	9.0	78	1.4	129.7%	0.04	0.47	<0.02	0.28	0.75	0.46	0.29		90	<6.2	3.7	24.0		
	May 18, 2021	YADHRL051	8.7	18.7	7.8	79	0.6	93.8%	0.15	0.44	0.05	0.95	1.39	0.39	1.00	7.6	131		10.0			
	May 18, 2021	YAD152A	12.1	21.6	9.2	85	0.8	138.3%	0.07	0.56	<0.02	0.58	1.14	0.55	0.59	35.0	67	6.5	7.3			
	May 18, 2021	YAD152C	11.6	22.3	9.4	85	0.9	134.8%	0.07	0.70	<0.02	0.50	1.20	0.69	0.51	46.0	66	<6.2	4.6			
	May 18, 2021	YAD156A	11.5	21.6	9.1	83	1.0	131.8%	0.05	0.53	<0.02	0.53	1.06	0.52	0.54	38.0	62	7.0	4.8			
	May 18, 2021	YAD169A	12.3	22.4	9.3	100	0.8	143.0%	0.04	0.56	<0.02	0.16	0.72	0.55	0.17	38.0	72	<6.2	5.2			
	May 18, 2021	YAD169B	11.2	21.4	8.9	82	0.9	127.3%	0.04	0.52	<0.02	0.52	1.04	0.51	0.53	33.0	66	<12.0	4.6			
	May 18, 2021	YAD169E	10.8	21.8	8.7	75	1.2	124.2%	0.03	0.45	<0.02	0.39	0.84	0.44	0.40	29.0	60	<6.2	4.6			
	May 18, 2021	YAD169F	11.0	21.5	8.8	76	1.1	125.7%	0.04	0.48	<0.02	0.44	0.92	0.47	0.45	39.0	73	<6.2	3.9	23.0		
	LAKE THOM-A-LEX	September 28, 2021	YAD160B	9.8	22.0	7.3	117	0.5	114.6%	0.07		<0.02	<0.02			0.02	49.0	102	9.8	8.9		
		September 28, 2021	YAD1611A	5.5	24.3	7.3	65	0.7	67.0%	0.05		0.03	<0.02			0.04	33.0	101	6.5	6.1	42.0	
August 5, 2021		YAD160B	6.8	28.6	7.6	124	0.4	89.7%	0.07		<0.02	<0.02			0.02	47.0		12.0	14.0			
August 5, 2021		YAD1611A	6.8	33.0	7.3	106	0.6	96.0%	0.05		<0.02	<0.02			0.02	30.0		7.0	6.8	42.0		
July 7, 2021		YAD160B	10.1	30.3	9.0	121	0.6	137.1%	0.06		<0.02	<0.02			0.02		101			9.1		
July 7, 2021		YAD1611A	9.3	30.7	9.4	140	0.5	127.4%	0.06		<0.02	<0.02			0.02		97			9.9	41.0	
June 9, 2021		YAD160B	8.6	27.3	7.8	119	0.7	110.8%	0.05	0.47	<0.02	<0.02	0.48	0.46	0.02		97		<6.2	6.4		
June 9, 2021		YAD1611A	8.1	27.9	7.8	110	1.2	104.8%	0.04	0.46	<0.02	<0.02	0.47	0.45	0.02		91		<6.2	3.6	38.0	
May 19, 2021		YAD160B	11.1	23.4	8.8	109	0.8	131.4%	0.05	0.61	<0.02	<0.02	0.62	0.60	0.02		97		<6.2	6.7		
May 19, 2021		YAD1611A	10.7	23.9	8.6	105	0.9	128.5%	0.04	0.61	<0.02	<0.02	0.62	0.60	0.02		92		<6.2	4.8	37.0	
TUCKERTOWN RESERVOIR	September 23, 2021	YAD172C	6.9	25.2	6.9	88	0.9	85.5%	0.05		0.08	0.37			0.45		65	6.2	6.8			
	September 23, 2021	YAD1780A	7.2	26.1	7.1	84	1.0	90.0%	0.04		0.08	0.36			0.44	23.0	67		5.2	22.0		
	August 25, 2021	YAD172C	7.0	30.1	7.1	74	0.5	94.5%	0.08		0.10	0.46			0.56	19.0	72	6.5	22.0			
	August 25, 2021	YAD1780A	10.5	31.4	9.2	41	0.5	143.4%	0.08		<0.02	0.21			0.22		71	8.2	10.0	20.0		
	July 26, 2021	YAD172C	8.8	29.2	8.5	84	0.8	116.0%	0.06		<0.02	0.41			0.42		77	<6.2	5.9			
	July 26, 2021	YAD1780A	10.5	29.8	8.6	87	1.1	140.3%	0.04		<0.02	0.36			0.37		66		2.6	24.0		
	June 15, 2021	YAD172C	12.6	27.6	9.6	88	0.8	161.8%	0.05	0.50	0.21	0.44	0.94	0.29	0.65		72	7.2	7.8			
	June 15, 2021	YAD1780A	10.9	28.5	8.8	86	1.4	142.8%	0.04	0.62	<0.02	0.32	0.94	0.61	0.33		67	<6.2	3.2	24.0		
May 24, 2021	YAD172C	7.5	24.2	7.2	81	1.1	89.9%	0.04	0.44	0.12	0.56	1.00	0.32	0.68		66		6.0				
May 24, 2021	YAD1780A	12.6	27.6	9.6	88	1.0	161.8%	0.05	0.67	<0.02	0.31	0.98	0.66	0.32		63		3.1	25.0			
BADIN LAKE	September 23, 2021	YAD178B	6.8	26.6	7.0	81	1.5	86.0%	0.03		0.05	0.33			0.38	12.0	61		2.8	22.0		
	September 23, 2021	YAD178E	3.9	25.6	6.8	83	1.8	48.8%	<0.02		0.02	0.36			0.38	4.7	57		1.9			
	September 23, 2021	YAD178F	5.4	26.6	6.8	81	1.9	68.5%	0.02		<0.02	0.39			0.40	6.0	57		2.1			
	September 23, 2021	YAD178F1	4.3	26.5	6.7	82	1.4	53.8%	0.02		0.02	0.41			0.43	4.0	59		2.8			
	August 25, 2021	YAD178B	11.8	31.7	9.4	91	1.2	162.2%	0.04		<0.02	0.09			0.10	28.0	65	<6.2	2.3	21.0		
	August 25, 2021	YAD178E	10.1	31.1	8.8	83	1.4	136.9%	0.02		<0.02	0.06			0.07	20.0	63	<6.2	1.8			
	August 25, 2021	YAD178F	10.6	31.2	9.0	86	1.6	143.9%	0.03		<0.02	0.17			0.18	20.0	64	<6.2	1.7			
	August 25, 2021	YAD178F1	10.2	31.4	9.2	87	1.1	139.4%	0.03		<0.02	0.15			0.16	30.0	63	<6.2	2.0			
	July 26, 2021	YAD178B	9.7	29.5	8.8	86	1.6	128.6%	0.03		<0.02	0.30			0.31	23.0	61	<6.2	2.2	21.0		
	July 26, 2021	YAD178E	8.8	29.2	8.5	84	1.9	116.0%	<0.02		<0.02	0.23			0.24	15.0	57	<6.2	1.7			
	July 26, 2021	YAD178F	6.6	28.6	7.1	85	2.0	86.7%	<0.02		<0.02	0.45			0.46	14.0	61	<6.2	1.7			
	July 26, 2021	YAD178F1	4.7	28.3	6.8	85	2.0	60.5%	<0.02		<0.02	0.52			0.53	10.0	59	<6.2	1.5			
	June 15, 2021	YAD178B	10.3	28.3	8.9	86	1.2	134.8%	0.04	0.48	<0.02	0.28	0.76	0.47	0.19		66	<6.2	3.3	26.0		
	June 15, 2021	YAD178E	10.4	28.3	9.2	83	1.0	136.7%	0.03	0.48	<0.02	0.18	0.66	0.47	0.29		61	<12.0	2.9			
	June 15, 2021	YAD178F	10.2	27.7	9.1	85	1.3	132.0%	0.03	0.46	<0.02	0.22	0.68	0.45	0.23		61	<6.2	2.9			
	June 15, 2021	YAD178F1	9.3	27.0	9.0	31	1.1	119.4%	0.03	0.46	<0.02	0.25	0.71	0.45	0.26		61	<6.2	3.0			
May 24, 2021	YAD178B	11.2	26.5	9.1	81	1.4	140.5%	0.03	0.44	<0.02	0.47	0.91	0.43	0.48		62		3.8	22.0			
May 24, 2021	YAD178E	11.6	25.2	9.2	78	1.5	141.9%	0.03	0.45	<0.02	0.34	0.79	0.44	0.35		55		3.0				
May 24, 2021	YAD178F	12.0	25.8	9.4	81	1.4	149.0%	0.02	0.45	<0.02	0.36	0.81	0.44	0.37		57		2.6				
May 24, 2021	YAD178F1	11.5	26.5	9.3	81	1.5	143.8%	<0.02	0.36	<0.02	0.34	0.70	0.35	0.35		59		2.5				
FALLS LAKE	September 14, 2021	YAD178F3	7.0	27.3	7.2	80	2.0	89.4%	<0.02		0.05	0.36			0.41	7.2	60		2.1			
	September 14, 2021	YAD178F5	7.0	27.6	7.2	80	1.8	89.2%	0.03		0.05	0.37			0.42	11.0	58		2.0	21.0		
	August 19, 2021	YAD178F3	7.3	28.3	7.7	82	1.7	94.2%	0.02		0.02	0.36			0.38	7.2	59		3.1			
	August 19, 2021	YAD178F5	7.5	28.7	7.5	81	1.7	98.1%	0.02		0.02	0.38			0.40	7.4	59		2.8	23.0		
	July 20, 2021	YAD178F3	6.8	27.3	6.5	82	2.1	86.3%	<0													

Appendix A - Yadkin-Pee Dee River Basin Lakes Data January 1, 2016 through December 31, 2021

Lake	SURFACE PHYSICAL DATA									PHOTIC ZONE DATA										Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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					
FALLS LAKE	May 24, 2021	YAD178F3	8.8	20.9	6.7	76	1.8	99.0%	<0.02	0.33	0.02	0.58	0.91	0.31	0.60		59		3.1			
	May 24, 2021	YAD178F5	8.9	21.5	6.7	77	1.7	101.1%	0.02	0.31	0.03	0.52	0.83	0.28	0.55		58		3.2	22.0		
LAKE REESE	September 8, 2021	YAD179B	8.3	28.4	7.8	100	0.3	108.8%	0.04		<0.02	<0.02			0.02	40.0	80		6.6			
	September 8, 2021	YAD179D	8.7	28.1	8.0	95	0.7	113.5%	0.03		<0.02	<0.02			0.02	30.0	74		5.3			
	September 8, 2021	YAD179F	9.9	28.0	8.6	92	0.8	128.6%	0.04		<0.02	<0.02			0.02	49.0	70		5.4	31.0		
	August 4, 2021	YAD179B	6.2	28.3	7.1	99	0.6	80.6%	0.05		<0.02	<0.02			0.02	22.0		8.5	8.7			
	August 4, 2021	YAD179D	7.9	28.1	7.9	88	0.6	101.6%	0.04		<0.02	<0.02			0.02	26.0		6.8	6.1			
	August 4, 2021	YAD179F	8.2	28.5	8.3	86	0.7	106.7%	0.03		<0.02	<0.02			0.02	18.0		<6.2	5.3	31.0		
	July 13, 2021	YAD179B	8.5	31.2	7.9	102	0.8	112.8%	0.04		<0.02	<0.02			0.02	40.0	75	7.8	7.4			
	July 13, 2021	YAD179D	8.3	30.3	8.3	93	0.9	110.5%	0.04		<0.02	<0.02			0.02	18.0	70	<6.2	4.5			
	July 13, 2021	YAD179F	8.9	30.3	8.7	89	1.0	118.9%	0.04		<0.02	<0.02			0.02	31.0	67	<6.2	5.1	34.0		
	June 29, 2021	YAD179B	10.9	30.4	8.7	96	0.9	145.4%	0.06		<0.02	<0.02			0.02		78	7.0	10.0			
	June 29, 2021	YAD179D	11.3	29.2	8.9	104	1.0	147.5%	0.04		<0.02	<0.02			0.02		68	<6.2	6.7			
	June 29, 2021	YAD179F	10.8	28.7	8.6	87	1.0	139.5%	0.04		<0.02	<0.02			0.02		61	<6.2	5.7	29.0		
May 20, 2021	YAD179B	10.8	26.2	8.7	114	0.9	133.3%	0.04	0.55	<0.02	<0.02	0.56	0.54	0.02		97		6.4				
May 20, 2021	YAD179D	10.0	26.4	8.6	111	1.1	123.7%	0.03	0.43	<0.02	<0.02	0.44	0.42	0.02		84		3.7				
May 20, 2021	YAD179F	9.6	25.9	8.2	106	0.9	118.4%	0.02	0.40	<0.02	<0.02	0.41	0.39	0.02		80		4.5	37.0			
BUNCH LAKE	September 8, 2021	YAD181G	8.2	26.6	7.5	82	2.2	104.1%	0.02		<0.02	<0.02			0.02	12.0	63		3.9	26.0		
	August 4, 2021	YAD181G	8.3	28.1	7.7	83	2.1	108.2%	<0.02		<0.02	<0.02			0.02	18.0	65	<6.2	2.8	28.0		
	July 13, 2021	YAD181G	7.8	29.4	7.6	84	2.5	103.3%								31.0	63	<6.2	1.8	27.0		
	June 2, 2021	YAD181G	10.1	22.1	7.9	87	3.3	115.9%	0.02	0.35	<0.02	0.04	0.39	0.34	0.05		69	<6.2	3.6	27.0		
	May 20, 2021	YAD181G	10.1	22.1	7.9	87	3.0	115.9%	<0.02	0.35	<0.02	0.07	0.42	0.34	0.08		63		4.0	28.0		
BACK CREEK LAKE	September 8, 2021	YAD181J	8.5	26.4	7.1	91	1.0	107.3%	0.06		<0.02	<0.02			0.02	35.0	75		4.1			
	September 8, 2021	YAD181K	8.2	26.6	7.5	82	1.2	104.1%	0.04		<0.02	<0.02			0.02	40.0	71		3.4			
	September 8, 2021	YAD181L	7.9	26.7	7.2	89	1.4	100.5%	0.04		<0.02	<0.02			0.02	26.0	69		2.9	28.0		
	August 4, 2021	YAD181J	7.9	28.1	8.4	88	0.7	102.1%	0.07		<0.02	<0.02			0.02	33.0		6.5	7.1			
	August 4, 2021	YAD181K	7.5	28.3	7.9	86	0.7	97.2%	0.04		<0.02	<0.02			0.02	36.0		<6.2	4.3			
	August 4, 2021	YAD181L	8.3	28.1	7.7	83	0.8	108.2%	0.04		<0.02	<0.02			0.02	30.0	71	<6.2	4.5	29.0		
	July 13, 2021	YAD181J	9.1	30.1	8.5	92	0.7	120.8%	0.06		<0.02	<0.02			0.02	32.0	74	6.2	7.6			
	July 13, 2021	YAD181K	9.2	29.2	8.4	90	0.9	120.7%	0.04		<0.02	<0.02			0.02	25.0	72	<6.2	4.3			
	July 13, 2021	YAD181L	9.4	29.8	8.6	91	0.9	124.0%	0.03		<0.02	<0.02			0.02	19.0	68	<6.2	3.6	30.0		
	June 2, 2021	YAD181J	10.4	25.7	8.5	98	1.0	129.3%	0.05	0.56	<0.02	<0.02	0.57	0.55	0.02		80	6.2	5.8			
	June 2, 2021	YAD181K	9.8	25.6	8.2	96	1.2	12.8%	0.03	0.44	<0.02	<0.02	0.45	0.43	0.02		75	<6.2	3.3			
	June 2, 2021	YAD181L	9.4	25.1	8.0	94	1.4	114.9%	0.03	0.42	<0.02	<0.02	0.43	0.41	0.02		73	<6.2	3.4	32.0		
May 20, 2021	YAD181J	10.3	22.4	8.5	94	1.0	118.7%	0.04	0.54	<0.02	<0.02	0.55	0.53	0.02		77		4.1				
May 20, 2021	YAD181K	9.7	23.2	8.2	93	1.5	113.1%	0.04	0.48	<0.02	<0.02	0.49	0.47	0.02		73		3.9				
May 20, 2021	YAD181L	8.8	23.0	7.6	94	1.5	101.9%	0.04	0.49	<0.02	<0.02	0.50	0.48	0.02		72		3.9	33.0			
LAKE TILLERY	September 14, 2021	YAD185A	7.8	26.6	6.8	80	1.0	98.0%	0.03		<0.02	0.35			0.36	17.0	63		4.0			
	September 14, 2021	YAD189	9.1	27.7	7.5	80	1.8	115.4%	0.03		<0.02	0.25			0.26	20.0	61		2.3			
	September 14, 2021	YAD189B	8.7	28.0	7.5	81	2.0	111.1%	0.02		<0.02	0.23			0.24	18.0	63		1.7			
	September 14, 2021	YAD189C	7.8	27.8	7.4	81	2.1	99.2%	0.02		<0.02	0.26			0.27	13.0	62		1.9	21.0		
	August 19, 2021	YAD185A	6.8	28.1	6.9	81	1.2	87.3%	0.02		0.04	0.38			0.42	4.3	64		4.4			
	August 19, 2021	YAD189	6.8	28.7	7.0	80	1.0	88.7%	0.03		<0.02	0.38			0.39	16.0	62		4.5			
	August 19, 2021	YAD189B	8.0	30.0	7.7	76	2.0	106.0%	0.02		0.02	0.20			0.22	12.0	59		2.0			
	August 19, 2021	YAD189C	8.1	30.8	7.8	78	1.5	108.6%	0.02		<0.02	0.20			0.21	10.0	51		2.3	21.0		
	July 20, 2021	YAD185A	8.1	28.1	6.4	80	1.4	104.5%	0.03		0.02	0.39			0.41	15.0	57	<6.2	4.3			
	July 20, 2021	YAD189	8.3	29.0	6.5	79	1.6	108.8%	0.02		<0.02	0.30			0.31	15.0	59	<6.2	2.9			
	July 20, 2021	YAD189B	8.1	29.0	6.6	79	1.6	106.5%	<0.02		<0.02	0.27			0.28	13.0		<6.2	2.1			
	July 20, 2021	YAD189C	8.0	29.1	6.8	78	1.9	104.4%	<0.02		<0.02	0.26			0.27	14.0		<6.2	1.7	21.0		
	June 30, 2021	YAD185A	9.9	29.6	8.3	79	1.6	129.5%	0.03		<0.02	0.34			0.35	11.0	57	<6.2	2.9			
	June 30, 2021	YAD189	9.9	29.8	8.7	77	1.8	131.1%	0.03		0.02	0.26			0.28	15.0	58	<6.2	3.2			
	June 30, 2021	YAD189B	10.0	29.6	8.9	77	1.8	131.8%	0.02		<0.02	0.17			0.18	15.0	52	<6.2	2.3			
	June 30, 2021	YAD189C	10.0	29.2	8.7	77	1.8	131.1%	<0.02		<0.02	0.16			0.17	14.0	53	<6.2	2.6	23.0		
May 24, 2021	YAD185A	8.6	22.2	6.7	77	1.4	98.9%	0.02	0.34	0.03	0.59	0.93	0.31	0.62		64		4.2				
May 24, 2021	YAD189	11.3	24.2	7.5	76	1.3	134.5%	0.02	0.36	<0.02	0.50	0.86	0.35	0.51		57		4.9				
May 24, 2021	YAD189B	11.0	26.6	8.8	76	2.8	137.8%	0.02	0.38	<0.02	0.42	0.80	0.37	0.43		50		3.4				
May 24, 2021	YAD189C	11.1	26.1	8.6	76	2.4	137.1%	0.02	0.42	<0.02	0.39	0.81	0.41	0.40		55		2.6	22.0			
BLEWETT FALLS LAKE	September 22, 2021	YAD260B	7.5	26.9	7.4	83	0.5	94.6%	0.07		0.03	0.35			0.38	12.0	76	16.0	17.0	23.0		
	August 25, 2021	YAD260B	10.7	31.7	9.0	82	0.5	145.0%	0.06		<0.02	0.14			0.15		71	9.2	9.1	23.0		
	July 22, 2021	YAD260B	11.3	29.7	7.7	96	0.6	148.1%	0.10		<0.02	0.68			0.69	27.0	82	11.0	12.0	26.0		
	June 24, 2021	YAD260B	8.6	26.9	6.7	120	0.6	106.6%	0.18		<0.02					28.0	100	12.0	14.0	35.0		
	May 26, 2021	YAD260B	11.2	27.9	8.9	85	0.7	142.9%	0.05	0.45	<0.02	0.43	0.88	0.44	0.44		64					

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2016 through December 31, 2021

Lake	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										Total Solids Suspended mg/L	Turbidity NTU	Total Hardnes mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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				
KANNAPOLIS LAKE	August 30, 2021	YAD207A	9.2	31.6	8.5	93	1.0	127.6%	0.04		0.02	<0.02			0.03	27.0	79	<6.2	4.2		
	August 30, 2021	YAD207C	9.0	30.8	8.5	93	1.4	123.4%	0.02		<0.02	<0.02			0.02	18.0	71	<6.2	2.6	24.0	
	August 2, 2021	YAD207A	9.5	30.5	9.0	93	1.0	129.6%	0.04		<0.02	<0.02			0.02	22.0	70	<6.2	3.9		
	August 2, 2021	YAD207C	9.6	30.2	9.0	92	1.0	130.1%	0.02		<0.02	<0.02			0.02	16.0	63	<6.2	2.3	23.0	
	June 9, 2021	YAD207A	9.8	29.3	8.2	90	1.1	130.9%	0.03	0.41	0.02	0.34	0.75	0.39	0.36		69	<6.2	5.2		
	June 9, 2021	YAD207C	9.8	28.9	8.4	86	1.5	129.7%	<0.02	0.36	<0.02	0.31	0.67	0.35	0.32		63	<6.2	2.7	24.0	
	May 11, 2021	YAD207A	8.0	22.6	8.0	41	1.0	94.5%	0.04	0.45	<0.02	0.58	1.03	0.44	0.59	11.0	71	6.5	7.0		
	May 11, 2021	YAD207C	8.7	23.4	7.4	81	1.5	103.8%	0.03	0.48	<0.02	0.58	1.06	0.47	0.59	5.7	66	<6.2	4.5	25.0	
LAKE FISHER	August 30, 2021	YAD215T	8.0	30.6	8.2	130	1.0	108.7%	0.04		<0.02	<0.02			0.02	29.0	95	<6.2	5.5		
	August 30, 2021	YAD216A	8.4	30.0	8.4	129	1.2	114.0%	0.04		<0.02	<0.02			0.02	29.0	94	<6.2	4.0	50.0	
	August 2, 2021	YAD215R	6.1	24.8	7.1	179	0.6	75.2%	0.05		0.10	0.40			0.50	6.9	125	6.5	10.0		
	August 2, 2021	YAD215T	7.6	29.5	8.2	134	0.6	101.0%	0.05		<0.02	<0.02			0.02	17.0	96	9.8	7.7		
	August 2, 2021	YAD216A	7.7	29.6	8.3	133	1.0	103.3%	0.03		<0.02	<0.02			0.02	11.0	91	<6.2	3.6	47.0	
	June 10, 2021	YAD215R	7.6	27.7	7.4	142	0.5	98.4%	0.08	0.63	<0.02	0.04	0.67	0.62	0.05		111	12.0	13.0		
	June 10, 2021	YAD215T	8.3	28.0	8.4	132	0.7	108.7%	0.04	0.44	<0.02	<0.02	0.45	0.43	0.02		99	<12.0	7.1		
	June 10, 2021	YAD216A	9.0	28.0	8.6	130	0.8	130.0%	0.03	0.46	<0.02	<0.02	0.47	0.45	0.02		93	<6.2	4.6	46.0	
	May 11, 2021	YAD215R	9.3	22.8	7.4	134	0.3	110.3%	0.10	0.71	<0.02	0.22	0.93	0.70	0.23	18.0	121	21.0	26.0		
	May 11, 2021	YAD215T	9.1	23.2	7.9	119	0.7	107.8%	0.06	0.66	<0.02	0.02	0.67	0.65	0.02	12.0	90	7.8	7.0		
	May 11, 2021	YAD216A	8.6	23.1	7.8	114	1.0	101.7%	0.03	0.52	<0.02	<0.02	0.53	0.51	0.02	30.0	82	<6.2	5.2	43.0	
	LAKE CONCORD	September 14, 2021	YAD216C	8.9	27.8	7.8	112	0.9	114.9%	0.05		0.03	<0.02			0.04	29.0	95	7.5	7.0	
September 14, 2021		YAD216E	10.0	28.2	8.1	115	0.5	131.2%	0.06		<0.02	<0.02			0.02	34.0	100	8.6	9.0		
September 14, 2021		YAD216G	8.9	28.0	7.8	113	0.9	115.7%	0.04		<0.02	<0.02			0.02	26.0	90		4.5	32.0	
August 11, 2021		YAD216C	10.1	32.2	8.4	119	0.4	141.2%	0.05		<0.02	<0.02			0.02	36.0	91	6.8	6.9		
August 11, 2021		YAD216E	8.8	28.9	8.4	82	1.2	115.8%	0.05		<0.02	0.24			0.25	65.0	69	<6.2	3.7		
August 11, 2021		YAD216G	10.1	30.5	8.6	117	0.6	137.2%	0.04		<0.02	<0.02			0.02	36.0	94	7.2	7.3	34.0	
July 7, 2021		YAD216C	10.4	30.0	8.7	117	0.7	139.5%	0.04		<0.02	<0.02			0.02	30.0	88		8.3		
July 7, 2021		YAD216E	10.2	30.1	8.6	118	0.5	138.5%	0.04		<0.02	<0.02			0.02	33.0	87		8.2		
July 7, 2021		YAD216G	10.5	29.7	8.8	116	0.7	141.3%	0.04		<0.02	<0.02			0.02	28.0	89		5.7	34.0	
June 9, 2021		YAD216C	9.3	29.5	8.2	115	0.8	124.8%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02		81	<6.2	4.9		
June 9, 2021		YAD216E	10.5	30.5	8.1	118	0.6	142.5%	0.05	0.47	<0.02	0.05	0.52	0.46	0.06		97	7.2	10.0		
June 9, 2021		YAD216G	9.3	29.4	8.2	115	1.0	123.7%	0.03	0.44	<0.02	<0.02	0.45	0.43	0.02		83	<6.2	4.6	34.0	
May 20, 2021		YAD216C	9.9	26.0	7.9	104	1.2	123.4%	0.04	0.46	<0.02	0.22	0.68	0.45	0.23		91		7.4		
May 20, 2021		YAD216E	10.0	26.9	7.5	112	0.8	125.8%	0.05	0.46	<0.02	0.32	0.78	0.45	0.33		103		15.0		
May 20, 2021	YAD216G	9.7	26.5	7.8	103	1.3	121.1%	0.03	0.39	<0.02	0.24	0.63	0.38	0.25		86	85.0	4.7	33.0		
LAKE MONROE	September 29, 2021	YAD232F	8.0	25.7	7.8	102	0.4	99.8%	0.23		<0.02	<0.02			0.02	98.0	89	11.0	6.7	31.0	
	August 25, 2021	YAD232D	12.5	32.9	9.5	114	0.6	176.4%	0.11		<0.02	<0.02			0.02		92	8.5	8.5		
	August 25, 2021	YAD232F	12.1	33.2	9.8	114	0.7	171.9%	0.11		<0.02	<0.02			0.02		87	7.5	7.5	32.0	
	July 14, 2021	YAD232D	10.7	30.5	8.9	118	0.6	143.6%	0.14		<0.02	<0.02			0.02		90	8.0	6.7		
	July 14, 2021	YAD232F	10.5	31.6	9.1	118	0.6	144.4%	0.10		<0.02	<0.02			0.02	32.0	88	<6.2	4.7	34.0	
	June 23, 2021	YAD232D	9.6	28.8	8.4	116	0.6	125.7%	0.11		<0.02	<0.02			0.02		89	8.2	7.2		
	June 23, 2021	YAD232F	6.6	28.0	6.8	114	0.7	85.1%	0.09		0.06	<0.02			0.07		95	<6.2	5.1	32.0	
	May 25, 2021	YAD232D	17.0	28.7	10.4	148	0.4	222.4%	0.14	1.70	<0.02	<0.02	1.71	1.69	0.02		114	18.0	7.8		
May 25, 2021	YAD232F	19.4	26.4	10.3	158	0.4	243.4%	0.14	1.60	<0.02	<0.02	1.61	1.59	0.02		110	22.0	6.9	34.0		
LAKE LEE	September 29, 2021	YAD232C	10.4	24.7	7.9	101	0.2	126.7%	0.19		<0.02	<0.02			0.02		100	16.0	16.0		
	September 29, 2021	YAD232H	10.7	24.6	8.4	100	0.2	131.0%	0.19		<0.02	<0.02			0.02	73.0	100	16.0	15.0		
	September 29, 2021	YAD233	7.6	24.1	7.2	101	0.2	92.4%	0.19		0.03	<0.02			0.04	75.0	98	14.0	14.0	33.0	
	August 25, 2021	YAD232C	12.8	32.2	9.5	100	0.4	178.9%	0.22		<0.02	<0.02			0.02		101	16.0	15.0		
	August 25, 2021	YAD232H	12.4	32.0	9.5	102	0.4	172.1%	0.24		<0.02	<0.02			0.02		101	16.0	14.0		
	August 25, 2021	YAD233	10.4	30.0	8.6	97	0.4	139.3%	0.22		<0.02	<0.02			0.02		96	15.0	11.0	31.0	
	July 14, 2021	YAD232C	10.6	29.7	8.6	124	0.3	141.1%	0.21		<0.02	0.13			0.14		115	18.0	14.0		
	July 14, 2021	YAD232H	11.4	29.7	9.0	129	0.3	151.6%	0.21		<0.02	<0.02			0.02		107	14.0	10.0		
	July 14, 2021	YAD233	11.7	30.6	9.2	129	0.4	157.8%	0.25		<0.02	0.15			0.16		109	14.0	12.0	44.0	
	June 23, 2021	YAD232C	9.0	28.4	6.7	144	0.3	117.2%	0.19		<0.02	<0.02			0.02		118	19.0	18.0		
	June 23, 2021	YAD232H	9.7	28.5	7.0	143	0.5	125.8%	0.22		<0.02	<0.02			0.02		115	17.0	15.0		
	June 23, 2021	YAD233	5.3	27.5	6.7	144	0.5	68.1%	0.16		0.07	<0.02			0.08		116	13.0	15.0	50.0	
May 25, 2021	YAD232C	12.7	25.9	8.8	147	0.4	157.4%	0.28	1.90	0.23	<0.02	1.91	1.67	0.24		132	18.0	21.0			
May 25, 2021	YAD232H	9.7	26.8	8.7	144	0.6	121.9%	0.24	1.80	0.13	<0.02	1.81	1.67	0.14		118	11.0	13.0			
May 25, 2021	YAD233	6.6	26.1	7.7	148	0.7	82.7%	0.36	2.00	0.47	<0.02	2.01	1.53	0.48		129	12.0	10.0	48.0		

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2016 through December 31, 2021

Lake	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										Solids Total mg/L	Solids Suspended mg/L	Turbidity NTU	Total Hardnes mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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						
LAKE TWITTY (STEWART)	September 29, 2021	YAD235D	9.2	25.6	8.2	124	0.6	114.3%	0.11		<0.02	0.03			0.04	111	7.5	7.2				
	September 29, 2021	YAD235F	8.1	25.3	7.8	124	0.6	99.2%	0.09		<0.02	0.05			0.06	52.0	99	7.5	5.9			
	September 29, 2021	YAD236	4.7	25.0	7.1	125	0.6	57.8%	0.08		0.09	0.14			0.23	31.0	88	7.0	6.4	41.0		
	August 25, 2021	YAD235D	10.9	31.5	9.2	129	0.7	150.6%	0.08		<0.02	<0.02			0.02		8	99.0	5.2			
	August 25, 2021	YAD235F	10.7	31.6	9.2	129	0.7	147.3%	0.08		<0.02	<0.02			0.02		96	7.2	5.4			
	August 25, 2021	YAD236	11.2	31.2	9.3	129	0.7	153.9%	0.07		<0.02	<0.02			0.02	49.0	121	<6.2	5.1	25.0		
	July 14, 2021	YAD235D	8.6	29.7	7.0	132	0.5	113.3%	0.10		<0.02	<0.02			0.02		92	9.2	8.8			
	July 14, 2021	YAD235F	8.4	29.5	6.9	131	0.5	110.2%	0.09		<0.02	<0.02			0.02		91	8.2	6.9			
	July 14, 2021	YAD236	5.9	29.3	6.7	132	0.5	76.9%	0.10		0.05	0.08			0.13		89	9.8	7.4	43.0		
	June 23, 2021	YAD235D	5.9	27.3	7.0	62	0.9	74.9%	0.08		0.07	0.19			0.26	29.0	91		5.7			
	June 23, 2021	YAD235F	6.2	27.4	6.9	128	0.9	79.2%	0.08		0.03	0.19			0.22	23.0	91	7.2	5.6			
	June 23, 2021	YAD236	4.0	27.4	6.7	129	0.9	50.9%	0.09		0.13	0.26			0.39	25.0	90	7.2	6.0	42.0		
	May 25, 2021	YAD235D	8.9	24.3	7.5	126	0.7	106.9%	0.10	1.00	<0.02	0.44	1.44	0.99	0.45		96	<8.3	7.3			
	May 25, 2021	YAD235F	10.9	24.9	9.0	127	0.7	131.9%	0.09	1.10	<0.02	0.32	1.42	1.09	0.33		94	<10.0	6.7			
	May 25, 2021	YAD236	8.0	24.2	7.6	126	0.7	96.1%	0.08	0.92	0.03	0.51	1.43	0.89	0.54		93	<10.0	7.7	40.0		
CODDLE CREEK RESERVOIR	September 14, 2021	YADCCR01	10.4	26.8	8.8	105	0.7	132.3%	0.02		<0.02	<0.02			0.02	38.0	83		7.0	34.0		
	September 14, 2021	YADCCR02	10.2	27.2	8.7	105	0.7	130.6%	0.02		<0.02	<0.02			0.02	41.0	85		7.6			
	September 14, 2021	YADCCR03	9.6	27.3	8.5	106	0.5	123.3%	0.04		<0.02	<0.02			0.02	39.0	87	7.2	14.0			
	August 11, 2021	YADCCR01	8.5	28.8	8.8	103	0.8	112.0%	0.03		<0.02	<0.02			0.02	31.0	78	<6.2	7.1	33.0		
	August 11, 2021	YADCCR02	8.8	29.9	8.7	104	0.7	117.6%	0.03		<0.02	<0.02			0.02	29.0	76	<6.2	7.7			
	August 11, 2021	YADCCR03	8.4	30.4	8.6	106	0.7	113.2%	0.04		<0.02	<0.02			0.02	31.0	79	<6.2	11.0			
	July 7, 2021	YADCCR01	11.6	28.3	9.1	106	0.9	152.0%	<0.02		<0.02	<0.02			0.02	38.0	72		7.6	33.0		
	July 7, 2021	YADCCR02	8.3	28.3	8.9	53	0.8	108.8%	0.02		<0.02	<0.02			0.02	33.0	74		8.2			
	July 7, 2021	YADCCR03	10.5	30.5	9.0	105	0.8	142.3%	0.03		<0.02	<0.02			0.02	35.0	76		11.0			
	June 9, 2021	YADCCR01	8.0	26.6	8.3	94	1.8	100.9%	<0.02	0.53	0.02	<0.02	0.54	0.51	0.03		67	<6.2	3.0	31.0		
	June 9, 2021	YADCCR02	7.9	27.7	8.0	95	1.8	101.5%	0.02	0.53	0.05	0.03	0.56	0.48	0.08		70	<6.2	3.8			
	June 9, 2021	YADCCR03	7.9	28.2	7.8	97	1.0	103.4%	0.03	0.47	0.04	0.04	0.51	0.43	0.08		74	<6.2	6.8			
	May 20, 2021	YADCCR01	12.6	24.0	9.6	96	0.7	150.1%	0.03	0.90	<0.02	<0.02	0.91	0.89	0.02		76		15.0	32.0		
	May 20, 2021	YADCCR02	12.7	25.9	9.4	97	0.6	157.2%	0.03	0.88	<0.02	<0.02	0.89	0.87	0.02		81		16.0			
	May 20, 2021	YADCCR03	11.8	26.5	9.1	96	0.4	147.4%	0.05	1.00	<0.02	<0.02	1.01	0.99	0.02		83		25.0			
ROBERDEL LAKE	September 30, 2021	YAD262E	6.5	23.3	6.3	29	0.8	76.0%	0.04		0.04	0.10			0.14	7.7	56	12.0	11.0			
	September 30, 2021	YAD263	7.8	23.3	6.4	29	0.9	91.0%	0.03		<0.02	0.08			0.09	13.0	44		3.1	8.0		
	August 30, 2021	YAD262E	7.1	30.4	6.4	28	0.7	94.4%	0.04		<0.02	<0.02			0.02	38.0	65	30.0	10.0			
	August 30, 2021	YAD263	7.6	31.0	6.6	28	0.7	103.0%	0.03		<0.02	<0.02			0.02	47.0	48	<6.2	3.6	8.0		
	July 28, 2021	YAD262E	5.9	30.1	6.2	28	0.8	78.4%	0.04		<0.02	<0.02			0.02	26.0	48	12.0	6.2			
	July 28, 2021	YAD263	7.6	30.2	6.7	28	0.8	101.0%	0.03		<0.02	<0.02			0.02		44	7.0	4.3	7.6		
	June 2, 2021	YAD262E	7.8	24.3	5.2	30	1.0	92.5%	0.04	0.56	<0.02	0.36	0.92	0.55	0.37		55	20.0	8.9			
	June 2, 2021	YAD263	7.9	24.1	5.3	29	1.0	93.8%	0.03	0.47	<0.02	0.31	0.78	0.46	0.32		40	<12.0	3.7	9.9		
	May 11, 2021	YAD262E	7.5	21.9	6.2	29	0.8	85.4%	0.03	0.49	0.03	0.46	0.95	0.46	0.49	4.9	36	<6.2	3.5			
	May 11, 2021	YAD263	8.2	22.4	6.3	29	0.8	94.0%	0.03	0.48	<0.02	0.46	0.94	0.47	0.47	12.0	34	<6.2	3.2	7.8		
ROCKINGHAM CITY LAKE	September 23, 2021	YAD265C	1.3	24.4	5.2	27	0.7	15.4%	<0.02		<0.02	<0.02			0.02	2.8	38	8.3	1.3	6.0		
	August 26, 2021	YAD265C	0.9	28.4	5.0	30	0.7	12.0%	0.03		<0.02	<0.02			0.02	13.0	50		1.8	11.0		
	August 4, 2021	YAD265C	0.6	24.8	4.9	28	0.6	7.5%	0.03		<0.02	<0.02				8.0		<6.2	1.9	2.6		
	June 30, 2021	YAD265C	1.8	28.5	5.8	26	0.8	22.7%	0.03		<0.02	<0.02			0.02	4.4	43		1.5	7.0		
	May 5, 2021	YAD265C	3.7	22.9	6.2	24	0.8	43.4%	0.04	0.63	<0.02	<0.02	0.64	0.62	0.02	3.0	42	<6.2	4.2	9.1		
WADESBORO CITY POND	September 22, 2021	YAD275H	7.3	25.9	7.3	62	0.7	90.6%	0.04		0.02	<0.02			0.03	23.0	61	6.2	11.0			
	September 22, 2021	YAD275J	6.1	25.8	7.1	62	0.7	75.3%	0.06		0.04	<0.02			0.05	33.0	60	8.2	8.3	20.0		
	August 25, 2021	YAD275H	10.7	31.3	9.4	67	0.9	145.4%	0.05		<0.02	<0.02			0.02		57	<6.2	7.9			
	August 25, 2021	YAD275J	10.8	31.2	9.4	66	1.0	145.6%	0.04		<0.02	<0.02			0.02		57	<6.2	6.0	19.0		
	July 22, 2021	YAD275H	8.8	29.7	6.8	63	0.8	116.5%	0.05		<0.02	<0.02			0.02	14.0	103	54.0	14.0			
	July 22, 2021	YAD275J	8.8	30.0	6.9	63	0.9	116.7%	0.03		<0.02	<0.02			0.02	19.0	59	<6.2	4.8	17.0		
	June 24, 2021	YAD275H	7.9	27.4	6.6	63	0.7	99.9%	0.05		<0.02	<0.02			0.02	27.0	57	8.2	8.6			
	June 24, 2021	YAD275J	8.1	27.3	6.8	63	0.7	101.5%	0.05		<0.02	<0.02			0.02	24.0	61	8.8	9.1	19.0		
	May 26, 2021	YAD275H	7.1	25.8	6.8	63	0.7	88.3%	0.04	0.94	0.04	<0.02	0.95	0.90	0.05		63	9.0	14.0			
	May 26, 2021	YAD275J	9.4	28.5	8.5	63	0.7	122.2%	0.04	0.94	<0.02	<0.02	0.95	0.93	0.02		66	6.5	11.0	19.0		
HAMLET CITY LAKE	September 23, 2021	YAD282A	4.0	25.4	5.9	42	0.7	48.7%	0.02		<0.02	<0.02			0.02	4.9	45		2.7			
	September 23, 2021	YAD283	4.5	25.1	6.7	43	0.7	54.6%	0.02		<0.02	<0.02			0.02	4.4	42		3.1			
	August 26, 2021	YAD282A	4.4	29.8	5.8	44	0.8	58.0%	<0.02		<0.02	<0.02			0.02	13.0	42		2.3			
	August 26, 2021	YAD283	4.4	29.6	5.8	44	0.8	58.0%	0.02		<0.02	<0.02			0.02	22.0	44		3.5			
	August 4, 2021	YAD282A	2.4	26.0	5.6	43	0.6	29.8%	0.03		<0.02	<0.02				13.0			13.0			
	August 4, 2021	YAD283	3.8	26.2	5.8	43	0.6	47.4%	0.02		<0.02	<0.02				17.0		<6.2	10.0			
	June 30, 2021	YAD282A	6.4	29.2	6.6	43	1.2	82.9%	0.02		<0.02	<0.02	</									

**Appendix A - Yadkin-Pee Dee River Basin Lakes Data
January 1, 2016 through December 31, 2021**

Lake	SURFACE PHYSICAL DATA									PHOTIC ZONE DATA									Total Solids Suspended mg/L	Turbidity NTU	Total Hardnes mg/L
	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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				
HAMLET CITY LAKE	May 5, 2021	YAD282A	6.9	24.6	7.1	39	1.1	84.0%	0.02	0.47	<0.02	<0.02	0.48	0.46	0.02	5.6	39	<6.2	2.1		
	May 5, 2021	YAD283	7.0	24.2	7.0	39	1.1	84.4%	0.02	0.44	<0.02	<0.02	0.45	0.43	0.02	3.4	41	<6.2	2.4		
WATER LAKE	September 23, 2021	YAD280C	5.9	24.5	6.4	51	1.0	71.7%	<0.02		0.02	0.54			0.56	1.2	50		1.0		
	September 23, 2021	YAD280E	6.6	25.6	6.6	52	2.2	82.0%	<0.02		0.06	0.24			0.30	3.0	40		<1.0	5.0	
	August 26, 2021	YAD280C	7.0	29.2	6.0	52	1.1	92.1%	<0.02		<0.02	0.25			0.26	6.2	45		<1.0		
	August 26, 2021	YAD280E	7.0	30.0	6.7	50	1.2	92.4%	<0.02		0.04	0.21			0.25	8.8	41		1.2	5.0	
	August 4, 2021	YAD280C	3.7	24.3	5.5	57	1.2	44.2%	<0.02		0.06	0.49			0.55	2.6		<6.2	<1.0		
	August 4, 2021	YAD280E	6.4	27.2	5.9	49	1.8	81.3%	<0.02		0.05	0.21			0.26	5.8		<6.2	<1.0	6.0	
	June 30, 2021	YAD280C	7.9	28.0	6.7	53	1.4	101.4%	<0.02		<0.02	0.50			0.51	2.6	44	<6.2	<1.0		
	June 30, 2021	YAD280E	6.5	23.6	6.5	47	2.7	78.0%	<0.02		0.07	0.28			0.35	3.5	37	<6.2	1.0	5.0	
	May 5, 2021	YAD280C	6.5	23.6	6.5	47	1.2	78.0%	<0.02	0.42	<0.02	0.66	1.08	0.41	0.67		53	<6.2	2.7		
	May 5, 2021	YAD280E	8.1	23.9	7.0	45	2.4	97.1%	<0.02	0.32	0.03	0.54	0.86	0.29	0.57	1.4	37	<6.2	<1.0	5.2	

Appendix B - Yadkin-Pee Dee Lakes Phytoplankton Analysis for 2021

Algal densities and dominance at Stations YAD007A and YAD008A at **W. Kerr Scott Lake**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YAD007A	5,100	n/a	Chrysophytes	82%	<i>Ochromonas</i>	78%
5/18/21	YAD008A	4,900	n/a	Chrysophytes	48%	<i>Dinobryon</i>	38%
6/23/21	YAD007A	13,000	mild	Greens	87%	<i>Eudorina</i>	82%
6/23/21	YAD008A	15,200	mild	Greens	75%	<i>Eudorina</i>	74%
7/26/21	YAD007A	25,400	moderate	Cyanobacteria	58%	<i>Cylindrospermopsis</i>	46%
8/10/21	YAD007A	22,500	moderate	Cyanobacteria	40%	<i>Ochromonas/ Cylindrospermopsis</i>	36%/30%
8/10/21	YAD008A	16,900	mild	Chrysophytes	49%	<i>Ochromonas</i>	49%
9/15/21	YAD007A	59,700	severe	Cyanobacteria	42%	no dominant	n/a
9/15/21	YAD008A	43,300	severe	Cyanobacteria	46%	<i>Eudorina</i>	36%

Algal biovolumes and dominance at Stations YAD007A and YAD008A at **W. Kerr Scott Lake**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YAD007A	300	Chrysophytes	79%	<i>Ochromonas</i>	74%
5/18/21	YAD008A	500	no dominant	n/a	<i>Dinobryon</i>	30%
6/23/21	YAD007A	6,800	Greens	95%	<i>Eudorina</i>	94%
6/23/21	YAD008A	7,600	Greens	90%	<i>Eudorina</i>	90%
7/26/21	YAD007A	2,400	no dominant	n/a	no dominant	n/a
8/10/21	YAD007A	2,600	no dominant	n/a	no dominant	n/a
8/10/21	YAD008A	1,200	Chrysophytes	42%	<i>Ochromonas</i>	42%
9/15/21	YAD007A	13,700	Greens	56%	<i>Eudorina</i>	55%
9/15/21	YAD008A	11,500	Greens	82%	<i>Eudorina</i>	81%

Algal densities and dominance at Stations YADLH01 and YADLH04 at **Lake Hampton**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YADLH01	24,000	moderate	Chrysophytes	88%	<i>Ochromonas</i>	86%
5/18/21	YADLH04	12,700	mild	Chrysophytes	90%	<i>Ochromonas</i>	83%
6/23/21	YADLH01	23,500	moderate	no dominant	n/a	no dominant	n/a
6/23/21	YADLH04	11,300	mild	Diatoms	40%	no dominant	n/a
7/14/21	YADLH01	26,200	moderate	no dominant	n/a	no dominant	n/a
7/14/21	YADLH04	22,200	moderate	Diatoms	52%	no dominant	n/a
8/10/21	YADLH01	23,400	moderate	Cyanobacteria	88%	<i>Cylindrospermopsis</i>	81%
8/10/21	YADLH04	47,200	severe	Cyanobacteria	96%	<i>Cylindrospermopsis</i>	92%
9/15/21	YADLH01	119,800	extreme	Cyanobacteria	86%	<i>Cylindrospermopsis</i>	84%
9/15/21	YADLH04	57,600	severe	Cyanobacteria	95%	<i>Cylindrospermopsis</i>	92%

Algal biovolumes and dominance at Stations YADLH01 and YADLH04 at **Lake Hampton**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YADLH01	1,500	Chrysophytes	84%	<i>Ochromonas</i>	82%
5/18/21	YADLH04	800	Chrysophytes	88%	<i>Ochromonas</i>	79%
6/23/21	YADLH01	5,800	no dominant	n/a	<i>Trachelomonas</i>	35%
6/23/21	YADLH04	2,600	no dominant	n/a	no dominant	n/a
7/14/21	YADLH01	2,800	no dominant	n/a	no dominant	n/a
7/14/21	YADLH04	2,200	no dominant	n/a	no dominant	n/a
8/10/21	YADLH01	2,600	no dominant	n/a	<i>Cylindrospermopsis/ Trachelomonas</i>	36%/ 32%
8/10/21	YADLH04	2,300	Cyanobacteria	96	<i>Cylindrospermopsis</i>	92%
9/15/21	YADLH01	8,300	Cyanobacteria	62%	<i>Cylindrospermopsis</i>	60%
9/15/21	YADLH04	3,900	Cyanobacteria	68%	<i>Cylindrospermopsis</i>	66%

Algal densities and dominance at Station YAD077C at **Salem Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	11,100	mild	Chrysophytes	41%	no dominant	n/a
6/9/21	10,900	mild	Chrysophytes	50%	<i>Dinobryon</i>	40%
7/7/21	9,700	n/a	no dominant	n/a	no dominant	n/a
8/5/21	12,100	mild	no dominant	n/a	no dominant	n/a

Algal biovolumes and dominance at Station YAD077C at **Salem Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	2,200	Diatoms	55%	<i>Asterionella</i>	49%
6/9/21	1,800	no dominant	n/a	no dominant	n/a
7/7/21	3,900	Dinoflagellates	43%	<i>Peridinium</i>	41%
8/5/21	3,000	no dominant	n/a	no dominant	n/a

Algal densities and dominance at Stations YAD152C and YAD169F at **High Rock Lake**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YAD152C	43,900	severe	Cyanobacteria	77%	<i>Cylindrospermopsis</i>	46%
5/18/21	YAD169F	18,800	mild	Cyanobacteria	59%	no dominant	n/a
6/15/21	YAD152C	33,000	severe	no dominant	n/a	no dominant	n/a
6/15/21	YAD169F	17,100	mild	no dominant	n/a	no dominant	n/a
7/13/21	YAD152C	35,700	severe	Cyanobacteria	79%	<i>Chroococcus</i>	35%
7/13/21	YAD169F	67,300	severe	Cyanobacteria	74%	<i>Chroococcus</i>	41%
8/11/21	YAD152C	55,800	severe	Cyanobacteria	78%	<i>Pseudanabaena</i>	32%
8/11/21	YAD169F	75,000	severe	Cyanobacteria	66%	<i>Pseudanabaena</i>	34%
9/13/21	YAD152C	118,400	extreme	Cyanobacteria	83%	<i>Pseudanabaena</i>	64%
9/13/21	YAD169F	23,300	moderate	Cyanobacteria	78%	<i>Pseudanabaena</i>	37%

Algal biovolumes and dominance at Stations YAD152C and YAD169F at **High Rock Lake**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/18/21	YAD152C	2,600	Cyanobacteria/ Diatoms	48%/ 43%	<i>Cylindrospermopsis/ round diatoms</i>	38%/ 38%
5/18/21	YAD169F	1,500	Diatoms	45%	no dominant	n/a
6/15/21	YAD152C	10,200	Euglenoids	42%	<i>Cylindrospermopsis</i>	37%
6/15/21	YAD169F	2,700	no dominant	n/a	no dominant	n/a
7/13/21	YAD152C	3,200	no dominant	n/a	<i>Chrysochromulina</i>	30%
7/13/21	YAD169F	7,100	Dinoflagellates	49%	<i>Peridinium</i>	31%
8/11/21	YAD152C	7,000	no dominant	n/a	no dominant	n/a
8/11/21	YAD169F	11,300	no dominant	n/a	no dominant	n/a
9/13/21	YAD152C	13,000	Cyanobacteria	48%	<i>Pseudanabaena</i>	43%
9/13/21	YAD169F	2,700	Cyanobacteria	44%	<i>Gonyostomum/ Pseudanabaena</i>	35%/ 32%

Algal densities and dominance at Station YAD1611A at **Lake Thom-a-Lex**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	41,100	severe	Cyanobacteria	54%	<i>Cylindrospermopsis</i>	35%
6/9/21	14,400	mild	no dominant	n/a	no dominant	n/a
7/7/21	98,400	severe	Cyanobacteria	80%	<i>Cylindrospermopsis</i>	42%
8/5/21	51,400	severe	Cyanobacteria	74%	<i>Cylindrospermopsis/ Chroococcus</i>	36%/30%
#####	67,400	severe	Cyanobacteria	73%	<i>Cylindrospermopsis</i>	48%

Algal biovolumes and dominance at Station YAD1611A at **Lake Thom-a-Lex**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	5,000	no dominant	n/a	no dominant	n/a
6/9/21	4,200	no dominant	n/a	<i>Gonyostomum</i>	34%
7/7/21	5,300	Cyanobacteria	61%	<i>Cylindrospermopsis</i>	39%
8/5/21	2,300	Cyanobacteria	65%	<i>Cylindrospermopsis</i>	39%
#####	5,700	Cyanobacteria	41%	no dominant	n/a

Algal densities and dominance at Stations YAD172C and YAD1780A at **Tuckertown Reservoir**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	YAD172C	15,800	mild	Cyanobacteria	77%	<i>Cylindrospermopsis</i>	47%
5/24/21	YAD1780A	28,600	moderate	Cyanobacteria/ Chrysophytes	52%/41%	<i>Cylindrospermopsis</i>	38%
6/15/21	YAD172C	5,700	n/a	no dominant	n/a	no dominant	n/a
6/15/21	YAD1780A	24,000	moderate	Cyanobacteria	49%	<i>Pseudanabaena</i>	34%
7/26/21	YAD172C	46,900	severe	Cyanobacteria	54%	<i>Chroococcus</i>	34%
7/26/21	YAD1780A	43,000	severe	Cyanobacteria	57%	<i>Chroococcus</i>	31%
8/25/21	YAD172C	15,900	mild	Cyanobacteria	53%	<i>Pseudanabaena</i>	36%
8/25/21	YAD1780A	46,900	severe	Cyanobacteria	57%	no dominant	n/a
9/23/21	YAD172C	18,800	mild	Cyanobacteria	77%	<i>Pseudanabaena</i>	38%
9/23/21	YAD1780A	33,700	severe	Cyanobacteria	69%	<i>Pseudanabaena</i>	34%

Algal biovolumes and dominance at Stations YAD172C and YAD1780A at **Tuckertown Reservoir**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	YAD172C	800	Cyanobacteria	62%	<i>Cylindrospermopsis</i>	43%
5/24/21	YAD1780A	3,100	no dominant	n/a	no dominant	n/a
6/15/21	YAD172C	1,300	Euglenoids	40%	<i>Trachelomonas</i>	40%
6/15/21	YAD1780A	3,600	no dominant	n/a	no dominant	n/a
7/26/21	YAD172C	6,200	no dominant	n/a	no dominant	n/a
7/26/21	YAD1780A	4,200	no dominant	n/a	no dominant	n/a
8/25/21	YAD172C	1,700	no dominant	n/a	no dominant	n/a
8/25/21	YAD1780A	3,000	Cyanobacteria	49%	<i>Pseudanabaena</i>	39%
9/23/21	YAD172C	1,500	Cyanobacteria	43%	no dominant	n/a
9/23/21	YAD1780A	5,000	Cryptomonads	44%	<i>Cryptomonas</i>	41%

Appendix B - Yadkin-Pee Dee Lakes Phytoplankton Analysis for 2021

Algal densities and dominance at Station YAD178F at **Badin Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	28,000	moderate	Chrysophytes	56%	<i>Ochromonas</i>	44%
6/15/21	22,100	moderate	no dominant	n/a	<i>Synedra</i>	32%
7/26/21	18,600	mild	Cyanobacteria	42%	no dominant	n/a
8/25/21	74,100	severe	Cyanobacteria	50%	no dominant	n/a
9/23/21	13,100	mild	Cyanobacteria	75%	<i>Cylindrospermopsis</i>	46%

Algal biovolumes and dominance at Station YAD178F at **Badin Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	3,400	no dominant	n/a	<i>Trachelomonas</i>	30%
6/15/21	3,000	no dominant	n/a	no dominant	n/a
7/26/21	2,100	no dominant	n/a	no dominant	n/a
8/25/21	6,800	no dominant	n/a	no dominant	n/a
9/23/21	900	Cyanobacteria	47%	<i>Cylindrospermopsis</i>	34%

Algal densities and dominance at Station YAD178F5 at **Falls Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	8,500	n/a	Chrysophytes	41%	<i>Ochromonas</i>	30%
6/30/21	2,000	n/a	Cyanobacteria	40%	no dominant	n/a
7/20/21	11,600	mild	Cyanobacteria	41%	no dominant	n/a
8/19/21	16,000	mild	Cyanobacteria	58%	no dominant	n/a
9/14/21	11,300	mild	Cryptomonads	44%	<i>Komma</i>	43%

Algal biovolumes and dominance at Station YAD178F5 at **Falls Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/24/21	1,400	Euglenoids	41%	<i>Trachelomonas</i>	41%
6/30/21	300	Euglenoids	61%	<i>Trachelomonas</i>	61%
7/20/21	2,100	Euglenoids	49%	<i>Trachelomonas</i>	49%
8/19/21	1,500	no dominant	n/a	<i>Peridinium</i>	32%
9/14/21	3,000	no dominant	n/a	<i>Trachelomonas</i>	34%

Algal densities and dominance at Station YAD179F at **Lake Reese**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	13,000	mild	Cyanobacteria	42%	<i>Cylindrospermopsis</i>	38%
#####	34,500	severe	no dominant	n/a	<i>Ochromonas</i>	33%
#####	51,800	severe	no dominant	n/a	no dominant	n/a
#####	139,400	extreme	Cyanobacteria	65%	<i>Cylindrospermopsis</i>	55%
9/8/21	37,600	severe	Greens	53%	<i>Ankistrodesmus</i>	51%

Algal biovolumes and dominance at Station YAD179F at **Lake Reese**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	2,500	Euglenoids	57%	<i>Trachelomonas</i>	57%
#####	3,100	no dominant	n/a	no dominant	n/a
#####	7,700	no dominant	n/a	no dominant	n/a
#####	11,600	no dominant	n/a	<i>Cylindrospermopsis</i>	33%
9/8/21	2,700	no dominant	n/a	no dominant	n/a

Algal densities and dominance at Station YAD181G at **Bunch Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	11,700	mild	Cyanobacteria	44%	no dominant	n/a
6/2/21	5,700	n/a	no dominant	n/a	no dominant	n/a
7/13/21	20,500	moderate	Greens	44%	no dominant	n/a
8/4/21	28,400	moderate	no dominant	n/a	no dominant	n/a
9/8/21	10,900	mild	Cyanobacteria	56%	no dominant	n/a

Algal biovolumes and dominance at Station YAD181G at **Bunch Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	4,000	Euglenoids	42%	<i>Trachelomonas</i>	42%
6/2/21	2,900	no dominant	n/a	no dominant	n/a
7/13/21	4,400	Prymnesiophytes	40%	<i>Chrysoschromulina</i>	40%
8/4/21	5,100	Cyanobacteria	52%	<i>Aphanizomenon</i>	51%
9/8/21	2,900	Cyanobacteria	65%	<i>Oscillatoria</i>	46%

Algal densities and dominance at Station YAD181L at **Back Creek Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	19,800	mild	Cyanobacteria	53%	<i>Cylindrospermopsis</i>	30%
6/2/21	17,500	mild	no dominant	n/a	no dominant	n/a
7/13/21	134,300	extreme	Cyanobacteria	61%	no dominant	n/a
8/4/21	126,300	extreme	Cyanobacteria/ Greens	49%/44%	<i>Ankistrodesmus</i>	41%
9/8/21	51,100	extreme	Cyanobacteria	60%	<i>Cylindrospermopsis</i>	55%

Algal biovolumes and dominance at Station YAD181L at **Back Creek Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	5,100	no dominant	n/a	no dominant	n/a
6/2/21	4,600	Prymnesiophytes	44%	<i>Chrysoschromulina</i>	44%
7/13/21	14,400	no dominant	n/a	no dominant	n/a
8/4/21	6,700	Cyanobacteria	68%	<i>Pseudanabaena</i>	54%
9/8/21	5,200	no dominant	n/a	<i>Trachelomonas</i>	32%

Algal densities and dominance at Station YAD189C at **Lake Tillery**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	12,600	mild	Cyanobacteria/ Chrysophytes	48%/40%	no dominant	n/a
#####	19,400	mild	Chrysophytes	42%	<i>Ochromonas</i>	31%
#####	16,900	mild	no dominant	n/a	no dominant	n/a
#####	27,100	moderate	Cyanobacteria	69%	no dominant	n/a
#####	21,900	moderate	Cyanobacteria	44%	no dominant	n/a

Algal biovolumes and dominance at Station YAD189C at **Lake Tillery**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	1,700	no dominant	n/a	<i>Cryptomonas</i>	33%
#####	3,300	no dominant	n/a	no dominant	n/a
#####	3,500	Cryptomonads	46%	<i>Cryptomonas</i>	38%
#####	4,000	no dominant	n/a	<i>Trachelomonas</i>	35%
#####	2,400	no dominant	n/a	no dominant	n/a

Algal densities and dominance at Station YAD260B at **Blewett Falls**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/26/21	18,000	mild	Chrysophytes	46%	no dominant	n/a
6/24/21	12,100	mild	no dominant	n/a	<i>Dinobryon</i>	38%
7/22/21	12,100	mild	no dominant	n/a	no dominant	n/a
8/25/21	11,500	mild	Cyanobacteria	49%	no dominant	n/a
9/22/21	7,200	n/a	no dominant	n/a	no dominant	n/a

Algal biovolumes and dominance at Station YAD260B at **Blewett Falls**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/26/21	4,500	Diatoms	55%	<i>Aulacoseira</i>	48%
6/24/21	4,300	no dominant	n/a	<i>Trachelomonas</i>	36%
7/22/21	2,200	no dominant	n/a	<i>Trachelomonas</i>	33%
8/25/21	2,000	Euglenoids	41%	<i>Trachelomonas</i>	31%
9/22/21	2,400	Euglenoids	68%	<i>Trachelomonas</i> / <i>Euglena</i>	38%/31%

Algal densities and dominance at Station YAD207C at **Kannapolis Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/11/21	5,700	n/a	Cyanobacteria	56%	no dominant	n/a
6/9/21	10,900	mild	Chrysophytes	40%	<i>Dinobryon</i>	38%
8/2/21	41,300	severe	Cyanobacteria	94%	<i>Cylindrospermopsis</i>	64%
8/30/21	28,000	moderate	Cyanobacteria	84%	no dominant	n/a
9/21/21	51,000	severe	Cyanobacteria	84%	<i>Chroococcus</i>	41%

Algal biovolumes and dominance at Station YAD207C at **Kannapolis Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/11/21	1,100	no dominant	n/a	<i>Aulacoseira</i>	35%
6/9/21	3,000	no dominant	n/a	<i>Chrysoschromulina</i>	32%
8/2/21	2,700	Cyanobacteria	62%	<i>Cylindrospermopsis</i> / <i>Peridinium</i>	47%/34%
8/30/21	1,700	Cyanobacteria	63%	<i>Pseudanabaena</i>	35%
9/21/21	3,000	no dominant	n/a	<i>Peridinium</i>	31%

Appendix B - Yadkin-Pee Dee Lakes Phytoplankton Analysis for 2021

Algal densities and dominance at Station YAD216A at **Lake Fisher**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	18,700	mild	Cyanobacteria	49%	<i>Ochromonas</i>	30%
#####	21,500	moderate	no dominant	n/a	<i>Ochromonas</i>	38%
8/2/21	41,900	severe	Greens/ Cyanobacteria	51%/ 40%	<i>Ankistrodesmus</i>	48%
#####	45,000	severe	Cyanobacteria	92%	<i>Cylindrospermopsis</i>	73%

Algal biovolumes and dominance at Station YAD216A at **Lake Fisher**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	1,600	no dominant	n/a	no dominant	n/a
#####	5,600	Raphidophytes	52%	<i>Gonyostomum</i>	52%
8/2/21	1,500	Greens	50%	<i>Ankistrodesmus</i>	41%
#####	2,200	Cyanobacteria	79%	<i>Cylindrospermopsis</i>	73%

Algal densities and dominance at Station YAD216G at **Lake Concord**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	14,700	mild	Cyanobacteria	74%	no dominant	n/a
6/9/21	10,600	mild	Chrysophytes	60%	<i>Ochromonas</i>	58%
7/7/21	166,300	extreme	Cyanobacteria	78%	<i>Planktolyngbya</i>	49%
#####	125,600	extreme	Cyanobacteria	87%	<i>Cylindrospermopsis</i>	71%
#####	50,300	severe	Cyanobacteria	75%	<i>Cylindrospermopsis</i>	41%

Algal biovolumes and dominance at Station YAD216G at **Lake Concord**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	1,100	no dominant	n/a	<i>Trachelomonas</i>	39%
6/9/21	1,100	no dominant	n/a	<i>Chrysochromulina/Ochromonas</i>	39%/ 33%
7/7/21	6,400	Cyanobacteria	50%	no dominant	n/a
#####	6,400	Cyanobacteria	74%	<i>Cylindrospermopsis</i>	68%
#####	2,900	no dominant	n/a	<i>Cylindrospermopsis</i>	35%

Algal densities and dominance at Stations YAD232D and YAD232F at **Lake Monroe**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/25/21	YAD232D	110,500	extreme	Cyanobacteria	99%	<i>Chroococcus</i>	96%
5/25/21	YAD232F	5,300	n/a	Cyanobacteria	66%	no dominant	n/a
6/23/21	YAD232F	29,600	moderate	Cyanobacteria	48%	no dominant	n/a
7/14/21	YAD232F	110,000	extreme	Cyanobacteria	41%	no dominant	n/a
8/24/21	YAD232F	98,800	severe	Cyanobacteria	69%	<i>Cylindrospermopsis</i>	33%
9/29/21	YAD232F	70,700	severe	Cyanobacteria	61%	<i>Cylindrospermopsis</i>	33%

Algal biovolumes and dominance at Stations YAD232D and YAD232F at **Lake Monroe**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/25/21	YAD232D	6,200	Cyanobacteria	99%	<i>Anabaena</i>	88%
5/25/21	YAD232F	3,000	Cyanobacteria	63%	<i>Anabaena</i>	53%
6/23/21	YAD232F	4,400	no dominant	n/a	<i>Cryptomonas</i>	37%
7/14/21	YAD232F	8,400	Diatoms	57%	round diatoms	54%
8/24/21	YAD232F	7,500	Cyanobacteria	63%	no dominant	n/a
9/29/21	YAD232F	5,000	no dominant	n/a	no dominant	n/a

Algal densities and dominance at Stations YAD232H and YAD233 at **Lake Lee**

Date	Station	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/25/21	YAD232H	13,300	mild	Cyanobacteria	71%	<i>Aphanizomenon</i>	50%
5/25/21	YAD233	8,200	n/a	Euglenoids	54%	<i>Trachelomonas</i>	53%
6/23/21	YAD233	26,600	moderate	Cyanobacteria	40%	<i>Chroococcus</i>	30%
7/14/21	YAD233	77,200	severe	no dominant	n/a	no dominant	n/a
8/24/21	YAD233	52,400	severe	Cyanobacteria	42%	no dominant	n/a
9/29/21	YAD233	44,700	severe	Cyanobacteria	50%	<i>Chroococcus</i>	42%

Algal biovolumes and dominance at Stations YAD232H and YAD233 at **Lake Lee**

Date	Station	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/25/21	YAD232H	11,100	Cyanobacteria	86%	<i>Anabaena</i>	55%
5/25/21	YAD233	11,700	Euglenoids	88%	<i>Trachelomonas</i>	86%
6/23/21	YAD233	9,600	Euglenoids	76%	<i>Trachelomonas</i>	76%
7/14/21	YAD233	18,000	Euglenoids	53%	<i>Trachelomonas</i>	46%
8/24/21	YAD233	4,100	Diatoms	49%	round diatoms	34%
9/29/21	YAD233	4,600	no dominant	n/a	<i>Trachelomonas</i>	36%

Algal densities and dominance at Station YAD236 at **Lake Twitty**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	29,300	moderate	no dominant	n/a	no dominant	n/a
#####	8,000	n/a	Greens	49%	no dominant	n/a
#####	19,600	mild	Cyanobacteria	45%	no dominant	n/a
#####	85,700	severe	Cyanobacteria	78%	<i>Pseudanabaena</i>	50%
#####	15,800	mild	Cyanobacteria	49%	<i>Pseudanabaena</i>	36%

Algal biovolumes and dominance at Station YAD236 at **Lake Twitty**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	7,200	no dominant	n/a	no dominant	n/a
#####	3,900	no dominant	n/a	no dominant	n/a
#####	4,200	no dominant	n/a	no dominant	n/a
#####	8,600	Cyanobacteria	55%	<i>Pseudanabaena</i>	46%
#####	1,900	no dominant	n/a	<i>Pseudanabaena</i>	32%

Algal densities and dominance at Station YADCCR01 at **Coddle Creek Reservoir**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	18,600	mild	Cyanobacteria	98%	<i>Aphanizomenon</i>	97%
6/9/21	13,500	mild	Cyanobacteria	79%	<i>Aphanizomenon</i>	76%
7/7/21	21,600	moderate	Cyanobacteria	84%	<i>Aphanizomenon/Cylindrospermopsis</i>	45%/ 39%
8/11/21	27,000	moderate	Cyanobacteria	92%	<i>Cylindrospermopsis</i>	91%
9/14/21	30,000	moderate	Cyanobacteria	87%	<i>Cylindrospermopsis</i>	84%

Algal biovolumes and dominance at Station YADCCR01 at **Coddle Creek Reservoir**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/20/21	6,200	Cyanobacteria	97%	<i>Aphanizomenon</i>	92%
6/9/21	3,800	Cyanobacteria	71%	<i>Aphanizomenon</i>	59%
7/7/21	4,000	Cyanobacteria	91%	<i>Aphanizomenon</i>	80%
8/11/21	2,000	Cyanobacteria	63%	<i>Cylindrospermopsis</i>	59%
9/14/21	2,200	Cyanobacteria	62%	<i>Cylindrospermopsis</i>	55%

Algal densities and dominance at Station YAD263 at **Roberdel Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	14,300	mild	Chrysophytes/ Cyanobacteria	50%/40%	<i>Cylindrospermopsis</i>	38%
6/2/21	10,200	mild	no dominant	n/a	no dominant	n/a
#####	30,900	severe	Diatoms	48%	<i>Asterionella</i>	40%
#####	32,000	severe	Cyanobacteria	47%	<i>Planktolyngbya</i>	44%
#####	19,800	mild	no dominant	n/a	no dominant	n/a

Algal biovolumes and dominance at Station YAD263 at **Roberdel Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	1,500	no dominant	n/a	<i>Chrysochromulina</i>	37%
6/2/21	2,700	no dominant	n/a	no dominant	n/a
#####	32,000	Diatoms	84%	<i>Asterionella</i>	84%
#####	7,200	Diatoms	61%	<i>Asterionella</i>	55%
#####	6,200	no dominant	n/a	no dominant	n/a

Algal densities and dominance at Station YAD265C at **Rockingham City Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	1,400	n/a	Chrysophytes	87%	<i>Dinobryon</i>	59%
#####	1,500	n/a	no dominant	n/a	no dominant	n/a
8/4/21	1,100	n/a	Greens	40%	<i>Coelastrum</i>	40%
#####	2,200	n/a	Cyanobacteria	53%	<i>Microcystis</i>	38%
#####	1,500	n/a	Cyanobacteria	55%	<i>Chroococcus</i>	38%

Algal biovolumes and dominance at Station YAD265C at **Rockingham City Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	100	Chrysophytes	60%	<i>Dinobryon/Microcystis</i>	44%/34%
#####	1,200	Raphidophytes	73%	<i>Gonyostomum</i>	73%
8/4/21	2,300	Raphidophytes	97%	<i>Gonyostomum</i>	97%
#####	2,700	Euglenoids	45%	<i>Gonyostomum</i>	32%
#####	200	Cryptomonads	51%	<i>Cryptomonas</i>	49%

Appendix B - Yadkin-Pee Dee Lakes Phytoplankton Analysis for 2021

Algal densities and dominance at Station YAD275J at **Wadesboro City Pond**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	59,000	severe	Chrysophytes	55%	<i>Ochromonas/ Aphanizomenon</i>	53%/33%
#####	16,400	mild	Cyanobacteria	76%	<i>Chroococcus</i>	53%
#####	23,600	moderate	Cyanobacteria	85%	<i>Cylindrospermopsis</i>	76%
#####	13,700	mild	Cyanobacteria	52%	no dominant	n/a
#####	20,000	mild	Cyanobacteria	71%	<i>Aphanizomenon</i>	32%

Algal biovolumes and dominance at Station YAD275J at **Wadesboro City Pond**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
#####	12,400	Cyanobacteria	73%	<i>Aphanizomenon</i>	72%
#####	1,500	Cyanobacteria/ Greens	58%/30%	<i>Aphanizomenon</i>	50%
#####	1,200	Cyanobacteria	81%	<i>Cylindrospermopsis</i>	73%
#####	2,400	Cyanobacteria	53%	no dominant	n/a
#####	4,000	Euglenoids/ Cyanobacteria	45%/40%	<i>Trachelomonas/ Aphanizomenon</i>	45%/33%

Algal densities and dominance at Station YAD283 at **Hamlet City Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	6,000	n/a	Chrysophytes	84%	<i>Ochromonas</i>	65%
6/30/21	2,800	n/a	no dominant	n/a	no dominant	n/a
8/4/21	3,400	n/a	Greens	47%	no dominant	n/a
8/26/21	6,600	n/a	Greens	60%	<i>Coelastrum</i>	45%
9/23/21	6,100	n/a	Greens	61%	<i>Coelastrum</i>	44%

Algal biovolumes and dominance at Station YAD283 at **Hamlet City Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	600	Chrysophytes	81%	<i>Ochromonas</i>	40%
6/30/21	2,500	Euglenoids	72%	<i>Euglena/ Trachelomonas</i>	38%/ 34%
8/4/21	1,800	Euglenoids	53%	<i>Trachelomonas</i>	42%
8/26/21	3,100	Euglenoids	65%	<i>Trachelomonas</i>	37%
9/23/21	3,000	Euglenoids/ Greens	47%/ 41%	<i>Trachelomonas</i>	33%

Algal densities and dominance at Station YAD280E at **Water Lake**

Date	Density (units/ml)	Bloom magnitude	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	2,300	n/a	Chrysophytes	84%	<i>Ochromonas</i>	75%
#####	3,100	n/a	no dominant	n/a	no dominant	n/a
8/4/21	9,100	n/a	Chrysophytes	63%	<i>Ochromonas</i>	43%
#####	7,500	n/a	Chrysophytes	65%	<i>Ochromonas</i>	37%
#####	4,000	n/a	Chrysophytes	45%	no dominant	n/a

Algal biovolumes and dominance at Station YAD280E at **Water Lake**

Date	Biovolume (mm ³ /m ³)	Dominant Group	Group % Dominance	Dominant Taxa	Taxa % Dominance
5/5/21	200	Chrysophytes	64%	<i>Ochromonas</i>	43%
#####	800	no dominant	n/a	<i>Chrysochromulina</i>	38%
8/4/21	2,700	Chrysophytes	41%	no dominant	n/a
#####	1,500	Chrysophytes	68%	<i>Synura</i>	55%
#####	1,500	no dominant	n/a	<i>Peridinium</i>	33%

Appendix C – Ecological Implications of Dominant Lake Algal Groups

Cyanobacteria (Blue-greens):

Cyanobacteria (also known as blue-green algae) are common indicators of nutrient enrichment. Cyanobacteria blooms can cause unsightly water discoloration, surface films, flecks, mats, taste and odor problems, and some, such as *Cylindrospermopsis*, are known to produce toxins (Wehr and Sheath 2003). Historically, there have been no documented cases of health problems caused by cyanobacteria in North Carolina.

Diatoms:

Diatoms are generally considered beneficial as a food source for small crustaceans, fish, and other aquatic life. They are well adapted to lower light intensities and tend to be more prevalent in freshwater systems during cooler months. Diatom blooms are known to cause taste and odor problems, and their silica cell walls are notorious for clogging water treatment plant intake filters (Wehr and Sheath 2003).

Euglenoids:

Euglenoids tend to be found in waters rich in organic matter and frequently associated with animal wastes. Euglenoid blooms can discolor water, ranging from red or brown to green (Wehr and Sheath 2003).

Greens:

Green algae are generally beneficial and provide food and shelter for many aquatic insects and fish. They may bloom when environmental conditions are conducive for excessive growth. Blooms are usually an indication of elevated nutrients. Some algal blooms can discolor the water and cause changes in the amount of oxygen in the water. This in turn can affect fish and other aquatic life. Filamentous greens can form large unsightly mats which can hamper boating, fishing, and swimming (Wehr and Sheath 2003).

Cryptomonads:

Cryptomonads are some of the most common algae in North Carolina. They are an important food source for many aquatic organisms (Wehr and Sheath 2003).

Dinoflagellates:

Dinoflagellates are known to form blooms which are generally a response to nutrient enrichment (Wehr and Sheath 2003).

Prymnesiophytes and Chrysochromulina:

Several species of the prymnesiophyte *Chrysochromulina* are common in North Carolina. They are known to form blooms and are common in eutrophic waters (Wehr and Sheath 2003). These blooms are more likely to occur during summer and fall. Blooms may discolor the water and are often associated with elevated levels of chlorophyll *a*.

Gonyostomum is common in bogs, lakes, and ponds that are generally of low pH (< 6). It is indicative of dystrophic and eutrophic conditions (Wehr and Sheath 2003). Although usually in low numbers, *Gonyostomum* is known to form nuisance blooms in the summer.

Chrysophytes:

Chrysophytes are generally an indicator of clean, low nutrient, waters (Wehr and Sheath 2003). They can be found throughout North Carolina but are rarely abundant. Some chrysophytes can cause tastes and odors in drinking water (Palmer, C. M. 1977).

Palmer, C. M. 1977. Algae and water pollution. EPA-600/9-77-036. National Technical Information Service, Springfield, VA).

Wehr, J. D. and R. G. Sheath (Eds). 2003. Freshwater algae of North America: ecology and classification. Academic Press, San Diego, CA.