LAKE & RESERVOIR ASSESSMENTS
LITTLE TENNESSEE RIVER BASIN

Nantahala Lake

Intensive Survey Branch
Water Sciences Section
Division of Water Resources
May 19, 2020

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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 = 10,000 to 20,000 units/ml
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 A measurement of oxygen 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 biological 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 biological 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 biological 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. DWR 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 Little Tennessee River basin is located within the Blue Ridge Province of the Appalachian Mountains of western North Carolina. It encompasses about 1,800 mi^2 in Swain, Macon, Clay, Graham, Cherokee, and Jackson counties. Much of the land within the basin is federally owned (49%) and in the U.S. Forest Service's Nantahala National Forest (including the Joyce Kilmer/Slick Rock Wilderness Area) or the Great Smoky Mountains National Park. The basin also includes the Cherokee Indian Reservation. The North Carolina section of the Little Tennessee River is typical of many other mountain rivers. The gradient is relatively steep in most reaches of the river and the substrate is dominated by riffle habitats. The headwater reaches of the Little Tennessee River are located in Georgia. Most tributaries are high gradient streams capable of supporting trout populations in the upper reaches. Most of the basin is forested. However, lower reaches of many tributary catchments are farmed or developed, resulting in the increased potential for nonpoint source problems. Ten lakes were sampled in this river basin by DWR staff in 2019.

A statewide fish consumption advisory for largemouth bass due to mercury contamination was issued by the NC Department of Health and Human Services, Division of Public Health. This advisory includes lakes in the Little Tennessee River Basin which might support largemouth bass. On September 10, 2008, an advisory regarding the consumption of walleye fish from Santeetlah and Fontana Lakes was issued due to elevated mercury levels found in walleye collected from these reservoirs An advisory regarding the consumption of smallmouth bass, walleye, yellow perch and largemouth bass taken from Nantahala Lake was added in December 2012 (https://epi.dph.ncdhhs.gov/oee/fish/advisories.htm).

Assessment Methodology

For this report, data from January 1, 2015 through December 31, 2019 were reviewed. Lake monitoring and sample collection activities performed by DWR field staff are in accordance with the Intensive Survey Unit Standard Operating Procedures Manual (http://portal.ncdenr.org/c/document_library/get_file?uuid=522a90a4-b593-426f-8c11-21a35569dfd8&groupId=38364) An interactive map of the state showing the locations of lake sites sampled by DWR may be found at http://www.arcgis.com/home/webmap/viewer.html?webmap=9dbc8edafb7743a9b7ef3f6fed5c4db0&extent=-87.8069,29.9342,-71.5801,38.7611.

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

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

For the purpose of reporting, algal blooms were determined by the measurement of unit density (units/ml). Unit density is a quantitative measurement of the number of filaments, colonies or single celled

taxa in a waterbody. Blooms are considered mild if they are between 10,000 and 20,000 units/ml. Moderate blooms are those between 20,000 and 30,000 units/ml. Severe blooms are between 30,000 and 100,000 units/ml and extreme blooms are those 100,000 units/ml or greater.

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

Quality Assurance of Field and Laboratory Lakes Data

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

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

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

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 DWR 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 2.0 (March 28, 2014) of this document is available

on the ISU website (https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/intensive-survey-branch).

Weather Overview for Summer 2019

May 2019 brought summer-like heat across the state, resulting in the 3rd warmest May since 1895. A strong Bermuda high pressure system sitting of the southeast coast produced and ongoing flow of warm, moist Atlantic and Gulf of Mexico air into the state. The preliminary statewide average temperature for May was 71.0°F, which was 5.1°F above the 1981 to 2010 average. Precipitation was on the dry side with the statewide average of 2.6", making May 2019 the 17th driest May out of the past 125 years. The mountain region of the state saw the most rainfall while the eastern regions were dry.

June brought a return of regular rainfall in North Carolina. The statewide precipitation average was 7.1" (8th wettest June since 1895). On June 7 through 10, a stalled cold front produced more than a foot of rain in the Foothills and northern Mountains. Due to the relaxing of the Bermuda high and the frequent rainfall events, temperatures in June were lower with the high temperatures one to two degrees below normal. Temperatures rose the final week of June into the upper 90s.

Elevated temperatures continued into July. Overnight temperatures ranked particularly high in the Mountains where much of the month was spent in a humid air mass that kept temperatures and dew points elevated. The rainfall in July followed a typical summertime pattern. A rainfall event on July 22 and 23 produced 4.2" of rain in Cherokee.

The summer heat retreated slightly in August as the Bermuda high system remained far to the east, allowing for more moderate temperatures across the state. Rainfall was scattered throughout the state leaving some areas wet while others remained dry. After a wet early summer, the Mountains became drier in August. Murphy received 1.6" of rain in August, making it the 5th driest August in the past 51 years for the region. As August came to a close, Hurricane Dorian formed in the Atlantic and headed east toward the US Southeast Coast.

Hurricane Dorian struck the northern Bahama Islands as a Category 5, then closely approached the Florida east coast before turning north and traveling up toward North Carolina. Dorian lost a great deal of its strength after striking the Bahamas and reached the southern coast of the state on September 5th as a Category 2 storm. Turning to the northeast, the eyewall of the hurricane traveled from the Cape Fear to Cape Lookout and then to Cape Hatteras before turning out to sea. Rainfall and winds from this hurricane was limited to the eastern part of North Carolina while the Mountain region saw little if any impacts.

September was exceptionally warm. The preliminary average statewide temperature of 74.1°F ranked this as tie 8th-warmest September in the past 125 years. The Mountain region was not spared from the early fall heat. Asheville reported 10 days with highest of 90°F or above. For the month as a whole, the average highs were 10 degrees above normal and the western two-thirds of the state were at least five degrees above normal. The western part of the state saw little if any rainfall in September. Such dry weather at this time of the year has an ominous connection to the Septembers of 1985, 1986 and 2007 which were also very dry and hot and heralded the beginning of a drought period.

LAKE & RESERVOIR ASSESSMENTS

HUC 06010202

Lake Sequoyah

Ambient Lakes Program Name	Lake Sequoyah		
Trophic Status (NC TSI)	Mesotrophic		
Mean Depth (meters)	2.1		
Volume ($10^6 m^3$)	0.1		
Watershed Area (mi^2)	36		
Classification	WS-III B Tr		
Stations	LTN006C	LTN008C	LTN008E
Number of Times Sampled	5	5	5

Lake Sequoyah, located near the Town of Highlands, is an impoundment of the Cullasaja River and serves as a water supply source for the town. This shallow lake has a maximum depth of 13 feet (four meters). The shoreline consists of residential homes and commercial businesses. The Highlands Country Club, which is comprised of a golf course and private homes, is also located in the watershed.

DWR staff sampled Lake Sequoyah monthly from May through September 2019. Secchi depths ranged from 0.6 to 2.1 meters. Surface dissolved oxygen in 2019 ranged from 5.6 to 8.1 mg/L and surface water temperatures ranged from 17.7 C° to 24.7 C° (Appendix A). Surface pH values for Lake Sequoyah from May through September ranged from 5.8 to 7.3 s.u.

Total phosphorus concentrations ranged from <0.02 mg/L to 0.05 mg/L (Appendix A). Total Kjeldahl nitrogen ranged from <0.20 to 0.55 mg/L and total organic nitrogen ranged from 0.19 to 0.54 mg/L. Chlorophyll *a* values ranged from 7.9 to 12.0 µg/L. Because Lake Sequoyah is designated as a Trout Water (Tr), chlorophyll *a* values may not exceed the state water quality standard of 15 µg/L. In July, turbidity values at the upper end of the lake (LTN006C) and at the mid-lake sampling site were greater than the state water quality standard of 10 NTU for lakes designated as a Trout Water (Appendix A).

An Algal Growth Potential Test conducted on water samples collected in July determined that phosphorus was the limiting nutrient for algal growth in this reservoir (Table 1).

Table 1. Algal Growth Potential Test, Lake Sequoyah, July 15, 2019.

July 15, 2019

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
LTN006C	3.18	3.30	5.51	Phosphorus
LTN008C	3.38	3.09	3.93	Phosphorus
LTN008E	1.99	2.42	4.13	Phosphorus

Station LTN008C was reanlayzed to determine the limiting nutrient, since initial results were not statistically significant. Phosphorus was confirmed as the limiting nutrient, although there was not as strong a response to P enrichment as at the other stations.

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
LTN008C	3.51	4.03	4.30	Phosphorus

Freshwater AGPT using *Selenastrum capricornutum* as test alga

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

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

Based on the NCTSI scores calculated for Lake Sequoyah in 2019, this lake was determined to exhibit moderate biological productivity or mesotrophic conditions. The trophic state has varied from oligotrophic to eutrophic since 1988 when DWR began monitoring efforts on Lake Sequoyah.

Nantahala Lake

Ambient Lakes Program Name	Nantahala Lake		
Trophic Status (NC TSI)	Oligotrophic		
Mean Depth (meters)	38.1		
Volume ($10^6 m^3$)	160.0		
Watershed Area (mi^2)	280		
Classification	B Tr		
Stations	LTN013B	LTN013C	LTN013D
Number of Times Sampled	5	5	5

Nantahala Lake lies in the western tip of North Carolina and is an impoundment of the Nantahala River. Duke Energy owns this reservoir, which was impounded in 1942 for hydroelectric power production. Nantahala Lake is 76 meters deep at the dam at maximum pool. The rugged, mountainous drainage area is primarily forested.

Nantahala Lake was monitored five times from May through September 2019 by DWR field staff. Secchi depths ranged from 2.8 to 5.0 meters, indicating very good water clarity (Appendix A). Surface dissolved oxygen ranged from 7.6 to 9.0 mg/L and surface water temperatures ranged from 20.3 C° to 27.7 C°. Surface pH values ranged from 6.9 to 8.2 s.u. and surface conductivity was very consistent, ranging from 13 to 15 µmhos/cm.

Nutrient concentrations were very low in Nantahala Lake in 2019; total phosphorus, total Kjeldahl nitrogen ammonia and nitrite plus nitrate were below DWR laboratory detection levels (Appendix A). Due to the limited availability of nutrients, chlorophyll *a* values were also low, ranging from 1.5 to 4.8 µg/L. Turbidity values were below the DWR laboratory detection level of <1.0 NTU. Based on the calculated NCTSI scores, Nantahala Lake was determined to have very low biological productivity (oligotrophic conditions). This reservoir has been consistently oligotrophic since monitoring by DWR began in 1981.

Bear Creek Reservoir

Ambient Lakes Program Name	Bear Creek Reservoir	
Trophic Status (NC TSI)	Oligotrophic	
Mean Depth (meters)	33.0	
Volume ($10^6 m^3$)	5.60	
Watershed Area (mi^2)	194	
Classification	WS-III B Tr	
Stations	LTN015B	LTN015D
Number of Times Sampled	5	5

Bear Creek Reservoir is a hydroelectric impoundment of the Tuckasegee River. Most of the 194 square kilometer upland drainage area is forested with steep slopes and clean, fast-moving streams. Bear Creek Lake was built in 1953 and is currently owned by Duke Energy.

DWR field staff monitored Bear Creek Reservoir five times from May through September in 2019. Surface dissolved oxygen ranged from 7.6 to 9.4 mg/L and surface water temperatures ranged from 18.6 C° to 27.0 C° (Appendix A). Surface pH values were between 6.7 and 8.6 s.u. and surface conductivity ranged from 8 to 16 µmhos/cm. Secchi depths for Bear Creek Reservoir ranged from 2.0 to 4.5 meters.

Nutrient concentrations in this reservoir were low. Values for total phosphorus, total Kjeldahl nitrogen and ammonia were below DWR laboratory detection levels (Appendix A). Nitrite plus nitrate nitrogen ranged from <0.02 to 0.06 mg/L and total organic nitrogen ranged from 0.09 to 0.19 mg/L. Chlorophyll *a* values were low (range = 1.3 to 6.5 µg/L). The turbidity measurements for Bear Creek Reservoir were <1.0 NTU. The growth of algae in Bear Creek Reservoir was determined to be limited by the nutrient, phosphorus, based on the results of an Algal Growth Potential Test conducted on lake water samples collected in July (Table 2).

Table 2. Algal Growth Potential Test, Bear Creek Reservoir, July 16, 2019.

July 16, 2019

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
LTN015D	0.13	0.18	0.63	Phosphorus
LTN015B	0.10	0.12	0.54	Phosphorus

Freshwater AGPT using *Selenastrum capricornutum* as test alga

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

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

This reservoir was determined to exhibit very low biological productivity (oligotrophic) in 2019 based on the calculated NCTSI scores for May through September and has been oligotrophic since it was first monitored by DWR in 1988.

Cedar Cliff Reservoir

Ambient Lakes Program Name	Cedar Cliff Reservoir	
Trophic Status (NC TSI)	Oligotrophic	
Mean Depth (meters)	27.1	
Volume ($10^6 m^3$)	7.20	
Watershed Area (mi^2)	210	
Classification	WS-III B Tr	
Stations	LTN015F	LTN015H
Number of Times Sampled	4	4

Cedar Cliff Reservoir is a picturesque mountain lake on the Tuckaseegee River. The lake is owned by Duke Energy and was built in 1952. The maximum depth is 53 meters and the watershed for this reservoir is mostly forested. Recreational activities at lake include swimming, boating, and trout fishing. The water level of Cedar Cliff Lake was lowered in September by 40 feet below full pond level by Duke Energy to allow modifications to the dam to be made. This resulted in the curtailment of sampling efforts by DWR due to loss of use of the boat ramp at the Cedar Cliff Access Area.

This lake was sampled monthly from May through August by DWR staff. Secchi depths in 2019 ranged from 1.4 to 3.5 meters (Appendix A). Surface dissolved oxygen ranged from 8.2 to 8.6 mg/L and surface water temperatures ranged from 20.9 C° to 26.6 C°. The lowest surface pH value was observed in August (6.6 s.u.) and the highest value occurred in June (7.1 s.u.). Surface conductivity ranged from 15 to 21 µmhos/cm.

Total phosphorus in Cedar Cliff Reservoir ranged from <0.02 to 0.02 mg/L and total Kjeldahl nitrogen ranged from <0.02 to 0.30 mg/L (Appendix A). Total organic nitrogen ranged from 0.09 to 0.29 mg/L. Chlorophyll *a* values in this reservoir ranged from 2.7 to 8.4 µg/L and turbidity was <1.0 NTU. Results from an Algal Growth Potential Test conducted on water samples collected from Cedar Cliff Reservoir in July determined that phosphorus was the nutrient limiting the growth of algae in the lake (Table 3).

Table 3. Algal Growth Potential Test, Cedar Cliff Reservoir, July 16, 2019.

July 16, 2019

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
LTN015F	0.12	0.13	0.43	Phosphorus
LTN015H	0.11	0.12	0.38	Phosphorus

Freshwater AGPT using *Selenastrum capricornutum* as test alga

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

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

Cedar Cliff Reservoir had very low biological productivity or oligotrophic conditions in 2019 based on the calculated NCTSI scores and has been oligotrophic since monitoring by DWR began in 1988.

Thorpe Reservoir

Ambient Lakes Program Name	Thorpe Reservoir			
Trophic Status (NC TSI)	Oligotrophic			
Mean Depth (meters)	23.2			
Volume ($10^6 m^3$)	82.6			
Watershed Area (mi^2)	96.0			
Classification	WS-III B Tr HQW			
Stations	LTN015L	LTN015N	LTN015P	LTN015R
Number of Times Sampled	5	5	5	5

Thorpe Reservoir, also known as Glenville Lake, is a man-made impoundment on the Tuckaseegee River in Jackson County, NC. The lake is used for recreational fishing, swimming, and boating. Owned by Duke Energy, the reservoir also has been used for hydroelectric power generation since its construction in 1941. The mean retention time of 294 days and most of the 95 km^2 drainage area is forested with scattered residences. Tributaries include West Fork Tuckaseegee River, Norton Creek, Hurricane Creek, Cedar Creek, Mill Creek, and Pine Creek.

Thorpe Reservoir was monitored monthly from May through September 2019. Secchi depths for this reservoir ranged from 1.5 to 4.0 meters. Surface dissolved oxygen ranged from 7.5 mg/L in September to 9.6 mg/L in May and surface water temperatures ranged from 18.7 C° in May to 22.0 C° in September. Surface pH values ranged from 6.8 to 8.0 s.u. and surface conductivity ranged from 22 to 25 µmhos/cm.

Total phosphorus and ammonia concentrations were below the DWR laboratory detection levels (Appendix A). Total Kjeldahl nitrogen ranged from <0.20 to 0.25 mg/L and total organic nitrogen ranged from 0.09 to 0.25 mg/L. Chlorophyll *a* values in 2019 ranged from 3.9 to 20.0 µg/L. In June, chlorophyll *a* values at each of the four lake sampling sites exceed the state water quality standard of 15.0 µg/L for a waterbody designated as a Trout Water (Tr). Turbidity values were also well below the Trout Water limit of 10 NTU. An Algal Growth Potential Test conducted on water samples collected in July determined that phosphorus was the limiting nutrient for algal growth in this reservoir (Table 4).

Table 4. Algal Growth Potential Test, Thorpe Reservoir, July 9, 2019.

July 9, 2019

Station	Maximum Standing Crop, Dry Weight (mg/L)			Limiting Nutrient
	Control	C+N	C+P	
LTN015R	0.15	0.17	0.61	Phosphorus
LTN015P	0.17	0.19	0.50	Phosphorus
LTN015N	0.16	0.19	0.50	Phosphorus
LTN015L	0.20	0.26	0.43	Phosphorus

Freshwater AGPT using *Selenastrum capricornutum* as test alga

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

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

Based on the calculated NCTSI scores, Thorpe Reservoir was determined to exhibit very low biological productivity or oligotrophic conditions. This reservoir has been consistently oligotrophic since it was first monitored by DWR staff in 1988.

LAKE & RESERVOIR ASSESSMENTS

HUC 06010204

Fontana Lake

Ambient Lakes Program Name	Fontana Lake				
Trophic Status (NC TSI)	Oligotrophic				
Mean Depth (meters)	41.2				
Volume (10^6 m^3)	1782.0				
Watershed Area (mi^2)	4020				
Classification	WS-IV B CA				
Stations	LTN031A	LTN031B	LTN031D	LTN031H	LTN031J
Number of Times Sampled	5	5	5	5	5

Fontana Lake, located along the southern boundary of the Great Smoky Mountain National Park, provides hydropower power and flood control on the Little Tennessee River. This reservoir is owned by the Federal Government and operated by the Tennessee Valley Authority (TVA). Construction on the dam began in 1942 and was completed in 1944. At a height of over 480 feet, the Fontana Dam is the highest dam east of the Mississippi River.

Fontana Lake was sampled monthly from May through September 2019 by DWR field staff. Secchi depths ranged from 2.3 to 4.2 meters in 2019 (Appendix A). Surface dissolved oxygen ranged from 7.9 to 9.4 mg/L and surface water temperatures ranged from 22.7 C° to 29.1 C°. Surface conductivity ranged from 11 to 27 µmhos/cm and surface pH ranged from 7.5 to 9.1 s.u.

Nutrient concentrations in Fontana Lake were low. Total phosphorus was <0.02 mg/L and total Kjeldahl nitrogen ranged from <0.02 to 0.22 mg/L. Total organic nitrogen ranged from 0.09 to 0.25 mg/L. Chlorophyll *a* values ranged from 2.1 to 18 µg/L. Lake turbidity measurements were consistently <1.0 NTU. Fontana Lake was oligotrophic (exhibited low biological productivity) in 2019 based on the NCTSI scores for May through September and has remained oligotrophic since monitoring by DWR began in 1981.

Lake Cheoah

Ambient Lakes Program Name	Lake Cheoah		
Trophic Status (NC TSI)	Oligotrophic		
Mean Depth (meters)	40.0		
Volume (10^6 m^3)	287.5		
Watershed Area (mi^2)	4165		
Classification	C Tr		
Stations	LTN032B	LTN032D	LTN032F
Number of Times Sampled	2	2	2

Lake Cheoah was originally constructed by the Aluminum Company of America (ALCOA) and is currently owned by Tallassee Power Company (TAPOCO). This is a narrow and deep impoundment of the Little Tennessee River on the North Carolina/Tennessee border. Inflow to this lake is dominated by the hypolimnetic discharge from Fontana Lake, located directly upstream. The upstream portion of the lake flows swiftly in response to this water release from Fontana Dam and water temperatures in Lake Cheoah are generally low.

Lake Cheoah was monitored by DWR field staff in May through September 2019. Secchi depths ranged from 2.0 to 7.3 meters (Appendix A). Surface dissolved oxygen values ranged from 6.7 to 10.3 mg/L and surface water temperatures ranged from 10.6 C° to 23.3 C°. Surface pH in Lake Cheoah ranged from 5.7 to 7.5 s.u. and surface conductivity ranged from 20 to 22 µmhos/cm.

Nutrient concentrations were low in Lake Cheoah in 2019. Total phosphorus, total Kjeldahl nitrogen and ammonia values were less than the DWR Laboratory detection level of 0.02 mg/L (Appendix A). Total organic nitrogen was consistently 0.09 mg/L. In response to the low nutrient concentrations, chlorophyll *a* values were also low, ranging from <1.0 to 2.2 µg/L. Nutrient and chlorophyll *a* concentrations observed in 2019 were similar to those previously recorded for this reservoir by DWR. Based on the calculated NCTSI scores, Lake Cheoah was determined to have very low biological productivity (oligotrophic conditions). This reservoir has been oligotrophic since it was first monitored by DWR in 1988.

Santeetlah Lake

Ambient Lakes Program Name	Santeetlah Lake		
Trophic Status (NC TSI)	Oligotrophic		
Mean Depth (meters)	17.1		
Volume ($10^6 m^3$)	195.0		
Watershed Area (mi^2)	451		
Classification	B Tr		
Stations	LTN037B	LTN037D	LTN037E
Number of Times Sampled	5	5	5

Santeetlah Lake is located on the Cheoah River in the mountains of western North Carolina and is owned by the Aluminum Company of America (ALCOA). This reservoir is used for hydroelectric power generation as well as providing recreational uses. Santeetlah Lake is a deep lake with a maximum depth of 213 feet (65 meters) and a mean hydraulic retention time of 161 days. Major tributaries to Santeetlah Lake include the Cheoah River, Santeetlah Creek, West Buffalo Creek and Snowbird Creek. The watershed consists of rugged, mountainous terrain, almost all of which is forested.

Santeetlah Lake was monitored monthly from May through August, and in October 2019 by DWR field staff. Secchi depths ranged from 1.7 to 5.3 meters, with the lowest Secchi depths observed in the Cheoah River arm of the lake in July (LTN037B; Appendix A). Surface dissolved oxygen ranged from 7.7 to 9.4 mg/L and surface water temperatures ranged from 21.5 C° to 28.7 C°. Surface pH values ranged from 7.1 to 8.6 s.u. and surface conductivity ranged from 13 to 26 µmhos/cm.

Total phosphorus and ammonia concentrations were less than the DWR Laboratory detection levels in 2019 (Appendix A). Total Kjeldahl nitrogen ranged from <0.02 to 0.28 mg/L and total organic nitrogen ranged from 0.09 mg/L to 0.31 mg/L. Chlorophyll *a* values were low, ranging from 5.2 to 15 µg/L. Turbidity values were also low (<1.0 NTU).

Santeetlah Lake had very low biological productivity or oligotrophic conditions in 2019 based on calculated NCTSI scores for the months it was sampled. This reservoir has been consistently oligotrophic since it was first monitored by DWR in 1981.

Calderwood Lake

Ambient Lakes Program Name	Calderwood Lake	
Trophic Status (NC TSI)	Oligotrophic	
Mean Depth (meters)	29.0	
Volume ($10^6 m^3$)	1.60	
Watershed Area (mi^2)	4807	
Classification	C Tr	
Stations	LTN040	LTN041
Number of Times Sampled	2	2

Construction of Calderwood Lake was completed in 1930 by the Aluminum Company of America (ALCOA) for hydropower production for their plant in Tennessee. This reservoir is currently owned by a subsidiary of ALCOA known as the Tallassee Power Company (TAPOCO). Located at the edge of the Great Smokey Mountains on the North Carolina/Tennessee border, Calderwood Lake is a narrow, but deeply channeled reservoir surrounded by forests. The Little Tennessee River (Lake Cheoah) is the major inflow to this reservoir.

DWR field staff sampled Calderwood Lake in May and October 2019. Surface dissolved oxygen ranged from 7.9 to 9.9 mg/L and surface water temperature ranged from 14.3 C° to 23.0 C° (Appendix A). Surface pH values ranged from 5.7 to 7.1 s.u. and surface conductivity ranged from 20 to 21 mhos/cm. Secchi depths for Calderwood Lake ranged from 3.0 to 5.3 meters in 2019. Turbidity values were <1.0 NTU

Nutrient concentration in 2019 were low. Total phosphorus, total Kjeldahl nitrogen and ammonia were at or below DWR Laboratory detection levels (Appendix A). Total organic nitrogen ranged from 0.09 to 0.19 mg/L. Chlorophyll *a* values were low in response to the limited availability of nutrients and ranged from <1.0 to 4.2 g/L. Based on the calculated NCTSI scores, Calderwood Lake was determined to be oligotrophic (i.e., exhibiting low biological productivity). This reservoir has remained oligotrophic since monitoring by DWR staff began in 1981.

Appendix A - Little Tennessee River Basin Lake Data
January 1, 2014 Through December 31, 2019

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	Total Solids mg/L	Total Suspended Solids mg/L	Turbidity NTU	Total Hardnes mg/L
HUC 06010202																				
LAKE SEQUOYAH	September 23, 2019	LTN006C	7.8	22.4	6.4	38	1.9	102.0%	0.02	<0.20	<0.02	0.07	0.17	0.09	0.08		16.0	<6.2	1.8	
	September 23, 2019	LTN008C	7.9	22.2	5.9	36	1.9	102.4%	<0.02	0.27	<0.02	0.04	0.31	0.26	0.05		13.0	<6.2	1.2	
	September 23, 2019	LTN008E	7.8	21.8	5.8	33	2.1	101.0%	<0.02	0.30	0.03	0.05	0.35	0.27	0.08		25.0	7.3	1.2	8.0
	August 20, 2019	LTN006C	5.6	22.5	6.3	39	1.1	73.0%	0.03	0.37	0.03	0.11	0.48	0.34	0.14		17.0	<6.2	4.9	
	August 20, 2019	LTN008C	7.0	23.2	6.4	36	1.3	93.1%	0.02	0.24	<0.02	0.07	0.31	0.23	0.08		15.0	<6.2	3.9	
	August 20, 2019	LTN008E	7.3	24.1	6.4	32	1.6	97.9%	0.02	0.24	<0.02	0.04	0.28	0.23	0.05		14.0	<6.2	3.0	10.0
	July 15, 2019	LTN006C	7.5	22.6	6.6	36	0.7	97.4%	0.04	0.50	0.04	0.16	0.66	0.46	0.20	7.9	31.0	7.3	11.0	
	July 15, 2019	LTN008C	8.1	22.4	6.8	27	0.6	105.5%	0.05	0.55	<0.02	0.12	0.67	0.54	0.13	12.0	29.0	9.5	11.0	
	July 15, 2019	LTN008E	8.0	24.7	7.3	25	0.6	108.6%	0.05	0.55	<0.02	0.14	0.69	0.54	0.15	9.6	27.0	10.0	9.7	8.6
	June 27, 2019	LTN006C	7.2	21.0	6.3	42	1.8	90.9%	0.03		0.03	0.17			0.20	5.7	47.0	8.3	2.3	
	June 27, 2019	LTN008C	7.9	21.1	6.5		1.8	100.1%	0.05		<0.02	0.10			0.11	8.6	41.0	28.0	2.3	
	June 27, 2019	LTN008E	8.1	21.3	6.7	31	2.0	102.7%	<0.02		<0.02	0.09			0.10	7.2	32.0	<6.2	1.8	8.0
	May 8, 2019	LTN006C	7.8	17.7	6,8	41	1.5	92.0%	<0.02	0.31	0.04	0.18	0.49	0.27	0.22	1.9	<12.0	<6.2	4.5	
	May 8, 2019	LTN008C	8.0	17.7	6.7	36	1.3	95.1%	<0.02	0.21	<0.02	0.12	0.33	0.20	0.13	2.2	<12.0	<6.2	3.2	
	May 8, 2019	LTN008E	8.1	17.9	6.6	34	1.4	96.6%	<0.02	0.20	<0.02	0.11	0.31	0.19	0.12	3.6	<12.0	<6.2	3.0	8.0
NANTAHALA LAKE	September 24, 2019	LTN013B	8.0	24.8	7.2	13	4.5	107.1%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		<12	<6.2	<1.0	
	September 24, 2019	LTN013C	8.0	24.9	7.1	13	3.9	107.3%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		14.0	<6.2	<1.0	
	September 24, 2019	LTN013D	8.1	24.9	7.3	13	4.9	108.6%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		<12	<6.2	<1.0	
	August 21, 2019	LTN013B	7.6	27.2	7.3	12	3.0	106.3%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		14.0	<6.2	<1.0	
	August 21, 2019	LTN013C	7.6	27.7	7.3	13	2.8	106.8%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		13.0	<6.2	<1.0	
	August 21, 2019	LTN013D	7.7	27.2	7.1	13	5.0	107.6%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		<12.0	<6.2	<1.0	
	July 23, 2019	LTN013B	7.7	25.9	7.0	13	3.7	105.7%								3.7	31.0	<6.2	<1.0	
	July 23, 2019	LTN013C	7.6	26.0	6.9	14	3.6	104.3%								2.7	31.0	<6.2	<1.0	
	July 23, 2019	LTN013D	7.6	26.0	6.9	14	4.0	104.4%								4.8	24.0	<6.2	<1.0	
	June 4, 2019	LTN013B	8.1	23.0	6.7	15	4.0	104.7%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	1.7	15.0	<6.2	<1.0	
	June 4, 2019	LTN013C	8.0	23.1	6.9	15	4.0	103.9%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	1.7	<12.0	<6.2	<1.0	
	June 4, 2019	LTN013D	8.1	23.1	8.2	15	4.2	105.0%	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	1.5	16.0	<6.2	<1.0	
	May 7, 2019	LTN013B	9.0	20.2	6.9	14	3.5	109.8%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	2.5	12.0	<6.2	<1.0	
	May 7, 2019	LTN013C	8.9	20.3	6.9	14	3.5	109.5%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	2.0	<12.0	<6.2	<1.0	
	May 7, 2019	LTN013D	8.8	20.8	6.9	14	3.5	109.0%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	2.4	<12.0	<6.2	<1.0	
HUC 06010203																				
BEAR CREEK RESERVOIR	September 11, 2019	LTN015B	8.1	24.5	8.6	16	3.2	105.3%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	4.1	<12.0	<6.2	<1.0	
	September 11, 2019	LTN015D	7.9	25.1	6.8	16	3.3	103.8%	<0.02	0.20	<0.02	<0.02	0.21	0.19	0.02	3.9	<12.0	<6.2	<1.0	6.0
	August 13, 2019	LTN015B	7.9	26.2	6.9	16	4.0	106.6%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	4.8	18.0	<6.2	<1.0	
	August 13, 2019	LTN015D	7.6	26.8	7.6	16	4.5	104.2%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	3.7	15.0	<6.2	<1.0	5.0
	July 16, 2019	LTN015B	8.1	26.9	6.8	15	2.0	110.8%								6.5	16.0	<6.2	<1.0	
	July 16, 2019	LTN015D	8.2	27.0	7.2	15	2.0	111.5%								5.4	20.0	<6.2	<1.0	5.1
	June 3, 2019	LTN015B	8.3	23.9	7.1	8	3.0	108.1%	<0.02	<0.20	<0.02	0.03	0.13	0.09	0.04	1.7	14.0	<6.2	<1.0	
	June 3, 2019	LTN015D	8.3	23.9	7.3	15	3.0	107.1%	<0.02	<0.20	<0.02	0.03	0.13	0.09	0.04	1.3	20.0	<6.2	<1.0	6.0
	May 8, 2019	LTN015B	9.4	18.6	6.7	13	3.0	109.5%	<0.02	<0.20	<0.02	0.06	0.16	0.09	0.07	2.0	<12.0	<6.2	<1.0	
	May 8, 2019	LTN015D	9.1	19.7	7.8	13	3.0	108.9%	<0.02	<0.20	<0.02	0.04	0.14	0.09	0.05	3.5	14.0	<6.2	<1.0	4.0
CEDAR CLIFF RESERVOIR	August 13, 2019	LTN015F	8.2	26.4	6.6	21	2.8	110.4%	<0.02	<0.20	<0.02	<0.02	0.13	0.09	0.04	3.9	15.0	<6.2	<1.0	
	August 13, 2019	LTN015H	8.2	26.6	6.8	20	3.5	111.6%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	6.3	21.0	<6.2	<1.0	5.0
	July 16, 2019	LTN015F	8.5	25.3	6.8	20	1.4	111.5%								7.6	23.0	<6.2	<1.0	
	July 16, 2019	LTN015H	8.5	25.9	6.8	17	2.1	113.3%								8.4	<12.0	<6.2	<1.0	5.1
	June 3, 2019	LTN015F	8.6	24.8	7.1	18	1.8	112.3%	<0.02	0.30	<0.02	<0.02	0.31	0.29	0.02	4.9	19.0	<6.2	<1.0	
	June 3, 2019	LTN015H	8.6	25.0	7.0	18	2.0	113.2%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	4.8	20.0	<6.2	<1.0	7.0
	May 8, 2019	LTN015F	8.6	20.9	6.7	16	3.5	103.9%	0.02	0.24	<0.02	0.03	0.27	0.23	0.04	2.7	27.0	8.0	<1.0	
	May 8, 2019	LTN015H	8.6	22.3	6.8	15	3.5	106.9%	<0.02	0.20	0.02	0.02	0.22	0.18	0.04	5.5	14.0	<6.2	<1.0	5.0
THORPE RESERVOIR	September 10, 2019	LTN015L	7.6	25.5	8.0	22	4.0	103.3%	<0.02	0.24	<0.02	<0.02	0.25	0.23	0.02	4.6	<12.0	<6.2	<1.0	
	September 10, 2019	LTN015N	7.6	25.3	7.1	22	4.0	104.0%	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	3.9	<12.0	<6.2	<1.0	
	September 10, 2019	LTN015P	7.5	25.3	6.7	22	3.5	102.9%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	4.2	<12.0	<6.2	<1.0	
	September 10, 2019	LTN015R	7.6	25.3	6.5	22	3.5	103.2%	<0.02	0.25	<0.02	<0.02	0.26	0.24	0.02	4.4	<12.0	<6.2	<1.0	5.0
	August 12, 2019	LTN015L	7.8	26.2	7.4	21	3.0	108.7%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	5.5	23.0	<6.2	<1.0	
	August 12, 2019	LTN015N	7.8	26.4	6.9	20	3.0	109.3%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	8.0	20.0	<6.2	<1.0	
	August 12, 2019	LTN015P	7.8	26.7	6.8	21	3.0	109.8%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	5.6	14.0	<6.2	<1.0	
	August 12, 2019	LTN015R	7.8	26.6	6.5	21	2.8	109.7%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	5.1	20.0	<6.2	<1.0	6.0
	July 16, 2019	LTN015L	8.0	25.8	6.5	20	1.5	110.1%								9.4	12.0	<6.2	<1.0	
	July 16, 2019	LTN015N	8.1	25.8	6.5	20	1.5	111.4%								11.0	14.0	<6.2	<1.0	
	July 16, 2019	LTN015P	8.1	25.8	6.7	20	1.5	111.4%								12.0	17.0	<6.2	<1.0	
	July 16, 2019	LTN015R	8.0	25.7	7.5	20	1.5	110.8%								11.0	15.0	<6.2	<1.0	5.1
	June 26, 2019	LTN015L	8.6	24.6	7.6	19	1.5	115.5%	<0.02		<0.02	<0.02			0.02	18.0	24.0	<6.2	<1.0	
	June 26, 2019	LTN015N	8.6	25.7	7.7	19	1.6	118.5%	<0.02		<0.02	<0.02			0.02	19.0	<12.0	<6.2	<1.0	
	June 26, 2019	LTN015P	8.7	24.6	8.5	19	1.5	118.2%	<0.02		<0.02	<0.02			0.02	20.0	<12.0	6.5	<1.0	
	June 26, 2019	LTN015R	8.7	24.9	8.6	20	1.5	118.7%	<0.02		<0.02	<0.02			0.02	19.0	<12.0	6.3	<1.0	5.0

Appendix A - Little Tennessee River Basin Lake Data
January 1, 2014 Through December 31, 2019

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	Total Solids mg/L	Total Suspended Solids mg/L	Turbidity NTU	Total Hardnes mg/L
THORPE RESERVOIR	May 7, 2019	LTN015L	9.5	18.8	8.2	19	2.0	114.6%	<0.02	0.23	<0.02	0.04	0.27	0.22	0.05	10.0	<12.0	<6.2	<1.0	
	May 7, 2019	LTN015N	9.6	18.9	8.2	20	2.3	115.9%	<0.02	0.22	<0.02	0.05	0.27	0.21	0.06	11.0	<12.0	<6.2	<1.0	
	May 7, 2019	LTN015P	9.6	18.7	8.0	20	2.3	115.7%	<0.02	0.20	<0.02	0.04	0.24	0.19	0.05	8.6	15.0	<6.2	<1.0	
	May 7, 2019	LTN015R	9.5	19.5	8.0	20	1.8	116.1%	<0.02	0.22	<0.02	0.04	0.26	0.21	0.05	8.2	14.0	<6.2	<1.0	5.0
HUC 06010204																				
LAKE FONTANA	September 17, 2019	LTN031A	8.4	28.1	8.8	27	2.5	113.9%	<0.02	0.10	<0.02	<0.02	0.11	0.09	0.02	4.5	<12.0	<6.2	<1,0	
	September 17, 2019	LTN031B	8.3	28.1	8.7	26	2.3	112.8%	<0.02	0.10	<0.02	<0.02	0.11	0.09	0.02	4.6	<12.0	<6.2	<1.0	
	September 17, 2019	LTN031D	8.2	27.9	8.6	25	3.0	111.0%	<0.02	0.10	<0.02	<0.02	0.11	0.09	0.02	4.2	<12.0	<6.2	<1.0	
	September 17, 2019	LTN031H	8.2	27.4	8.4	24	3.3	109.2%								2.1	<12.0	<6.2	<1.0	
	September 17, 2019	LTN031J	8.1	27.4	8.4	23	3.3	108.9%	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	2.6	<12.0	<6.2	<1.0	8.0
	August 14, 2019	LTN031A	8.1	28.8	8.7	25	3.5	111.9%	<0.02	0.22	<0.02	0.02	0.24	0.21	0.03	6.0	16.0	<6.2	<1.0	
	August 14, 2019	LTN031B	8.1	28.7	8.6	25	3.0	111.4%	<0.02	0.26	<0.02	<0.02	0.27	0.25	0.02	7.1	25.0	<6.2	<1.0	
	August 14, 2019	LTN031D	7.9	28.9	8.4	24	3.0	108.8%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02	7.4	28.0	<6.2	<1.0	
	August 14, 2019	LTN031H	8.0	28.3	8.3	22	3.5	108.8%	<0.02	0.21	<0.02	<0.02	0.22	0.20	0.02	7.5	22.0	<6.2	<1.0	
	August 14, 2019	LTN031J	7.9	28.3	8.3	22	3.6	107.5%	<0.02	0.23	<0.02	<0.02	0.24	0.22	0.02	6.4	19.0	<6.2	<1.0	7.0
	July 17, 2019	LTN031A	9.2	29.1	9.1	26	2.5	127.3%								18.0	20.0	<6.2	<1.0	
	July 17, 2019	LTN031B	8.8	29.1	8.9	26	2.7	121.3%								9.5	23.0	<6.2	<1.0	
	July 17, 2019	LTN031D	8.6	28.9	8.9	25	2.7	118.2%								14.0	22.0	<6.2	<1.0	
	July 17, 2019	LTN031H	8.4	28.2	8.7	23	2.7	114.5%								6.0	20.0	<6.2	<1.0	
	July 17, 2019	LTN031J	8.3	28.5	8.7	23	2.7	112.7%								5.1	18.0	<6.2	<1.0	8.2
	June 20, 2019	LTN031A	8.7	25.6	8.5	23	3.4	113.1%	<0.02		<0.02	<0.02			0.02	8.3	12.0	<6.2	<1.0	
	June 20, 2019	LTN031B	8.5	25.7	8.3	24	4.2	111.4%	<0.02		<0.02	<0.02			0.02	7.5	13.0	<6.2	<1.0	
	June 20, 2019	LTN031D	8.6	23.0	8.3	23	3.9	112.4%	<0.02		<0.02	<0.02			0.02	7.1	23.0	<6.2	<1.0	
	June 20, 2019	LTN031H	8.6	24.7	8.3	22	3.7	110.0%	<0.02		<0.02	<0.02			0.02	4.7	19.0	<6.2	<1.0	
	June 20, 2019	LTN031J	8.5	24.9	8.1	21	4.1	109.0%	<0.02		<0.02	<0.02			0.02	5.0	47.0	<6.2	<1.0	8.0
	May 20, 2019	LTN031A	9.2	24.1	8.7	24	3.5	115.8%	0.58	<0.20	<0.02	<0.02	0.11	0.09	0.02		22.0	<6.2	<1.0	
	May 20, 2019	LTN031B	9.3	23.9	8.8	24	3.0	117.3%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		19.0	<6.2	<1.0	
	May 20, 2019	LTN031D	9.4	23.0	8.8	11	2.5	116.2%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		18.0	<6.2	<1.0	
	May 20, 2019	LTN031H	9.2	22.7	8.3	22	3.0	112.9%	<0.02	0.22	<0.02	<0.02	0.23	0.21	0.02		18.0	<6.2	<1.0	
	May 20, 2019	LTN031J	8.9	23.2	7.5	22	3.0	110.4%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		18.0	<6.2	<1.0	7.0
LAKE CHEOAH	September 18, 2019	LTN032B	6.7	14.8	5.7	22	3.0	69.1%	<0.02	<0.20	<0.02	0.16	0.26	0.09	0.17		<12.0	<6.2	<1.0	
	September 18, 2019	LTN032D	6.8	15.0	6.0	22	6.0	69.9%	<0.02	<0.20	<0.02	0.17	0.27	0.09	0.18		13.0	<6.2	<1.0	
	September 18, 2019	LTN032F	8.7	19.7	6.6	21	6.0	99.0%	<0.02	<0.20	<0.02	0.15	0.25	0.09	0.16		13.0	<6.2	<1.0	
	August 14, 2019	LTN032B	8.1	13.0	5.8	20	2.8	80.6%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02	<1.0	22.0	<6.2	<1.0	
	August 14, 2019	LTN032D	8.1	13.9	5.8	20	2.8	82.1%	<0.02	<0.20	<0.02	<0.02	0.27	0.09	0.18	<1.0	23.0	<6.2	<1.0	
	August 14, 2019	LTN032F	9.5	22.0	7.0	20	2.8	114.0%	<0.02	<0.20	<0.02	<0.02	0.25	0.09	0.16	2.4	19.0	<6.2	<1.0	
	July 17, 2019	LTN032B	8.9	11.6	6.1	21	3.4	85.4%								<1.0	18.0	<6.2	<1.0	
	July 17, 2019	LTN032D	8.2	12.0	6.0	20	7.3	78.9%								<1.0	16.0	<6.2	<1.0	
	July 17, 2019	LTN032F	9.5	21.0	6.9	20	3.8	111.4%								1.7	22.0	<6.2	<1.0	
	June 19, 2019	LTN032B	9.9	10.6	6.2	20	4.4	93.7%	<0.02		<0.02	0.16			0.17	<1.0	22.0	<6.2	<1.0	
	June 19, 2019	LTN032D	9.7	11.4	6.3	20	6.3	93.6%	<0.02		<0.02	0.15			0.16	<1.0	21.0	<6.2	<1.0	
	June 19, 2019	LTN032F	9.0	23.3	7.1	20	4.6	110.9%	<0.02		<0.02	0.12			0.13		25.0	<6.2	<1.0	
	May 20, 2019	LTN032B	10.2	14.7	7.3	22	2.0	106.1%	<0.02	<0.20	<0.02	0.10	0.20	0.09	0.11		19.0	<6.2	<0.1	
	May 20, 2019	LTN032D	10.3	15.5	7.5	22	2.9	108.2%	<0.02	<0.20	<0.02	0.10	0.20	0.09	0.11		18.0	<6.2	<0.1	
	May 20, 2019	LTN032F	9.9	19.8	7.3	22	3.5	112.8%	<0.02	<0.20	<0.02	0.09	0.19	0.09	0.10		21.0	<6.2	<0.1	
SANTEETLAH LAKE	September 24, 2019	LTN037B	8.3	26.0	7.6	21	3.2	109.7%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		14.0	<6.2	<1.0	
	September 24, 2019	LTN037D	8.1	25.9	7.5	19	4.3	106.5%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		<12.0	<6.2	<1.0	
	September 24, 2019	LTN037E	8.1	25.8	7.6	19	4.6	106.1%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		<12.0	<6.2	<1.0	
	August 21, 2019	LTN037B	7.9	28.7	7.7	21	4.7	109.5%	<0.02	0.28	<0.02	<0.02	0.29	0.27	0.02		16.0	<6.2	<1.0	
	August 21, 2019	LTN037D	7.7	27.2	7.1	13	4.7	107.6%	<0.02	0.24	<0.02	<0.02	0.25	0.23	0.02		12.0	<6.2	<1.0	
	August 21, 2019	LTN037E	7.7	27.9	7.5	18	4.7	104.7%	<0.02	0.26	<0.02	<0.02	0.27	0.25	0.02		14.0	<6.2	<1.0	
	July 24, 2019	LTN037B	8.5	27.0	8.6	20	1.7	114.1%								10.0	38.0	<6.2	<1.0	
	July 24, 2019	LTN037D	8.4	26.9	8.5	20	2.6	112.5%								15.0	35.0	<6.2	<1.0	
	July 24, 2019	LTN037E	8.3	26.4	7.0	19	3.0	109.8%								10.0	38.0	<6.2	<1.0	
	June 19, 2019	LTN037B	8.5	25.0	8.0	24	2.9	111.2%	<0.02		<0.02	<0.02			0.02	8.2	22.0	<6.2	<1.0	
	June 19, 2019	LTN037D	8.4	25.0	7.5	20	4.4	109.3%	<0.02		<0.02	<0.02			0.02	7.5	27.0	<6.2	<1.0	
	June 19, 2019	LTN037E	8.3	24.8	7.5	20	5.3	107.9%	<0.02		<0.02	<0.02			0.02	7.0	16.0	<6.2	<1.0	
	May 7, 2019	LTN037B	9.4	22.7	7.7	26	3.0	115.5%	<0.02	0.20	<0.02	0.06	0.52	0.31	0.21	5.7	<12.0	<6.2	<1.0	
	May 7, 2019	LTN037D	9.2	22.6	7.7	22	3.0	112.8%	<0.02	<0.20	<0.02	0.03	0.52	0.31	0.21	5.5	<12.0	<6.2	<1.0	
	May 7, 2019	LTN037E	9.1	21.5	7.7	21	3.1	109.8%	<0.02	<0.20	<0.02	0.04	0.52	0.31	0.21	5.2	<12.0	<6.2	<1.0	
CALDERWOOD LAKE	September 18, 2019	LTN040	7.9	16.1	6.0	21	3.0	83.4%	<0.02	<0.20	<0.02	<0.02	0.11	0.09	0.02		13.0	<6.2	<1.0	
	September 18, 2019	LTN041	9.3	19.9	6.4	21	4.0	105.6%	<0.02	<0.20	<0.02	0.12	0.22	0.09	0.13		<12.0	<6.2	<1.0	
	August 14, 2019	LTN040	9.6	14.3	5.7		5.3	97.3%	<0.02	<0.20	<0.02	0.16	0.26	0.09	0.17	1.0	27.0	<6.2	<1.0	
	August 14, 2019	LTN041	9.4	23.0	6.7	21	4.4	114.4%	<0.02	<0.20	<0.02	0.13	0.23	0.09	0.14	2.0	13.0	<6.2	<1.0	
	July 24, 2019	LTN040	9.3	16.7	6.3	12	3.3	98.6%								2.0	39.0	<6.2	<1.0	
	July 24, 2019	LTN041	9.2	20.3	6.7	20	3.5	105.2%								1.9	46.0	<6.2	<1.0	
	June 26, 2019	LTN040	9.7	15.2	6.2	20	4.5	99.3%	<0.02		<0.02	0.11			0.12	1.6	21.0	<6.2	<1.0	
	June 26, 2019	LTN041	9.3	20.8	6.8	20	4.8	106.9%	<0.02		<0.02	0.10			0.11	2.4	28.0	<6.2	<1.0	
	May 20, 2019	LTN040	9.9	16.0	7.1	21	3.4	104.1%	<0.02	0.54	<0.02	0.10	0.64	0.53	0.11		18.0	<6.2	<1.0	
	May 20, 2019	LTN041	9.9	19.4	7.1	21	3.0	111.9%	<0.02	<0.20	<0.02	0.09	0.19	0.09	0.10		17.0	<6.2	<1.0	