LAKE & RESERVOIR ASSESSMENTS
CATAWBA RIVER BASIN

Lake Norman

Intensive Survey Branch
Water Sciences Section
Division of Environmental Quality
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GLOSSARY

Algae	Small aquatic plants that occur as single cells, colonies, or filaments. May also be referred to as phytoplankton, although phytoplankton are a subset of algae.
Algal biovolume	The volume of all living algae in a unit area at a given point in time. To determine biovolume, individual cells in a known amount of sample are counted. Cells are measured to obtain their cell volume, which is used in calculating biovolume
Algal density	The density of algae based on the number of units (single cells, filaments and/or colonies) present in a milliliter of water. The severity of an algae bloom may be determined by the algal density as follows: Mild bloom = 20,000 to 30,000 units/ml Severe bloom = 30,000 to 100,000 units/ml Extreme bloom = Greater than 100,000 units/ml
Algal Growth Potential Test (AGPT)	A test to determine the nutrient that is the most limiting to the growth of algae in a body of water. The sample water is split such that one sub-sample is given additional nitrogen, another is given phosphorus, a third may be given a combination of nitrogen and phosphorus, and one sub-sample is not treated and acts as the control. A specific species of algae is added to each sub-sample and is allowed to grow for a given period of time. The dry weights of algae in each sub-sample and the control are then measured to determine the rate of productivity in each treatment. The treatment (nitrogen or phosphorus) with the greatest algal productivity is said to be the limiting nutrient of the sample source. If the control sample has an algal dry weight greater than 5 mg/L, the source water is considered to be unlimited for either nitrogen or phosphorus.
Centric diatom	Diatoms are photosynthetic algae that have a siliceous skeleton (frustule) found in almost every aquatic environment including fresh and marine waters, as well as moist soils. Centric diatoms are circular in shape and are often found in the water column.
Chlorophyll *a*	Chlorophyll *a* is an algal pigment that is used as an approximate measure of algal biomass. The concentration of chlorophyll *a* is used in the calculation of the NCTSI, and the value listed is a lake-wide average from all sampling locations.
Clinograde	In productive lakes where oxygen levels drop to zero in the lower waters near the bottom, the graphed changes in oxygen from the surface to the lake bottom produces a curve known as clinograde curve.
Coccoid	Round or spherical shaped cell
Conductivity	This is a measure of the ability of water to conduct an electrical current. This measure increases as water becomes more mineralized. The concentrations listed are the range of values observed in surface readings from the sampling locations.
Dissolved oxygen	The range of surface concentrations found at the sampling locations.
Dissolved oxygen saturation	The capacity of water to absorb oxygen gas. Often expressed as a percentage, the amount of oxygen that can dissolve into water will change depending on a number of parameters, the most important being temperature. Dissolved oxygen saturation is inversely proportion to temperature, that is, as temperature increases, water's capacity for oxygen will decrease, and vice versa.
Eutrophic	Describes a lake with high plant productivity and low water transparency.
Eutrophication	The process of physical, chemical, and biological changes associated with nutrient, organic matter, and silt enrichment and sedimentation of a lake.

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

Overview

The Catawba River and the Broad River Basins form the headwaters of the Santee-Cooper River system, which flows through South Carolina to the Atlantic Ocean. The basin is the eighth largest river basin in the state covering 3,279 square miles in the south central portion of western North Carolina. The Catawba River has its source on the eastern slopes of the Blue Ridge Mountains in McDowell County, and flows eastward, then southward, to the state line near Charlotte. The headwaters of the river are formed by swift flowing, cold water streams originating in the steep terrain of the mountains. Although the topography of the upper basin is characterized by mountains, smaller hills give way to a rolling terrain near the state line. As the basin enters the Inner Piedmont, land use shifts from forest to agricultural and urban uses. Though urban areas are not numerous in the upper basin, the lower portion of the basin contains many cities, including the Charlotte metropolitan area.

Eight lakes were sampled in this river basin by DWR staff in 2017. Three lakes appear on the 2014 303(d) List of Impaired Waters (Table 1) (http://portal.ncdenr.org/web/wq/ps/mtu/assessment).

Table 1. Catawba River Basin Lakes on the 2014 303(d) List of Impaired Waters.

Lake	Location	Violation	303(d) Year
Lake Norman below elevation 76	From Lyle Creek to Cowan's Dam	PCB Fish Tissue Advisory	2014
Mountain Island Lake	From Water Intake at River Bend Steam Station to Mountain Island Dam (Town of Mount Holly water supply intake)	PCB Fish Tissue Advisory	2014
Lake Wylie below elevation 570	From Mountain Island Dam to NC/SC state line	PCB Fish Tissue Advisory	2014
Catawba River (Lake Wylie South Fork Catawba Arm)	South Fork Catawba River Arm of Lake Wylie	Elevated Copper Level PCB Fish Tissue Advisory	2008 2014

On April 2, 2008, a state-wide fish consumption advisory was placed on fish caught in the state which may be high in mercury. These include largemouth bass, blackfish (bowfin), catfish, and jackfish (chain pickerel) See http://www.epi.state.nc.us/epi/fish/current.html for additional information on fish consumption advisories in the state.

Following the description of the assessment methodology used for the Lumber River Basin, there are individual summaries for each of the lakes.

Assessment Methodology

For this report, data from January 1, 2011 through December 31, 2016 were reviewed. Lake monitoring and sample collection activities performed by DWR field staff are in accordance with the Intensive Survey Unit Standard Operating Procedures Manual (http://portal.ncdenr.org/c/document_library/get_file?uuid=522a90a4-b593-426f-8c11-21a35569dfd8&groupId=38364) An interactive map of the state showing the locations of lake sites sampled by DWR may be found at http://www.arcgis.com/home/webmap/viewer.html?webmap=9dbc8edafb7743a9b7ef3f6fed5c4db0&extent=-87.8069,29.9342,-71.5801,38.7611.

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

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

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

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

Quality Assurance of Field and Laboratory Lakes Data

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

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

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

Weather Overview for Summer 2017

May 2017 moderate temperatures were primarily due to frequent cloudy skies which held down daytime temperatures and prevented the loss of heat at night. The average statewide temperature was 67.1°F. Average rainfall was 6.5”, making May 2017 the 6th wettest May on record. Cool temperatures continued into June with a statewide average temperature of 73.2°F. Rainfall in the Catawba River Basin in June ranged from 5” to 10”.

Summer heat picked up in July with the statewide average temperature becoming 78.1°F. The central Piedmont region of the state received less than 50% of the normal July rainfall. The Catawba River Basin, however did not fall within the region of Abnormally Dry conditions as determined by the State Drought Monitor in July.

The statewide average temperature in August dripped to 75.2°F. The Charlotte region of the Catawba River Basin experienced 13 to 15 days with temperatures above 90°F during the month. In September, the central and southern Catawba River Basin picked up a month’s worth of rainfall from the remnants of Hurricane Irma. The statewide average temperature in September was 69.7°F. The moderate temperatures in September reduced the potential severity of the dryness which continued in the central portion of the state.

Lake James

Ambient Lakes Program Name	Lake James					
Trophic Status (NC TSI)	Oligotrophic					
Mean Depth (meters)	14.0					
Volume ($10^6 m^3$)	36.9					
Watershed Area (mi^2)	380					
Classification	WS-IV B C					
Stations	CTB013B	CTB013C	CTB015A	CTB015C	CTB023A1	CTB023B
Number of Times Sampled	5	5	5	5	5	5

Lake James is formed by the impoundment of the Catawba and Linville Rivers and is the most upstream reservoir of the Catawba River Chain Lakes. The Catawba and Linville River portions of Lake James are joined by a small canal. Water flows from the Catawba River portion of Lake James through this canal into the Linville River side. Due to the shallowness of the canal as compared with the reservoir on either side, warm, oxygenated surface water from the Catawba River portions flows into the Linville River section during the summer months, and the colder, less oxygenated water is trapped within the Catawba River side of Lake James. Hypolimnetic water (the deeper, colder bottom water) from Lake James exits the reservoir from the Linville River portion. This leaves the warmer, more oxygenated water flowing in from the Catawba River. The result of these hydrologic dynamics produces distinct differences in the temperature profiles in each side of the reservoir.

DWR staff monitored Lake James from May through September 2017. Secchi depths ranged from 0.8 to 4.0 meters and surface dissolved oxygen ranged from 7.5 to 9.6 mg/L (Appendix A). Surface pH values ranged from 7.5 to 8.3 s.u. and surface conductivities ranged from 52 to 69 μmhos/cm.

Total phosphorus concentrations were similar to those previously observed in this reservoir (range = <0.02 to 0.05 mg/L; Appendix A). Total organic nitrogen ranged from 0.19 to 0.44 mg/L and both NH3 and NOx were at or below DWR laboratory detection levels. Chlorophyll *a* values ranged from 2.2 to 39.0 *u*g/L with the greatest monthly values occurring at the upstream sampling site CTB013B. Analysis of phytoplankton samples collected from two sites at Lake James (CTB015A and CTB015C) indicated the algal densities (units/ml) in the lake were dominated by bluegreen algae belonging to three taxa – *Pseudanabaena, Planktolyngbya and Cylindrospermopsis*. An Algal Growth Potential Test was conducted on a water sample collected by staff at each of the six lake sampling sites in Lake James (Table 2). Results indicated that the lake's ability to support nuisance blooms of algae was limited by the concentration of nitrogen at site CTB013B, (located in the upper end of the Catawba River Arm of the lake), and phosphorus limited in the remaining five sampling sites.

Table 2. Algal Growth Potential Test Results for Lake James, August 23, 2017.

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CTB013B	5.63	40.90	5.82	Nitrogen
CTB013C	0.33	0.35	1.03	Phosphorus
CTB015A	0.28	0.25	0.94	Phosphorus
CTB015C	0.27	0.31	2.38	Phosphorus
CTB023A1	0.82	0.72	1.45	Phosphorus
CTB023B	0.52	0.64	0.70	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

Lake James was determined to exhibit low biological productivity (oligotrophic conditions) in 2017 based on the calculated NCTSI scores. This lake has been predominantly oligotrophic since monitoring by DWR began in 1981.

Lake Rhodhiss

Ambient Lakes Program Name	Lake Rhodhiss		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	6.0		
Volume ($10^6 m^3$)	36.70		
Watershed Area (mi^2)	1090.0		
Classification	WS-IV CA		
Stations	CTB034A	CTB040A	CTB040B
Number of Times Sampled	5	5	5

Lake Rhodhiss is a run-of-the-river reservoir located on the Catawba River downstream of Lake James and upstream of Lake Hickory. Constructed in 1925 and owned by Duke Progress Energy, Lake Rhodhiss has a mean residence time of 21 days. This reservoir is used for hydropower generation, as a water supply, and for public recreation.

DWR staff monitored Lake Rhodhiss from May through September 2017. Secchi depths ranged from 0.5 to 1.7 meters, with the lowest secchi readings observed at the upper end of the reservoir (CTB034A; Appendix A). Surface dissolved oxygen ranged from 7.0 to 10.9 mg/L and surface pH values ranged from 7.1 to 9.2 s.u. The surface pH values recorded at CTB040B at the lower end of the reservoir in July was greater than the state water quality standard of 9.0 s.u.

Total phosphorus in Lake Rhodhiss ranged from 0.02 to 0.09 mg/L and total organic nitrogen ranged from 0.20 to 0.49 mg/L (Appendix A). Chlorophyll *a* values ranged from <1.0 to 25.0 µg/L. Based on the calculated NCTSI scores for 2017, Lake Rhodhiss was determined to be predominantly eutrophic (exhibiting elevated biological productivity). This lake has exhibited moderate (mesotrophic) to elevated biological productivity since DWR monitoring began in 1981.

Lake Hickory

Ambient Lakes Program Name	Lake Hickory			
Trophic Status (NC TSI)	Mesotrophic			
Mean Depth (meters)	10.0			
Volume ($10^6 m^3$)	16.60			
Watershed Area (mi^2)	1310.0			
Classification	WS-IV B CA			
Stations	CTB048A	CTB056A	CTB058C	CTB058D
Number of Times Sampled	5	5	5	5

Lake Hickory is located immediately downstream of Lake Rhodhiss on the Catawba River. This reservoir, which is owned by Duke Progress Energy, has an average retention time of 33 days and a maximum depth of 18 meters.

DWR field staff monitored this reservoir from May through September 2017. Secchi depths ranged from 0.9 meter in May to 1.9 meters in August (Appendix A). Surface dissolved oxygen ranged from 7.4 to 10.4 mg/L and surface pH values ranged from 7.0 to 9.1 s.u. The highest value for surface pH (9.1 s.u.) was greater than the state water quality standard of 9.0 s.u. for pH.

Total phosphorus in Lake Hickory in 2017 ranged from <0.02 to 0.03 mg/L and total organic nitrogen ranged from 0.22 to 0.39 mg/L. Chlorophyll *a* values in this reservoir did not exceed the state water quality standard of 40 *u*g/L and ranged from 4.7 to 28.0 *u*g/L. Based on the calculated NCTSI scores, Lake Hickory was moderately productive (mesotrophic) in May, July and August, and very productive (eutrophic) in June and September. Overall, this reservoir was determined to be mesotrophic in 2017. Lake Hickory's trophic state has varied between eutrophic and mesotrophic since DWR monitoring began in 1981.

Lookout Shoals Lake

Ambient Lakes Program Name	Lookout Shoals Lake		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	9.0		
Volume ($10^6 m^3$)	4.60		
Watershed Area (mi^2)	1450.0		
Classification	WS-IV B CA		
Stations	CTB0581F	CTB058F	CTB058G
Number of Times Sampled	5	5	5

Lookout Shoals Lake is one of the smaller Catawba chain lakes with a surface area of 1,270 acres and 39 miles of shoreline. The lake is owned by Duke Progress Energy and is located between Lake Hickory and Lake Norman on the Catawba River. Construction of the Lookout Shoals Dam was begun in 1914 and was completed in 1916, making it the first dam built on the Catawba River in North Carolina by J. B. Duke. Lookout Shoals Lake has a maximum depth of 18.3 meters and a mean hydraulic retention time of nine days, the shortest of any lake in the Catawba River basin. The waters of the lake are used to generate electricity at the Lookout Shoals Hydroelectric plant as well as for public recreation.

Lookout Shoals Lake was monitored by DWR staff once a month from May through September 2017. Secchi depths for this reservoir ranged from 0.9 to 1.9 meters (Appendix A). Surface dissolved oxygen ranged from 7.7 to 10.9 mg/L and surface pH ranged from 7.2 to 8.8 s.u.

Nutrient concentrations in Lookout Shoals Lake in 2017 were slightly higher than those observed by DWR on previous sampling trips. Total phosphorus ranged from 0.02 to 0.04 mg/L and total organic nitrogen ranged from 0.23 to 0.44 mg/L. Chlorophyll *a* values in 2017 ranged from 6.2 to 26.0 *u*g/L. An Algal Growth Potential Test was conducted on a water sample collected by staff from site CTB058F located near the center of the lake (Table 3). Results indicated that the lake's ability to support nuisance blooms of algae was limited by the concentration of nitrogen in the lake water.

Table 3. Algal Growth Potential Test Results for Lookout Shoals Lake, July 6, 2017.

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CTB058F	0.51	3.18	0.65	Nitrogen

Freshwater AGPT using *Selenastrum capricornutum* as test alga

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

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

Lookout Shoals Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in May through August and moderate biological productivity (mesotrophic conditions) in September. Historically, this reservoir has been predominantly mesotrophic since monitoring began by DWR in 1981. Continued monitoring of Lookout Shoals Lake is recommended to monitor potential increases in the lake's trophic state.

Lake Norman

Ambient Lakes Program Name	Lake Norman							
Trophic Status (NC TSI)	Oligotrophic							
Mean Depth (meters)	10.0							
Volume ($10^6 m^3$)	131.5							
Watershed Area (mi^2)	1790							
Classification	WS-IV B CA							
Stations	CTB079A	CTB082A	CTB082AA	CTB082B	CTB082BB	CTB082M	CTB082Q	CTB082R
Number of Times Sampled	5	5	5	5	5	5	5	5

Lake Norman, North Carolina's largest man-made lake is located between Lookout Shoals Lake and Mountain Island Lake on the Catawba River. Owned by Duke Progress Energy, Lake Norman is used to generate electricity at Cowans Ford Dam, the Marshall Steam Station and McGuire Nuclear Station. This reservoir is also a popular public recreation lake. Recreational activities include fishing, boating and swimming.

Lake Norman was monitored by DWR staff once a month from May through September 2017. Secchi depths ranged from 1.0 to 4.1 mg/L, indicating good water clarity (Appendix A). Surface dissolved oxygen ranged from 5.7 to 9.4 mg/L and surface pH values ranged from 6.7 to 8.4 s.u. Surface conductivity in Lake Norman ranged from 20 to 71 *u*mhos/cm.

Nutrient concentrations were similar to those previously observed by DWR. Total phosphorus ranged from <0.02 to 0.03 mg/L and total organic nitrogen ranged from 0.19 to 0.35 mg/L. Chlorophyll *a* ranged from 1.5 to 22.0 *u*g/L. Based on the monthly calculated NCTSI scores, Lake Norman was determined to exhibit low biological productivity in 2017. This reservoir has exhibited moderate (mesotrophic) to very low biological productivity since monitoring by DWR began in 1981. Lake Norman from Lyle Creek to Cowan's Dam is on the 2014 303(d) List of Impaired Waters for a PCB Fish Consumption Advisory (Table 1) (http://epi.publichealth.nc.gov/oee/fish/advisories.html).

Mountain Island Lake

Ambient Lakes Program Name	Mountain Island Lake					
Trophic Status (NC TSI)	Oligotrophic					
Mean Depth (meters)	5.0					
Volume ($10^6 m^3$)	71.0					
Watershed Area (mi^2)	1860					
Classification	WS-IV B CA					
Stations	CTB083B	CTB086A	CTB086B	CTB086C	CTB087	CTB087A
Number of Times Sampled	5	5	5	5	5	5

Mountain Island Lake is owned by Duke Progress Energy and receives the outflow of Lake Norman upstream. The lake was filled when construction on the Mountain Island Hydroelectric Station was completed in 1924. Mountain Island is a relatively small and narrow lake with a surface area of 3,235 acres and 61 miles of shoreline. The lake has a mean hydraulic retention time of only ten days. Mountain Island Lake is a water supply source for the City of Charlotte and is used by Duke Energy to generate electricity at both the Riverbend Steam Station and the Mountain Island Steam Station.

Mountain Island Lake was monitored by DWR staff once a month from May through September 2017. Surface dissolved oxygen ranged from 5.4 mg/L at the upper end of the reservoir in July (CTB083B) to 8.7 mg/L in May (Appendix A). Surface pH ranged from 6.6 to 9.0 s.u. and surface conductivity ranged from 58 to 89 *u*mhos/cm. Secchi depths in Mountain Island Lake (range = 1.1 to 3.2 meters) indicated good water clarity.

In 2017, total phosphorus concentrations were similar to those previously observed by DWR, ranging from <0.02 to 0.02 mg/L. Total organic nitrogen varied from 0.19 to 0.35 mg/L. Chlorophyll *a* values were low, ranging from 1.2 to 15.0 *u*g/L. An Algal Growth Potential Test was conducted on water samples collected from Mountain Island Lake in July 2017 (Table 4). Results indicated that potential nuisance algal blooms in the lake were limited by the concentrations of phosphorus in the lake water.

Table 4. Algal Growth Potential Test Results for Mountain Island Lake, July 24, 2017.

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
CTB083B	0.21	0.24	4.29	Phosphorus
CTB086B	0.22	0.26	4.05	Phosphorus
CTB086C	0.29	0.36	1.31	Phosphorus
CTB087	0.22	0.25	3.04	Phosphorus
CTB087A	0.21	0.19	2.71	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

The trophic state of Mountain Island Lake in 2017 indicated low biological productivity (oligotrophic conditions) in May, June, August and September and moderate productivity (mesotrophic conditions) in July. Overall, the lake was determined to be oligotrophic. This reservoir has been predominantly oligotrophic since monitoring by DWR was begun in 1981. Mountain Island Lake is currently listed on the 2014 303(d) List of Impaired Waters for a PCB Fish Consumption Advisory (Table 1) (http://epi.publichealth.nc.gov/oee/fish/advisories.html).

Lake Wylie

Ambient Lakes Program Name	Lake Wylie							
Trophic Status (NC TSI)	Eutrophic							
Mean Depth (meters)	7.0							
Volume ($10^6 m^3$)	35.3							
Watershed Area (mi^2)	3020							
Classification	WS-IV, V B CA							
Stations	CTB103	CTB105B	CTB174	CTB177	CTB178	CTB198B5	CTB198C5	CTB198D
Number of Times Sampled	5	5	5	5	5	5	5	5

Lake Wylie is a man-made impoundment which was constructed in 1904 with a hydroelectric dam located near Fort Mills, South Carolina. The dam was rebuilt in 1924, creating the present shoreline with the upper portion of the lake in North Carolina and the majority of the lower portion in South Carolina. The lake is owned by Duke Progress Energy and is located in Gaston and Mecklenburg Counties in North Carolina and York County in South Carolina. Major tributaries to Lake Wylie including the Catawba River, the South Fork Catawba River, Crowders Creek, Catawba Creek and Allison Creek. This lake is used to generate electricity and for public recreation.

Lake Wylie was monitored by DWR field staff once a month from May through September 2017. Surface dissolved oxygen ranged from 5.8 to 10.3 mg/L and surface pH values ranged from 7.1 to 9.0 s.u. (Appendix A). Surface conductivity in Lake Wylie ranged from 22 to 164 *u*mhos/cm. The highest surface conductivity readings for each sampling month was observed at CTB198B5 located in the Crowders Creek arm of the lake. Secchi depths ranged from 0.5 to 1.9 meters

Total phosphorus concentrations ranged from 0.02 to 0.08 mg/L and total organic nitrogen ranged from 0.22 to 0.79 mg/L. Chlorophyll *a* values (range = 2.6 to 55.0 *u*g/L) exceeded the state water quality standard of 40 *u*g/L twice in 2017. Algal densities in Lake Wylie at two sampling sites (CTB178 and CTB198D) were dominated by bluegreen algae of the taxa, *Cylindrospermopsis.* Lake Wylie is on the 2014 303(d) List of Impaired Waters for a PCB Fish Consumption Advisory (Table 1) (http://epi.publichealth.nc.gov/oee/fish/advisories.html) and for elevated levels of copper in the South Fork Catawba River arm.

Lake Wylie was determined to have elevated biological productivity from May through September based on the calculated NCTSI scores for each sampling trip in 2017. This reservoir has been predominantly eutrophic since DWR monitoring began in 1981.

Bessemer City Lake

Ambient Lakes Program Name	Bessemer City Lake
Trophic Status (NC TSI)	Mesotrophic
Mean Depth (meters)	3.0
Volume ($10^6 m^3$)	0.02
Watershed Area (mi^2)	0.4
Classification	WS-II HQW CA
Stations	CTBBCL1
Number of Times Sampled	5

This small impoundment is the water supply source for Bessemer City in Gaston County. The drainage area is approximately one square kilometer, and is characterized by rolling hills. Land use in the watershed is mostly forest with small residential and agricultural areas. Public access to this lake is restricted.

Bessemer City Lake was monitored by DWR staff once a month from May through September 2017. Secchi depths for this small lake ranged from 1.3 to 2.0 meters, indicating good water clarity. Surface dissolved oxygen ranged from 7.6 to 9.3 mg/L and surface pH values ranged from 7.0 to 7.7 s.u. Surface conductivity was between 81 and 85 *u*mhos/cm.

Total phosphorus ranged from <0.02 mg/L to 0.03 mg/L, with the higher values observed in May. Total organic nitrogen ranged from 0.40 to 0.47 mg/L and nitrite plus nitrate ranged from <0.02 to 0.16 mg/L. Chlorophyll *a* values ranged from 8.2 to 18.0 *u*g/L. Based on the calculated NCTSI scores, Bessemer City Lake had elevated biological productivity (eutrophic conditions) in May and was moderately productive (mesotrophic) from June through September. Typically, the trophic state of this lake has varied between oligotrophic and mesotrophic since 1990 when it was first monitored by DWR.

		SURFACE PHYSICAL DATA							PHOTIC ZONE DATA											
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Secchi Depth 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	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
LAKE JAMES	September 18, 2017	CTB013B	9.6	24.2	8.3	62	1.0	119.1	0.03	0.45	<0.02	<0.02	0.49	0.44	0.05	20.0	44	<12.0	6.2	
	September 18, 2017	CTB013C	9.1	24.6	8.2	67	3.6	113.1	<0.02	0.22	<0.02	0.02	0.23	0.21	0.02	11.0	44	<6.2	1.3	
	September 18, 2017	CTB015A	8.2	25.1	7.8	64	3.1	103.8	<0.02	0.31	<0.02	<0.02	0.32	0.30	0.02	6.2	44	<6.2	1.3	
	September 18, 2017	CTB015C	8.0	25.1	7.7	57	4.0	101.1	<0.02	0.29	<0.02	<0.02	0.30	0.28	0.02	5.7	39	<6.2	1.4	17.0
	September 18, 2017	CTB023A1	8.1	27.4	8.0	53	3.5	106.4	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	10.0	35	<6.2	1.6	
	September 18, 2017	CTB023B	8.2	25.4	7.8	53	4.0	103.5	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	5.8	34	<6.2	1.5	
	August 23, 2017	CTB013B	8.1	29.0	7.7	69	1.0	110.2	0.04	0.41	<0.02	<0.02	0.42	0.40	0.02	18.0	71	<12.0	6.1	
	August 23, 2017	CTB013C	8.2	28.3	7.8	62	3.8	110.0	<0.02	0.22	<0.02	0.02	0.24	0.21	0.03	5.4	53	<6.2	1.6	
	August 23, 2017	CTB015A	7.9	28.3	7.6	60	4.0	105.9	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	4.2	50	<6.2	1.1	
	August 23, 2017	CTB015C	8.3	28.0	7.8	56	3.0	111.0	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	3.4	39	<6.2	1.1	16.0
	August 23, 2017	CTB023A1	8.3	28.2	8.0	56	2.3	111.8	<0.02	0.27	<0.02	<0.02	0.28	0.26	0.02	5.0		<6.2	1.3	
	August 23, 2017	CTB023B	8.4	27.8	7.9	56	3.0	111.9	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	5.1	42	<6.2	1.2	
	July 27, 2017	CTB013B	8.6	29.7	8.3	61	1.0	117.9	0.05	0.43	<0.02	<0.02	0.44	0.42	0.02	25.0	62	<12.0	7.8	
	July 27, 2017	CTB013C	7.7	30.3	8.1	58	3.3	106.8	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	3.6	40	<6.2	1.3	
	July 27, 2017	CTB015A	7.5	29.8	7.8	56	3.2	102.7	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	2.6	40	<6.2	1.3	
	July 27, 2017	CTB015C	7.8	29.5	8.2	53	3.8	105.9	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	2.8	32	<6.2	1.1	16.0
	July 27, 2017	CTB023A1	8.0	28.9	8.3	55	3.2	108.3	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	6.0	38	<6.2	1.6	
	July 27, 2017	CTB023B	7.7	29.8	8.2	54	3.5	105.9	<0.02	0.39	<0.02	<0.02	0.40	0.38	0.02	3.8	38	<6.2	1.4	
	June 20, 2017	CTB013B	9.5	26.2	8.2	54	0.8	121.8	0.05	0.43	<0.02	<0.02	0.44	0.42	0.02	39.0	86	15.0	11.0	
	June 20, 2017	CTB013C	8.6	26.7	7.9	54	1.8	111.5	<0.02	0.25	<0.02	<0.02	0.26	0.24	0.02	6.7	76	<6.2	2.7	
	June 20, 2017	CTB015A	8.1	27.3	7.4	55	2.0	105.5	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	4.2	78	<6.2	2.3	
	June 20, 2017	CTB015C	8.2	27.4	8.0	53	3.0	108.0	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	4.2	77	<6.2	1.4	17.0
	June 20, 2017	CTB023A1	8.2	27.7	7.9	53	2.8	108.3	<0.02	0.24	<0.02	<0.02	0.25	0.23	0.02	5.8	75	<6.2	1.9	
	June 20, 2017	CTB023B	8.4	27.2	7.8	54	3.0	109.4	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	4.4	71	<6.2	1.1	
	May 16, 2017	CTB013B	9.6	21.2	7.5	56	0.9	108.6	0.03	0.24	<0.02	0.15	0.39	0.23	0.16	4.4	71	<6.2	9.2	
	May 16, 2017	CTB013C	9.5	23.8	7.8	52	2.0	112.7	0.02	0.24	<0.02	0.03	0.27	0.23	0.04	4.7	55	<6.2	2.2	
	May 16, 2017	CTB015A	9.4	22.8	8.0	55	2.0	110.2	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	3.8	66	<12.0	1.8	
	May 16, 2017	CTB015C	9.2	23.8	8.0	57	2.5	109.8	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	2.4	60	<6.2	2.1	17.0
	May 16, 2017	CTB023A1	9.4	22.6	7.7	53	2.5	109.3	<0.02	0.26	<0.02	<0.02	0.27	0.25	0.02	2.6	49	<6.2	3.3	
	May 16, 2017	CTB023B	9.2	24.3	7.8	55	2.5	110.5	<0.02	0.21	<0.02	<0.02	0.22	0.21	0.01	2.2	58	<6.2	2.0	
LAKE RHODHISS	September 13, 2017	CTB034A	8.5	17.6	7.3	41	0.5	92.1	0.06	0.42	<0.02	0.21	0.63	0.41	0.22	2.1	58	16.0	22.0	14.0
	September 13, 2017	CTB040A	9.4	21.9	7.3	60	1.5	111.1	0.04	0.50	<0.02	0.02	0.52	0.49	0.03	25.0	46	<6.2	4.5	17.0
	September 13, 2017	CTB040B	7.5	21.8	6.9	61	1.3	88.9	0.03	0.44	0.03	0.12	0.56	0.41	0.15	16.0	47	<6.2	5.2	17.0
	August 9, 2017	CTB034A	7.6	24.9	7.1	54	0.5	54.0	0.07	0.25	0.02	0.22	0.47	0.23	0.24	2.0	70	13.0	24.0	17.0
	August 9, 2017	CTB040A	10.1	27.3	9.0	61	1.3	131.1	0.03	0.44	<0.02	0.01	0.45	0.43	0.02	24.0	57	<6.2	3.3	16.0
	August 9, 2017	CTB040B	9.6	28.0	9.0	61	1.3	126.5	0.02	0.38	<0.02	0.03	0.41	0.37	0.04	20.0	54	<6.2	3.3	16.0
	July 24, 2017	CTB034A	7.0	28.3	7.1	58	0.6	91.9	0.09	0.36	0.02	0.31	0.67	0.34	0.33	1.7	66	<12.0	18.0	18.0
	July 24, 2017	CTB040A	10.0	30.3	9.0	59	1.3	136.5	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	19.0	48	<6.2	2.9	17.0
	July 24, 2017	CTB040B	9.8	31.3	9.2	61	1.9	136.0	0.02	0.34	<0.02	<0.02	0.35	0.33	0.02	16.0	52	<6.2	2.6	16.0
	June 27, 2017	CTB034A	8.2	23.6	7.1	55	1.0	99.5	0.07	0.33	<0.02	0.32	0.65	0.32	0.33	<1.0	84	<12.0	11.0	17.0
	June 27, 2017	CTB040A	10.1	27.0	8.6	55	1.7	130.8	0.02	0.34		<0.02	0.35			13.0	74	<6.2	3.2	17.0
	June 27, 2017	CTB040B	10.9	26.5	8.5	57	1.3	139.9	0.06	0.42	<0.02	<0.02	0.43	0.41	0.02	22.0	104	<6.2	4.5	16.0
	May 8, 2017	CTB034A	9.4	17.4	7.2	23	1.3	1.0								<1.0	40	7.5	6.2	18.0
	May 8, 2017	CTB040A	8.5	18.2	7.2	45	0.7	0.9	0.02	0.21	<0.02	0.18	0.39	0.20	0.19	1.6	62	<6.2	11.0	14.0
	May 8, 2017	CTB040B	8.5	21.4	7.6	48	1.1	1.0	0.03	0.29	<0.02	0.18	0.47	0.28	0.19	12.0	44	<6.2	7.1	15.0
LAKE HICKORY	September 26, 2017	CTB048A	9.0	25.1	8.5	57	1.4	112.1	0.03	0.39	<0.02	<0.02	0.40	0.38	0.02		52	<6.2	3.3	
	September 26, 2017	CTB056A	10.0	25.2	9.0	60	1.6	125.1	0.03	0.34	0.02	<0.02	0.35	0.32	0.03		51	<6.2	2.3	
	September 26, 2017	CTB058C	10.4	25.3	9.1	59	1.5	130.5	0.03	0.23	<0.02	<0.02	0.24	0.22	0.02	24.0	46	<6.2	2.0	
	September 26, 2017	CTB058D	10.0	25.2	9.0	60	1.5	125.1	0.02	0.30	<0.02	<0.02	0.31	0.29	0.02	17.0	46	<6.2	1.6	15.0
	August 10, 2017	CTB048A	8.7	27.0	7.0	58	1.2	111.3	0.02	0.43	<0.02	0.08	0.51	0.42	0.09	28.0	60	<12.0	3.9	
	August 10, 2017	CTB056A	7.7	26.5	7.4	28	1.8	98.5	<0.02	0.33	<0.02	<0.02	0.34	0.32	0.02	17.0	54	<6.2	2.4	
	August 10, 2017	CTB058C	7.7	27.2	7.0	56	1.9	100.2	<0.02	0.34	<0.02	<0.02	0.35	0.33	0.02	14.0	52	<6.2	1.9	
	August 10, 2017	CTB058D	7.4	25.9	7.1	27	1.8	93.5	<0.02	0.31	<0.02	<0.02	0.32	0.30	0.02	12.0	50	<6.2	1.7	14.0
	July 6, 2017	CTB048A	8.0	27.2	7.8	27	1.1	102.8	0.02	0.36	0.02	0.10	0.46	0.34	0.12	14.0	72	<12.0	4.6	
	July 6, 2017	CTB056A	8.9	28.3	7.9	54	1.4	117.7	0.02	0.34	<0.02	<0.02	0.35	0.33	0.02	18.0	68	<6.2	2.6	
	July 6, 2017	CTB058C	9.1	28.4	7.9	48	1.4	120.5	0.02	0.31	<0.02	<0.02	0.32	0.30	0.02	16.0	68	<6.2	2.6	
	July 6, 2017	CTB058D	9.1	29.0	8.2	53	1.5	121.5	0.02	0.38	<0.02	<0.02	0.39	0.37	0.02	17.0	64	<6.2	2.8	15.0
	June 7, 2017	CTB048A	9.8	25.0	7.2	48	0.9	122.0	0.03	0.39	<0.02	0.03	0.42	0.38	0.04	15.0	67	<12.0	6.0	
	June 7, 2017	CTB056A	10.3	24.9	8.0	52	1.2	129.3	0.02	0.38	<0.02	<0.02	0.39	0.37	0.02	13.0	68	<6.2	2.8	
	June 7, 2017	CTB058C	9.8	25.7	8.7	52	1.2	124.6	0.03	0.40	<0.02	<0.02	0.41	0.39	0.02	14.0	63	<6.2	2.7	
	June 7, 2017	CTB058D	10.0	25.3	8.6	54	1.3	125.5	0.02	0.38	<0.02	<0.02	0.39	0.37	0.02	10.0	63	<6.2	2.7	14.0
	May 9, 2017	CTB048A	8.2	17.3	7.1	48	0.9	88.4	0.03	0.25	<0.02	0.20	0.45	0.24	0.21	4.7	42	<6.2	11.0	
	May 9, 2017	CTB056A	9.0	19.1	7.2	50	1.3	99.7	0.02	0.29	<0.02	0.22	0.51	0.28	0.23	14.0	29	<6.2	5.4	
	May 9, 2017	CTB058C	9.1	19.7	7.0	48	1.3	102.7	0.02	0.32	<0.02	0.23	0.55	0.31	0.24	18.0	46	<6.2	5.2	
	May 9, 2017	CTB058D	8.7	20.0	6.9	48	1.4	98.5	0.02	0.30	0.02	0.23	0.53	0.28	0.25	16.0	95	<6.2	4.2	15.0
LOOKOUT SHOALS LAKE	September 26, 2017	CTB0581F	8.0	24.8	7.4	57	1.3	99.6	0.02	0.29	<0.02	0.17	0.46	0.28	0.18	7.1	49	<6.2	3.2	
	September 26, 2017	CTB058F	7.8	24.5	7.3	27	1.5	96.9	0.02	0.27	0.02	0.14	0.41	0.25	0.16	9.0	47	<6.2	2.2	
	September 26, 2017	CTB058G	10.1	25.7	8.8	57	1.6	127.9	0.02	0.30	<0.02	0.08	0.38	0.29	0.09	11.0	45	<12.0	1.9	15.0
	August 10, 2017	CTB0581F	8.4	28.2	7.2	53	1.9	109.7	0.02	0.33	0.02	0.11	0.44	0.31	0.13	7.8	53	<6.2	3.3	
	August 10, 2017	CTB058F	8.9	27.5	7.6	19	1.5	115.2	0.02	0.35	<0.02	0.04	0.39	0.34	0.05	19.0	55	<6.2	3.3	
	August 10, 2017	CTB058G	7.7	25.8	7.5	26	1.8	96.8	0.02	0.32	<0.02	0.03	0.35	0.31	0.04	20.0	52	<6.2	2.6	14.0
	July 6, 2017	CTB0581F	9.4	29.3	8.0	50	0.9	126.5	0.04	0.45	<0.02	0.09	0.54	0.44	0.10	22.0	65	<6.2	6.8	
	July 6, 2017	CTB058F	10.0	29.7	8.7	50	1.0	135.5	0.03	0.42	<0.02	0.04	0.46	0.41	0.05	19.0	64	<6.2	5.0	
	July 6, 2017	CTB058G	10.1	29.9	8.9	50	1.1	136.6	0.03	0.40	<0.02	<0.02	0.41	0.39	0.02	26.0	60	<6.2	3.6	13.0
	June 7, 2017	CTB0581F	9.0	25.1	8.0	49	1.1	112.8	0.03	0.40	0.03	0.19	0.59	0.37	0.22	7.7	63	<6.2	7.6	

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA											
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Secchi Depth 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	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
	June 7, 2017	CTB058F	9.6	24.6	7.7	48	1.0	119.5	0.02	0.37	<0.02	0.02	0.39	0.36	0.03	12.0	69	<6.2	5.3	
	June 7, 2017	CTB058G	10.9	24.7	8.5	50	1.2	134.8	0.02	0.42	<0.02	0.06	0.48	0.41	0.07	17.0	64	<6.2	4.1	13.0
LOOKOUT	May 9, 2017	CTB0581F	8.1	19.6	7.3	50	1.0	91.0	0.03	0.28	0.05	0.28	0.56	0.23	0.33	6.3	43	<6.2	7.8	
SHOALS	May 9, 2017	CTB058F	9.1	19.1	7.2	49	1.0	100.6	0.03	0.32	0.04	0.26	0.58	0.28	0.30	14.0	46	<6.2	7.5	
LAKE	May 9, 2017	CTB058G	9.8	19.5	7.2	49	1.0	109.2	0.03	0.36	0.02	0.26	0.62	0.34	0.28	21.0		<12.0	7.2	14.0
LAKE	September 7, 2017	CTB079A	7.3	24.0	6.8	60	1.1	88.1	0.03	0.36	<0.02	0.16	0.52	0.35	0.17	17.0	54	<6.2	6.0	18.0
NORMAN	September 7, 2017	CTB082A	8.1	25.2	6.9	57	1.3	57.0	0.02	0.36	<0.02	<0.02	0.37	0.35	0.02	18.0	48	<6.2	4.6	15.0
	September 7, 2017	CTB082AA	7.6	26.9	6.8	60	3.4	97.8	<0.02	0.24	<0.02	0.05	0.29	0.23	0.06	4.2	47	<6.2	1.6	15.0
	September 7, 2017	CTB082B	5.7	25.9	7.0	60	2.4	71.7	<0.02	0.26	0.04	0.06	0.32	0.22	0.10	5.4	51	<6.2	1.6	16.0
	September 7, 2017	CTB082BB	7.2	28.3	6.9	58	4.1	94.3	<0.02	0.21	<0.02	0.05	0.26	0.20	0.06	2.4	46	<6.2	1.3	15.0
	September 7, 2017	CTB082M	6.2	25.0	6.8	62	2.5	76.8	<0.02	0.23	0.04	0.03	0.26	0.19	0.07	6.2	47	<6.2	1.7	16.0
	September 7, 2017	CTB082Q	7.4	26.1	6.9	57	3.2	93.5	<0.02	0.21	<0.02	0.04	0.25	0.20	0.05	3.3	46	<6.2	1.5	15.0
	September 7, 2017	CTB082R	7.2	26.4	6.9	57	3.5	91.2	<0.02	0.24	<0.02	0.04	0.28	0.23	0.05	3.0	44	<12.0	1.3	15.0
	August 14, 2017	CTB079A	5.5	27.2	6.7	57	1.0	70.9	0.02	0.28	0.030	0.11	0.39	0.25	0.14	9.0	46	8.0	6.9	15.0
	August 14, 2017	CTB082A	7.9	28.5	7.3	58	2.1	104.7	<0.02	0.26	<0.02	<0.02	0.27	0.25	0.02	13.0	43	<6.2	2.2	4.8
	August 14, 2017	CTB082AA	7.4	31.5	7.4	60	3.1	102.4	<0.02	0.20	<0.02	0.06	0.26	0.19	0.07	3.9	43	<6.2	1.5	14.0
	August 14, 2017	CTB082B	7.5	28.9	7.1	59	2.0	99.9	<0.02	0.24	<0.02	0.04	0.28	0.23	0.05	15.0	48	<6.2	2.9	16.0
	August 14, 2017	CTB082BB	6.9	32.1	7.2	60	3.2	96.4	<0.02	0.20	<0.02	0.06	0.26	0.19	0.07	3.6	43	<12.0	1.1	14.0
	August 14, 2017	CTB082M	8.3	29.7	7.4	59	2.3	111.5	<0.02	0.25	<0.02	<0.02	0.26	0.24	0.02	12.0	45	<6.2	2.0	14.0
	August 14, 2017	CTB082Q	7.7	30.3	7.4	59	3.0	105.1	<0.02	0.20	<0.02	0.04	0.24	0.19	0.05	5.0	46	<6.2	1.4	14.0
	August 14, 2017	CTB082R	7.5	29.3	7.3	59	3.4	100.3	<0.02	0.20	<0.02	0.04	0.24	0.19	0.05	3.7	42	<6.2	1.3	14.0
	July 17, 2017	CTB079A	8.9	29.6	7.4	58	1.4	120.0	0.02		0.02	0.02			0.03	22.0	62	<12.0	5.1	16.0
	July 17, 2017	CTB082A	8.0	30.8	7.5	61	2.0	109.7	<0.02		<0.02	<0.02			0.02	11.0	70	<6.2	3.4	16.0
	July 17, 2017	CTB082AA	7.1	33.1	7.0	60	3.1	101.4	<0.02		<0.02	0.09			0.10	5.0	52	<6.2	1.2	15.0
	July 17, 2017	CTB082B	7.3	30.7	6.8	63	2.1	100.1	<0.02		<0.02	0.06			0.07	11.0	51	<6.2	2.1	18.0
	July 17, 2017	CTB082BB	7.7	31.7	7.1	60	3.4	107.8	<0.02		<0.02	<0.02			0.02	10.0	62	<6.2	1.6	15.0
	July 17, 2017	CTB082M	8.3	30.5	7.3	59	2.7	113.4	<0.02		<0.02	<0.02			0.02	3.9	61	<6.2	1.7	15.0
	July 17, 2017	CTB082Q	7.7	30.8	7.2	59	3.1	105.7	<0.02		<0.02	0.06			0.07	5.7	54	<6.2	1.4	16.0
	July 17, 2017	CTB082R	7.6	31.3	7.0	60	3.0	104.6	<0.02		<0.02	0.08			0.09	6.6	51	<6.2	1.3	15.0
	June 1, 2017	CTB079A	9.4	25.6	7.7	60	1.1	117.6	0.03	0.33	<0.02	0.16	0.49	0.32	0.17	11.0	60	<6.2	6.2	16.0
	June 1, 2017	CTB082A	9.4	27.1	8.4	70	1.9	120.6	0.02	0.28	<0.02	<0.02	0.29	0.27	0.02	9.2	68	<6.2	2.4	18.0
	June 1, 2017	CTB082AA	7.9	28.5	7.2	66	3.3	104.5	<0.02	0.23	<0.02	0.17	0.40	0.22	0.18	3.0	64	<6.2	1.3	15.0
	June 1, 2017	CTB082B	9.2	26.8	7.6	69	2.0	117.9	0.02	0.30	<0.02	0.14	0.44	0.29	0.15	12.0	68	<6.2	2.9	18.0
	June 1, 2017	CTB082BB	7.8	27.9	7.1	66	3.0	102.1	<0.02	0.22	<0.02	0.17	0.39	0.21	0.18	3.6	78	<12.0	1.2	16.0
	June 1, 2017	CTB082M	9.0	26.8	7.6	67	2.6	115.4	<0.02	0.26	<0.02	0.09	0.35	0.25	0.10	7.9	68	<6.2	1.7	17.0
	June 1, 2017	CTB082Q	8.5	26.7	7.3	65	3.2	108.2	<0.02	0.20	<0.02	0.14	0.34	0.19	0.15	3.7	73	<6.2	1.1	16.0
	June 1, 2017	CTB082R	8.2	27.2	7.3	65	3.2	105.8	<0.02	0.20	<0.02	0.15	0.35	0.19	0.16	4.1	82	<6.2	1.4	17.0
	May 4, 2017	CTB079A	8.6	20.7	7.2	58	1.0	98.1	0.03	0.38	0.03	0.29	0.67	0.35	0.32	6.9	52	<6.2	8.0	15.0
	May 4, 2017	CTB082A	9.0	22.9	7.3	71	2.3	107.3	<0.02	0.28	<0.02	0.06	0.34	0.27	0.07	8.1	50	<6.2	3.1	18.0
	May 4, 2017	CTB082AA	8.4	23.2	7.2	20	3.0	101.0	<0.02	0.21	<0.02	0.16	0.37	0.20	0.17	1.5	53	<6.2	2.6	
	May 4, 2017	CTB082B	9.4	22.2	6.7	68	1.8	109.9	0.02	0.27	<0.02	0.18	0.45	0.26	0.19	9.6	57	<12.0	2.5	18.0
	May 4, 2017	CTB082BB	8.6	22.6	7.2	63	3.1	102.2	<0.02	0.20	<0.02	0.18	0.38	0.19	0.19	2.2	49	<6.2	2.2	16.0
	May 4, 2017	CTB082M	9.1	22.4	7.4	67	2.6	107.6	<0.02	0.22	<0.02	0.13	0.35	0.21	0.14	4.1	53	<6.2	1.9	
	May 4, 2017	CTB082Q	8.9	21.5	7.3	63	3.0	103.2	<0.02	0.20	<0.02	0.16	0.36	0.19	0.17	2.0	50	<6.2	2.2	16.0
	May 4, 2017	CTB082R	8.8	21.5	7.3	62	3.2	102.0	<0.02	0.20	<0.02	0.17	0.37	0.19	0.18	2.0		<6.2	2.1	
MOUNTAIN	September 13, 2017	CTB083B	7.7	23.9	6.6	58	2.9	93.0	<0.02	0.26	<0.02	0.05	0.31	0.25	0.06	2.6	49	<6.2	1.6	
ISLAND	September 13, 2017	CTB086A	7.9	22.9	6.9	61	1.3	94.0	0.02	0.36	<0.02	0.09	0.45	0.35	0.10	7.0	51	<6.2	6.0	
LAKE	September 13, 2017	CTB086B	7.6	23.2	7.0	61	1.7	90.9	<0.02	0.26	<0.02	0.06	0.32	0.25	0.07	3.7	49	<6.2	3.8	
	September 13, 2017	CTB086C	8.1	23.0	7.0	61	1.5	96.1	0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	11.0	50	<6.2	3.7	
	September 13, 2017	CTB087	7.5	23.8	7.0	60	2.2	90.6	<0.02	0.30	<0.02	0.06	0.36	0.29	0.07	3.0	48	<6.2	2.5	
	September 13, 2017	CTB087A	7.3	24.0	9.0	60	2.1	88.5	<0.02	0.24	0.020	0.06	0.30	0.22	0.08	2.5	50	<6.2	2.5	15.0
	August 9, 2017	CTB083B	6.1	27.4	6.9	60	2.9	78.1	<0.02	0.22	<0.02	0.07	0.29	0.21	0.08	2.6	58	<12.0	1.2	
	August 9, 2017	CTB086A	7.4	27.7	7.1	89	1.4	95.3	0.02	0.33	<0.02	0.20	0.53	0.32	0.21	8.4	70	<6.2	4.7	
	August 9, 2017	CTB086B	6.6	28.3	6.9	63	1.1	85.7	<0.02	0.23	0.020	0.07	0.30	0.21	0.09	3.3	56	<6.2	2.7	
	August 9, 2017	CTB086C	6.9	28.4	7.0	66	1.4	90.0	0.02	0.27	<0.02	<0.02	0.28	0.26	0.02	12.0	59	<6.2	4.1	
	August 9, 2017	CTB087	6.8	28.7	7.0	63	2.6	89.0	<0.02	0.23	<0.02	0.06	0.29	0.22	0.07	3.5	51	<6.2	1.9	
	August 9, 2017	CTB087A	6.8	28.6	7.0	63	2.5	89.7	<0.02	0.22	<0.02	0.06	0.28	0.21	0.07	4.5	54	<6.2	2.1	16.0
	July 24, 2017	CTB083B	5.4	28.4	6.8	60	2.5	71.1	<0.02	0.24	<0.02	0.10	0.34	0.23	0.11	5.8	56	<6.2	1.9	
	July 24, 2017	CTB086A	6.7	29.7	7.2	78	1.3	89.9	0.02	0.36	<0.02	0.16	0.52	0.35	0.17	9.8	70	<6.2	4.3	
	July 24, 2017	CTB086B	6.7	30.1	7.2	63	1.8	90.9	<0.02	0.26	<0.02	0.08	0.34	0.25	0.09	6.4	46	<6.2	2.9	
	July 24, 2017	CTB086C	7.4	31.2	7.4	66	1.5	102.2	0.02	0.33	<0.02	0.02	0.35	0.32	0.03	15.0	51	<6.2	3.9	
	July 24, 2017	CTB087	6.8	31.3	7.1	63	2.3	94.6	<0.02	0.27	<0.02	0.06	0.33	0.26	0.07	7.3	61	<6.2	2.6	
	July 24, 2017	CTB087A	7.3	31.1	7.2	62	2.3	100.0	<0.02	0.23	<0.02	0.06	0.29	0.22	0.07	7.8	62	<6.2	2.2	17.0
	June 27, 2017	CTB083B	6.6	26.8	7.0	60	2.8	83.7	<0.02	0.22	<0.02	0.16	0.38	0.21	0.17	3.1	78	<6.2	1.2	
	June 27, 2017	CTB086A	8.0	26.6	6.9	79	1.2	100.9	<0.02	0.31	<0.02	0.22	0.53	0.30	0.23	8.5	97	<6.2	4.6	
	June 27, 2017	CTB086B	6.8	27.2	6.9	61	2.8	87.1	<0.02	0.20	<0.02	0.16	0.36	0.19	0.17	2.3	98	<6.2	2.4	
	June 27, 2017	CTB086C	7.9	27.8	7.0	67	1.5	102.2	<0.02	0.30	<0.02	0.10	0.40	0.29	0.11	6.7	84	<6.2	3.2	
	June 27, 2017	CTB087	7.4	27.6	6.9	63	1.9	95.2	<0.02	0.27	<0.02	0.15	0.42	0.26	0.16	3.8	84	<6.2	2.5	
	June 27, 2017	CTB087A	7.4	27.4	7.1	64	2.6	95.8	<0.02	0.32	<0.02	0.15	0.47	0.31	0.16	4.3		<6.2	1.9	16.0
	May 10, 2017	CTB083B	8.5	21.4		63	3.2	97.7	<0.02	0.20	<0.02	0.18	0.38	0.19	0.19	2.2	47	47.0	<6.2	
	May 10, 2017	CTB086A	8.8	23.1		84	1.2	104.9	0.02	0.27	<0.02	0.42	0.69	0.26	0.43	6.5	62	62.0	<6.2	
	May 10, 2017	CTB086B	8.3	22.5		63	2.7	97.9	<0.02	0.20	<0.02	0.19	0.39	0.19	0.20	1.2	53	53.0	<6.2	
	May 10, 2017	CTB086C	8.7	22.8		66	1.8	103.2	0.02	0.26	<0.02	0.14	0.40	0.25	0.15	3.5	<6.2	50.0	<6.2	
	May 10, 2017	CTB087	8.2	22.9		62	2.3	97.5	<0.02	0.24	0.02	0.19	0.43	0.22	0.21	1.5	<6.2	46.0	<6.2	
	May 10, 2017	CTB087A	8.4	22.1		64	2.3	98.5	0.02	0.21	<0.02	0.20	0.41	0.20	0.21	1.6	<6.2	48.0	<6.2	16.0
LAKE	September 25, 2017	CTB103	7.0	25.9	7.7	65	1.2	87.7	0.03	0.24	0.02	0.08	0.32	0.22	0.10	3.2	44	<12.0	4.6	
WYLIE	September 25, 2017	CTB105B	7.5	25.4	7.3	74	0.9	92.5	0.03	0.34	<0.02	0.06	0.40	0.33	0.07	9.3	44	<6.2	5.2	
	September 25, 2017	CTB174	7.5	28.9	7.5	78	0.7	98.6	0.04	0.30	<0.02	0.21	0.51	0.29	0.22	22.0	52	<6.2	8.1	
	September 25, 2017	CTB177	9.0	26.8	8.1	79	1.0	114.6	0.04	0.46	<0.02	<0.02	0.47	0.45	0.02	22.0	50	<6.2	4.6	
	September 25, 2017	CTB178	8.8	26.1	7.8	75	1.2	110.0	0.03	0.34	<0.02	0.03	0.37	0.33	0.04	20.0	54	<6.2	3.5	
	September 25, 2017	CTB198B5	8.4	26.1	7.7	146	1.0	105.4	0.06	0.60	0.04	0.09	0.69	0.56	0.13	26.0	92	10.0	10.0	
	September 25, 2017	CTB198C5	10.3	26.2	8.6	102	1.0	129.5	0.04	0.44	<0.02	<0.02	0.45	0.43	0.02	26.0	68	<6.2	4.6	
	September 25, 2017	CTB198D	10.1	26.6	9.0	85	1.6	127.5	0.03	0.35	<0.02	<0.02	0.36	0.34	0.02	16.0	53	<6.2	1.8	23.0

Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Secchi Depth 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	Total Solids Suspended mg/L	Turbidity NTU	Total Hardness mg/L
		SURFACE PHYSICAL DATA							PHOTIC ZONE DATA											
LAKE WYLIE	August 24, 2017	CTB103	6.4	29.8	7.5	22	1.1	86.7	0.02	0.27	0.04	0.07	0.34	0.23	0.11	5.2	60	6.2	6.4	
	August 24, 2017	CTB105B	7.0	30.6	7.2	83	1.2	95.1	0.03	0.43	<0.02	<0.02	0.44	0.42	0.02	14.0	62	<6.2	5.5	
	August 24, 2017	CTB174	6.8	33.8	7.2	79	1.1	97.8	0.04	0.36	0.04	0.13	0.49	0.32	0.17	14.0	64	<6.2	6.9	
	August 24, 2017	CTB177	7.1	30.2	7.3	83	1.1	96.5	0.04	0.43	<0.02	<0.02	0.44	0.42	0.02	20.0	64	<6.2	4.9	
	August 24, 2017	CTB178	7.3	30.0	7.5	81	1.5	98.0	0.03	0.37	<0.02	0.02	0.39	0.36	0.03	16.0	64	<12.0	3.2	
	August 24, 2017	CTB198B5	6.7	30.0	7.3	119	0.7	119.0	0.07	0.63	0.04	0.02	0.65	0.59	0.06	29.0	98	12.0	12.0	
	August 24, 2017	CTB198C5	5.8	28.0	7.3	48	1.0	75.8	0.05	0.54	<0.02	<0.02	0.55	0.53	0.02	32.0	88	7.5	7.0	
	August 24, 2017	CTB198D	8.1	30.1	8.0	83	1.9	109.0	0.02	0.33	<0.02	<0.02	0.34	0.32	0.02	12.0	62	<6.2	1.9	20.0
	July 18, 2017	CTB103	6.8	30.1	7.2	69	1.1	91.1	0.03		<0.02	0.12			0.13	6.1	80	<6.2	4.7	
	July 18, 2017	CTB105B	7.2	30.5	7.2	36	1.4	97.7	0.02		<0.02	0.08			0.09	10.0	75	<6.2	3.4	
	July 18, 2017	CTB174	7.2	31.9	7.1	77	1.1	99.7	0.03	0.36	0.03	0.17	0.53	0.33	0.20	15.0	86	<12.0	4.9	
	July 18, 2017	CTB177	5.9	30.7	7.1	86	0.9	79.7	0.05	0.58	0.03	0.02	0.60	0.55	0.05	30.0	76	<6.2	6.3	
	July 18, 2017	CTB178	7.9	30.5	7.5	76	1.2	106.5	0.03		<0.02	0.03			0.04	21.0	78	<6.2	2.3	
	July 18, 2017	CTB198B5	8.4	30.7	7.9	126	0.7	114.1	0.05	0.70	<0.02	<0.02	0.71	0.69	0.02	31.0	103	7.8	7.1	
	July 18, 2017	CTB198C5	8.4	31.6	8.6	83	1.0	115.3	0.02	0.53	<0.02	<0.02	0.54	0.52	0.02	18.0	84	<6.2	3.5	
	July 18, 2017	CTB198D	8.4	31.5	8.3	91	1.7	115.1	0.02	0.50	<0.02	<0.02	0.51	0.49	0.02	19.0	89	<6.2	2.5	21.0
	June 13, 2017	CTB103	9.0	27.3	7.7	67	1.0	115.0	0.02	0.33	<0.02	0.12	0.45	0.32	0.13	12.0	91	<6.2	5.5	
	June 13, 2017	CTB105B	8.6	27.2	7.4	67	1.1	110.3	0.02	0.36	<0.02	0.09	0.45	0.35	0.10	12.0	86	<6.2	5.2	
	June 13, 2017	CTB174	9.4	28.4	8.1	78	0.9	122.2	0.04	0.52	0.02	0.24	0.76	0.50	0.26	24.0	111	<6.2	5.6	
	June 13, 2017	CTB177	9.2	28.2	7.9	69	1.2	119.0	0.03	0.40	<0.02	0.05	0.45	0.39	0.06	20.0	88	<6.2	3.3	
	June 13, 2017	CTB178	9.2	27.5	8.0	67	1.4	118.8	0.02	0.43	<0.02	0.03	0.46	0.42	0.04	19.0	68	<6.2	2.6	
	June 13, 2017	CTB198B5	9.3	29.7	7.7	104	0.5	124.3	0.07	0.80	<0.02	<0.02	0.81	0.79	0.02	55.0	143	<12.0	11.0	
	June 13, 2017	CTB198C5	9.7	28.5	8.7	83	0.9	129.1	0.03	0.46	<0.02	<0.02	0.47	0.45	0.02	23.0	106	<6.2	5.1	
	June 13, 2017	CTB198D	10.2	28.8	9.0	70	1.4	134.3	0.02	0.41	<0.02	<0.02	0.42	0.40	0.02	19.0	106	<6.2	2.7	19.0
	May 31, 2017	CTB103	7.2	24.4	7.8	65	0.9	87.5	0.02	0.28	<0.02	0.20	0.48	0.27	0.21	2.6	106	6.8	7.9	
	May 31, 2017	CTB105B	7.4	23.8	7.5	67	0.8	89.4	0.02	0.29	<0.02	0.20	0.49	0.28	0.21	4.1	100	6.8	9.6	
	May 31, 2017	CTB174	10.7	25.7	8.7	82	1.0	133.4	0.06	0.61	<0.02	0.27	0.88	0.60	0.28	41.0	100	6.8	5.4	
	May 31, 2017	CTB177	10.4	25.7	8.3	83	0.9	129.9	0.04	0.57	<0.02	<0.02	0.58	0.56	0.02	35.0	80	6.5	5.3	
	May 31, 2017	CTB178	9.2	25.8	7.8	71	1.2	115.0	0.04	0.42	<0.02	0.12	0.54	0.41	0.13	17.0	94	<6.2	4.7	
	May 31, 2017	CTB198B5	7.2	23.2	7.3	164	0.5	86.2	0.03	0.56	0.04	0.46	1.02	0.52	0.50	17.0	172	24.0	17.0	
	May 31, 2017	CTB198C5	9.6	26.2	7.9	83	1.1	120.9	0.08	0.48	<0.02	<0.02	0.49	0.47	0.02	23.0	61	6.2	6.3	
	May 31, 2017	CTB198D	10.6	26.9	8.8	76	1.2	135.1	0.03	0.42	<0.02	0.03	0.45	0.41	0.04	20.0	82	<12.0		20.0
BESSEMER CITY LAKE	September 13, 2017	CTBBCL1	8.4	21.8	7.5	81	1.6	98.6	0.02	0.41	<0.02	<0.02	0.42	0.40	0.02	16.0	62	<12.0	4.6	26.0
	August 9, 2017	CTBBCL1	7.9	26.7	7.5	81	2.0	100.8	0.02	0.41	<0.02	0.04	0.45	0.40	0.05	13.0	70	<6.2	3.8	17.0
	July 24, 2017	CTBBCL1	7.6	30.3	7.7	85	1.8	103.7	0.02	0.50	0.03	0.07	0.57	0.47	0.10	8.2	65	<6.2	3.3	27.0
	June 27, 2017	CTBBCL1	8.2	30.5	7.0	83	1.4	112.2	<0.02	0.42	<0.02	0.12	0.54	0.41	0.13	9.7	86	<6.2	3.2	29.0
	May 10, 2017	CTBBCL1	9.3	21.2		81	1.3	107.7	0.03	0.41	<0.02	0.16	0.57	0.40	0.17	18.0	64	<12.0	5.4	29.0