LAKE & RESERVOIR ASSESSMENTS
YADKIN-PEE DEE RIVER BASIN

Winston Lake

Intensive Survey Unit
Environmental Sciences Section
Division of Water 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. DWQ 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 from 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-three reservoirs were sampled in the Yadkin-Pee Dee River Basin between 1 January 2007 and 30 September 2011.

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. For further background information on a particular lake (including sampling data), please go to http://www.esb.enr.state.nc.us/.

Seven lakes in the Yadkin-Pee Dee River Basin are on the USEPA's 303(d) List of Impaired Waters. Lake Thom-A-Lex, Back Creek Lake, Lake Monroe, Lake Lee and Lake Twitty (Lake Stewart) are listed for violations of the state's chlorophyll *a* water quality standard. High Rock Lake is listed for violations of the state chlorophyll a, turbidity and pH water quality standards. Badin Lake is listed for a fish consumption advisory related to PCB present in fish taken from this lake.

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.

Assessment Methodology

For this report, data from January 1, 2007 through December 31, 2011 were reviewed. Lake monitoring and sample collection activities performed by DWQ 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)

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. 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.

Additional data considered as part of the use support assessment include historic DWQ water quality data, documented algal blooms and/or fish kills, problematic aquatic macrophytes, or listing on the EPA's 303(d) List of Impaired Waters.

For a more complete discussion of lake ecology and assessment, please go to http://portal.ncdenr.org/web/wq/ess/isu. The 1992 North Carolina Lake Assessment Report (downloadable from this website) contains a detailed chapter on ecological concepts that clarifies how the parameters discussed in this review relate to water quality and reservoir health.

Quality Assurance of Field and Laboratory Lakes Data

Data collected in the field via single or multiparameter water quality meters are entered into the Ambient Lakes Database within 24 hours of the sampling date. These data are then reviewed for accuracy and completeness within a week of entry. Data that have not been reviewed are given a 'P' code for 'Provisional' (data has been entered but not been verified for accuracy and/or completeness). Data that have been verified are given an 'A' code for 'Accepted'.

Chemistry data from the DWQ Water Quality Laboratory are entered into the Lakes Database within 48 hours of receipt from the lab. As with the field data, laboratory results are coded 'P' until the entered data is verified for entry accuracy and completeness, after which, the code is changed to 'A'. Generally, laboratory data entered into the Lakes Database are verified within a week following the initial entry.

Data, either laboratory or field, which appear to be out of range for the lake sampled are double checked against field sheets or the laboratory results form by the Lakes Data Administrator for possible data entry error. If there are data entry mistakes, possible equipment, sampling, and/or analysis errors, these are investigated and corrected if possible. If the possible source of an error cannot be determined, the data remains in the database. If an error is determined, the data value is removed from the appropriate database parameter field and placed in the 'Notes' field along with a comment regarding the error. Chemistry results received from the laboratory that have been given an qualification code are also entered into the 'Notes' field along with the assigned laboratory code. Laboratory qualification coded data or data which may be in error due to sampling, handling, and/or equipment problems are only entered into the 'Notes' field and never in the data field(s) in the Ambient Lakes Database.

Additional information regarding the Quality Assurance Program is covered in the Ambient Lake Monitoring Program Quality Assurance Plan. Version 1.1 (December 2011) of this document will be available on the ISU website (http://portal.ncdenr.org/web/wq/ess/isu) following final approval by the USEPA.

Weather Overview for Summer 2011

May 2011 saw temperatures in most locations of the state 1° to 3°F above normal on average. The southwestern mountain region of the state experienced the 5th driest May on record while the eastern part of the state experienced the driest May on record. Stream flow and shallow groundwater levels in the eastern portion of the state dropped in May with some groundwater wells in the coastal counties moving toward record low levels for this time of the year (NC State Climate Office, June 6, 2011).

Hot and dry conditions continued in June 2011. The central and eastern portions of the state also received less than 75% of normal rainfall. Most regions east of I-95 ranked as the top five driest on record for the period April through June. Groundwater conditions at several eastern NC monitoring wells reached new record lows for June and some communities implemented water restrictions in response to the drought (NC State Climate Office, July 7, 2011).

Despite drought conditions in central and eastern NC, substantial storms brought heavy rain, to the state in June. July 2011 was the warmest July on record for Raleigh-Durham Airport, Cape Hatteras, Elizabeth City and Aurora. Rainfall in July was more prevalent as compared with previous months. Thunderstorms produced locally intense rainfall amounts resulting in flooding and providing some relief to the northern Piedmont and Yadkin River basin. However, much of eastern NC continued to experience very dry conditions. May through July rainfall totals were the driest on record for Wilmington, New Bern and Morehead City (Figure 1; NC State Climate Office, August 5, 2011).

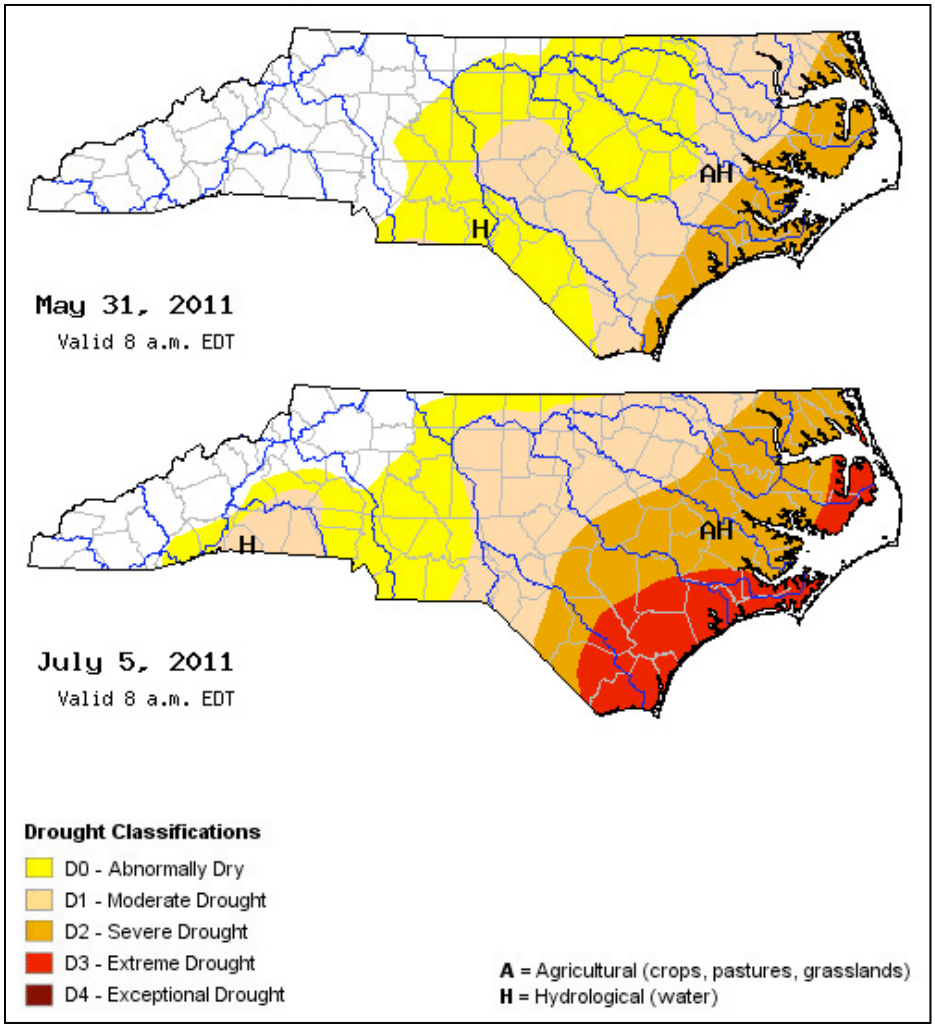

Figure 1. US Drought Monitor for North Carolina, May 31 and July 5, 2011 (Courtesy of NCDENR Division of Water Resources).

Warm and dry conditions continued in August 2011. While not as warm as July, many cities in NC ranked August 2011 in the top 25% for warmth, while most locations in western NC ranked in the top 25% for

dryness. Hurricane Irene made a significant impact on eastern NC in late August. Prior to Hurricane Irene, the ongoing drought was the most significant concern for municipalities and agriculture. Rainfall from the hurricane resulted in an unprecedented four-category improvement in the US Drought Monitor for parts of eastern NC (Figures 2 and 3). However, stream flow and groundwater levels continued to be below normal further inland, even in counties that experienced several inches of rainfall from Irene. Dry conditions persisted along the Yadkin River Basin. Reservoirs in this river basin exhibited drops in water level due to the combination of heat and low rainfall (NC State Climate Office, September 8, 2011).

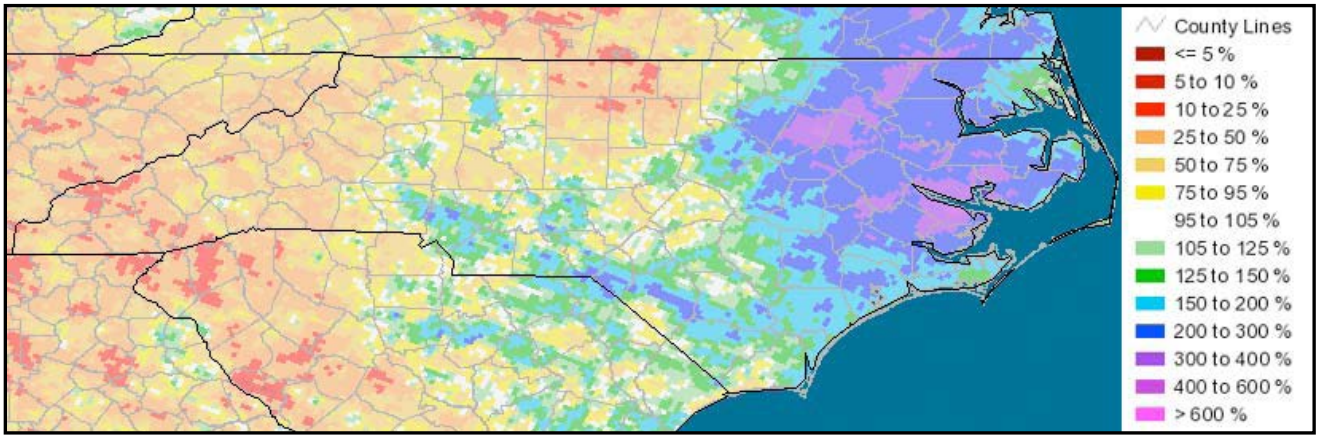

Figure 2. Percent of Normal Rainfall for North Carolina, August 2011 (Based on estimate Based on Radar Data*;Courtesy NWS/NCEP*).

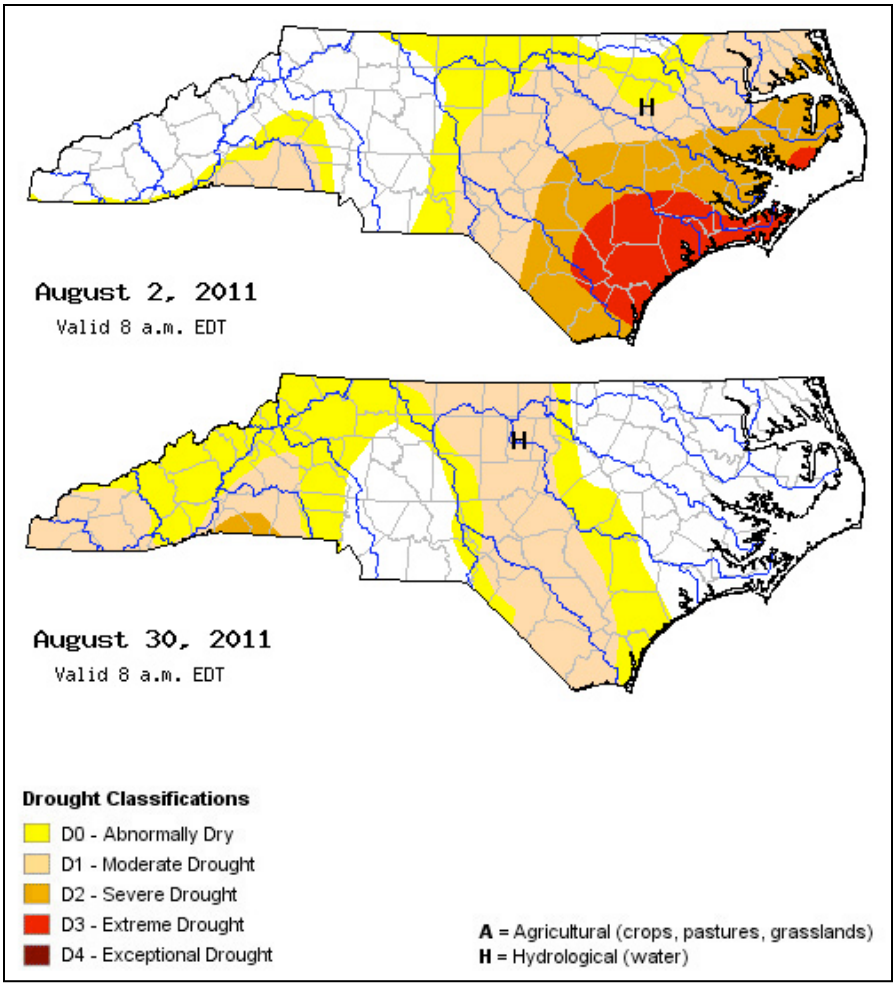

Figure 3. US Drought Monitor for North Carolina, August 2 and August 30, 2011 (Courtesy of NCDENR Division of Water Resources).

September 2011 brought temperatures that were generally near normal and rain that fell in generous amounts in central and western NC where it was most needed. (NC State Climate Office, October 5, 2011). .

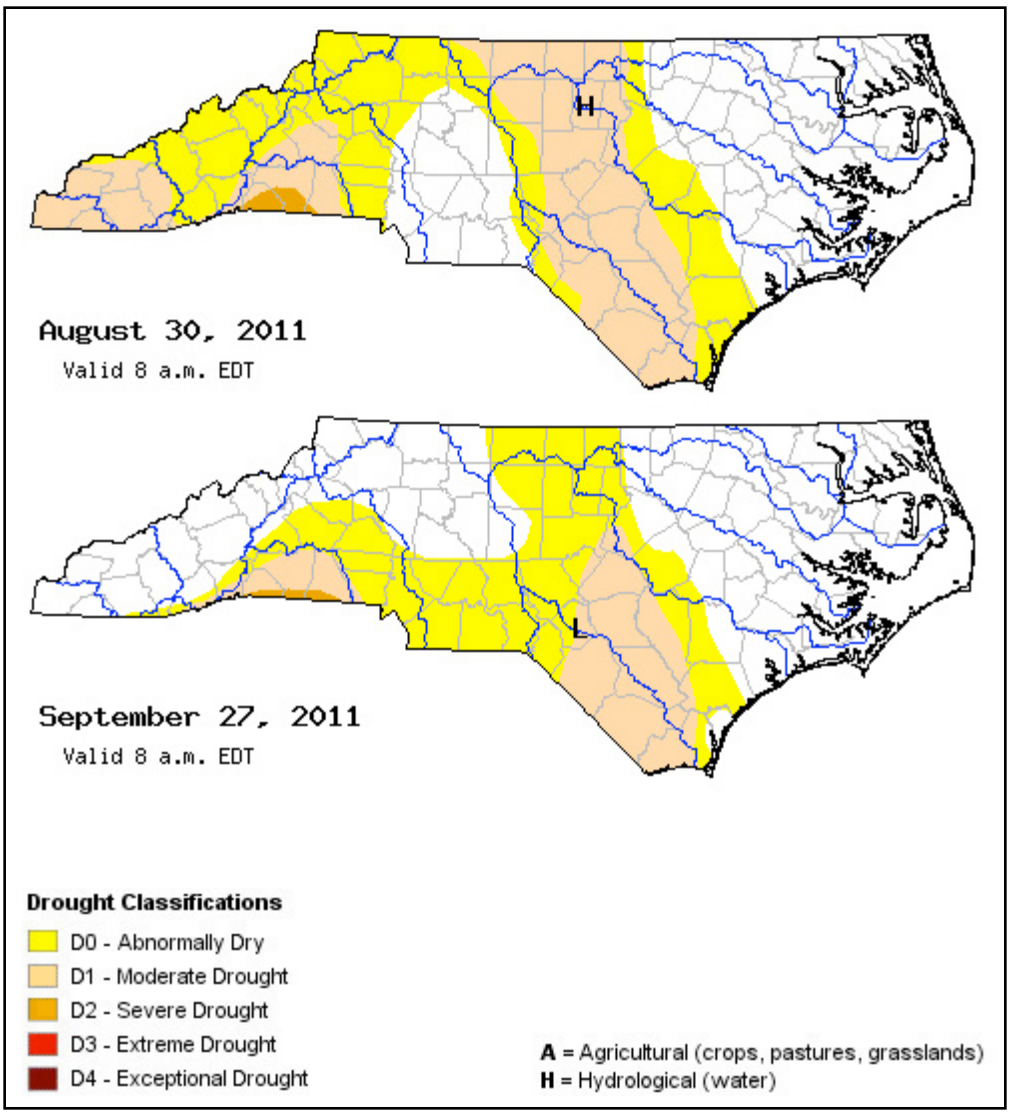

Figure 4. US Drought Monitor for North Carolina, August 30 and September 27, 2011 (Courtesy of NCDENR Division of Water Resources).

LAKE & RESERVOIR ASSESSMENTS

HUC 03040101

Kerr Scott Reservoir

Ambient Lakes Program Name	Kerr Scott Reservoir		
Trophic Status (NC TSI)	Mesotrophic		
Mean Depth (meters)	12.0		
Volume ($10^6 m^3$)	189.00		
Watershed Area (mi^2)	348.0		
Classification	WS-IV B Tr		
Stations	YAD007A	YAD008	YAD008A
Number of Times Sampled	10	10	10

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.

DWQ field staff sampled Kerr Scott Reservoir five times in 2011. Surface dissolved oxygen ranged from 7.1. to 8.9 mg/L and surface water temperatures ranged from 23.4 °C in late September to 30.9 °C on August 1, 2011. Surface pH values for this lake ranged from 7.1 to 8.9 s.u. and conductivity values ranged from 40 to 44 µmhos/cm. Secchi depths indicated that the clarity of the water in Kerr Scott reservoir was good (range = 1.5 to 2.0 meters).

Total phosphorus and ammonia concentrations were at or below DWQ Laboratory detection levels (Appendix A). Total organic nitrogen ranged from 0.20 to 0.29 mg/L. Chlorophyll *a* values ranged from 5.2 to 18 *µ*g/L, with the highest chlorophyll *a* values occurring in late September. Based on calculated NCTSI scores for 2011, Kerr Scott Reservoir was determined to have moderate biological productivity (mesotrophic conditions).

Kerr Scott Reservoir was previously sampled five times in 2009 by DWQ field staff. Surface dissolved oxygen ranged from 5.4 mg/L to 9.1 mg/L and surface pH ranged from 6.9 s.u. to 8.9 s.u. (Appendix A). Secchi depths ranged from 0.9 meter to 2.0 meters, with the majority of these readings greater than 1.5 meters. The lower Secchi depth measurements were recorded on June 9, 2009 (0.9 to 1.0 meter). Staff field notes indicate that heavy rains (5.0" or more) fell within this reservoir's watershed at the end of May. This may have contributed to increased turbidity values in June as compared with other sampling months in 2009.

Total phosphorus concentrations in 2009 ranged from <0.02 mg/L to 0.39 mg/L and the greatest values were observed in June at all there lake sampling sites. Total Kjeldahl nitrogen ranged from <0.02 mg/L to 0.39 mg/L, with the greatest concentrations of this nutrient also observed in June. Ammonia ranged from <0.02 mg/L to 0.02 mg/L and nitrite plus nitrate ranged from <0.02 mg/L to 0.04 mg/L. Chlorophyll *a* values in 2009 ranged from 6.7 µg/L to 18 µg/L. Based on calculated NCTSI scores, Kerr Scott Reservoir demonstrated moderate biological productivity (mesotrophic conditions) in 2009.

Winston Lake

Ambient Lakes Program Name	Winston Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	2.0
Volume ($10^6 m^3$)	0.03
Watershed Area (mi^2)	7.0
Classification	C
Stations	YAD077D
Number of Times Sampled	10

Winston Lake is a small reservoir located in the City of Winston-Salem. The lake was built in 1919 as a water supply source but is no longer used for that purpose. The lake is currently used for non-contact recreation such as fishing.

DWQ field staff sampled one station in Winston Lake five times from May through September of 2011. Surface dissolved oxygen ranged from 6.0 mg/L in September to 8.9 mg/L in August (Appendix A). Surface water temperatures ranged from 19.9 °C in May to 31.5 °C in August. Surface pH values (range = 6.0 to 7.6 s.u.) were slightly lower than previous recorded values for this lake. Secchi depths ranged from 0.6 to 1.4 meters. The lower Secchi depths recorded in 2011 coincided with rain that had fallen within the lake watershed within 42 hours of the lake being sampled. Turbidity values were also greater on these sampling dates. Staff described the lake water as appearing brown in color at that time, suggests reduced clarity due to rainfall.

Total phosphorus values in 2011 ranged from 0.03 mg/L to 0.05 mg/L (Appendix A). The greatest nitrite plus nitrate (0.15 mg/L) and ammonia (0.13 mg/L) values were recorded in July, while the greatest total organic nitrogen (0.59 mg/L) and total Kjeldahl nitrogen (0.68 mg/L) values were recorded in September. Chlorophyll *a* values in 2011 ranged from 11 µg/L in May to 25 µg/L in August. Staff field notes recorded during the August sampling effort on Lake Winston indicated that the water appeared green in color and that a surface algae bloom was observed near the boat ramp and fish feeders.

Winston Lake was previously sampled five times in 2009. Surface dissolved oxygen ranged from 7.3 mg/L to 9.1 mg/L and surface pH was relatively stable, ranging from 7.3 to 7.7 mg/L. Secchi depths for Winston Lake in 2009 ranged from 0.8 to 1.0 meter. Total phosphorus ranged from 0.03 mg/L to 0.04

mg/L and total Kjeldahl nitrogen ranged from 0.37 mg/L to 0.55 mg/L. Both ammonia (0.05 mg/L) and nitrite plus nitrate (0.31 mg/L) were greatest in May. Chlorophyll *a* ranged from 8.2 µg/L in May to 22.0 µg/L in August.

Based on calculated NCTSI scores for both 2011 and 2009, Winston Lake was determined to exhibit elevated biological productivity (eutrophic conditions).

Salem Lake

Ambient Lakes Program Name	Salem Lake		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	5.0		
Volume ($10^6 m^3$)	0.80		
Watershed Area (mi^2)	26.0		
Classification	WS-III CA		
Stations	YAD077A	YAD077B	YAD077C
Number of Times Sampled (2009)	5	4	5

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 as well as serving as a reserve water basin for the Yadkin River (http://www.cityofws.org/Assets/CityOfWS//Documents/departments/utilities/pdf_files/Water%20Division%20Operations2.pdf). In 2011, the lake water level was drawn down for dam repair and water quality monitoring was not conducted.

Staff at the Winston-Salem Regional Office of DWQ sampled Salem Lake five times during the summer of 2009. Data collected during these sampling trips are located in Appendix A. Salem Lake was not sampled in 2011 due to construction work on the lake's dam.

In 2009, surface dissolved oxygen in Salem Lake ranged from 6.6 mg/L to 8.6 mg/L. The lowest Secchi depths were observed in August (0.7 to 0.9 meters). Chlorophyll *a* values ranged from 9 µg/L to 31 µg/L in 2009 with field notes indicating that the lake water appeared green in color in July. Based on the calculated NCTSI scores, Salem Lake exhibited elevated biological productivity (eutrophic conditions) in 2009. Historically, this 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)	Eutrophic										
Mean Depth (meters)	5.0										
Volume ($10^6 m^3$)	314.0										
Watershed Area (mi^2)	3929.0										
Classification	WS-IV B CA, B, WS-V										
Stations	YADHRL051	YAD152	YAD152A	YAD152C	YAD1561A	YAD156A	YADHRL052	YAD169A	YAD169B	YAD169E	YAD169F
Number of Times Sampled	5	5	5	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 erodable, 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 was sampled five times in 2011 by DWQ field staff. Surface dissolved oxygen ranged from 6.3 mg/L in August to 14.0 mg/L (percent dissolved oxygen = 182.7%) in September (Appendix A). Surface water temperature in High Rock Lake ranged from 21.5 °C in May to 32.5 °C in August. Surface pH values in 2011 ranged from 7.0 s.u. in May to 9.6 s.u. in September. Surface pH values were greater than the state water quality standard of 9.0 s.u in 18 out of a total of 55 measurements or a total of 32.7%

of the surface measurements made in 2011. Secchi depths in July, August and September were less than one meter lakewide, suggesting that the water clarity in High Rock Lake was poor. In May, Secchi depths were at or greater than a meter at 8 of 11 sampling sites and in June, this number was reduced to three out of eleven sampling sites.

Total phosphorus ranged from 0.04 to 0.18 mg/L. Total Kjeldahl nitrogen ranged from 0.56 to 1.10 mg/L and ammonia was generally below the DWQ Water Quality Laboratory detection level (Appendix A). Turbidity values greater than the state water quality standard of 25 NTU were observed four times in 2011. All of these observations were made at the upstream sampling site in High Rock Lake near Trading Ford (YADHRL051). This sampling site is very shallow and has a depth of approximately 1.5 meters.

Chlorophyll *a* values in 2011 ranged from 13 to 85 µg/L. Thirty-two out of 55 chlorophyll *a* samples collected at High Rock Lake in 2011 were greater than the state water quality standard of 40 µg/L (58.2%).

High Rock was determined to exhibit elevated biological productivity (eutrophic conditions) on May 2, May 31 and August 8, and extremely elevated biological productivity (hypereutrophic conditions) on July 11 and September 13. High Rock Lake is currently listed on the 303(d) List of Impaired Waters for standards violations of chlorophyll *a*, turbidity and pH.

Lake Thom-A-Lex

Ambient Lakes Program Name	Lake Thom-A-Lex	
Trophic Status (NC TSI)		
Mean Depth (meters)	8.0	
Volume ($10^6 m^3$)	7.80	
Watershed Area (mi^2)	39.0	
Classification	WS-III CA	
Stations	YAD160B	YAD1611A
Number of Times Sampled	15	15

Lake Thom-A-Lex is located near the Cities of Lexington and Thomasville. The lake 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.

In 2011, DWQ field staff monitored Lake Thom-A-Lex monthly from May through September. Surface dissolved oxygen ranged from 4.1 mg/L in September to 8.9 mg/L in August 2011. Low surface dissolved oxygen in September was observed at the downstream lake sampling site and may have been due to a turnover event associated with cooler temperatures that occurred that week. Surface water temperatures

for Lake Thom-A-Lex ranged from 21.4 °C in May to 31.8 °C in August and surface pH values ranged from 6.2 to 7.7 s.u. in 2011. Secchi depths, a measurement of water clarity, were less than a meter at the upstream lake sampling site and ranged from 0.7 to 1.0 meter at the lower end of the lake. These values suggest that the water clarity of Thom-A-Lex Lake is moderate to poor and may be reduced by the presence of suspended sediment particles as reflected in total solids values, which ranged from 84 to 108 mg/L in 2011.

Total phosphorus ranged from 0.04 to 0.08 mg/L and total organic nitrogen ranged from 0.52 to 0.81 mg/L. Nitrite plus nitrate values were at or below DWQ Laboratory detections levels while ammonia ranged below detection level to 0.16 mg/L. Chlorophyll *a* ranged from 19 to 40 µg/L with values consistently greater at the upper end of the lake as compared with the lower end near the dam. Phytoplankton samples collected in 2010 indicated that algal blooms in Lake Thom-A-Lex were moderate in May through July, then became extreme in August before declining to severe in September. Algal densities were dominated by the blue-green algae *Aphanocapsa sp.*, *Cylindrospermopsis sp*, and *Pseudanabaena sp.* Algal biovolumes were dominated by the blue-green alga *Pseudanabaena sp.* and the euglenoid *Trachelomonas sp.* Blue-green algae are indicators of nutrient enrichment and euglenoids are found in waters rich in organic matter.

Lake Thom-A-Lex was also sampled by DWQ staff from the Winston-Salem Regional Office monthly from May through September in 2009 and 2010 for a total of 10 sampling trips. Secchi depths were predominantly less than one meter (Appendix A), suggesting that the water clarity of this lake was poor. Field notes by staff indicated that the lake water was either brown from suspended sediments following rain events, or green in color (suggesting an increase in algal productivity).

Surface dissolved oxygen ranged from 3.6 mg/L at the upstream sampling site (YAD1611A) on July 29, 2006 to 8.9 mg/L at the sampling site near the dam (YAD160B) on September 9, 2011. The surface dissolved oxygen value of 3.6 mg/L was less than the state water quality standard of 4.0 mg/L for an instantaneous dissolved oxygen measurement. Further, dissolved oxygen throughout the water column at the upstream sampling site on July 29, 2009 was less than the state water quality standard. Field notes indicated that 0.2" of rain had fallen the evening previous to lake sampling. Turbidity values at both lake sampling sites on this date were greater than the state water quality standard of 25 NTU for lakes.

Photic zone total phosphorus in 2009 and 2010 ranged from 0.04 mg/L to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.50 mg/L to 0.75 mg/L. In 2009, both ammonia and nitrite plus nitrate values were at or less than DWQ laboratory detection levels. In 2010, ammonia values ranged from <0.02 mg/L to 0.13 mg/L and nitrite plus nitrate ranged from <0.02 mg/L to 0.26 mg/L. Chlorophyll *a* ranged from 9.6 µg/L to 41 µg/L, with the latter value greater than the state water quality standard of 40 ug/L.

Based on calculated NCTSI scores, Lake Thom-A-Lex was determined to exhibit elevated biological productivity (eutrophic conditions) in 2009, 2010 and 2011. Lake Thom-A-Lex is on the 2010 303(d) List of Impaired Waters for violations of the state's chlorophyll *a* standard.

Tuckertown Reservoir

Ambient Lakes Program Name	Tuckertown Reservoir	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	10.0	
Volume ($10^6 m^3$)	289.00	
Watershed Area (mi^2)	4210.0	
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 and its primary uses are hydroelectric power generation and public recreation. The watershed surrounding this lake is composed of forested, agricultural and urban areas.

DWQ staff sampled Tuckertown Reservoir five times in 2011 (monthly from May through September). Surface dissolved oxygen ranged from 4.9 mg/L in September to 11.4 mg/L in May (Appendix A). Both surface dissolved oxygen readings were measured at the sampling site near the dam. Surface water temperatures ranged from 21.4 °C to 31.6 °C. Both of these water temperature measurements were observed at the upper lake sampling site located downstream from Flat Creek. Surface pH values ranged from 7.6 to 9.2 s.u. and Secchi depths ranged from 0.1 to 1.2 meters.

Total phosphorus concentrations in Tuckertown Reservoir ranged from 0.04 to 0.06 mg/L and total organic nitrogen ranged from 0.32 to 0.83 mg/L. These values are similar to previously recorded nutrient values for this lake by DWQ. Concentrations of ammonia and nitrite plus nitrate were greatest in September and may have been due to a turnover event in the lake when cooler surface water sinks and displaces warmer bottom water, which rises toward the surface, bringing bottom nutrients as well as low dissolved oxygen concentrations with it.

Chlorophyll *a* values in Tuckertown Reservoir in 2011 ranged from 14 µg/L in September to 54 µg/L in July. The values for chlorophyll *a* in July and August at both lake sampling sites were greater than the state water quality standard of 40 µg/L. Algal blooms were mild during May, June and September and severe in July and August. Algal densities were dominated by the diatom *Fragilaria sp.* in May and by the blue-green alga *Pseudanabaena sp*. the remainder of the summer. Algal biovolumes were dominated by the blue-green alga *Pseudanabaena sp*. and by the cryptomonad *Cryptomonas sp*. in August. Blue-green algae are common indicators of nutrient enrichment and both cryptomonads and diatoms are generally considered beneficial as food sources for many aquatic organisms.

Floating algae mats observed near the upstream lake sampling site were identified as *Lyngbya wollei*. This blue-green alga forms dense, fibrous mats that normally attached to the bottom that can dislodge and float on the surface of the water. Large accumulations of *Lyngbya* mats can be unsightly, give off an offensive musty odor as they decay and reduce the recreational value of a lake.

Based on the calculated NCTSI scores, Tuckertown Reservoir was determined to have elevated biological productivity (eutrophic conditions) in 2011.

Badin Lake

Ambient Lakes Program Name	Badin Lake			
Trophic Status (NC TSI)	Eutrophic			
Mean Depth (meters)	14.0			
Volume ($10^6 m^3$)	344.00			
Watershed Area (mi^2)	4116.0			
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 of rural with some agriculture.

DWQ field staff sampled Badin Lake monthly from May through September 2011. Surface dissolved oxygen in this lake ranged from 4.5 mg/L in September (after the lake turned over) to 10. 5m/L in May and June near the dam (sampling site YAD178F; Appendix A). Surface water temperature ranged from 23.5 °C to 30.6 °C and surface pH ranged from 7.6 to 9.2 s.u. The surface pH values in June were greater than the state water quality standard of 9.0 s.u. Secchi depths ranged from 1.1 to 2.3 meters, indicating that the clarity of the lake water was good.

Total phosphorus concentrations ranged from 0.02 to 0.04 mg/L and total organic nitrogen ranged from 0.27 mg/L in September to 0.54 mg/L in July. Ammonia concentrations were generally at or below DWQ Laboratory detection levels while nitrite plus nitrate ranged from 0.04 to 0.52 mg/L. Chlorophyll *a* values for Badin Lake in 2011 ranged from 3.1 to 28 μg/L. The concentrations of chlorophyll *a* in Badin Lake for 2011 were similar to concentrations measured in this lake since it was first monitored by DWQ in 1981. An Algal Growth Potential Test was performed on water samples collected from Badin Lake in August 2011 (Table 1). The results of that test indicated that three of the most upstream lake sampling site was limited for nitrogen (i.e., nitrogen controls the growth of algae at this sampling site). The three remaining sampling sites were co-limited for nitrogen and phosphorus.

Based on the calculated NCTSI scores, Badin Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2011. The trophic state of Badin Lake has been either mesotrophic or eutrophic since it was first monitored by DWQ in 1981.

Table 1. Algal Growth Potential Test Results for Badin Lake, August 24, 2011.

Station	Control	C+N	C+P	C+N+P	Limiting Nutrient
YAD178B	4.0	5.7	4.3		N
YAD178F	3.7	4.8	4.5	15.8	N+P
YAD178F1	3.6	2.9	4.2	19.1	N+P
YAD178E	2.6	2.0	3.0	25.2	N+P

AGPT - Algal Growth Potential Test

MSC - Maximum Standing Crop

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

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

C+N+P - Control + 1.0 mg/L Nitrate-N + 0.05 mg/L Phosphate-P

In June 2008, officials from Stanly County requested the NC Department of Health and Human Services investigate the existing Badin Lake environmental data to determine if consuming fish from the Lake posed a health risk to the public. In late summer 2008, the NC Department of Environment and Natural Resources, Division of Water Quality collected fish from three areas of Badin Lake – the northeast, northwest and southwest segments. Different fish species were collected to obtain a representative sample of fish in the lake that are commonly caught and eaten. These fish were analyzed for PCBs and PAH (polynuclear aromatic hydrocarbons). While no PAHs were detected in the fish, concentrations of PCBs in some catfish and largemouth bass were greater than the NC Division of Public Health level of concern (i.e., the maximum concentration level of a substance the state of NC has determined as safe). Based on these findings, the NC Division of Public Health placed a fish consumption advisory on Badin Lake in 2009 for elevated levels of polychlorinated biphenyls (PCBs) found in catfish and largemouth bass taken from the lake (http://www.epi.state.nc.us/epi/fish/current.html). This fish consumption advisory also placed Badin Lake on the 303(d) List of Impaired Waters.

Falls Lake

Ambient Lakes Program Name	Falls Lake	
Trophic Status (NC TSI)	Mesotrophic	
Mean Depth (meters)	10.0	
Volume ($10^6 m^3$)	177.00	
Watershed Area (mi^2)	2552.0	
Classification	WS-IV B CA	
Stations	YAD178F3	YAD178F5
Number of Times Sampled	5	5

Falls Lake is a small run-of-the-river impoundment located between Badin Lake and Lake Tillery on the Yadkin River. Falls Lake has a drainage basin of 6,610 km^2 with the major inflow coming from the discharge of Badin Lake into the Yadkin River. The topography of the watershed is hilly with forests and some agriculture.

Falls Lake was sampled five times in 2011 by DWQ field staff. Surface dissolved oxygen ranged from 5.0 mg/L in July to 8.9 mg/L in May (Appendix A). Surface water temperature ranged from 19.2 °C to 29.2 °C and surface pH values ranged from 7.1 to 8.6 s.u. Secchi depths for Falls Lake ranged from 1.2 to 2.3 meters, indicating that the clarity of the lake water was good.

Total phosphorus ranged from 0.02 to 0.03 mg/L and total organic nitrogen ranged from 0.48 to 1.04 mg/L. The greatest total phosphorus and total organic nitrogen values were observed in May (Appendix A). Chlorophyll *a* values ranged from 3.2 to 15.0 μg/L. Based on calculated NCTSI scores for 2011, Falls Lake was determined to have moderate biological productivity (mesotrophic conditions) at the time it was sampled.

Lake Reese

Ambient Lakes Program Name	Lake Reese		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	5.0		
Volume ($10^6 m^3$)	0.90		
Watershed Area (mi^2)	100.0		
Classification	WS-III CA		
Stations	YAD077A	YAD077B	YAD077C
Number of Times Sampled	10	10	10

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 primary water supply (Back Creek Lake) has a three-foot drop in level.

DWQ staff sampled this lake monthly from May through September in 2011. Surface dissolved oxygen ranged from 9.8 mg/L in May to 4.5 mg/L in September following heavy rainfall in the lake's watershed (Appendix A). Surface water temperatures ranged from 27.3 °C in May to 31.5 °C in July. Surface pH values ranged from 6.2 to 7.7 s.u. and surface conductivity ranged from 104 to 130 µmhos/cm. Secchi depths for Falls Lake during the 2011 sampling period ranged from less than a meter at the upper end of the lake (YAD179B) to 1.7 meters near the dam (YAD179F). This pattern indicates that water entering the reservoir is more turbid and carries a greater load of suspended sediment which gradually settles out as the water travels the length of the reservoir until the turbidity is much less near the dam. Both turbidity and total solids demonstrate a similar pattern of greater values at the upper end of the reservoir and generally lower values further downstream.

Total phosphorus ranged from 0.02 to 0.04 mg/L, with greater concentrations of total phosphorus occurring at the most upstream lake sampling site (YAD179B; Appendix A). Ammonia and nitrite plus nitrate values were below DWQ Laboratory detection limits during all sampling trips except September following a significant rainfall event. Total organic nitrogen ranged from 0.35 to 0.66 mg/L. Chlorophyll *a* values in Lake Reese ranged from 8.0 to 26.0 µg/L, with the highest chlorophyll *a* values occurring at YAD179B.

Analysis of phytoplankton samples collected from Lake Reese indicated that the algal densities in the lake were dominated by blue-green algae (primarily *Chroococcus sp., Cylindrospermopsis sp.,* and *Aphanocapsa sp.*). Algal biovolumes were dominated by the green alga *Ankistrodesmus sp*. during May, the blue-green *Aphanizomenon sp*. during June and August, and the chrysophyte *Synura sp*. during September. Based on the calculated NCTSI scores for 2011, Lake Reese was found to have elevated biological productivity or eutrophic conditions.

Lake Reese was previously sampled in 2009 by DWQ field staff from the Winston-Salem Regional Office. Surface dissolved oxygen ranged from 5.4 mg/L on September 10, 2009 to 8.9 mg/L in May 2009 (Appendix A). Lake surface water temperature ranged from 21.4 °C to 30.5 °C and surface pH ranged

from 7.6 to 8.5 s.u. Secchi depths ranged from 0.6 meter to 1.2 meters. Photic zone total phosphorus ranged from 0.02 mg/L to 0.06 mg/L and total Kjeldahl nitrogen ranged from 0.40 mg/L in May to 0.58 mg/L in July. Concentrations of both ammonia and nitrite plus nitrate were below DWQ laboratory detection levels. Chlorophyll *a* values in 2009 were less than the state water quality standard of 40 µg/L (range = 15 to 31 µg/L). Lake Reese was determined to exhibit elevated biological productivity (eutrophic conditions) in 2009 based on calculated NCTSI scores.

Lake Bunch

Ambient Lakes Program Name	Lake Bunch
Trophic Status (NC TSI)	Mesotrophic
Mean Depth (meters)	3.0
Volume ($10^6 m^3$)	0.04
Watershed Area (mi^2)	2.0
Classification	WS-II HQW CA
Stations	YAD181G
Number of Times Sampled	10

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.

DWQ staff sampled this lake five times in 2011. Dissolved oxygen at the surface of the lake ranged from 6.7 to 8.4 mg/L and surface water temperature ranged from 23.9 °C to 3.1 °C (Appendix A). Secchi depths for June through September ranged from 2.0 to 3.3 meters, indicating that the water clarity for this lake is very good.

Total phosphorus concentrations in 2011 ranged from 0.02 mg/L to below DWQ laboratory detection levels (Appendix A). Ammonia and nitrite plus nitrate concentrations were also below detection levels. Total organic nitrogen ranged from 0.32 to 0.39 mg/L. Chlorophyll *a* values ranged from 4.9 to 29 µg/L. Based on the calculated NCTSI scores for 2011, Lake Bunch was determined to have elevated biological productivity in May (eutrophic conditions), moderate productivity in June, August and September (mesotrophic conditions), and very low biological productivity in July (oligotrophic conditions). Overall, Bunch Lake exhibited mesotrophic conditions during the summer of 2011.

Lake Bunch was previously sampled in 2009 by DWQ field staff from the Winston-Salem Regional Office. Secchi depths ranged from 0.8 meter in June following a heavy rainfall event (>5.0") to 2.6 meters on October 8, 2009 (Appendix A). Staff field notes indicated that Lake Bunch appeared muddy in June. The

greatest recorded value for turbidity (18 NTU) was in June and may have resulted from suspended sediments in the water column.

Surface dissolved oxygen ranged from 7.3 to 8.8 mg/L and surface pH ranged from 7.2 to 8.2 s.u. Total phosphorus ranged from 0.02 to 0.07 mg/L and total Kjeldahl nitrogen ranged from 0.41 to 0.82 mg/L. The greatest values recorded for these two nutrients were in June. Values for ammonia and nitrite and nitrate were at or below DWQ laboratory detection levels. Chlorophyll *a* concentrations ranged from 16 µg/L in May to 47 µg/L in August 2009(which was greater than the state water quality standard of 40 µg/L). Based on the calculated NCTSI scores, Lake Bunch exhibited moderate biological productivity (mesotrophic conditions) in May and September and elevated biological productivity (eutrophic conditions) in June, July and August 2009.

McCrary Lake

Ambient Lakes Program Name	Lake McCrary
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	3.0
Volume ($10^6 m^3$)	0.90
Watershed Area (mi^2)	1.0
Classification	WS-II HQW CA
Stations	YAD181E
Number of Times Sampled	5

McCrary Lake was built in 1924 by the City of Asheboro for use as a water supply. The dam was rebuilt in 1984 for safety reasons. The maximum depth of this small reservoir is approximately 15 feet (five meters). An unnamed tributary to Cedar Fork Creek is the major inflow to the lake. The drainage area is almost completely wooded. McCrary Lake is primarily used to regulate flow upstream of Lake Bunch. A landfill is located on the west side of McCrary Lake and Lake Bunch.

McCrary Lake was sampled five times in 2011 by DWQ field staff. Surface water temperatures ranged from 20.0 °C in September and October to 30.4 °C in August. Surface dissolved oxygen ranged from 5.4 to 7.7 mg/L and surface pH ranged from 7.5 to 8.5 s.u. Secchi depths in 2011 ranged from 1.2 to 3.0 meters.

Total phosphorus concentrations in Lake McCrary in 2011 ranged from 0.03 to 0.04 mg/L and total organic nitrogen ranged from 0.45 to 0.61 mg/L. Nitrite plus nitrate values were below DWQ Laboratory detection levels while ammonia ranged from below laboratory detection level to 0.06 mg/L. Chlorophyll *a* values ranged from 17 µg/L to 50 µg/L. Chlorophyll *a* values in May (50 µg/L) and in August (41 µg/L) were greater than the state water quality standard of 40 µg/L. McCrary Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2011 based on the calculated NCTSI scores.

DWQ field staff previously sampled McCrary Lake in 2009. Surface dissolved oxygen ranged from 6.2 to 8.4 mg/L and surface pH ranged from 6.6 to 7.5 s.u. (Appendix A). Secchi depths ranged from 0.7 meter on June 25, 2009 to 2.6 meters on October 8, 2009. A heavy rainfall occurred within the lake's watershed on June 18th and field notes indicated that McCrary Lake appeared muddy when it was sampled on the 25th of June. Suspended sediment in the water column would have contributed to the Secchi depth of less than a meter, a turbidity value of 23 NTU and a total solids concentration of 7.0 mg/L (Appendix A).

Photic zone total phosphorus ranged from 0.02 mg/L to 0.05 mg/L, the latter value recorded on June 25, 2009. The greatest concentration of total Kjeldahl nitrogen during the 2009 sampling trips was also recorded on June 25th. Both ammonia and nitrite plus nitrate values were at or below the DWQ laboratory detection levels with the exception of nitrite plus nitrate results in May (0.08 mg/L). Chlorophyll *a* concentrations in 2009 ranged from 13 to 38 μg/L. Based on calculated NCTSI scores, McCrary Lake was determined to exhibit elevated biological productivity (eutrophic conditions).

Back Creek Lake

Ambient Lakes Program Name	Back Creek Lake		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	4.0		
Volume ($10^6 m^3$)	5.00		
Watershed Area (mi^2)	16.0		
Classification	WS-II HQW CA		
Stations	YAD181J	YAD181K	YAD181L
Number of Times Sampled	15	15	15

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 five times in 2011 by DWQ field staff. Surface water temperatures ranged from 25.1 °C to 30.6 °C and surface dissolved oxygen ranged from 6.1 to 8.6 mg/L (Appendix A). Secchi depths in Back Creek Lake ranged from 0.6 to 1.5 meters, with the lower Secchi depths occurring most frequently at the upper end of the lake (YAD181J).

Total phosphorus in 2011 ranged from 0.02 to 0.09 mg/L and total organic nitrogen ranged from 0.48 to 0.74 mg/L. Ammonia and nitrite plus nitrate values were below DWQ Laboratory detection levels.

Chlorophyll *a* values ranged from 10 to 52 µg/L. The greatest chlorophyll *a* value observed in 2011 was at the upper end of the lake (52 µg/L) and was greater than the state water quality standard of 40 µg/L. Notes taken by field staff describe the upper end of the lake appearing turbid and the water having a green color. Analysis of phytoplankton samples collected from the lake indicated that algal blooms were severe (30,000 to 100,000 units per ml) throughout the summer of 2011. Algal densities were dominated by the green alga *Ankistrodesmus* sp. during May, the blue-green alga *Aphanocapsa sp.* during June, and *Cylindrospermopsis sp.* through mid to late summer. By biovolume, *Ankistrodesmus* sp. dominated in May and blue-green alga *Aphanizomenon sp*. dominated in July and *Pseudanabaena sp*. dominated in August. Blue-green algae are common indicators of nutrient enrichment and are capable of producing taste and odor problems in drinking water.

Back Creek Lake was determined to have elevated biological productivity (eutrophic conditions) in 2011 based on the calculated NCTSI scores. Back Creek Lake is also on the 2010 303(d) List of Impaired Waters for violations of the state's chlorophyll *a* standard.

DWQ field staff previously sampled Back Creek Lake in 2009 and 2010. In 2009, surface dissolved oxygen in Back Creek Lake ranged from 6.3 to 9.5 mg/L and surface water temperature ranged from 21.6 °C to 29.1 °C. Surface pH values ranged from 7.0 to 8.6 s.u. Secchi depths in 2009 ranged from 0.7 to 1.1 meters. Total phosphorus concentrations ranged from 0.04 mg/L to 0.08 mg/L and total Kjeldahl nitrogen ranged from 0.59 mg/L to 0.81 mg/L. Both ammonia and nitrite plus nitrate values were below the DWQ laboratory detection levels in 2009. Chlorophyll *a* values at all lake sampling sites in June and July were greater than the state water quality standard of 40 µg/L (Appendix A). Back Creek Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2009 based on calculated NCTSI scores.

Both the lowest (4.2 mg/L) and highest (8.6 mg/L) surface dissolved oxygen values were observed on October 7, 2010 (Appendix A). The lowest value was slightly greater than the state water quality standard of 4.0 mg/L for an instantaneous dissolved oxygen value. Field notes indicated that the lake level was down approximately three feet and the aeration system near the dam was not operating on October 7th. The color of the water in the upper end of the lake was green while the color near the dam was brown.

Surface pH values in 2010 ranged from 6.7 s.u. to 8.7 s.u. and surface water temperatures ranged from 19.0 °C in October to 31.7 °C in May (Appendix A). The 2010 Secchi depths ranged from 0.4 to 1.5 meters with the lowest Secchi depth measurements recorded in October 2010. Photic zone total phosphorus ranged from 0.02 mg/L to 0.09 mg/L and total Kjeldahl nitrogen ranged from 0.42 mg/L to 0.80 mg/L. Ammonia and nitrite plus nitrate values were at or less than the DWQ laboratory detection levels with the exception of values for nitrite plus nitrate in October (range = 0.02 to 0.09 mg/L). Two chlorophyll *a* values recorded in October 2010 (52 and 58 µg/L) were greater than the state water quality standard of 40 µg/L. Based on the calculated NCTSI scores, Back Creek Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2010.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040104

Lake Tillery

Ambient Lakes Program Name	Lake Tillery			
Trophic Status (NC TSI)	Mesotrophic			
Mean Depth (meters)	10.0			
Volume ($10^6 m^3$)	207.00			
Watershed Area (mi^2)	4834.0			
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 was sampled by DWQ once monthly from May and through September 2011 for a total of five sampling events. Surface dissolved oxygen in this reservoir ranged from 6.6 mg/L in August to 9.9 mg/L in May (Appendix A). Surface water temperatures ranged from 20.4 °C in May to 31.9 °C in July. Surface pH values were within state water quality standards and ranged from 7.7 to 8.4 s.u. Secchi depths for Lake Tillery were consistently greater than one meter and ranged from 1.3 meters in May to 3.0 meters in September, indicating that the water clarity was good.

Total phosphorus concentrations ranged from <0.02 to 0.04 mg/L and total organic nitrogen ranged from 0.28 to 0.43 mg/L. Ammonia concentrations were below DWQ Laboratory detection levels in 2011 and nitrite plus nitrate ranged from <0.02 to 0.21 mg/L. Overall, nutrient concentrations in 2011 were similar to concentrations previously recorded from other DWQ sampling trips. Chlorophyll *a* values ranged from 6.1 to 20.0 µg/L, which is less that the state water quality standard of 40.0 µg/L. Based on calculated NCTSI scores for 2011, Lake Tillery was determined to have elevated biological productivity (eutrophic conditions) in May and June and moderate productivity (mesotrophic conditions) in July, August and September.

Hydrilla (*Hydrilla verticillata*) is present in Lake Tillery and management consists of a combination of herbicide treatments and grass carp stocking. In 2010, the lake was stocked with over 1500 grass carp and an additional 850 grass carp were added in 2011. Herbicide treatment of approximately 90 acres was also planned for 2011.

Blewett Falls Lake

Ambient Lakes Program Name	Blewett Falls Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	12.0
Volume ($10^6 m^3$)	8.30
Watershed Area (mi^2)	6784.0
Classification	WS-IV B CA
Stations	YAD260B
Number of Times Sampled	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.

DWQ field staff sampled this lake monthly from May through September 2011. Surface dissolved oxygen ranged from 14.0 mg/L on June 1 to 8.4 mg/L on September 21. Surface water temperatures ranged from 24.7 °C to 30.3 °C. Surface pH in June was greater than the state water quality standard of 9.0 s.u. Field notes indicate that the water at the sampling site in June appeared green in color, which along with the elevated surface dissolved oxygen measurement, was suggestive of increased algal productivity. Secchi depths in 2011 ranged from 0.9 to 1.1 meters.

Total phosphorus concentrations ranged from 0.04 to 0.12 mg/L and total organic nitrogen ranged from 0.50 to 0.93 mg/L. Ammonia ranged from below DWQ Laboratory detection levels to 0.13 mg/L and nitrite plus nitrate ranged from 0.02 to 0.77 mg/L. Chlorophyll *a* values ranged from 10 to 44 μg/L with the greatest value measured in June. The June chlorophyll *a* value was greater than the state water quality standard of 40 μg/L. Both nutrient and chlorophyll *a* in 2011 were similar to previously recorded values by DWQ for this lake. Blewett Falls Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2011 based on the calculated NCTSI scores.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040105

Kannapolis Lake

Ambient Lakes Program Name	Kannapolis Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	5.0	
Volume ($10^6 m^3$)	5.20	
Watershed Area (mi^2)	11.0	
Classification	WS-III CA	
Stations	YAD207A	YAD207C
Number of Times Sampled	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 DWQ staff.

In 2011, the water level in Kannapolis Lake dropped due to limited rainfall in the region. By September, the level of the lake had dropped approximately five to six feet from normal pool elevation based on field observations. Surface dissolved oxygen in 2011 ranged from 6.0 to 9.1 mg/L and surface water temperatures ranged from 21.9 °C to 30.5 °C (Appendix A). Secchi depths ranged from 0.4 to 1.2 meters with the Secchi depths at the upper end of this lake (YAD207A) consistently less than a meter. Photic zone total phosphorus ranged from 0.03 to 0.08 mg/L and total organic nitrogen ranged from 0.50 to 0.91 mg/L. Ammonia and nitrite plus nitrate values were greatest on September 28th.

Chlorophyll *a* ranged from 13 to 52 µg/L. The greatest chlorophyll *a* values were observed at the upper end of the reservoir on September 8th (44 µg/L) and September 28th (52 µg/L). Both of these values were greater than the state water quality standard of 40 µg/L. Algal blooms were extreme in June through August and severe in September. Algal densities were dominated by the blue-greens *Aphanocapsa sp.* and *Cylindrospermopsis sp.* throughout the study. Algal biovolumes were dominated by the euglenoid *Trachelomonas sp.* during June and late September and the blue-green *Cylindrospermopsis sp.* during early September.

Based on the calculated NCTSI scores for 2011, Kannapolis Lake was determined to have elevated biological productivity (eutrophic conditions). This lake has been consistently eutrophic since it was first monitored by DWQ in 1989.

Lake Fisher

Ambient Lakes Program Name	Lake Fisher		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	5.0		
Volume ($10^6 m^3$)	3.20		
Watershed Area (mi^2)	78.0		
Classification	WS-IV CA		
Stations	YAD215R	YAD215T	YAD216A
Number of Times Sampled	5	5	5

Located north of Concord, Lake Fisher is the primary water supply source for the city. In addition to a water supply, the lake is 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 sampled monthly from May through September by DWQ field staff in 2011. Due to limited rainfall in the region, the water level dropped during the summer and was approximately three to four feet below normal pool elevation by September 14th. The lake level increased to near normal level in late September following a major storm event. Surface dissolved oxygen in Lake Fisher ranged from 7.3 to 8.8 mg/L and surface water temperature ranged from 21.7 °C to 30.0 °C (Appendix A). Secchi depths ranged from 0.2 to 1.5 meters. The majority of Secchi depths measured in 2011 were less than 1.0 meter, suggesting that the clarity of the lake water was limited.

Total phosphorus ranged from 0.03 to 0.07 mg/L and total organic nitrogen ranged from 0.59 to 0.93 mg/L. Ammonia and nitrite plus nitrate concentrations were below DWQ Laboratory detection levels (Appendix A). Chlorophyll *a* values ranged from 20 to 56 µg/L. Five of the 15 chlorophyll *a* samples exceeded the state water quality standard of 40 µg/L. Algal assemblage densities and biovolumes were dominated by the blue-green algae *Pseudanabaena sp., Cylindrospermopsis sp.,* and *Anabaena sp.* throughout the summer. At station YAD215R on September 28th, the turbidity was measured at 30 NTU, which was greater than the state water quality standard of 25 NTU for lakes and reservoirs.

Lake Fisher was determined to have elevated biological productivity (eutrophic conditions) based on calculated NCTSI scores for all of the sampling dates with the exception of September 28th when the trophic state of this lake was determined to be exceptionally productive (hypereutrophic).

Lake Concord

Ambient Lakes Program Name	Lake Concord		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)	4.0		
Volume ($10^6 m^3$)	1.30		
Watershed Area (mi^2)	4.0		
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 on the immediate shoreline.

DWQ field staff sampled Lake Concord from May through September in 2011 for a total of five sampling events. Surface dissolved oxygen ranged from 9.8 mg/L in May to 7.0 mg/L in August (Appendix A). In September, surface dissolved oxygen values dropped due to lake turnover in response to cooler air temperatures. Surface water temperatures were also lowest in September (26.7 °C at each of the three lake sampling sites). The greatest surface water temperatures were observed in July. Secchi depths were consistently less than a meter, suggesting that the water clarity of Lake Concord was poor.

Total phosphorus ranged from 0.03 to 0.06 mg/L and total organic nitrogen ranged from 0.55 to 0.99 mg/L in 2011. Both ammonia and nitrite plus nitrate values were below DWQ Laboratory detection levels. Chlorophyll *a* ranged from 17 to 51 µg/L. In August, chlorophyll *a* values for all three lake sampling sites were greater than the state water quality standard of 40 µg/L.

Algal blooms were extreme during May through August and severe in September. Algal densities were dominated by the blue-green algae *Planktolyngbya sp*., *Cylindrospermopsis sp.*, and *Pseudanabaena sp.* Algal biovolumes were dominated by *Planktolyngbya sp.* in May, *Pseudanabaena sp.* in August, and a variety of centric diatoms in September.

Based on calculated NCTSI scores for 2011, Lake Concord was determined to exhibit elevated biological productivity (eutrophic conditions). This lake has consistently demonstrated elevated productivity since is was first monitored by DWQ in 1989.

Lake Lee

Ambient Lakes Program Name	Lake Lee		
Trophic Status (NC TSI)	Hypereutrophic		
Mean Depth (meters)	2.0		
Volume ($10^6 m^3$)	9.50		
Watershed Area (mi^2)	51.0		
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 2011 by DWQ field staff. Surface dissolved oxygen in this lake ranged from 4.5 to 13.3 mg/L and surface water temperature ranged from 19.3 °C in May to 34.3 °C in July (Appendix A). Surface pH ranged from 6.1 to 9.1 s.u. The greatest pH value was recorded at the lower end of the lake near the dam on July 28th and was greater than the state water quality standard of 9.0 s.u. Secchi depths for Lake Lee were consistently less than one meter, indicating that the clarity of the lake water was greatly reduced. Turbidity values ranged from 17 to 50 NTU with all three of the turbidity values measured in May was greater than the state water quality standard of 25 NTU for lakes and reservoirs. Rain had fallen within the lake's watershed prior to sampling in May and field notes indicate that the lake water appeared muddy.

Total phosphorus in Lake Lee in 2011 ranged from 0.17 to 0.91 mg/L and total organic nitrogen ranged from 1.79 to 2.99 mg/L (Appendix A). Ammonia ranged from <0.02 to 0.77 mg/L and nitrite plus nitrate ranged from <0.02 to 3.40 mg/L. Chlorophyll *a* values ranged from 31 to 110 µg/L and chlorophyll *a* values at all three lake sampling sites from June through September were greater than the state water quality standard of 40 µg/L.

Algal blooms were severe during May and extreme during June through September. Algal densities were dominated by the blue-green alga *Aphanocapsa sp.* and algal biovolumes were dominated by the euglenoid *Trachelomonas sp*. Blue-green algae are common indicators of nutrient enrichment and form blooms that cause unsightly water discoloration, surface films, flecks, mats, and taste and odor problems in drinking water. Euglenoids, which tend to be found in waters rich in organic matter, can discolor water. Colors range from red or brown to green and may form dense surface films that are often described as looking like "spilled paint" on the water surface.

Based on the calculated NCTSI scores, Lake Lee was determined to have exceptionally elevated biological productivity (hypereutrophic conditions) in 2011. This lake is also on the 303(d) List of Impaired Waters for violations of the state's chlorophyll *a* standard.

Lake Monroe

Ambient Lakes Program Name	Lake Monroe	
Trophic Status (NC TSI)	Hypereutrophic	
Mean Depth (meters)	5.0	
Volume ($10^6 m^3$)	1.80	
Watershed Area (mi^2)	9.0	
Classification	WS-IV CA	
Stations	YAD232F	YAD232D
Number of Times Sampled	5	5

Lake Monroe is a secondary water supply reservoir built in 1955 for the City of Monroe and is also used for recreation. 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.

Lake Monroe was sampled by DWQ field staff from May through September in 2011 for a total of five sampling trips. Surface dissolved oxygen in 2011 ranged from 6.3 to 10.3 mg/L and surface water temperature ranged from 22.8 °C in May to 33.8 °C in July (Appendix A). Surface pH ranged from 6.0 to 9.0 s.u. and Secchi depths, a measurement of water clarity, ranged from 0.5 to 0.7 meter. These low Secchi depths are indicators of limited water clarity. Observations by the lake monitors note that the water appeared green in color.

Total phosphorus concentrations in Lake Monroe ranged from 0.06 to 0.24 mg/L and total organic nitrogen ranged from 1.36 to 2.08 mg/L (Appendix A). Ammonia concentrations ranged from <0.02 to.12 mg/L and nitrite plus nitrate ranged from <0.02 to 0.17 mg/L. Chlorophyll *a* ranged from 28 to 82 µg/L, with values in June through September exceeding the state water quality standard of 40 µg/L. Algal blooms were extreme during May, June, and August and severe during July and September. Algal densities were dominated by the blue-greens algae *Aphanocapsa sp.* and *Cylindrospermopsis sp*. Algal biovolumes were dominated by the blue-green alga *Anabaena sp.* during June and September, the green algae *Crucigenia sp.* and *Coelastrum sp.* during May and July and by the euglenoid *Trachelomonas sp.* during August.

Lake Monroe was determined to have exceptional biological productivity (hypereutrophic conditions) in 2011 based on the calculated NCTSI scores. This lake was also determined to be hypereutrophic in 2006 when it was previously monitored by DWQ. Nutrient enrichment appears to be the primary

contributor to the lake's elevated productivity. Lake Monroe is on the 303(d) List of Impaired Waters due to violations of the state chlorophyll *a* standard.

Lake Twitty (Lake Stewart)

Ambient Lakes Program Name	Lake Twitty (Stewart)		
Trophic Status (NC TSI)	Hypereutrophic		
Mean Depth (meters)	5.0		
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. An aeration system is located near the dam to improve the quality of raw drinking water drawn from this lake.

DWQ field staff sampled Lake Twitty monthly from May through September in 2011. Surface dissolved oxygen ranged from 3.5 mg/L in May to 10.5 mg/L in September (Appendix A). Surface dissolved oxygen concentrations in the Chinkapin Creek Arm (YAD235D) and near the dam (YAD236) in May were less than the state water quality standard of 4.0 mg/L for an instantaneous measurement. Surface water temperatures ranged from 22.7 °C to 33.7 °C and surface pH ranged from 6.0 to 9.0 s.u. Secchi depths for Lake Twitty ranged from 0.6 to 1.0 meter, with the majority of the measurements less than a meter in 2011, indicating that the clarity of the lake water was limited.

Total phosphorus ranged from 0.08 to 0.11 mg/L and total organic nitrogen ranged from 0.92 to 1.28 mg/L (Appendix A). Ammonia in Lake Twitty ranged from <0.02 to 0.10 mg/L and nitrite plus nitrate ranged from <0.02 to 0.55 mg/L. Chlorophyll *a* values ranged from 20 to 65 µg/L. The availability of nutrients may have encouraged algal growth in this lake. Chlorophyll *a* values at all three sampling sites in July through September 2011 were greater than the state water quality standard of 40 µg/L. Chlorophyll *a* at the most upstream lake sampling site (YAD235F) in May was also greater than the state water quality standard.

Analysis of algae samples collected monthly from Lake Twitty indicated that a moderate to severe algal bloom occurred in May and June. In July, the bloom became extreme and remained elevated through September. Algal densities were dominated the blue-green algae *Aphanocapsa sp.* and *Anabaena sp*. Algal biovolumes were dominated by *Anabaena sp.* and the euglenoid, *Trachelomonas sp*. Blue-green

algae are common indicators of nutrient enrichment and euglenoids are frequently found in waters rich in organic matter.

Based on the calculated NCTSI scores for 2011, Lake Twitty was determined to exhibit exceptionally elevated biological productivity (eutrophic conditions). Lake Twitty was previously determined to be hypereutrophic in late June through September 2006. This lake is on the 303(d) List of Impaired Waters for violations of the state's chlorophyll *a* standard.

Coddle Creek Reservoir (Lake Howell)

Ambient Lakes Program Name	Coddle Creek Reservoir		
Trophic Status (NC TSI)	Eutrophic		
Mean Depth (meters)			
Volume ($10^6 m^3$)	18.90		
Watershed Area (mi^2)	47.0		
Classification	WS-II HQW		
Stations	YADCCR03	YADCCR02	YADCCR01
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. DWQ sampled Coddle Creek Reservoir for the first time in 2006.

Coddle Creek Reservoir was sampled monthly from May through September by DWQ field staff. Surface dissolved oxygen ranged from 8.9 mg/L in May to 6.6 mg/L in August. The lowest surface water temperatures were observed in May (25.5 °C) and the highest temperatures occurred in July (32.2 °C; Appendix A). Surface pH values in July at all three lake sampling sites ranged from 9.1 to 9.2 s.u.and were greater than the state water quality standard of 9.0 s.u. Secchi depths were greatest in May (range = 0.7 to 1.3 meters) but dropped to below one meter at all three lake sampling sites from June through September.

Total phosphorus in 2011 ranged from 0.02 to 0.07 mg/L and total organic nitrogen ranged from 0.80 to 1.29 mg/L (Appendix A). Both ammonia and nitrite plus nitrate values were below DWQ Water Quality Laboratory detection levels. Chlorophyll *a* concentrations ranged from 21 to 51 µg/L, with six of the 15 chlorophyll *a* values for 2011 greater than the state water quality standard of 40 µg/L. Algal blooms were mild during May and severe during the rest of the summer. Algal densities were dominated by the blue-green algae *Aphanizomenon sp.* and *Cylindrospermopsis sp.* throughout the summer. In algal assemblage biovolumes, *Aphanizomenon sp.* was dominant from May through July. The blue-green *Anabaena sp.* was dominant during August, and the euglenoid *Trachelomonas sp.* was dominant during

September. Based on calculated NCTSI scores, Coddle Creek Reservoir was determined to exhibit elevated biological productivity or eutrophic conditions in 2011.

LAKE & RESERVOIR ASSESSMENTS

HUC 03040201

Roberdel Lake

Ambient Lakes Program Name	Roberdel Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	3.0	
Volume ($10^6 m^3$)	10.00	
Watershed Area (mi^2)	140.0	
Classification	WS-III CA	
Stations	YAD262E	YAD263
Number of Times Sampled	5	5

Roberdel Lake, located near the City of Rockingham, is a water supply reservoir originally built as a millpond in the 1930s. 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.

DWQ field staff monitored Roberdel Lake monthly from May through September 2011. Surface dissolved oxygen ranged from 6.2 to 7.1 mg/L and surface water temperature ranged from 21.8 °C to 31.9 °C (Appendix A). The highest surface water temperatures for Roberdel Lake were observed in July. The Surface pH values in August and September near the dam (YAD263) exceeded the lower end of the state water quality standard of 6.0 s.u. Secchi depths, a measurement of water clarity, ranged from 0.6 to 1.4 meters.

Total phosphorus ranged from 0.02 to 0.03 mg/L and total organic nitrogen ranged from 0.36 to 0.56 mg/L (Appendix A). Ammonia ranged from <0.02 to 0.06 mg/L and nitrite plus nitrate ranged from <0.02 to 0.22 mg/L. Chlorophyll *a* values for Roberdel Lake ranged from 6.4 to 15.0 µg/L. Based on the calculated NCTSI scores for 2011, Roberdel Lake was determined to exhibit elevated biological productivity (eutrophic conditions).

Rockingham City Lake

Ambient Lakes Program Name	Rockingham City Lake
Trophic Status (NC TSI)	Eutrophic
Mean Depth (meters)	1.0
Volume ($10^6 m^3$)	0.02
Watershed Area (mi^2)	20.0
Classification	WS-III CA
Stations	YAD265C
Number of Times Sampled	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.

DWQ field staff sampled Rockingham City Lake monthly from May through September in 2011. Surface dissolved oxygen was below the state water quality standard of 4.0 mg/L for an instantaneous reading on each of these sampling visits (range = 0.9 to 2.3 mg/L). Surface pH values ranged from 5.0 to 5.4 s.u. and Secchi depths were less than one meter (Appendix A). These conditions have been observed in this lake since it was first sampled by DWQ in 1992. Numerous aquatic plants are present along the lake's shoreline and May field notes indicated that the lake water had a tannic or tea coloration. Surface water temperatures in 2011 ranged from 19.9 °C to 28.9 °C.

In 2011, total phosphorus ranged from 0.04 to 0.05 mg/L and total organic nitrogen ranged from 0.58 to 0.77 mg/L. Nitrite plus nitrate was below DWQ Laboratory detection levels. Ammonia values were also below detections levels with the exception of a measurement in July, which was 0.07 mg/L. Chlorophyll *a* concentrations ranged from 4.6 µg/L in May to 24 µg/L in August.

Based on the calculated NCTSI scores for 2011, Rockingham City Lake was determined to exhibit elevated biological productivity (eutrophic conditions).

Wadesboro City Pond

Ambient Lakes Program Name	Wadesboro City Pond	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	2.0	
Volume ($10^6 m^3$)	0.1	
Watershed Area (mi^2)	9.0	
Classification	WS-II HQW CA	
Stations	YAD275H	YAD275J
Number of Times Sampled	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. Wadesboro City Pond was monitored monthly between May and September, totaling five sampling events in 2011.

The lowest surface dissolved oxygen value was recorded in September (5.5 mg/L) and the greatest value was observed in July (8.0 mg/L; Appendix A). Surface water temperatures ranged from 23.2 °C to 34.4 °C and surface pH ranged from 6.3 to 7.8 s.u. Secchi depths, a measurement of water clarity, ranged from 1.0 to 2.2 meters – indicating that the water clarity for this lake was good.

Total phosphorus in 2011 ranged from 0.03 to 0.05 mg/L and total organic nitrogen ranged from 0.37 to 0.71 mg/L. Concentrations of total Kjeldahl nitrogen, ammonia and nitrite plus nitrate were greatest in September (Appendix A). Chlorophyll *a* values ranged from 10 to 48 µg/L. Chlorophyll *a* values at the sampling site near the dam (YAD275J) were greater than the state water quality standard of 40 µg/L in July and August. Algal blooms were mild in June, moderate in July, and severe in August and September. Algal densities were dominated by the green algae *Dictyosphaerium sp.* and *Coelastrum sp.* during June and July and the blue-green alga *Cylindrospermopsis sp.* during September. Algal biovolumes were dominated by *Coelastrum sp.* during June and the euglenoid *Trachelomonas sp.* during July and August.

Samples of submerged aquatic plants collected from Wadesboro City Pond were identified as *Najas minor* or Slender Naiad. This plant is only problematic if it forms dense stands that hinder fishing, swimming and boating in the lake.

Based on calculated NCTSI scores, Wadesboro City Pond was determined to have elevated biological productivity (eutrophic conditions) in 2011.

Hamlet City Lake

Ambient Lakes Program Name	Hamlet City Lake	
Trophic Status (NC TSI)	Eutrophic	
Mean Depth (meters)	1.0	
Volume ($10^6 m^3$)	0.04	
Watershed Area (mi^2)	10.0	
Classification	C	
Stations	YAD282A	YAD283
Number of Times Sampled	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. Future plans for this park include nature trails and water areas for paddle boats.

Hamlet City Lake was sampled by DWQ field staff monthly from May through September 2011. Surface dissolved oxygen in May and June ranged from 4.2 to 4.4 mg/L and was below the state water quality standard of 4.0 mg/L for an instantaneous reading in July, August and September (Appendix A). Surface water temperature in 2011 ranged from 22.2 °C in May to 30.2 °C in August. Surface pH values ranged from 5.4 to 6.1 s.u., which were similar to pH values previously observed in this lake. Secchi depths ranged from 0.7 to 1.2 meters. The low Secchi depths observed in July may have been due to heavy rainfall within the lake watershed the previous evening, which suspended lake sediments and increased nonpoint source runoff into the lake. Pond lilies and hornwort or coontail (*Ceratophyllum demersum*) were observed in this small lake by field sampling staff.

Total phosphorus in Hamlet City Lake ranged from 0.03 to 0.04 mg/L and total organic nitrogen ranged from 0.45 to 0.64 mg/L. Nitrite plus nitrate values were below DWQ Laboratory detection levels in 2011. Ammonia values were also be low detection levels from May through August, and ranged from 0.03 to 0.08 mg/L in September. Chlorophyll *a* ranged from 11 to 26 μg/L, with the lowest values observed in May and the greater values occurring in August. Hamlet City Lake was determined to exhibit elevated biological productivity (eutrophic conditions) in 2011 based on calculated NCTSI scores.

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Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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
KERR SCOTT RESERVOIR	September 26, 2011	YAD007A	8.2	23.7	7.7	44	1.9	96.9%	0.02	0.26	<0.02	0.03	0.29	0.25	0.04	18.0	38	<6.2	2.3
	September 26, 2011	YAD008	7.6	23.5	7.8	43	1.9	89.5%	<0.02	0.22	0.02	0.05	0.27	0.20	0.07	18.0	38	<6.2	2.2
	September 26, 2011	YAD008A	7.2	23.4	7.9	43	2.2	84.6%	<0.02	0.22	0.02	0.06	0.28	0.20	0.08	13.0	38	<6.2	1.9
	August 29, 2011	YAD007A	7.3	27.7	7.8	44	1.6	92.8%	0.02	0.28	<0.02	<0.02	0.29	0.27	0.02	12.0	43	<6.2	4.3
	August 29, 2011	YAD008	7.4	27.6	8.1	43	1.7	93.9%	<0.02	0.29	<0.02	<0.02	0.30	0.28	0.02	11.0	40	<6.2	3.0
	August 29, 2011	YAD008A	7.1	27.5	8.2	43	1.7	89.9%	<0.02	0.24	<0.02	<0.02	0.25	0.23	0.02	9.9	40	<6.2	2.5
	August 1, 2011	YAD007A	8.3	31.2	8.9	44	1.5	112.1%	0.02	0.25	<0.02	0.02	0.27	0.24	0.03	10.0	38	<12	3.9
	August 1, 2011	YAD008	8.2	30.9	8.9	43	1.7	110.2%	0.02	0.28	<0.02	<0.02	0.29	0.27	0.02	9.8	36	<6.2	3.1
	August 1, 2011	YAD008A	8.3	30.7	8.8	44	1.9	111.2%	<0.02	0.24	<0.02	<0.02	0.25	0.23	0.02	7.5	40	<6.2	3.2
	June 20, 2011	YAD007A	8.2	25.9	7.9	43	1.6	100.9%	0.02	0.29	<0.02	0.02	0.31	0.28	0.03	12.0	44	<12	3.6
	June 20, 2011	YAD008	8.9	26.3	8.1	42	1.5	110.3%	0.02	0.25	<0.02	<0.02	0.26	0.24	0.02	13.0	42	<6.2	3.6
	June 20, 2011	YAD008A	8.7	26.5	8.2	42	1.7	108.2%	0.02	0.24	<0.02	<0.02	0.25	0.23	0.02	14.0	42	<6.2	3.0
	May 24, 2011	YAD007A	8.9	25.1	7.3	40	1.6	107.9%	0.02	0.31	0.02	0.15	0.46	0.29	0.17	6.4	39	<6.2	5.0
	May 24, 2011	YAD008	8.5	24.9	7.3	40	1.9	102.7%	0.02	0.30	<0.02	0.06	0.36	0.29	0.07	5.2	39	<6.2	2.9
	May 24, 2011	YAD008A	8.1	24.9	7.1	41	2.0	97.9%	0.02	0.28	<0.02	0.04	0.32	0.27	0.05	5.4	36	<6.2	3.2
	September 23, 2009	YAD007A	7.5	23.9	7.3	41	1.6	89.0%	0.02	0.24	<0.02	0.02	0.26	0.23	0.03	18.0	46	<6.2	3.3
	September 23, 2009	YAD008	6.3	23.9	7.2	42	1.8	74.7%	0.02	<0.20	<0.02	0.05	0.06	0.00	0.06	17.0	42	<6.2	2.7
	September 23, 2009	YAD008A	5.4	23.8	6.9	42	1.8	63.9%	<0.02	<0.20	<0.02	0.07	0.08	0.00	0.08	17.0	41	<6.2	2.6
	August 5, 2009	YAD007A	8.4	27.8	8.9	42	1.8	107.0%	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02		42	<12	2.2
	August 5, 2009	YAD008	8.2	28.6	8.9	42	2.0	105.9%	0.02	0.25	<0.02	<0.02	0.26	0.24	0.02		53	<6.2	2.4
	August 5, 2009	YAD008A	8.2	28.6	8.8	42	1.7	105.9%	0.02	0.26	<0.02	<0.02	0.27	0.25	0.02		54	<6.2	2.5
	July 7, 2009	YAD007A	7.3	26.2	8.0	41	1.5	90.3%	0.02	0.34	<0.02	0.02	0.36	0.33	0.03	11.0	56	<6.2	4.2
	July 7, 2009	YAD008	7.5	26.6	7.8	41	1.8	93.5%	0.02	0.31	0.02	0.02	0.33	0.29	0.04	10.0	53	<6.2	3.4
	July 7, 2009	YAD008A	7.2	27.0	7.6	40	2.0	90.4%	0.02	0.26	0.02	0.03	0.29	0.24	0.05	12.0	63	<6.2	3.2
	June 9, 2009	YAD007A	9.1	25.6	8.6	37	0.9	111.4%	0.04	0.39	<0.02	<0.02	0.40	0.38	0.02	14.0	38	<6.2	8.2
	June 9, 2009	YAD008	8.8	27.3	8.1	38	1.0	111.1%	0.03	0.39	<0.02	<0.02	0.40	0.38	0.02	16.0	37	6.2	6.6
	June 9, 2009	YAD008A	8.6	27.4	7.8	38	0.9	108.7%	0.03	0.35	<0.02	<0.02	0.36	0.34	0.02	13.0	36	<6.2	6.9
	May 13, 2009	YAD007A	8.4	21.7	7.5	41	1.8	95.5%	0.02	0.25	<0.02	0.04	0.29	0.24	0.05	6.7	46	<6.2	3.7
	May 13, 2009	YAD008	8.4	21.5	7.7	40	1.9	95.2%	0.02	0.27	<0.02	0.03	0.30	0.26	0.04	6.8	44	<6.2	3.3
	May 13, 2009	YAD008A	8.4	21.0	8.2	40	2.1	94.3%	0.02	0.26	<0.02	0.02	0.28	0.25	0.03	6.8	53	<6.2	2.7
WINSTON LAKE	September 8, 2011	YAD077D	6.0	24.1	6.0	81	0.7	71.4%	0.05	0.68	0.09	0.11	0.79	0.59	0.20	24.0	80	12.0	23.0
	August 4, 2011	YAD077D	8.9	31.5	6.8	83	1.1	120.8%	0.04	0.55	0.06	0.15	0.70	0.49	0.21	25.0	69	<12	9.7
	July 7, 2011	YAD077D	7.1	28.7	6.0	81	1.4	91.9%	0.04	0.56	0.13	0.22	0.78	0.43	0.35	18.0	79	8.5	15.0
	June 9, 2011	YAD077D	8.6	30.3	6.9	110	1.2	114.4%	0.03	0.34	0.03	0.30	0.64	0.31	0.33	11.0	81	<12	7.1
	May 5, 2011	YAD077D	8.6	19.8	7.6	98	0.6	94.2%	0.05	0.49	0.05	0.37	0.86	0.44	0.42	24.0	85	16.0	26.0
	September 22, 2009	YAD077D	7.3	22.8	7.7	94	0.8	84.8%	0.04	0.48	0.03	0.06	0.54	0.45	0.09	15.0	90	14.0	17.0
	August 11, 2009	YAD077D	8.0	29.6	7.4	101	1.1	105.1%	0.03	0.39	<0.02	0.02	0.41	0.38	0.03		82	7.0	6.5
	July 16, 2009	YAD077D	9.1	27.1	7.6	100	0.8	114.4%	0.03	0.55	<0.02	0.08	0.63	0.54	0.09	22.0	89	8.8	11.0
	June 30, 2009	YAD077D	7.7	27.4	7.7	99	1.1	97.4%	0.04	0.46	0.03	0.26	0.72	0.43	0.29	16.0	91	<6.2	8.6
	May 12, 2009	YAD077D	7.3	19.7	7.3	99	1.1	79.8%	0.03	0.37	0.05	0.31	0.68	0.32	0.36	8.2	72	<6.2	11.0
SALEM LAKE	September 15, 2009	YAD077A	7.8	25.5	7.6	99	1.0	95.3%	0.03	0.43	<0.02	<0.02	0.44	0.42	0.02	24.0	85	<6.2	5.1
	September 15, 2009	YAD077B	7.2	24.9	7.6	95	1.1	87.0%	0.03	0.43	<0.02	<0.02	0.44	0.42	0.02		78	<6.2	4.5
	September 15, 2009	YAD077C	7.6	25.2	7.4	98	1.1	92.3%	0.02	0.42	<0.02	<0.02	0.43	0.41	0.02	19.0	79	<6.2	3.6
	August 19, 2009	YAD077A	6.8	28.9	7.7	98	0.7	88.3%	0.03	0.49	<0.02	<0.02	0.50	0.48	0.02	26.0	49	6.8	7.7
	August 19, 2009	YAD077B	6.8	28.6	7.8	93	0.8	87.8%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	22.0	78	<6.2	5.9
	August 19, 2009	YAD077C	7.0	28.4	7.7	91	0.9	90.1%	0.03	0.51	<0.02	<0.02	0.52	0.50	0.02	25.0	78	<6.2	4.6
	July 29, 2009	YAD077A	6.8	29.1	8.0	94	0.7	88.6%	0.04	0.48	<0.02	<0.02	0.49	0.47	0.02	26.0	86	6.8	8.4
	July 29, 2009	YAD077B	6.6	28.4	8.0	90	0.8	84.9%	0.03	0.48	<0.02	<0.02	0.49	0.47	0.02	24.0	84	<6.2	6.7
	July 29, 2009	YAD077C	7.4	27.9	7.9	89	1.0	94.4%	0.03	0.51	<0.02	<0.02	0.52	0.50	0.02	31.0	82	<6.2	4.0
	June 3, 2009	YAD077A	8.2	27.5	7.8	95	1.2	103.9%	0.43		<0.02	<0.02			0.02	14.0	72	<6.2	4.9
	June 3, 2009	YAD077B	7.8	27.1	7.6	92	1.5	98.1%	0.04		<0.02	0.03			0.04	13.0	75	13.0	7.0
	June 3, 2009	YAD077C	8.2	26.8	8.0	93	1.7	102.6%	0.02		<0.02	<0.02			0.02	8.8	71	<6.2	2.7
	May 6, 2009	YAD077A	7.9	20.3	7.5	94	0.8	87.4%	0.03	0.52	<0.02	0.10	0.62	0.51	0.11	27.0	76	6.8	7.2
	May 6, 2009	YAD077C	8.6	20.1	7.8	88	1.3	94.8%	0.02	0.39	<0.02	0.08	0.47	0.38	0.09	20.0	72	<6.2	4.0
HIGH ROCK LAKE	September 13, 2011	YADHRL052	8.2	26.9	8.5	122	0.6	102.8%	0.05	0.70	<0.02	<0.02	0.71	0.69	0.02	42.0	86	8.2	6.9
	September 13, 2011	YAD1561A	14.0	28.9	9.6	120	0.5	181.8%	0.07	1.10	<0.02	<0.02	1.11	1.09	0.02	86.0	86	11.0	7.8
	September 13, 2011	YAD156A	13.2	28.1	9.3	117	0.5	169.0%	0.07	1.00	<0.02	<0.02	1.01	0.99	0.02	74.0	80	10.0	8.6
	September 13, 2011	YAD169B	13.2	28.2	9.3	115	0.5	169.3%	0.06	0.91	<0.02	0.08	0.99	0.90	0.09	70.0	85	7.5	6.0
	September 13, 2011	YAD169E	13.0	28.3	9.2	112	0.6	167.0%	0.05	0.72	<0.02	<0.02	0.73	0.71	0.02	49.0	77	<12	6.2
	September 13, 2011	YAD169F	14.0	29.2	9.5	118	0.5	182.7%	0.05	0.80	<0.02	<0.02	0.81	0.79	0.02	53.0	81	7.2	4.8
	September 13, 2011	YADHRL051	7.9	24.2	8.2	81	0.2	94.2%	0.16	0.68	0.04	0.70	1.38	0.64	0.74	84.0	95	26.0	45.0
	September 13, 2011	YAD152	9.0	27.8	8.6	105	0.5	114.6%	0.09	1.00	<0.02	0.06	1.06	0.99	0.07	71.0	84	14.0	13.0
	September 13, 2011	YAD152A	12.8	27.3	9.2	97	0.4	161.6%	0.11	1.00	<0.02	0.18	1.18	0.99	0.19	77.0	81	16.0	20.0
	September 13, 2011	YAD152C	11.8	27.3	9.3	110	0.6	148.9%	0.08	0.97	<0.02	0.12	1.09	0.96	0.13	81.0	82	10.0	10.0
	September 13, 2011	YAD169A	10.1	27.8	8.9	117	0.6	128.6%	0.05	0.72	<0.02	0.04	0.76	0.71	0.05	44.0	85	7.5	4.9
	August 8, 2011	YADHRL052	7.3	31.2	8.5	111	0.6	98.6%	0.05	0.64	<0.02	0.01	0.65	0.63	0.02	34.0	87	7.2	7.2
	August 8, 2011	YAD1561A	8.7	31.9	9.1	102	0.6	118.9%	0.06	0.80	<0.02	0.03	0.83	0.79	0.04	58.0	77	9.2	8.5
	August 8, 2011	YAD156A	7.7	31.5	9.3	100	0.6	104.6%	0.05	0.67	<0.02	0.18	0.85	0.66	0.19	44.0	100	7.0	6.2
	August 8, 2011	YAD169B	8.8	31.2	9.3	102	0.7	118.9%	0.06	0.71	<0.02	0.22	0.93	0.70	0.23	54.0	76	6.8	6.2
	August 8, 2011	YAD169E	9.8	32.5	9.3	101	0.7	135.3%	0.05	0.78	<0.02	0.01	0.79	0.77	0.02	54.0	73	7.2	5.4
	August 8, 2011	YAD169F	10.4	32.0	8.9	102	0.5	142.4%	0.06	0.83	<0.02	0.01	0.84	0.82	0.02	61.0	79	7.5	5.1
	August 8, 2011	YADHRL051	6.3	31.1	8.4	113	0.2	85.0%	0.20	0.69	0.04	1.20	1.89	0.65	1.24	27.0	130	39.0	50.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
KERR SCOTT	September 26, 2011	YAD007A							
RESERVOIR	September 26, 2011	YAD008							
	September 26, 2011	YAD008A				<0.4	<2.0	2.3	11.0
	August 29, 2011	YAD007A							
	August 29, 2011	YAD008							
	August 29, 2011	YAD008A				<0.4	<2.0	2.4	11.0
	August 1, 2011	YAD007A							
	August 1, 2011	YAD008							
	August 1, 2011	YAD008A				<0.4	<2.0	2.2	11.0
	June 20, 2011	YAD007A							
	June 20, 2011	YAD008							
	June 20, 2011	YAD008A				<0.4	2.0	2.4	10.0
	May 24, 2011	YAD007A							
	May 24, 2011	YAD008							
	May 24, 2011	YAD008A				<0.4	<2.0	2.3	11.0
	September 23, 2009	YAD007A	1.00		3.1	<0.4	<2.0	3.1	11.9
	September 23, 2009	YAD008							
	September 23, 2009	YAD008A	1.00	110	3.1	<0.4	<2.0	2.9	11.9
	August 5, 2009	YAD007A	1.00		3.1	<0.4	<2.0	2.1	11.9
	August 5, 2009	YAD008							
	August 5, 2009	YAD008A	1.10	53	3.1	<0.4	2.0	2.1	12.3
	July 7, 2009	YAD007A	1.00		3.1	<0.4	2.2	1.9	11.9
	July 7, 2009	YAD008							
	July 7, 2009	YAD008A	1.00	73	3.0	<0.4	2.2	1.9	11.6
	June 9, 2009	YAD007A	0.93		2.7	<0.4	2.1	1.8	10.6
	June 9, 2009	YAD008							
	June 9, 2009	YAD008A	0.92	160	2.7	<0.4	2.2	1.9	10.5
	May 13, 2009	YAD007A	0.99		3.1	<0.4	2.3	2.4	11.8
	May 13, 2009	YAD008							
	May 13, 2009	YAD008A	0.97	58	3.0	<0.4	2.2	2.2	11.5
WINSTON	September 8, 2011	YAD077D							
LAKE	August 4, 2011	YAD077D							
	July 7, 2011	YAD077D							
	June 9, 2011	YAD077D							
	May 5, 2011	YAD077D							
	September 22, 2009	YAD077D							
	August 11, 2009	YAD077D							
	July 16, 2009	YAD077D							
	June 30, 2009	YAD077D							
	May 12, 2009	YAD077D							
SALEM	September 15, 2009	YAD077A							
LAKE	September 15, 2009	YAD077B							
	September 15, 2009	YAD077C	2.70		7.1	<0.4	2.1	11.0	28.8
	August 19, 2009	YAD077A							
	August 19, 2009	YAD077B							
	August 19, 2009	YAD077C	2.70		6.5	<0.4	<2.0	7.9	27.3
	July 29, 2009	YAD077A							
	July 29, 2009	YAD077B							
	July 29, 2009	YAD077C	2.60		6.3	<0.4	2.7	8.9	26.4
	June 3, 2009	YAD077A							
	June 3, 2009	YAD077B							
	June 3, 2009	YAD077C	2.60		6.9				27.9
	May 6, 2009	YAD077A							
	May 6, 2009	YAD077C	2.60		6.8	<0.4	3.9	9.4	27.7
HIGH	September 13, 2011	YADHRL052							
ROCK	September 13, 2011	YAD1561A							
LAKE	September 13, 2011	YAD156A							
	September 13, 2011	YAD169B							
	September 13, 2011	YAD169E							
	September 13, 2011	YAD169F				<0.4	5.6	8.0	27.0
	September 13, 2011	YADHRL051							
	September 13, 2011	YAD152							
	September 13, 2011	YAD152A							
	September 13, 2011	YAD152C							
	September 13, 2011	YAD169A							
	August 8, 2011	YADHRL052							
	August 8, 2011	YAD1561A							
	August 8, 2011	YAD156A							
	August 8, 2011	YAD169B							
	August 8, 2011	YAD169E							
	August 8, 2011	YAD169F				<0.4	5.3	6.8	25.0
	August 8, 2011	YADHRL051							

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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
HIGH ROCK LAKE	August 8, 2011	YAD152	7.9	31.2	9.2	106	0.5	106.7%	0.09	1.00	<0.02	0.01	1.01	0.99	0.02	60.0	90	12.0	12.0
	August 8, 2011	YAD152A	9.2	31.0	8.8	102	0.5	123.9%	0.10	0.80	<0.02	0.52	1.32	0.79	0.53	55.0	90	<12.0	13.0
	August 8, 2011	YAD152C	8.3	30.9	8.4	102	0.6	111.6%	0.08	0.73	<0.02	0.40	1.13	0.72	0.41	56.0	82	8.2	8.6
	August 8, 2011	YAD169A	7.4	31.3	8.8	109	0.6	100.1%	0.04	0.66	<0.02	0.01	0.67	0.65	0.02	36.0	78	6.2	4.9
	July 11, 2011	YADHRL052	8.8	31.0	8.6	138	0.4	118.5%	0.07	0.95	<0.02	<0.02	0.96	0.94	0.02	56.0	93	11.0	8.9
	July 11, 2011	YAD1561A	8.2	30.5	8.5	96	0.7	109.5%	0.05	0.73	0.02	0.12	0.85	0.71	0.14	47.0	70	7.8	5.3
	July 11, 2011	YAD156A	10.3	31.2	8.9	96	0.6	139.1%	0.06	0.77	<0.02	0.09	0.86	0.76	0.10	53.0	64	7.0	7.2
	July 11, 2011	YAD169B	10.2	31.5	9.1	99	0.6	138.5%	0.07	0.71	<0.02	0.16	0.87	0.70	0.17	42.0	72	<12	5.9
	July 11, 2011	YAD169E	9.9	31.5	9.2	99	0.6	134.4%	0.05	0.76	<0.02	0.02	0.78	0.75	0.03	42.0	74	<6.2	5.0
	July 11, 2011	YAD169F	8.7	30.6	8.7	96	0.7	116.3%	0.05	0.72	<0.02	0.12	0.84	0.71	0.13	38.0	74	7.2	4.9
	July 11, 2011	YADHRL051	7.5	29.7	7.8	73	0.1	98.7%	0.18	0.85	<0.02	0.55	1.40	0.84	0.56	40.0	126	30.0	85.0
	July 11, 2011	YAD152	10.7	31.7	9.2	104	0.4	145.8%	0.08	1.00	<0.02	<0.02	1.01	0.99	0.02	56.0	80	17.0	9.0
	July 11, 2011	YAD152A	11.2	31.5	9.2	99	0.5	152.1%	0.09	0.88	<0.02	0.17	1.05	0.87	0.18	61.0	76	9.8	10.0
	July 11, 2011	YAD152C	10.8	31.4	9.2	101	0.5	146.4%	0.08	0.94	<0.02	0.06	1.00	0.93	0.07	51.0	71	8.2	6.9
	July 11, 2011	YAD169A	8.9	30.8	8.7	111	0.5	119.4%	0.05	0.74	<0.02	<0.02	0.75	0.73	0.02	41.0	74	8.0	6.0
	May 31, 2011	YADHRL052	8.8	28.5	7.9	118	1.0	113.5%	0.04	0.62	<0.02	<0.02	0.63	0.61	0.02	23.0	80	6.8	5.6
	May 31, 2011	YAD1561A	11.0	28.9	8.6	91	0.9	142.8%	0.05	0.56	<0.02	0.28	0.84	0.55	0.29	38.0	66	8.2	6.9
	May 31, 2011	YAD156A	13.0	28.7	8.9	90	0.8	168.2%	0.07	0.74	<0.02	0.33	1.07	0.73	0.34	49.0	73	8.8	11.0
	May 31, 2011	YAD169B	11.4	28.9	8.9	96	0.9	148.0%	0.05	0.72	<0.02	0.16	0.88	0.71	0.17	30.0	70	7.2	5.2
	May 31, 2011	YAD169E	11.6	28.6	8.8	94	1.0	149.8%	0.05	0.66	<0.02	0.14	0.80	0.65	0.15	30.0	67	7.0	5.4
	May 31, 2011	YAD169F	12.2	29.3	8.7	96	1.0	159.5%	0.04	0.69	<0.02	0.15	0.84	0.68	0.16	33.0	65	<6.2	5.6
	May 31, 2011	YADHRL051	6.8	25.4	8.3	76	0.2	82.9%	0.14	0.50	<0.02	0.76	1.26	0.49	0.77	23.0	86	24.0	45.0
	May 31, 2011	YAD152	10.9	29.4	8.6	99	0.9	142.8%	0.04	0.66	<0.02	0.05	0.71	0.65	0.06	32.0	74	10.0	6.9
	May 31, 2011	YAD152A	14.4	30.2	8.9	87	0.4	191.2%	0.09	0.67	<0.02	0.45	1.12	0.66	0.46	51.0	78	12.0	24.0
	May 31, 2011	YAD152C	13.4	28.8	9.2	87	0.7	173.7%	0.08	0.69	<0.02	0.38	1.07	0.68	0.39	56.0	74	<12.0	13.0
	May 31, 2011	YAD169A	10.7	30.0	8.7	111	0.9	141.6%	0.04	0.61	<0.02	<0.02	0.62	0.60	0.02	23.0	78	6.5	4.7
	May 2, 2011	YADHRL052	9.5	22.7	7.3	130	1.0	110.2%	0.04	0.63	<0.02	0.08	0.71	0.62	0.09	39.0	56	7.5	6.8
	May 2, 2011	YAD1561A	8.9	22.2	7.2	86	1.2	102.2%	0.05	0.52	0.03	0.37	0.89	0.49	0.40	24.0	76	<6.2	6.1
	May 2, 2011	YAD156A	8.3	22.2	7.3	85	1.0	95.3%	0.05	0.47	0.02	0.50	0.97	0.45	0.52	25.0	70	6.5	5.7
	May 2, 2011	YAD169B	9.7	22.7	7.6	85	0.9	112.5%	0.06	0.43	<0.02	0.61	1.04	0.42	0.62	29.0	76	<12	5.8
	May 2, 2011	YAD169E	9.1	22.3	7.5	85	1.2	104.7%	0.04	0.51	0.02	0.46	0.97	0.49	0.48	18.0	68	<6.2	5.3
	May 2, 2011	YAD169F	8.7	22.3	7.5	83	1.1	100.1%	0.04	0.43	0.02	0.48	0.91	0.41	0.50	16.0	76	<6.2	5.0
	May 2, 2011	YADHRL051	7.9	21.5	7.2	79	0.3	89.5%	0.12	0.44	0.11	0.81	1.25	0.33	0.92	13.0		18.0	35.0
	May 2, 2011	YAD152	9.1	23.4	7.4	97	1.0	106.9%	0.04	0.46	<0.02	0.16	0.62	0.45	0.17	20.0	65	6.2	6.0
	May 2, 2011	YAD152A	8.4	22.5	7.3	80	0.5	97.0%	0.10	0.48	0.06	0.76	1.24	0.42	0.82	24.0	70	13.0	20.0
	May 2, 2011	YAD152C	10.5	22.9	7.7	85	1.0	122.2%	0.08	0.61	<0.02	0.61	1.22	0.60	0.62	41.0	47	10.0	6.1
	May 2, 2011	YAD169A	9.9	22.5	7.0	88	1.1	114.4%	0.05	0.54	<0.02	0.44	0.98	0.53	0.45	26.0	70	7.0	6.1
LAKE THOM-A-LEX	September 8, 2011	YAD160B	6.0	26.3	7.0	115	0.5	74.4%	0.08	0.69	0.04	0.03	0.72	0.65	0.07	40.0	108	16.0	27.0
	September 8, 2011	YAD1611A	4.1	27.2	6.8	119	1.0	51.7%	0.04	0.74	0.16	<0.02	0.75	0.58	0.17	22.0	92	<12	5.9
	August 4, 2011	YAD160B	8.9	31.8	8.4	115	0.7	121.5%	0.05	0.82	<0.02	<0.02	0.83	0.81	0.02	37.0	93	9.5	9.1
	August 4, 2011	YAD1611A	5.2	30.7	6.3	112	0.8	69.7%	0.04	0.78	<0.02	<0.02	0.79	0.77	0.02	32.0	84	6.8	8.3
	July 7, 2011	YAD160B	7.9	29.2	6.7	120	0.6	103.1%	0.06	0.77	<0.02	<0.02	0.78	0.76	0.02	34.0	100	<12	12.0
	July 7, 2011	YAD1611A	5.2	28.3	6.2	114	0.7	66.8%	0.06	0.70	0.07	<0.02	0.71	0.63	0.08	29.0	102	10.0	17.0
	June 9, 2011	YAD160B	8.9	30.7	8.7	125	0.9	119.2%	0.05	0.65	<0.02	<0.02	0.66	0.64	0.02	27.0	95	6.8	8.1
	June 9, 2011	YAD1611A	6.3	29.4	6.7	121	1.0	82.5%	0.04	0.59	<0.02	<0.02	0.60	0.58	0.02	19.0	92	6.2	8.7
	May 5, 2011	YAD160B	7.6	22.3	7.5	114	0.5	87.5%	0.07	0.55	<0.02	<0.02	0.56	0.54	0.02	29.0	106	20.0	27.0
	May 5, 2011	YAD1611A	8.4	21.4	7.7	109	1.0	95.0%	0.04	0.53	<0.02	<0.02	0.54	0.52	0.02	27.0		8.0	8.0
	September 21, 2010	YAD160B	7.8	26.3	8.2	110	0.5	96.7%	0.06	0.75	<0.02	<0.02	0.76	0.74	0.02	38.0	106	12.0	12.0
	September 21, 2010	YAD1611A	6.9	26.6	7.7	108	0.7	86.0%	0.04	0.73	0.02	0.02	0.75	0.71	0.04	41.0	91	<6.2	9.8
	August 4, 2010	YAD160B	7.2	28.6	7.9	111	0.6	93.0%	0.04	0.64	<0.02	<0.02	0.65	0.63	0.02	39.0	94	<6.2	8.6
	August 4, 2010	YAD1611A	4.8	28.7	7.5	112	0.6	62.1%	0.04	0.64	0.13	<0.02	0.65	0.51	0.14	24.0	93	<6.2	9.4
	July 21, 2010	YAD160B	8.1	30.5	8.6	112	0.5	108.1%	0.05	0.64	<0.02	<0.02	0.65	0.63	0.02	34.0	91	11.0	14.0
	July 21, 2010	YAD1611A	6.1	29.6	7.5	111	0.7	80.2%	0.05	0.68	0.06	0.02	0.70	0.62	0.08	32.0	97	8.5	15.0
	June 10, 2010	YAD160B	8.2	29.6		111	0.4	107.8%	0.07	0.60	<0.02	<0.02	0.61	0.59	0.02	22.0	90	15.0	21.0
	June 10, 2010	YAD1611A	5.8	27.4		110	0.4	73.3%	0.04	0.51	0.06	0.06	0.57	0.45	0.12	13.0	140	13.0	17.0
	May 12, 2010	YAD160B	6.4	21.1	7.3	107	0.3	72.0%	0.08	0.62	0.07	0.08	0.70	0.55	0.15	24.0	120	20.0	30.0
	May 12, 2010	YAD1611A	5.9	20.1	7.1	95	0.4	65.0%	0.06	0.50	0.03	0.26	0.76	0.47	0.29	9.6	110	<12	32.0
	September 15, 2009	YAD160B	8.6	26.0	7.8	114	0.7	106.0%	0.06	0.62	<0.02	<0.02	0.63	0.61	0.02	23.0	120	7.2	7.6
	September 15, 2009	YAD1611A	6.1	25.6	7.7	114	0.7	74.7%	0.05	0.65	<0.02	<0.02	0.66	0.64	0.02	33.0	140	<12	7.7
	August 19, 2009	YAD160B	7.2	29.5	7.5	113	0.5	94.5%	0.07	0.72	<0.02	<0.02	0.73	0.71	0.02	31.0	98	9.0	11.0
	August 19, 2009	YAD1611A	4.4	28.9	7.7	113	0.5	57.1%	0.05	0.72	<0.02	<0.02	0.73	0.71	0.02	38.0	96	6.5	9.3
	July 29, 2009	YAD160B	5.4	28.8	7.8	110	0.5	70.0%	0.07	0.66	<0.02	<0.02	0.67	0.65	0.02	39.0	110	14.0	16.0
	July 29, 2009	YAD1611A	3.6	27.6	7.6	110	0.7	45.7%	0.05	0.73	0.02	<0.02	0.74	0.71	0.03	36.0	100	6.8	8.4
	June 3, 2009	YAD160B	9.0	27.9	8.0	118	0.5	114.8%	0.06		<0.02	<0.02			0.02	39.0	110	12.0	13.0
	June 3, 2009	YAD1611A	7.6	26.8	7.8	116	0.8	95.1%	0.04		<0.02	<0.02			0.02	35.0	96	<12.0	7.3
	May 6, 2009	YAD160B	6.5	21.2	7.6	113	0.5	73.2%	0.06	0.66	0.03	<0.02	0.67	0.63	0.04	28.0	121	16.0	21.0
	May 6, 2009	YAD1611A	6.7	20.4	7.0	107	1.0	74.3%	0.04	0.52	0.05	0.02	0.54	0.47	0.07	24.0	94	<6.2	7.7
TUCKERTOWN RESERVOIR	September 20, 2011	YAD172C	8.1	24.1	8.1	100	0.7	96.4%	0.05	0.62	0.03	0.38	1.00	0.59	0.41	33.0	82	<12	5.3
	September 20, 2011	YAD1780A	4.9	24.8	7.8	102	1.1	59.1%	0.04	0.55	0.13	0.35	0.90	0.42	0.48	14.0	76	<6.2	3.9
	August 24, 2011	YAD172C	7.3	29.4	8.1	105	0.6	95.6%	0.06	0.67	<0.02	0.34	1.01	0.66	0.35	45.0	81	7.8	7.5
	August 24, 2011	YAD1780A	7.0	30.1	8.0	102	1.0	92.8%	0.05	0.61	<0.02	0.18	0.79	0.60	0.19	41.0	77	7.0	5.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
HIGH ROCK LAKE	August 8, 2011	YAD152							
	August 8, 2011	YAD152A							
	August 8, 2011	YAD152C							
	August 8, 2011	YAD169A							
	July 11, 2011	YADHRL052							
	July 11, 2011	YAD1561A							
	July 11, 2011	YAD156A							
	July 11, 2011	YAD169B							
	July 11, 2011	YAD169E							
	July 11, 2011	YAD169F				<0.4	5.2	6.8	27.0
	July 11, 2011	YADHRL051							
	July 11, 2011	YAD152							
	July 11, 2011	YAD152A							
	July 11, 2011	YAD152C							
	July 11, 2011	YAD169A							
	May 31, 2011	YADHRL052							
	May 31, 2011	YAD1561A							
	May 31, 2011	YAD156A							
	May 31, 2011	YAD169B							
	May 31, 2011	YAD169E							
	May 31, 2011	YAD169F				<0.4	5.0	6.1	24.0
	May 31, 2011	YADHRL051							
	May 31, 2011	YAD152							
	May 31, 2011	YAD152A							
	May 31, 2011	YAD152C							
	May 31, 2011	YAD169A							
	May 2, 2011	YADHRL052							
	May 2, 2011	YAD1561A							
	May 2, 2011	YAD156A							
	May 2, 2011	YAD169B							
	May 2, 2011	YAD169E							
	May 2, 2011	YAD169F				<0.4	5.5	5.0	24.0
	May 2, 2011	YADHRL051							
	May 2, 2011	YAD152							
	May 2, 2011	YAD152A							
	May 2, 2011	YAD152C							
	May 2, 2011	YAD169A							
LAKE THOM-A-LEX	September 8, 2011	YAD160B							
	September 8, 2011	YAD1611A				<0.4	3.6	4.5	39
	August 4, 2011	YAD160B							
	August 4, 2011	YAD1611A				<0.4	4.6	4.2	38.0
	July 7, 2011	YAD160B							
	July 7, 2011	YAD1611A				<0.4	5.8	4.9	38.0
	June 9, 2011	YAD160B							
	June 9, 2011	YAD1611A				<0.4	6.7	4.9	40.0
	May 5, 2011	YAD160B							
	May 5, 2011	YAD1611A				<0.4	7.9	5.1	33.0
	September 21, 2010	YAD160B							
	September 21, 2010	YAD1611A				<0.4	4.5	4.1	35.0
	August 4, 2010	YAD160B							
	August 4, 2010	YAD1611A				<0.4	5.1	5.2	39.0
	July 21, 2010	YAD160B							
	July 21, 2010	YAD1611A				<0.4	5.2	5.4	37.0
	June 10, 2010	YAD160B							
	June 10, 2010	YAD1611A	3.70		9.8	<0.4	6.4	4.1	39.7
	May 12, 2010	YAD160B							
	May 12, 2010	YAD1611A	3.30		8.4	0.5	5.9	3.5	35.0
	September 15, 2009	YAD160B							
	September 15, 2009	YAD1611A	3.80		11.0	<0.4	4.4	4.8	43.1
	August 19, 2009	YAD160B							
	August 19, 2009	YAD1611A	3.80		11.0	<0.4	3.6	4.2	43.1
	July 29, 2009	YAD160B							
	July 29, 2009	YAD1611A	3.60		10.0	<0.4	4.9	4.4	39.8
	June 3, 2009	YAD160B							
	June 3, 2009	YAD1611A	3.90		10.0				41.0
	May 6, 2009	YAD160B							
	May 6, 2009	YAD1611A	3.60		9.4	<0.4	9.9	5.6	38.3
TUCKERTOWN RESERVOIR	September 20, 2011	YAD172C							
	September 20, 2011	YAD1780A				<0.4	5.3	7.9	25.0
	August 24, 2011	YAD172C							
	August 24, 2011	YAD1780A				<0.4	4.6	6.9	27.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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
TUCKERTOWN RESERVOIR	July 25, 2011	YAD172C	9.0	31.6	9.0	97	0.7	122.4%	0.06	0.84	<0.02	0.07	0.91	0.83	0.08	54.0	79	9.2	7.1
	July 25, 2011	YAD1780A	9.5	31.3	9.2	98	0.1	128.6%	0.05	0.78	<0.02	<0.02	0.79	0.77	0.02	49.0	72	<12	5.9
	June 6, 2011	YAD172C	8.6	27.1	8.2	94	1.1	108.2%	0.05	0.49	<0.02	0.30	0.79	0.48	0.31	20.0	72	<6.2	5.6
	June 6, 2011	YAD1780A	10.4	29.4	8.8	94	1.2	136.2%	0.04	0.51	<0.02	0.20	0.71	0.50	0.21	22.0	71	<6.2	4.0
	May 11, 2011	YAD172C	7.0	21.4	7.6	86	0.9	79.2%	0.06	0.39	0.07	0.58	0.97	0.32	0.65	16.0	68	8.0	7.9
	May 11, 2011	YAD1780A	11.4	24.3	8.7	87	1.1	136.2%	0.05	0.54	<0.02	0.42	0.96	0.53	0.43	37.0	63	7.8	6.1
BADIN LAKE	September 20, 2011	YAD178B	5.4	25.1	7.8	96	1.5	65.5%	0.03	0.37	<0.02	0.26	0.63	0.36	0.27	7.8	72	<6.2	2.6
	September 20, 2011	YAD178E	4.5	25.4	7.6	90	1.7	54.9%	0.02	0.32	0.04	0.15	0.47	0.28	0.19	3.1	70	<6.2	1.8
	September 20, 2011	YAD178F	4.6	25.2	8.0	96	1.8	55.9%	0.02	0.31	<0.02	0.28	0.59	0.30	0.29	4.3	72	<6.2	1.9
	September 20, 2011	YAD178F1	4.7	25.2	7.7	95	1.8	57.1%	0.02	0.28	<0.02	0.28	0.56	0.27	0.29	4.8	74	<6.2	2.0
	August 24, 2011	YAD178B	6.5	29.4	8.4	94	1.5	85.1%	0.03	0.44	<0.02	0.12	0.56	0.43	0.13	20.0	66	<6.2	2.8
	August 24, 2011	YAD178E	5.2	29.2	7.7	87	2.3	67.9%	0.02	0.34	<0.02	0.04	0.38	0.33	0.05	8.2	60	<6.2	1.8
	August 24, 2011	YAD178F	5.5	29.2	7.5	92	2.0	71.8%	0.02	0.36	<0.02	0.12	0.48	0.35	0.13	11.0	64	<6.2	2.3
	August 24, 2011	YAD178F1	5.9	29.4	7.9	93	2.0	77.3%	0.02	0.36	<0.02	0.11	0.47	0.35	0.12	14.0	67	<6.2	3.0
	July 25, 2011	YAD178B	8.5	30.6	8.8	90	1.1	113.7%	0.03	0.55	<0.02	0.06	0.61	0.54	0.07	24.0	64	<6.2	4.1
	July 25, 2011	YAD178E	7.8	30.8	8.7	86	1.7	104.7%	0.02	0.38	<0.02	0.04	0.42	0.37	0.05	11.0	62	<6.2	2.0
	July 25, 2011	YAD178F	8.1	30.1	8.7	89	1.4	107.4%	0.02	0.43	<0.02	0.04	0.47	0.42	0.05	18.0	64	<6.2	2.3
	July 25, 2011	YAD178F1	8.1	29.9	8.3	89	1.1	107.0%	0.02	0.42	<0.02	0.05	0.47	0.41	0.06	16.0	62	<6.2	2.6
	June 6, 2011	YAD178B	10.1	30.0	9.2	84	1.2	133.7%	0.04	0.47	0.02	0.23	0.70	0.45	0.25	28.0	73	<6.2	3.6
	June 6, 2011	YAD178E	10.0	29.4	9.1	82	1.7	131.0%	0.03	0.41	<0.02	0.25	0.66	0.40	0.26	23.0	63	<6.2	2.8
	June 6, 2011	YAD178F	10.5	30.0	9.1	86	1.3	139.0%	0.03	0.50	<0.02	0.20	0.70	0.49	0.21	20.0	70	<6.2	3.5
	June 6, 2011	YAD178F1	10.0	29.8	9.1	86	1.5	131.9%	0.03	0.43	<0.02	0.18	0.61	0.42	0.19	14.0	72	<6.2	2.9
	May 11, 2011	YAD178B	10.0	23.7	7.8	86	1.6	118.2%	0.03	0.43	<0.02	0.44	0.87	0.42	0.45	14.0	60	<6.2	4.1
	May 11, 2011	YAD178E	9.3	23.6	7.7	85	2.2	109.7%	0.02	0.39	<0.02	0.52	0.91	0.38	0.53	12.0	62	<6.2	2.6
	May 11, 2011	YAD178F	10.5	23.5	7.9	87	1.9	123.6%	0.03	0.42	<0.02	0.47	0.89	0.41	0.48	16.0	58	<6.2	3.0
	May 11, 2011	YAD178F1	9.9	24.6	7.9	87	2.2	119.0%	0.03	0.38	<0.02	0.48	0.86	0.37	0.49	14.0	58	<6.2	2.8
FALLS LAKE	October 5, 2011	YAD178F3	7.8	22.8	8.6	96	2.3	90.6%	0.02	0.36	0.04	0.31	0.67	0.32	0.35	3.2	71	<6.2	2.2
	October 5, 2011	YAD178F5	7.6	23.0	8.0	95	2.3	88.6%	0.02	0.30	0.03	0.30	0.60	0.27	0.33	4.6	70	<6.2	2.6
	August 16, 2011	YAD178F3	7.4	28.5	7.9	93	2.2	95.4%	0.02	0.40	0.10	0.08	0.48	0.30	0.18	4.2	66	<6.2	1.9
	August 16, 2011	YAD178F5	7.4	29.2	7.6	92	1.2	96.6%	0.02	0.38	0.04	0.12	0.50	0.34	0.16	7.8	62	<6.2	2.1
	July 12, 2011	YAD178F3	5.0	26.8	7.3	91	1.8	62.5%	0.02	0.38	0.04	0.35	0.73	0.34	0.39	5.8	60	<12	2.2
	July 12, 2011	YAD178F5	6.6	29.0	7.3	90	1.4	85.8%	0.02	0.40	<0.02	0.33	0.73	0.39	0.34	11.0	60	<6.2	2.5
	June 13, 2011	YAD178F3	7.1	24.2	7.5	88	1.9	84.7%	0.02	0.37	0.03	0.53	0.90	0.34	0.56	5.1	66	<6.2	2.6
	June 13, 2011	YAD178F5	8.1	25.5	7.5	88	1.9	99.0%	0.03	0.37	<0.02	0.52	0.89	0.36	0.53	13.0	68	<6.2	2.2
	May 9, 2011	YAD178F3	8.9	19.2	7.1	89	1.8	96.4%	0.03	0.34	0.02	0.65	0.99	0.32	0.67	6.5	70	<6.2	4.0
	May 9, 2011	YAD178F5	8.5	19.5	7.1	90	2.3	92.6%	0.03	0.40	0.03	0.64	1.04	0.37	0.67	7.0	71	<6.2	3.5
LAKE REESE	September 28, 2011	YAD179B	8.0	25.4	6.9	104	0.9	97.6%	0.04	0.62	0.07	0.08	0.70	0.55	0.15	20.0	85	8.5	16.0
	September 28, 2011	YAD179D	7.4	24.8	6.8	107	1.3	89.3%	0.03	0.64	0.14	0.06	0.70	0.50	0.20	14.0	78	<6.2	8.3
	September 28, 2011	YAD179F	4.5	24.4	6.2	108	1.2	53.9%	0.02	0.69	0.24	0.06	0.75	0.45	0.30	8.0	78	6.2	12.0
	August 23, 2011	YAD179B	5.5	29.2	7.2	110	0.8	71.8%	0.04	0.66	<0.02	<0.02	0.67	0.65	0.02	26.0	84	8.2	8.6
	August 23, 2011	YAD179D	6.4	28.9	7.4	109	1.0	83.1%	0.03	0.55	<0.02	<0.02	0.56	0.54	0.02	18.0	78	<6.2	7.1
	August 23, 2011	YAD179F	7.2	28.9	7.7	110	1.0	93.5%	0.04	0.53	<0.02	<0.02	0.54	0.52	0.02	14.0	80	<6.2	4.8
	July 26, 2011	YAD179B	6.6	31.5	6.9	112	0.7	89.6%	0.04	0.67	<0.02	<0.02	0.68	0.66	0.02	26.0	88	<12	9.0
	July 26, 2011	YAD179D	7.1	31.3	7.3	113	1.1	96.1%	0.02	0.62	<0.02	<0.02	0.63	0.61	0.02	18.0	84	<6.2	5.0
	July 26, 2011	YAD179F	7.5	30.6	7.6	116	1.2	100.3%	0.02	0.56	<0.02	<0.02	0.57	0.55	0.02	18.0	82	<6.2	4.1
	June 28, 2011	YAD179B	8.3	31.4	7.7	130	0.8	112.5%	0.04	0.51	<0.02	<0.02	0.52	0.50	0.02	19.0	94	8.2	10.0
	June 28, 2011	YAD179D	8.2	30.9	7.6	125	1.2	110.2%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	14.0	86	<12	4.5
	June 28, 2011	YAD179F	7.7	31.3	7.6	121	1.7	104.2%	0.02	0.42	<0.02	<0.02	0.43	0.41	0.02	9.2	80	<6.2	3.8
	May 24, 2011	YAD179B	9.8	28.5	7.7	117	0.9	126.3%	0.03	0.47	<0.02	<0.02	0.48	0.46	0.02	18.0	86	6.5	6.5
	May 24, 2011	YAD179D	9.2	27.5	7.5	115	1.3	116.5%	0.02	0.44	<0.02	<0.02	0.45	0.43	0.02	13.0	84	<6.2	3.7
	May 24, 2011	YAD179F	9.0	27.3	7.1	112	1.5	113.6%	0.02	0.36	<0.02	<0.02	0.37	0.35	0.02	9.8	82	<6.2	4.1
	September 10, 2009	YAD179B	5.4	25.4	7.7	113	0.6	65.9%	0.04	0.53	<0.02	<0.02	0.54	0.52	0.02	28.0	94	9.4	10.0
	September 10, 2009	YAD179D	7.1	25.7	7.7	110	0.9	87.1%	0.03	0.51	<0.02	<0.02	0.52	0.50	0.02	22.0	88		5.6
	September 10, 2009	YAD179F	7.6	26.0	7.6	107	1.0	93.7%	0.03	0.46	<0.02	<0.02	0.47	0.45	0.02	18.0	88		6.7
	August 20, 2009	YAD179B	7.5	30.5	8.4	107	0.9	100.1%	0.04	0.54	<0.02	<0.02	0.55	0.53	0.02	22.0	100	<6.2	6.0
	August 20, 2009	YAD179D	7.5	29.9	8.4	104	1.1	99.1%	0.03	0.49	<0.02	<0.02	0.50	0.48	0.02	15.0	86	<6.2	4.4
	August 20, 2009	YAD179F	7.6	29.6	8.1	103	1.1	99.9%	0.03	0.48	<0.02	<0.02	0.49	0.47	0.02	16.0	100	<6.2	4.1
	July 30, 2009	YAD179B	7.7	29.3	7.9	113	0.6	100.7%	0.04	0.62	<0.02	<0.02	0.63	0.61	0.02	31.0	94	8.0	8.6
	July 30, 2009	YAD179D	7.1	29.0	7.7	109	0.9	92.3%	0.03	0.58	<0.02	<0.02	0.59	0.57	0.02	23.0	87	<6.2	6.6
	July 30, 2009	YAD179F	7.4	28.0	7.8	106	0.9	94.6%	0.02	0.56	<0.02	<0.02	0.57	0.55	0.02	20.0	94	<6.2	
	June 11, 2009	YAD179B	8.1	27.7	8.3	110	0.8	103.0%	0.06	0.46	<0.02	<0.02	0.47	0.45	0.02	27.0	87	9.0	13.0
	June 11, 2009	YAD179D	8.3	27.3	8.5	109	1.0	104.8%	0.03	0.45	<0.02	<0.02	0.46	0.44	0.02	24.0	94	<6.2	6.5
	June 11, 2009	YAD179F	8.2	27.1	8.5	108	1.1	103.1%	0.04	0.47	<0.02	<0.02	0.48	0.46	0.02	29.0	92	<6.2	8.3
	May 14, 2009	YAD179B	8.9	21.4	7.8	116	0.9	100.6%	0.03	0.46	<0.02	<0.02	0.47	0.45	0.02	28.0	90	6.3	9.1
	May 14, 2009	YAD179D	8.4	22.0	7.7	111	1.2	96.1%	0.02	0.40	<0.02	<0.02	0.41	0.39	0.02	20.0	88	<6.2	5.0
	May 14, 2009	YAD179F	8.5	22.6	7.7	105	1.2	98.4%	0.02	0.41	<0.02	<0.02	0.42	0.40	0.02	15.0	86	<6.2	4.1

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
TUCKERTOWN RESERVOIR	July 25, 2011	YAD172C							
	July 25, 2011	YAD1780A				<0.4	4.9	6.5	25.0
	June 6, 2011	YAD172C							
	June 6, 2011	YAD1780A				<0.4	5.1	5.9	26.0
	May 11, 2011	YAD172C							
	May 11, 2011	YAD1780A				<0.4	5.3	5.6	24.0
BADIN LAKE	September 20, 2011	YAD178B							
	September 20, 2011	YAD178E							
	September 20, 2011	YAD178F							
	September 20, 2011	YAD178F1				<0.4	4.7	7.0	24.0
	August 24, 2011	YAD178B							
	August 24, 2011	YAD178E							
	August 24, 2011	YAD178F							
	August 24, 2011	YAD178F1				<0.4	4.5	6.2	25.0
	July 25, 2011	YAD178B							
	July 25, 2011	YAD178E							
	July 25, 2011	YAD178F							
	July 25, 2011	YAD178F1				<0.4	5.1	6.3	23.0
	June 6, 2011	YAD178B							
	June 6, 2011	YAD178E							
	June 6, 2011	YAD178F				<0.4	5.4	5.9	21.0
	June 6, 2011	YAD178F1							
	May 11, 2011	YAD178B							
	May 11, 2011	YAD178E							
	May 11, 2011	YAD178F							
	May 11, 2011	YAD178F1				<0.4	5.8	6.0	24.0
FALLS LAKE	October 5, 2011	YAD178F3							
	October 5, 2011	YAD178F5				<0.4	4.9	7.1	24.0
	August 16, 2011	YAD178F3							
	August 16, 2011	YAD178F5				<0.4	4.6	7.4	24.0
	July 12, 2011	YAD178F3							
	July 12, 2011	YAD178F5				<0.4	5.0	6.2	24.0
	June 13, 2011	YAD178F3							
	June 13, 2011	YAD178F5				<0.4	5.2	5.7	23.0
	May 9, 2011	YAD178F3							
	May 9, 2011	YAD178F5				<0.4	6.0	5.9	24.0
LAKE REESE	September 28, 2011	YAD179B							
	September 28, 2011	YAD179D							
	September 28, 2011	YAD179F				<0.4	3.0	4.7	37.0
	August 23, 2011	YAD179B							
	August 23, 2011	YAD179D							
	August 23, 2011	YAD179F				<0.4	3.7	5.0	39.0
	July 26, 2011	YAD179B							
	July 26, 2011	YAD179D							
	July 26, 2011	YAD179F				<0.4	4.4	5.8	39.0
	June 28, 2011	YAD179B							
	June 28, 2011	YAD179D							
	June 28, 2011	YAD179F				<0.4	5.3	5.9	41.0
	May 24, 2011	YAD179B							
	May 24, 2011	YAD179D							
	May 24, 2011	YAD179F				<0.4	5.9	5.7	39.0
	September 10, 2009	YAD179B							
	September 10, 2009	YAD179D							
	September 10, 2009	YAD179F	4.20		9.3	<0.4	3.1	5.8	40.5
	August 20, 2009	YAD179B							
	August 20, 2009	YAD179D							
	August 20, 2009	YAD179F	4.20		9.0	<0.4	3.0	4.5	39.8
	July 30, 2009	YAD179B							
	July 30, 2009	YAD179D							
	July 30, 2009	YAD179F	4.30		9.4	<0.4	4.0	5.0	41.2
	June 11, 2009	YAD179B							
	June 11, 2009	YAD179D							
	June 11, 2009	YAD179F	4.30		9.5	<0.4	5.4	4.7	41.4
	May 14, 2009	YAD179B							
	May 14, 2009	YAD179D							
	May 14, 2009	YAD179F	4.20		9.0	<0.4	6.5	4.7	39.8

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU
BUNCH LAKE	September 27, 2011	YAD181G	8.4	23.9	7.9	84	3.0	99.6%	0.02	0.33	<0.02	<0.02	0.34	0.32	0.02	16.0	64	<12	7.5
	September 12, 2011	YAD181G	7.6	26.9	8.2	85	3.3	95.2%	0.02	0.36	<0.02	<0.02	0.37	0.35	0.02	39.0	61	<6.2	4.1
	August 3, 2011	YAD181G	6.7	31.1	8.0	84	3.2	90.4%	<0.02	0.37	<0.02	<0.02	0.38	0.36	0.02	4.9	61	<6.2	3.0
	June 23, 2011	YAD181G	8.1	29.2	7.1	87	3.0	92.7%	0.02	0.40	<0.02	<0.02	0.41	0.39	0.02	5.7	63	<6.2	2.5
	May 26, 2011	YAD181G	8.0	27.3	7.8	87	1.0	101.0%	0.02	0.38	<0.02	<0.02	0.39	0.37	0.02	11.0	61	<6.2	2.5
	October 8, 2009	YAD181G	7.6	20.6	7.5	68	2.3	84.6%	0.02	0.43	<0.02	<0.02	0.44	0.42	0.02	10.0	290	<6.2	2.8
	August 13, 2009	YAD181G	7.3	28.7	7.2	64	2.2	94.4%	0.03	0.72	<0.02	<0.02	0.73	0.71	0.02	47.0	77	<6.2	7.4
	July 9, 2009	YAD181G	8.2	27.0	8.2	64	1.7	102.9%	0.02	0.76	<0.02	<0.02	0.77	0.75	0.02	37.0	70	<6.2	8.6
	June 25, 2009	YAD181G	8.8	27.5	7.9	64	0.8	111.5%	0.07	0.82	<0.02	<0.02	0.83	0.81	0.02	39.0	74	<12	18.0
	May 28, 2009	YAD181G	7.9	27.4	7.5	102	2.1	99.9%	0.02	0.41	<0.02	<0.02	0.42	0.40	0.02	16.0	91	<12.0	3.2
LAKE MCCRARY	October 3, 2011	YAD181E	5.4	20.0	8.3	118	1.4	59.4%	0.02	0.35	0.03	<0.02	0.36	0.32	0.04	8.4	86	<6.2	5.8
	September 12, 2011	YAD181E	5.4	20.0	8.3	118	1.4	59.4%	0.02	0.46	<0.02	<0.02	0.47	0.45	0.02	17.0	83	<12	3.3
	August 3, 2011	YAD181E	6.8	30.4	8.5	117	2.5	90.6%	0.03	0.62	<0.02	<0.02	0.63	0.61	0.02	41.0	90	<6.2	5.2
	June 23, 2011	YAD181E	7.1	28.8	7.9	121	3.0	92.0%	0.03	0.59	0.06	<0.02	0.60	0.53	0.07	38.0	90	7.2	6.8
	May 26, 2011	YAD181E	7.7	26.7	7.5	120	1.2	96.1%	0.04	0.58	0.05	<0.02	0.59	0.53	0.06	50.0	84	<12	6.8
	October 8, 2009	YAD181E	6.8	20.2	7.2	91	2.6	75.1%	0.02	0.64	0.11	<0.02	0.65	0.53	0.12	32.0	93	<6.2	5.5
	August 13, 2009	YAD181E	6.2	28.2	6.6	79	2.4	79.5%	0.03	0.59	<0.02	<0.02	0.60	0.58	0.02	34.0	88	<12	6.0
	July 9, 2009	YAD181E	6.9	26.9	6.8	71	1.4	86.5%	0.03	0.54	<0.02	<0.02	0.55	0.53	0.02	18.0	82	<6.2	
	June 25, 2009	YAD181E	7.9	28.3	7.3	71	0.7	101.5%	0.05	0.92	<0.02	0.02	0.94	0.91	0.03	38.0	90	7.0	23.0
	May 28, 2009	YAD181E	8.4	26.6	7.5	77	2.2	104.7%	0.03	0.46	0.02	0.08	0.54	0.44	0.10	13.0	84	<6.2	2.9
BACK CREEK LAKE	September 28, 2011	YAD181J	8.5	25.1	6.8	96	0.6	103.1%	0.09	0.76	<0.02	0.02	0.78	0.75	0.03	52.0	92	19.0	36.0
	September 28, 2011	YAD181K	8.3	25.2	6.7	97	1.0	100.8%	0.04	0.58	<0.02	<0.02	0.59	0.57	0.02	37.0	76	7.8	8.0
	September 28, 2011	YAD181L	8.3	25.5	6.2	97	1.1	101.4%	0.03	0.60	<0.02	<0.02	0.61	0.59	0.02	27.0	73	6.5	6.6
	August 23, 2011	YAD181J	6.8	28.6	7.5	101	0.8	87.8%	0.05	0.75	<0.02	<0.02	0.76	0.74	0.02	28.0	81	7.0	7.7
	August 23, 2011	YAD181K	7.7	28.4	7.2	100	0.7	99.1%	0.03	0.67	<0.02	<0.02	0.68	0.66	0.02	24.0	78	<6.2	4.5
	August 23, 2011	YAD181L	7.9	28.2	7.9	100	0.9	101.3%	0.03	0.69	<0.02	<0.02	0.70	0.68	0.02	17.0	80	<12	4.4
	July 26, 2011	YAD181J	6.2	30.5	6.9	102	0.6	82.8%	0.07	0.68	<0.02	0.03	0.71	0.67	0.04	18.0	84	13.0	17.0
	July 26, 2011	YAD181K	7.3	30.4	7.1	102	1.4	97.3%	0.03	0.64	<0.02	<0.02	0.65	0.63	0.02	26.0	78	<6.2	4.7
	July 26, 2011	YAD181L	7.3	30.1	7.1	101	1.4	96.8%	0.02	0.57	<0.02	<0.02	0.58	0.56	0.02	16.0	77	<6.2	4.0
	June 28, 2011	YAD181J	8.6	30.6	7.2	105	1.1	115.0%											
	June 28, 2011	YAD181K	8.0	30.4	7.4	104	1.5	106.6%	0.02	0.49	<0.02	<0.02	0.50	0.48	0.02	15.0	74	<6.2	3.5
	June 28, 2011	YAD181L	7.8	29.8	7.3	105	1.5	102.9%	0.02	0.50	<0.02	<0.02	0.51	0.49	0.02	16.0	71	<6.2	3.3
	May 24, 2011	YAD181J	8.3	27.0	6.8	100	0.9	104.2%	0.05	0.70	<0.02	<0.02	0.71	0.69	0.02	20.0	80	7.0	6.8
	May 24, 2011	YAD181K	7.9	26.6	6.7	96	1.5	98.5%	0.02	0.50	<0.02	<0.02	0.51	0.49	0.02	10.0	78	<6.2	2.7
	May 24, 2011	YAD181L	7.3	26.4	7.2	97	1.5	90.7%	0.02	0.49	<0.02	<0.02	0.50	0.48	0.02	10.0	76	<6.2	3.5
	October 7, 2010	YAD181J	8.6	19.4	7.5	92	0.5	93.5%	0.08	0.80	<0.02	0.02	0.82	0.79	0.03	58.0	73	11.0	14.0
	October 7, 2010	YAD181K	7.5	19.8	7.5	90	0.5	82.2%	0.07	0.71	<0.02	0.05	0.76	0.70	0.06	52.0	71	9.8	13.0
	October 7, 2010	YAD181L	4.2	19.0	7.6	89	0.4	45.3%	0.09	0.65	0.02	0.09	0.74	0.63	0.11	18.0	65	8.5	18.0
	August 26, 2010	YAD181J	6.5	28.8	7.6	98	0.5	84.2%	0.05	0.72	<0.02	<0.02	0.73	0.71	0.02	34.0	74	7.2	10.0
	August 26, 2010	YAD181K	6.9	28.9	7.5	98	0.7	89.6%	0.03	0.56	<0.02	<0.02	0.57	0.55	0.02	24.0	70	<6.2	5.5
	August 26, 2010	YAD181L	6.2	28.3	7.4	97	0.9	79.7%	0.03	0.55	<0.02	<0.02	0.56	0.54	0.02	20.0	71	20.0	5.2
	July 8, 2010	YAD181J	8.3	30.6	8.7	103	0.7	111.0%	0.05	0.58	<0.02	<0.02	0.59	0.57	0.02	19.0	88	7.5	8.1
	July 8, 2010	YAD181K	8.0	30.7	8.7	101	1.0	107.2%	0.03	0.47	<0.02	<0.02	0.48	0.46	0.02	10.0	81	<6.2	4.6
	July 8, 2010	YAD181L	7.7	30.4	8.5	99	1.1	102.6%	0.03	0.47	<0.02	<0.02	0.48	0.46	0.02	11.0	76	<6.2	4.0
	June 23, 2010	YAD181J	8.1	31.5		101	1.1	110.0%	0.04	0.61	<0.02	<0.02	0.62	0.60	0.02	36.0	83	<12	6.4
	June 23, 2010	YAD181K	8.0	31.7		100	1.1	109.0%	0.03	0.52	<0.02	<0.02	0.53	0.51	0.02	14.0	82	<6.2	4.0
	June 23, 2010	YAD181L	7.1	31.1		98	1.3	95.8%	0.02	0.42	<0.02	<0.02	0.43	0.41	0.02	9.6	82	<6.2	5.6
	May 13, 2010	YAD181J	8.1	23.5	7.6	102	0.7	95.4%	0.04	0.57	<0.02	<0.02	0.58	0.56	0.02	18.0	70	7.2	8.4
	May 13, 2010	YAD181K	7.8	23.1	7.5	94	1.0	91.1%	0.03	0.48	<0.02	<0.02	0.49	0.47	0.02	12.0	72	<6.2	4.8
	May 13, 2010	YAD181L	8.4	22.9	7.5	94	1.3	97.8%	0.02	0.46	<0.02	<0.02	0.47	0.45	0.02	11.0	69	<6.2	4.5
	September 10, 2009	YAD181J	5.3	25.1	7.6	95	0.7	64.3%	0.06	0.67	<0.02	<0.02	0.68	0.66	0.02	40.0	84	7.0	9.2
	September 10, 2009	YAD181K	6.7	25.4	7.4	95	0.8	81.7%	0.04	0.59	<0.02	<0.02	0.60	0.58	0.02	34.0	83		6.2
	September 10, 2009	YAD181L	6.3	25.0	7.2	99	0.7	76.3%	0.06	0.71	<0.02	<0.02	0.72	0.70	0.02	28.0	86		8.1
	August 20, 2009	YAD181J	8.2	29.0	7.0	90	0.8	106.6%	0.06	0.79	<0.02	<0.02	0.80	0.78	0.02	40.0	110	<6.2	6.5
	August 20, 2009	YAD181K	7.8	29.5	8.2	90	0.9	102.3%	0.04	0.66	<0.02	<0.02	0.67	0.65	0.02	30.0	88	<6.2	4.5
	August 20, 2009	YAD181L	7.9	29.1	8.1	91	1.0	102.9%	0.05	0.69	<0.02	<0.02	0.70	0.68	0.02	32.0	87	<12	5.8
	July 30, 2009	YAD181J	6.4	28.5	7.9	92	0.8	82.5%	0.06	0.73	<0.02	<0.02	0.74	0.72	0.02	40.0	82	6.5	7.4
	July 30, 2009	YAD181K	7.5	28.2	7.4	91	0.9	96.2%	0.04	0.64	<0.02	<0.02	0.65	0.63	0.02	54.0	95	<6.2	4.5
	July 30, 2009	YAD181L	7.5	28.0	7.3	91	0.9	95.8%	0.05	0.65	<0.02	<0.02	0.66	0.64	0.02	43.0	82	6.2	5.9
	June 11, 2009	YAD181J	9.5	27.0	8.6	92	0.9	119.3%	0.08	0.81	<0.02	<0.02	0.82	0.80	0.02	53.0	100	6.8	7.4
	June 11, 2009	YAD181K	9.3	26.4	8.4	94	1.0	115.5%	0.07	0.78	<0.02	<0.02	0.79	0.77	0.02	53.0	85	<6.2	6.0
	June 11, 2009	YAD181L	8.5	26.3	7.8	94	1.0	105.4%	0.06	0.72	<0.02	<0.02	0.73	0.71	0.02	45.0	85	<6.2	8.2
	May 14, 2009	YAD181J	8.0	21.6	7.5	101	1.0	90.8%	0.06	0.71	<0.02	<0.02	0.72	0.70	0.02	37.0	90	6.5	6.5
	May 14, 2009	YAD181K	8.2	22.0	7.2	100	1.1	93.8%	0.04	0.63	<0.02	<0.02	0.64	0.62	0.02	25.0	82	<6.2	3.9
	May 14, 2009	YAD181L	8.3	22.0	7.2	100	1.0	95.0%	0.05	0.73	<0.02	<0.02	0.74	0.72	0.02	24.0	81	<12	6.9
LAKE TILLERY	September 15, 2011	YAD1815A	9.4	28.1	8.2	92	2.5	120.3%	0.03	0.38	<0.02	0.08	0.46	0.37	0.09	14.0	69	<6.2	2.4
	September 15, 2011	YAD189	9.1	28.5	8.1	85	2.8	117.3%	0.02	0.38	<0.02	<0.02	0.39	0.37	0.02	15.0	65	<6.2	2.3
	September 15, 2011	YAD189B	9.2	28.4	8.4	83	2.8	118.4%	0.02	0.37	<0.02	<0.02	0.38	0.36	0.02	9.0	65	<6.2	1.6
	September 15, 2011	YAD189C	7.8	28.5	7.9	83	3.0	100.6%	<0.02	0.34	<0.02	0.02	0.36	0.33	0.03	6.1	66	<6.2	1.6

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
BUNCH	September 27, 2011	YAD181G				<0.4	2.6	5.1	26.0
LAKE	September 12, 2011	YAD181G				<0.4	2.8	5.2	26.0
	August 3, 2011	YAD181G				<0.4	3.0	5.1	27.0
	June 23, 2011	YAD181G				<0.4	3.3	5.3	27.0
	May 26, 2011	YAD181G				<0.4	3.1	5.4	28.0
	October 8, 2009	YAD181G	2.30		6.2	<0.4	2.8	5.8	25.0
	August 13, 2009	YAD181G	2.10		5.5	<0.4	2.7	3.5	22.4
	July 9, 2009	YAD181G	2.10		5.4	<0.4	3.4	3.0	22.1
	June 25, 2009	YAD181G	2.90		7.1	<0.4	3.4	3.0	29.7
	May 28, 2009	YAD181G	4.40		11.0				45.6
LAKE	October 3, 2011	YAD181E				<0.4	3.0	5.0	46.0
MCCRARY	September 12, 2011	YAD181E				<0.4	3.1	4.8	46.0
	August 3, 2011	YAD181E				<0.4	3.3	4.7	46.0
	June 23, 2011	YAD181E				<0.4	3.5	5.0	47.0
	May 26, 2011	YAD181E				<0.4	3.7	5.5	46.0
	October 8, 2009	YAD181E	3.80		9.9	<0.4	2.7	6.0	40.4
	August 13, 2009	YAD181E	3.30		8.3	<0.4	2.8	2.6	34.3
	July 9, 2009	YAD181E	3.00		7.0	<0.4	3.4	2.2	29.8
	June 25, 2009	YAD181E	2.00		5.3	<0.4	3.5	2.2	21.5
	May 28, 2009	YAD181E	2.60		7.0				28.2
BACK	September 28, 2011	YAD181J							
CREEK	September 28, 2011	YAD181K							
LAKE	September 28, 2011	YAD181L				<0.4	3.5	5.1	31.0
	August 23, 2011	YAD181J							
	August 23, 2011	YAD181K							
	August 23, 2011	YAD181L				<0.4	4.1	5.2	31.0
	July 26, 2011	YAD181J							
	July 26, 2011	YAD181K							
	July 26, 2011	YAD181L				<0.4	4.1	5.8	32.0
	June 28, 2011	YAD181J							
	June 28, 2011	YAD181K							
	June 28, 2011	YAD181L				<0.4	4.6	5.7	33.0
	May 24, 2011	YAD181J							
	May 24, 2011	YAD181K							
	May 24, 2011	YAD181L				<0.4	5.1	5.6	31.0
	October 7, 2010	YAD181J							
	October 7, 2010	YAD181K							
	October 7, 2010	YAD181L				<0.4	3.7	4.2	28.0
	August 26, 2010	YAD181J							
	August 26, 2010	YAD181K							
	August 26, 2010	YAD181L				<0.4	4.3	5.4	31.0
	July 8, 2010	YAD181J							
	July 8, 2010	YAD181K							
	July 8, 2010	YAD181L				<0.4	5.2	5.4	31.0
	June 23, 2010	YAD181J							
	June 23, 2010	YAD181K							
	June 23, 2010	YAD181L	3.30		8.1	<0.4	5.4	5.3	33.8
	May 13, 2010	YAD181J							
	May 13, 2010	YAD181K							
	May 13, 2010	YAD181L	3.30		7.8	<0.4	5.6	5.6	33.0
	September 10, 2009	YAD181J							
	September 10, 2009	YAD181K							
	September 10, 2009	YAD181L	3.50		8.0	<0.4	3.2	6.1	34.4
	August 20, 2009	YAD181J							
	August 20, 2009	YAD181K							
	August 20, 2009	YAD181L	3.30		6.7	<0.4	3.3	4.7	30.3
	July 30, 2009	YAD181J							
	July 30, 2009	YAD181K							
	July 30, 2009	YAD181L	3.30		7.2	<0.4	4.0	5.1	31.6
	June 11, 2009	YAD181J							
	June 11, 2009	YAD181K							
	June 11, 2009	YAD181L	3.10		7.5	<0.4	5.2	5.0	31.5
	May 14, 2009	YAD181J							
	May 14, 2009	YAD181K							
	May 14, 2009	YAD181L	3.40		8.1	<0.4	6.0	5.6	34.2
LAKE	September 15, 2011	YAD1815A							
TILLERY	September 15, 2011	YAD189							
	September 15, 2011	YAD189B							
	September 15, 2011	YAD189C				<0.4	4.5	6.6	20.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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
LAKE TILLERY	August 16, 2011	YAD1815A	8.7	29.4	8.2	86	1.3	113.9%	0.03	0.40	<0.02	0.02	0.42	0.39	0.03	16.0	68	<12	3.5
	August 16, 2011	YAD189	7.7	29.7	8.1	84	1.5	101.4%	0.02	0.38	<0.02	0.04	0.42	0.37	0.05	11.0	64	<6.2	3.0
	August 16, 2011	YAD189B	6.6	29.6	7.9	82	1.9	86.7%	0.02	0.34	<0.02	0.06	0.40	0.33	0.07	11.0	60	<6.2	2.5
	August 16, 2011	YAD189C	6.6	29.5	7.7	82	1.7	86.6%	0.02	0.35	<0.02	0.06	0.41	0.34	0.07	11.0	66	<6.2	2.2
	July 12, 2011	YAD1815A	8.2	31.7	8.1	83	1.4	111.7%	0.02	0.38	<0.02	0.07	0.45	0.28	0.17	11.0	60	<6.2	2.3
	July 12, 2011	YAD189	8.2	31.9	8.3	83	1.5	112.1%	0.02	0.38	<0.02	0.04	0.42	0.37	0.05	13.0	60	<6.2	6.1
	July 12, 2011	YAD189B	8.7	30.9	8.2	83	1.7	116.9%	0.02	0.36	<0.02	0.02	0.38	0.35	0.03	11.0	58	<6.2	2.1
	July 12, 2011	YAD189C	8.2	30.6	8.4	83	1.6	109.6%	0.02	0.38	<0.02	0.04	0.42	0.37	0.05	11.0	56	<6.2	2.0
	June 13, 2011	YAD1815A	8.7	29.6	8.1	86	1.5	1114.3%	0.03	0.44	<0.02	0.19	0.63	0.43	0.20	16.0	74	<6.2	3.6
	June 13, 2011	YAD189	9.3	29.5	8.3	86	1.4	122.0%	0.03	0.47	<0.02	0.21	0.68	0.46	0.22	14.0	66	<6.2	3.6
	June 13, 2011	YAD189B	8.9	29.2	8.2	86	2.0	116.2%	0.02	0.39	<0.02	0.21	0.60	0.38	0.22	14.0	63	<6.2	2.4
	June 13, 2011	YAD189C	8.6	28.9	8.2	86	2.1	111.7%	0.03	0.44	<0.02	0.20	0.64	0.43	0.21	14.0	76	<12	3.2
	May 9, 2011	YAD1815A	8.5	20.4	7.4	90	1.3	94.3%	0.04	0.44	0.02	0.65	1.09	0.42	0.67	7.4	73	<12	7.4
	May 9, 2011	YAD189	9.9	22.4	7.7	90	1.8	114.1%	0.04	0.42	<0.02	0.55	0.97	0.41	0.56	20.0	69	<6.2	3.3
	May 9, 2011	YAD189B	9.7	22.4	7.6	89	2.1	111.8%	0.03	0.47	<0.02	0.58	1.05	0.46	0.59	11.0	94	<6.2	3.2
	May 9, 2011	YAD189C	9.5	23.2	7.6	89	2.3	111.2%	0.03	0.38	<0.02	0.59	0.97	0.37	0.60	13.0	70	<6.2	3.1
BLEWETT FALLS LAKE	September 21, 2011	YAD260B	8.4	24.7	7.5	105	0.9	101.1%	0.06	0.68	0.13	0.11	0.79	0.55	0.24	27.0	76	<6.2	9.0
	August 24, 2011	YAD260B	8.9	29.9	8.3	101	1.0	117.6%	0.06	0.63	<0.02	0.10	0.73	0.62	0.11	28.0	76	<6.2	6.0
	July 20, 2011	YAD260B	10.9	29.1	8.9	99	1.1	135.5%	0.06	0.73	<0.02	0.02	0.75	0.72	0.03	27.0	72	<6.2	3.8
	June 15, 2011	YAD260B	10.4	29.1	8.9	99	1.1	135.5%	0.04	0.51	<0.02	0.26	0.77	0.50	0.27	20.0	74	<6.2	3.8
	June 1, 2011	YAD260B	14.0	30.3	9.2	128	0.9	186.2%	0.12	0.94	<0.02	0.77	1.71	0.93	0.78	44.0	106	<6.5	6.1
KANNAPOLIS LAKE	September 28, 2011	YAD207A	9.1	24.6	7.5	87	0.6	109.3%	0.08	0.92	<0.02	0.03	0.95	0.91	0.04	52.0	83	12.0	13.0
	September 28, 2011	YAD207C	7.5	24.1	7.6	90	0.8	89.3%	0.05	0.65	0.08	0.02	0.67	0.57	0.10	30.0	82	7.2	7.5
	September 8, 2011	YAD207A	6.0	26.1	8.4	89	0.4	74.1%	0.07	0.93	0.03	<0.02	0.94	0.90	0.04	44.0	83	11.0	12.0
	September 8, 2011	YAD207C	6.1	25.9	8.1	89	0.4	75.1%	0.04	0.72	<0.02	<0.02	0.73	0.71	0.02	35.0	76	7.5	7.4
	August 10, 2011	YAD207A	7.2	30.5	8.7	85	0.6	96.1%	0.07	0.80	<0.02	<0.02	0.81	0.79	0.02	40.0	84	<12	11.0
	August 10, 2011	YAD207C	7.8	30.3	8.7	82	0.6	103.8%	0.04	0.77	<0.02	<0.02	0.78	0.76	0.02	28.0	76	<6.2	6.3
	June 29, 2011	YAD207A	7.0	29.6	7.5	91	0.9	92.0%	0.06	0.68	<0.02	<0.02	0.69	0.67	0.02	27.0	80	8.0	7.8
	June 29, 2011	YAD207C	7.8	29.0	7.7	88	1.1	101.4%	0.03	0.56	<0.02	<0.02	0.57	0.55	0.02	16.0	69	<6.2	4.4
	May 19, 2011	YAD207A	7.4	21.9	7.6	91	0.7	84.5%	0.05	0.58	0.03	<0.02	0.59	0.55	0.04	22.0	82	7.8	8.1
	May 19, 2011	YAD207C	7.5	21.9	7.5	89	1.2	85.6%	0.04	0.53	0.03	<0.02	0.54	0.50	0.04	13.0	76	<6.2	5.8
LAKE FISHER	September 28, 2011	YAD215R	8.5	23.7	7.5	123	0.2	100.4%	0.07	0.94	<0.02	<0.02	0.95	0.93	0.02	54.0	113	20.0	30.0
	September 28, 2011	YAD215T	8.4	23.6	7.5	127	0.4	99.1%	0.06	0.87	<0.02	<0.02	0.88	0.86	0.02	56.0	100	15.0	16.0
	September 28, 2011	YAD216A	7.6	23.4	7.4	134	0.5	89.3%	0.05	0.84	<0.02	<0.02	0.85	0.83	0.02	52.0	103	12.0	13.0
	September 14, 2011	YAD215R	8.8	27.9	8.5	145	0.4	112.3%	0.04	0.74	<0.02	<0.02	0.75	0.73	0.02	41.0	107	11.0	7.2
	September 14, 2011	YAD215T	8.5	27.2	8.3	145	0.4	107.1%	0.04	0.76	<0.02	<0.02	0.77	0.75	0.02	38.0	110	9.8	6.7
	September 14, 2011	YAD216A	8.7	27.1	8.4	145	0.5	109.4%	0.04	0.66	<0.02	<0.02	0.67	0.65	0.02	34.0	109	10.0	7.4
	August 10, 2011	YAD215R	8.3	30.9	8.6	140	1.5	111.6%	0.06	0.87	<0.02	<0.02	0.88	0.86	0.02	47.0	116	14.0	13.0
	August 10, 2011	YAD215T	8.3	30.8	8.6	139	0.4	111.4%	0.04	0.78	<0.02	<0.02	0.80	0.78	0.02	32.0	100	8.2	8.1
	August 10, 2011	YAD216A	8.4	30.7	8.8	139	0.7	112.5%	0.03	0.73	<0.02	<0.02	0.74	0.72	0.02	28.0	106	6.2	5.2
	June 29, 2011	YAD215R	7.3	29.9	7.8	145	0.6	96.4%	0.06	0.72	<0.02	<0.02	0.73	0.71	0.02	33.0	109	14.0	11.0
	June 29, 2011	YAD215T	7.7	29.7	8.1	146	0.8	101.4%	0.04	0.60	<0.02	<0.02	0.61	0.59	0.02	23.0	98	8.8	4.8
	June 29, 2011	YAD216A	7.9	29.3	8.2	145	0.9	103.3%								20.0	100	7.5	4.4
	May 19, 2011	YAD215R	7.8	21.9	7.5	142	0.3	89.1%	0.05	0.61	<0.02	<0.02	0.62	0.60	0.02	24.0	108	9.0	9.5
	May 19, 2011	YAD215T	6.8	22.7	7.5	142	0.9	78.8%	0.04	0.58	<0.02	<0.02	0.59	0.57	0.02	12.0	107	7.5	7.0
	May 19, 2011	YAD216A	7.6	21.7	7.6	139	0.9	86.4%	0.04	0.55	<0.02	<0.02	0.56	0.54	0.02	19.0	100	10.0	4.7
LAKE CONCORD	September 7, 2011	YAD216C	4.7	26.7	8.2	111	0.6	58.7%	0.06	0.61	<0.02	<0.02	0.62	0.60	0.02	26.0	98	11.0	9.0
	September 7, 2011	YAD216E	4.6	26.7	7.6	111	0.7	57.4%	0.05	0.66	<0.02	<0.02	0.67	0.65	0.02	27.0	93	7.2	9.0
	September 7, 2011	YAD216G	4.9	26.7	7.7	112	0.7	61.2%	0.04	0.64	<0.02	<0.02	0.65	0.63	0.02	24.0	92	6.2	7.0
	August 15, 2011	YAD216C	6.1	28.3	7.9	106	0.5	78.4%	0.05	0.86	0.02	<0.02	0.87	0.84	0.03	51.0	90	<12	13.0
	August 15, 2011	YAD216E	7.3	28.1	7.9	105	0.4	93.5%	0.06	0.89	<0.02	<0.02	0.90	0.88	0.02	45.0	100	18.0	18.0
	August 15, 2011	YAD216G	7.0	28.2	7.9	105	0.5	89.8%	0.04	0.82	<0.02	<0.02	0.83	0.81	0.02	49.0	92	7.8	12.0
	July 21, 2011	YAD216C	9.1	31.1	8.5	101	0.6	122.7%	0.04	0.68	<0.02	<0.02	0.69	0.67	0.02	22.0	80	6.2	6.6
	July 21, 2011	YAD216E	8.4	31.2	8.4	103	0.6	113.5%	0.05	0.65	<0.02	<0.02	0.66	0.64	0.02	28.0	80	9.2	10.0
	July 21, 2011	YAD216G	9.3	31.3	8.5	101	0.8	125.8%	0.03	0.58	<0.02	<0.02	0.59	0.57	0.02	17.0	78	<12	6.2
	June 30, 2011	YAD216C	7.7	29.2	8.2	104	0.4	100.5%	0.05	0.98	<0.02	<0.02	0.99	0.97	0.02	34.0			11.0
	June 30, 2011	YAD216E	7.8	29.5	8.2	105	0.4	102.3%	0.06	1.00	<0.02	<0.02	1.01	0.99	0.02	30.0			13.0
	June 30, 2011	YAD216G	8.0	29.5	8.5	106	0.5	105.0%	0.04	0.88	<0.02	<0.02	0.89	0.87	0.02	32.0			8.5
	May 25, 2011	YAD216C	9.4	29.5	7.6	114	0.9	123.3%	0.05	0.66	<0.02	<0.02	0.67	0.65	0.02	43.0	90	10.0	8.7
	May 25, 2011	YAD216E	9.6	29.9	7.7	115	0.6	126.8%	0.05	0.59	<0.02	<0.02	0.60	0.58	0.02	19.0	96	9.8	11.0
	May 25, 2011	YAD216G	9.8	28.1	7.7	115	0.8	125.5%	0.04	0.56	<0.02	<0.02	0.57	0.55	0.02	17.0	92	8.2	6.9
LAKE LEE	September 26, 2011	YAD232C	12.0	27.5	8.4	140	0.4	152.0%	0.23	1.90	<0.02	<0.02	1.91	1.89	0.02	95.0	128	19.0	22.0
	September 26, 2011	YAD232H	10.1	25.3	8.4	141	0.4	122.9%	0.21	1.80	<0.02	<0.02	1.81	1.79	0.02	110.0	121	17.0	19.0
	September 26, 2011	YAD233	11.7	25.7	8.6	141	0.5	143.5%	0.20	1.80	<0.02	<0.02	1.81	1.79	0.02	100.0	117	20.0	18.0
	August 25, 2011	YAD232C	11.4	32.4	8.7	142	0.4	157.2%	0.22	2.00	<0.02	<0.02	2.01	1.99	0.02	72.0	126	18.0	19.0
	August 25, 2011	YAD232H	11.1	30.5	8.8	145	0.4	148.2%	0.25	2.20	<0.02	<0.02	2.21	2.19	0.02	103.0	136	18.0	21.0
	August 25, 2011	YAD233	11.6	31.1	8.6	143	0.5	156.4%	0.17	1.80	<0.02	<0.02	1.81	1.79	0.02	81.0	124	14.0	17.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
LAKE TILLERY	August 16, 2011	YAD1815A							
	August 16, 2011	YAD189							
	August 16, 2011	YAD189B							
	August 16, 2011	YAD189C				<0.4	4.7	6.8	22.0
	July 12, 2011	YAD1815A							
	July 12, 2011	YAD189							
	July 12, 2011	YAD189B							
	July 12, 2011	YAD189C				<0.4	5.2	5.8	21.0
	June 13, 2011	YAD1815A							
	June 13, 2011	YAD189							
	June 13, 2011	YAD189B							
	June 13, 2011	YAD189C				<0.4	5.5	5.7	22.0
	May 9, 2011	YAD1815A							
	May 9, 2011	YAD189							
	May 9, 2011	YAD189B							
	May 9, 2011	YAD189C				<0.4	5.7	6.2	23.0
BLEWETT FALLS LAKE	September 21, 2011	YAD260B				<0.4	5.6	8.1	23.0
	August 24, 2011	YAD260B				<0.4	5.3	7.4	24
	July 20, 2011	YAD260B				<0.4	5.7	8.7	26.0
	June 15, 2011	YAD260B				<0.4	6.0	6.8	24.0
	June 1, 2011	YAD260B				<0.4	7.1	9.5	31.0
KANNAPOLIS LAKE	September 28, 2011	YAD207A							
	September 28, 2011	YAD207C				<0.4	3.0	5.4	23.0
	September 8, 2011	YAD207A							
	September 8, 2011	YAD207C				<0.4	3.2	5.8	22.0
	August 10, 2011	YAD207A							
	August 10, 2011	YAD207C				<0.4	3.7	5.6	17.0
	June 29, 2011	YAD207A							
	June 29, 2011	YAD207C				<0.4	4.3	5.5	22.0
	May 19, 2011	YAD207A							
	May 19, 2011	YAD207C				<0.4	4.5	5.5	26.0
LAKE FISHER	September 28, 2011	YAD215R							
	September 28, 2011	YAD215T							
	September 28, 2011	YAD216A				<0.4	3.4	9.6	43.0
	September 14, 2011	YAD215R							
	September 14, 2011	YAD215T							
	September 14, 2011	YAD216A				<0.4	3.9	13.0	46.0
	August 10, 2011	YAD215R							
	August 10, 2011	YAD215T							
	August 10, 2011	YAD216A				<0.4	4.6	11.0	43.0
	June 29, 2011	YAD215R							
	June 29, 2011	YAD215T							
	June 29, 2011	YAD216A				<0.4	5.1	11.0	50.0
	May 19, 2011	YAD215R							
	May 19, 2011	YAD215T							
	May 19, 2011	YAD216A				<0.4	6.4	11.0	46.0
LAKE CONCORD	September 7, 2011	YAD216C							
	September 7, 2011	YAD216E							
	September 7, 2011	YAD216G				<0.4	2.5	7.5	31
	August 15, 2011	YAD216C							
	August 15, 2011	YAD216E							
	August 15, 2011	YAD216G				<0.4	2.7	8.8	29.0
	July 21, 2011	YAD216C							
	July 21, 2011	YAD216E							
	July 21, 2011	YAD216G				<0.4	3.1	7.7	27.0
	June 30, 2011	YAD216C							
	June 30, 2011	YAD216E							
	June 30, 2011	YAD216G				<0.4	3.8	7.8	28.0
	May 25, 2011	YAD216C							
	May 25, 2011	YAD216E							
	May 25, 2011	YAD216G				<0.4	4.2	9.4	31.0
LAKE LEE	September 26, 2011	YAD232C							
	September 26, 2011	YAD232H							
	September 26, 2011	YAD233				<0.4	2.8	12.0	42.0
	August 25, 2011	YAD232C							
	August 25, 2011	YAD232H							
	August 25, 2011	YAD233				<0.4	2.4	11.0	44.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

	SURFACE PHYSICAL DATA								PHOTIC ZONE DATA										
Lake	Date	Sampling Station	DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent 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
LAKE LEE	July 28, 2011	YAD232C	11.3	34.0	8.6	148	0.4	160.0%	0.29	2.10	0.03	<0.02	2.11	2.07	0.04	76.0	132	23.0	21.0
	July 28, 2011	YAD232H	10.7	32.5	8.7	149	0.4	147.8%	0.28	2.20	0.03	<0.02	2.21	2.17	0.04	98.0	132	19.0	24.0
	July 28, 2011	YAD233	13.3	34.3	9.1	153	0.5	189.3%	0.23	2.10	0.02	<0.02	2.11	2.08	0.03	96.0	132	16.0	17.0
	June 23, 2011	YAD232C	7.8	30.6	6.4	149	0.5	104.3%	0.39	2.10	0.06	<0.02	2.11	2.04	0.07	57.0	136	16.0	22.0
	June 23, 2011	YAD232H	10.2	30.6	7.1	151	0.4	136.4%	0.31	2.40	0.02	<0.02	2.41	2.38	0.03	92.0	137	18.0	25.0
	June 23, 2011	YAD233	8.5	30.4	6.1	150	0.6	113.3%	0.29	2.40	0.07	<0.02	2.41	2.33	0.08	99.0	130	13.0	19.0
	May 18, 2011	YAD232C	6.6	19.3	6.9	158	0.3	71.6%	0.91	3.50	0.51	3.40	6.90	2.99	3.91	31.0	172	36.0	50.0
	May 18, 2011	YAD232H	4.5	20.4	6.8	165	0.4	49.9%	0.44	3.00	0.77	2.30	5.30	2.23	3.07	41.0	150	24.0	37.0
	May 18, 2011	YAD233	6.5	22.4	6.6	169	0.4	74.9%	0.49	3.40	0.77	2.80	6.20	2.63	3.57	34.0	143	18.0	34.0
LAKE MONROE	September 26, 2011	YAD232D	9.8	25.5	7.9	124	0.5	119.7%	0.12	1.50	<0.02	<0.02	1.51	1.49	0.02	65.0	106	16.0	15.0
	September 26, 2011	YAD232F	10.2	25.1	8.0	126	0.6	123.7%	0.08	1.50	<0.02	<0.02	1.51	1.49	0.02	68.0	102	12.0	10.0
	August 25, 2011	YAD232D	8.7	31.0	8.8	121	0.5	117.1%	0.12	1.70	<0.02	<0.02	1.71	1.69	0.02	46.0	100	13.0	15.0
	August 25, 2011	YAD232F	9.2	31.9	9.0	121	0.6	125.8%	0.07	1.50	<0.02	<0.02	1.51	1.49	0.02	40.0	98	9.2	8.9
	July 28, 2011	YAD232D	9.2	32.7	8.8	119	0.5	127.5%	0.12	1.80	0.02	<0.02	1.81	1.78	0.03	60.0	100	14.0	12.0
	July 28, 2011	YAD232F	9.0	33.8	8.3	121	0.6	127.0%	0.07	1.60	<0.02	<0.02	1.61	1.59	0.02	45.0	92	9.0	9.8
	June 23, 2011	YAD232D	10.3	30.1	8.6	125	0.5	136.5%	0.24	2.20	0.12	<0.02	2.21	2.08	0.13	82.0	108	14.0	19.0
	June 23, 2011	YAD232F	9.7	30.7	8.2	121	0.6	129.9%	0.06	1.50	<0.02	<0.02	1.51	1.49	0.02	48.0	93	8.5	12.0
	May 18, 2011	YAD232D	6.9	22.8	6.5	121	0.6	80.2%	0.13	1.50	0.07	0.17	1.67	1.43	0.24	32.0	110	13.0	18.0
	May 18, 2011	YAD232F	6.3	23.5	6.0	119	0.7	74.2%	0.09	1.40	0.04	<0.02	1.41	1.36	0.05	28.0	101	8.0	7.9
LAKE TWITTY (STEWART)	September 26, 2011	YAD235D	8.4	24.5	6.8	148	0.7	100.8%	0.09	0.97	<0.02	<0.02	1.03	0.96	0.07	51.0	103	9.8	10.0
	September 26, 2011	YAD235F	10.5	24.9	8.8	149	0.6	126.9%	0.08	1.00	<0.02	<0.02	1.12	0.99	0.13	46.0	99	7.8	11.0
	September 26, 2011	YAD236	6.2	24.1	6.1	149	0.7	73.8%	0.09	1.00	<0.02	<0.02	1.01	0.99	0.02	64.0	97	11.0	11.0
	August 25, 2011	YAD235D	8.4	30.5	8.2	152	0.8	112.1%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	65.0	103	7.2	7.4
	August 25, 2011	YAD235F	7.9	30.2	8.4	152	0.8	104.9%	0.11	1.10	<0.02	<0.02	1.11	1.09	0.02	56.0	104	9.5	8.2
	August 25, 2011	YAD236	8.5	30.1	8.5	152	0.8	112.7%	0.08	1.10	<0.02	<0.02	1.11	1.09	0.02	47.0	99	7.2	5.8
	July 28, 2011	YAD235D	9.7	33.7	9.0	159	0.8	136.7%	0.09	1.20	<0.02	<0.02	1.21	1.19	0.02	51.0	110	8.0	9.1
	July 28, 2011	YAD235F	8.6	32.1	8.7	158	0.8	118.0%	0.10	1.20	<0.02	<0.02	1.21	1.19	0.02	54.0	105	<12	9.5
	July 28, 2011	YAD236	8.4	32.2	8.6	157	0.8	115.4%	0.10	1.30	0.02	<0.02	1.31	1.28	0.03	48.0	102	6.5	9.9
	June 23, 2011	YAD235D	7.7	29.6	6.5	152	0.8	101.2%	0.10	1.10	<0.02	<0.02	1.11	1.09	0.02	34.0	100	<12	8.1
	June 23, 2011	YAD235F	7.0	29.5	6.7	153	1.0	91.8%	0.08	1.00	0.03	0.02	1.02	0.97	0.05	46.0	102	7.0	6.6
	June 23, 2011	YAD236	5.9	29.2	6.0	153	0.9	77.0%	0.08	1.10	0.10	0.03	1.13	1.00	0.13	33.0	101	<6.2	7.3
	May 18, 2011	YAD235D	3.9	23.3	6.3	151	1.0	45.7%	0.10	0.93	<0.02	0.55	1.48	0.92	0.56	20.0	106	8.2	8.1
	May 18, 2011	YAD235F	4.9	23.5	6.7	151	0.9	57.7%	0.09	1.00	0.02	0.44	1.44	0.98	0.46	24.0	104	7.2	8.1
	May 18, 2011	YAD236	3.5	22.7	6.1	151	0.9	40.6%	0.09	0.99	0.02	0.54	1.53	0.97	0.56	20.0	106	7.2	6.7
CODDLE CREEK RESERVOIR	September 7, 2011	YADCCR01	6.7	26.3	8.1	109	0.7	83.1%	0.03	1.20	<0.02	<0.02	1.21	1.19	0.02	42.0	88	<6.2	9.4
	September 7, 2011	YADCCR02	8.0	26.6	8.7	110	0.5	99.7%	0.04	1.20	<0.02	<0.02	1.21	1.19	0.02	48.0	92	<12	12.0
	September 7, 2011	YADCCR03	7.3	26.8	8.3	108	0.4	91.3%	0.07	1.30	<0.02	<0.02	1.31	1.29	0.02	51.0	106	17.0	26.0
	August 15, 2011	YADCCR01	6.6	28.5	8.7	108	0.6	85.1%	0.03	1.10	<0.02	<0.02	1.11	1.09	0.02	39.0	84	<6.2	11.0
	August 15, 2011	YADCCR02	6.9	28.7	8.6	105	0.5	89.3%	0.03	1.20	<0.02	<0.02	1.21	1.19	0.02	46.0	88	6.2	12.0
	August 15, 2011	YADCCR03	7.7	29.2	8.7	106	0.4	100.5%	0.06	1.30	<0.02	<0.02	1.31	1.29	0.02	52.0	100	10.0	20.0
	July 21, 2011	YADCCR01	8.7	32.2	9.1	110	0.7	119.5%	0.02	0.98	<0.02	<0.02	0.99	0.97	0.02	19.0	74	<6.2	8.0
	July 21, 2011	YADCCR02	9.1	33.2	9.2	111	0.6	127.1%	0.02	0.92	<0.02	<0.02	0.93	0.91	0.02	21.0	74	<6.2	7.7
	July 21, 2011	YADCCR03	9.0	32.3	9.2	111	0.6	123.9%	0.03	0.94	<0.02	<0.02	0.95	0.93	0.02	26.0	73	<6.2	8.6
	June 22, 2011	YADCCR01	7.8	28.6	8.8	108	0.8	100.7%	0.03	0.92	<0.02	<0.02	0.93	0.91	0.02	39.0	75	6.5	8.4
	June 22, 2011	YADCCR02	8.0	28.6	8.5	109	0.8	103.3%	0.03	0.90	<0.02	<0.02	0.91	0.89	0.02	34.0	78	<6.2	9.0
	June 22, 2011	YADCCR03	7.7	29.6	8.6	108	0.8	101.2%	0.04	0.88	<0.02	<0.02	0.89	0.87	0.02	36.0	80	8.5	10.0
	May 25, 2011	YADCCR01	8.9	25.9	8.0	104	1.3	109.5%	0.02	0.81	<0.02	<0.02	0.82	0.80	0.02	32.0	74	<6.2	7.1
	May 25, 2011	YADCCR02	8.6	27.4	7.9	104	1.0	108.7%	0.03	0.92	<0.02	<0.02	0.93	0.91	0.02	46.0	75	6.8	9.1
	May 25, 2011	YADCCR03	7.6	27.5	7.6	107	0.7	96.3%	0.06	0.86	<0.02	0.02	0.88	0.85	0.03	30.0	92	18.0	20.0
ROBERDEL LAKE	September 29, 2011	YAD262E	7.0	26.0	6.0	29	1.0	86.3%	0.02	0.51	0.04	0.03	0.54	0.47	0.07	6.9	37	<6.2	3.2
	September 29. 2011	YAD263	7.1	25.7	5.6	29	1.4	87.1%	0.02	0.52	0.06	0.03	0.55	0.46	0.09	6.7	41	<6.2	5.5
	August 30, 2011	YAD262E	6.6	28.0	6.0	29	1.0	84.3%	0.03	0.57	<0.02	<0.02	0.58	0.56	0.02	13.0	54	11.0	5.7
	August 30, 2011	YAD263	7.0	28.4	5.8	29	1.4	90.1%	0.02	0.54	<0.02	<0.02	0.55	0.53	0.02	14.0	40	<12.0	3.5
	July 14, 2011	YAD262E	6.3	31.1	6.9	28	0.6	85.0%	0.03	0.51	<0.02	<0.02	0.52	0.50	0.02	15.0	49	14.0	11.0
	July 14, 2011	YAD263	6.3	31.9	7.1	29	0.9	86.1%	0.02	0.48	<0.02	<0.02	0.49	0.47	0.02	13.0	40	<6.2	4.1
	June 9, 2011	YAD262E	6.2	29.1	7.1	30	1.0	80.8%	0.03	0.47	<0.02	<0.02	0.48	0.46	0.02	9.9	36	<6.2	3.0
	June 9, 2011	YAD263	6.4	28.8	7.0	30	1.1	82.9%								11.0	32	<12	2.9
	May 5, 2011	YAD262E	7.1	21.8	7.1	32	1.2	80.9%	0.02	0.38	0.02	0.22	0.60	0.36	0.24	11.0	62	<6.2	4.1
	May 5, 2011	YAD263	6.6	21.8	7.5	32	1.3	75.2%	0.02	0.41	<0.02	0.22	0.63	0.40	0.23	6.4	44	<12	3.5
ROCKINGHAM CITY LAKE	September 15, 2011	YAD265C	2.3	25.2	5.2	30	0.9	27.9%	0.03	0.64	<0.02	<0.02	0.65	0.63	0.02	10.0	62	12.0	4.4
	August 11, 2011	YAD265C	2.1	28.4	5.2	29	0.8	27.0%	0.04	0.78	<0.02	<0.02	0.79	0.77	0.02	24.0	59	<6.2	5.1
	July 14, 2011	YAD265C	0.9	28.9	5.1	29	0.7	11.7%	0.05	0.83	0.07	<0.02	0.84	0.76	0.08	23.0	64	7.5	7.2
	June 16, 2011	YAD265C	2.2	26.5	5.0	32	0.7	27.4%	0.04	0.72	<0.02	<0.02	0.73	0.71	0.02	20.0	52	<6.2	3.5
	May 19, 2011	YAD265C	1.3	19.9	5.4	29	0.8	14.3%	0.04	0.59	<0.02	<0.02	0.60	0.58	0.02	4.6	52	7.2	2.8

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
LAKE LEE	July 28, 2011	YAD232C							
	July 28, 2011	YAD232H							
	July 28, 2011	YAD233				<0.4	2.6	11.0	46.0
	June 23, 2011	YAD232C							
	June 23, 2011	YAD232H							
	June 23, 2011	YAD233				<0.4	4.8	12.0	45.0
	May 18, 2011	YAD232C							
	May 18, 2011	YAD232H							
	May 18, 2011	YAD233				<0.4	8.5	13.0	47.0
LAKE MONROE	September 26, 2011	YAD232D							
	September 26, 2011	YAD232F				<0.4	3.2	11.0	36.0
	August 25, 2011	YAD232D							
	August 25, 2011	YAD232F				<0.4	4.2	12.0	32.0
	July 28, 2011	YAD232D							
	July 28, 2011	YAD232F				<0.4	5.3	11.0	30.0
	June 23, 2011	YAD232D							
	June 23, 2011	YAD232F				<0.4	5.6	11.0	32.0
	May 18, 2011	YAD232D							
	May 18, 2011	YAD232F				<0.4	6.3	11.0	34.0
LAKE TWITTY (STEWART)	September 26, 2011	YAD235F							
	September 26, 2011	YAD235D							
	September 26, 2011	YAD236				<0.4	6.2	13.0	42.0
	August 25, 2011	YAD235F							
	August 25, 2011	YAD235D							
	August 25, 2011	YAD236				<0.4	5.9	14.0	44.0
	July 28, 2011	YAD235F							
	July 28, 2011	YAD235D							
	July 28, 2011	YAD236				<0.4	7.3	13.0	45.0
	June 23, 2011	YAD235F							
	June 23, 2011	YAD235D							
	June 23, 2011	YAD236				<0.4	8.0	14.0	44.0
	May 18, 2011	YAD235F							
	May 18, 2011	YAD235D							
	May 18, 2011	YAD236				<0.4	10.0	15.0	43.0
CODDLE CREEK RESERVOIR	September 7, 2011	YADCCR01				<0.4	4.0	5.4	36
	September 7, 2011	YADCCR02							
	September 7, 2011	YADCCR03							
	August 15, 2011	YADCCR01				<0.4	4.8	6.6	33.0
	August 15, 2011	YADCCR02							
	August 15, 2011	YADCCR03							
	July 21, 2011	YADCCR01				<0.4	5.5	5.7	35.0
	July 21, 2011	YADCCR02							
	July 21, 2011	YADCCR03							
	June 22, 2011	YADCCR01				<0.4	6.4	5.8	34.0
	June 22, 2011	YADCCR02							
	June 22, 2011	YADCCR03							
	May 25, 2011	YADCCR01				<0.4	5.7	5.4	33.0
	May 25, 2011	YADCCR02							
	May 25, 2011	YADCCR03							
ROBERDEL LAKE	September 29, 2011	YAD262E				<0.4	<2.0	3.7	6.9
	September 29. 2011	YAD263							
	August 30, 2011	YAD262E							
	August 30, 2011	YAD263				<0.4	<2.0	3.6	6.9
	July 14, 2011	YAD262E							
	July 14, 2011	YAD263				<0.4	<2.0	4.2	6.9
	June 9, 2011	YAD262E							
	June 9, 2011	YAD263				<0.4	<2.0	3.6	7.0
	May 5, 2011	YAD262E							
	May 5, 2011	YAD263				<0.4	<2.0	4.2	6.9
ROCKINGHAM CITY LAKE	September 15, 2011	YAD265C				<0.4	<2.0	4.6	7.9
	August 11, 2011	YAD265C				<0.4	<2.0	3.9	7.9
	July 14, 2011	YAD265C				<0.4	<2.0	3.7	
	June 16, 2011	YAD265C				<0.4	<2.0	4.1	8.0
	May 19, 2011	YAD265C				<0.4	<2.0	3.8	9.0

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE PHYSICAL DATA DO mg/L	Temp Water C	pH s.u.	Cond. µmhos/cm	Depth Secchi meters	Percent SAT	PHOTIC ZONE DATA TP mg/L	TKN mg/L	NH3 mg/L	NOx mg/L	TN mg/L	TON mg/L	TIN mg/L	Chla µg/L	Solids Total mg/L	Total Solids Suspended mg/L	Turbidity NTU
WADESBORO CITY POND	September 21, 2011	YAD275H	5.8	23.5	6.5	68	1.0	68.3%	0.04	0.80	0.13	0.01	0.81	0.67	0.14	17.0	60	<6.2	7.3
	September 21, 2011	YAD275J	5.5	23.2	7.0	68	1.0	64.4%	0.03	0.76	0.11	0.01	0.77	0.65	0.12	18.0	63	<6.2	6.5
	August 24, 2011	YAD275H	7.3	30.4	6.5	58	1.2	97.3%	0.04	0.67	<0.02	<0.02	0.68	0.66	0.02	16.0	52	<6.2	4.3
	August 24, 2011	YAD275J	7.0	29.8	6.3	58	1.3	92.3%	0.05	0.72	<0.02	<0.02	0.73	0.71	0.02	43.0	58	6.8	5.1
	July 20, 2011	YAD275H	8.0	34.4	7.4	63	1.1	114.0%	0.03	0.66	<0.02	<0.02	0.67	0.65	0.02	10.0	62	7.2	5.4
	July 20, 2011	YAD275J	7.8	33.6	6.7	62	1.7	109.7%	0.04	0.65	<0.02	<0.02	0.66	0.64	0.02	48.0	64	13.0	7.4
	June 15, 2011	YAD275H	7.6	29.1	7.8	63	2.2	99.0%	0.04	0.38	<0.02	<0.02	0.39	0.37	0.02	16.0	58	<6.2	2.9
	June 15, 2011	YAD275J	7.5	29.6	7.7	63	2.1	98.6%	0.04	0.43	<0.02	<0.02	0.44	0.42	0.02	22.0	62	7.0	4.2
	June 1, 2011	YAD275H	7.8	30.0	7.8	66	1.9	103.2%	0.04	0.51	<0.02	<0.02	0.52	0.50	0.02	18.0	65	<6.2	4.5
	June 1, 2011	YAD275J	7.9	29.8	7.8	66	1.9	104.2%	0.05	0.56	<0.02	<0.02	0.57	0.55	0.02	19.0	62	<6.2	7.3
HAMLET CITY LAKE	September 15, 2011	YAD282A	3.9	26.5	5.8	46	1.2	48.5%	0.03	0.51	0.08	<0.02	0.52	0.43	0.09	20.0	50	<6.2	2.1
	September 15, 2011	YAD283	3.7	26.6	6.0	46	1.1	46.1%	0.04	0.56	0.03	<0.02	0.57	0.53	0.04	21.0	53	<6.2	3.2
	August 11, 2011	YAD282A	3.5	29.9	5.8	41	0.9	46.2%	0.04	0.65	<0.02	<0.02	0.66	0.64	0.02	26.0	48	6.2	6.9
	August 11, 2011	YAD283	3.9	30.2	6.1	41	0.9	51.8%	0.03	0.63	<0.02	<0.02	0.64	0.62	0.02	26.0	46	6.2	4.9
	July 14, 2011	YAD282A	2.2	29.1	5.5	40	0.7	28.7%	0.04	0.61	<0.02	<0.02	0.62	0.60	0.02	20.0	53	9.0	10.0
	July 14, 2011	YAD283	3.5	29.6	5.9	40	0.8	46.0%	0.04	0.58	<0.02	<0.02	0.59	0.57	0.02	20.0	50	9.5	8.2
	June 16, 2011	YAD282A	4.4	27.7	5.4	45	0.9	55.9%	0.04	0.56	<0.02	<0.02	0.57	0.55	0.02	24.0	49	<6.2	4.9
	June 16, 2011	YAD283	4.2	27.7	5.8	46	1.1	53.4%	0.04	0.60	<0.02	<0.02	0.61	0.59	0.02	23.0	53	<6.2	4.2
	May 19, 2011	YAD282A	4.4	22.2	5.6	4.7	0.9	50.5%	0.04	0.46	<0.02	<0.02	0.47	0.45	0.02	11.0	52	<12	4.3
	May 19, 2011	YAD283	4.3	22.3	6.0	47	0.9	49.5%	0.04	0.50	<0.02	<0.02	0.51	0.49	0.02	12.0	52	12.0	4.1

Appendix A - Yadkin-Pee Dee River Basin Lakes Data

January 1, 2007 through December 31, 2011

Lake	Date	Sampling Station	SURFACE METALS DATA Mg mg/L	Fe µg/L	Ca mg/L	Fluoride mg/L	Sulfate mg/L	Chloride mg/L	Total Hardnes mg/L
WADESBORO CITY POND	September 21, 2011	YAD275H							
	September 21, 2011	YAD275J							
	August 24, 2011	YAD275H							
	August 24, 2011	YAD275J				<0.4	2.0	4.8	16.0
	July 20, 2011	YAD275H							
	July 20, 2011	YAD275J				<0.4	<2.0	6.9	17.0
	June 15, 2011	YAD275H							
	June 15, 2011	YAD275J				<0.4	3.0	5.6	19.0
	June 1, 2011	YAD275H							
	June 1, 2011	YAD275J				<0.4	3.0	6.1	17.0
HAMLET CITY LAKE	September 15, 2011	YAD282A							
	September 15, 2011	YAD283							
	August 11, 2011	YAD282A							
	August 11, 2011	YAD283							
	July 14, 2011	YAD282A							
	July 14, 2011	YAD283							
	June 16, 2011	YAD282A							
	June 16, 2011	YAD283							
	May 19, 2011	YAD282A							
	May 19, 2011	YAD283							