LAKE & RESERVOIR ASSESSMENTS
LITTLE TENNESSEE RIVER BASIN

Nantahala 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 many 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 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 photosynthetic algae that have a siliceous skeleton (frustule) and are found in almost every aquatic environment including fresh and marine waters, soils, in fact almost anywhere moist. 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 dissolved 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 north 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 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 (NCDENR, April 2005).

Ten lakes were sampled in this river basin by DWQ staff in 2009. Following the description of the assessment methodology used for the Little Tennessee River Basin, there are individual summaries for each of the lakes and a two-paged matrix that distills the information used to make the lakes use support assessments. For additional information on a particular lake (including sampling data), please go to http://www.esb.enr.state.nc.us/.

In addition to monitoring conducted by NCDENR, the Tennessee Valley Authority (TVA) monitors the ecological health at 69 sites on 31 reservoirs. Each site is monitored every other year unless a substantial change in the ecological health score occurs during a two-year cycle. If that occurs, the site is monitored the next year to confirm that the change was not temporary. Roughly half the sites are sampled each year on an alternating basis. The overall health ratings of TVA reservoirs are based on five ecological indicators: dissolved oxygen, chlorophyll, fish, bottom life and sediment. The purpose of this monitoring is to provide information on the integrity or "health" of the aquatic ecosystems of the reservoirs. The rating scheme ranges from "Poor" (a score of less than 59) to "Fair" (a score ranging from 59 to 72) to "Good" (a score greater than 72) (http://www.tva.gov/environment/ecohealth/index.htm).

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 (http://www.epi.state.nc.us/epi/fish/current.html)

Assessment Methodology

For this report, data from January 1, 2005 through September 30, 2009 were reviewed. All lakes were sampled only during the summer of 2009 in May through September. Data were assessed for excursions of the state's water quality standards for chlorophyll *a*, pH, dissolved oxygen, water temperature, and turbidity as they apply to lake's use classification (i.e., general surface water or Class C, Water Supply (WS), Trout Water (Tr), etc.). 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.

A water quality standard is exceeded (denoted by CE in matrix) if data values do not meet the state's water quality standard for more than 10% of the samples where the sample size consists of 10 or more observations for the basinwide assessment period. Ideally, 10 observations are needed to provide

sufficient data for a reasonable interpretation of water quality conditions within the lake or reservoir. Fewer observations increase the possibility of misinterpreting random unusual conditions as representative of ongoing water quality trends, but are still useful for identifying possible water quality issues and targeting particular lakes for more intensive study and use support assessment. If the water quality standard is exceeded, either in less than 10% of the data collected during the assessment period or if the sample observation size is less than 10 for the basinwide assessment period, then the water quality standard for that parameter is designated exceeded (E in the matrix).

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.

Lakes receive an overall rating of Supporting or Impaired when 10 or more samples per water quality criteria are collected for evaluation within the basinwide assessment period. Otherwise, the lake is considered as Not Rated. The exception is for a lake listed on the 303(d) List of Impaired Waters or where additional data indicates water quality problems not captured during sampling. These lakes are listed as Impaired along with the reason for the impairment.

For a more complete discussion of lake ecology and assessment, please go to http://www.esb.enr.state.nc.us/. The 1990 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.

LAKE & RESERVOIR ASSESSMENTS

HUC 06010203

Lake Sequoyah

Lake Sequoyah is located near Highlands and is an impoundment of the Cullasaja River. The Town of Highlands uses the lake as a backup water supply. 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 consists of a golf course and private homes, is also located in the watershed. Lake Sequoyah is classified WS-III B Tr.

DWQ staff sampled Lake Sequoyah monthly from May through September 2009. Surface dissolved ranged from 7.3 to 9.7 mg/L and surface pH values ranged from 7.3 to 8.6 s.u. Secchi depths ranged from 1.5 to 2.2 meters in June through September. In May, these measurements were much lower (0.5 to 0.8 meters) and may have been due to suspended sediments from a recent thunderstorm immediately prior to the sampling of the lake. Increased sedimentation due to this rainfall event was also indicated by elevated turbidity values, especially at the mid-lake sampling site (LTN008C; 50 NTU) and at the sampling site near the dam (LTN008E; 12 NTU). These turbidity values exceeded the state water quality of 10 NTU for lakes such as Lake Sequoyah that have a supplemental designation as Trout Waters.

Nutrient concentrations ranged from low to moderate from June through September and elevated in May and (Appendix B). Chlorophyll *a* values were low (range = 1.2 to 6.7 µg/L). Analysis of phytoplankton present in the lake indicated that assemblages from May through August were dominated with various types of diatoms. In September, the dominant algae were colonial greens. No algal blooms were documented for Lake Sequoyah during the monitoring period in 2009.

An Algal Growth Potential Test (AGPT) was performed on Lake Sequoyah in July 2009. All three sites were sampled. Composite water samples within the photic zone was collected at each site and shipped to the EPA Region IV Lab in Athens, GA for analysis. The results of the test are shown below in Table 1. The lake water at all of the sites were determined to be phosphorus limited (i.e., algal productivity was limited by the concentration of phosphorus present in the water).

Table 1. Results of Algal Growth Potential Test – July 13, 2009.

AGPT- MSC, mg/L (Dry Weight)

Station	Control	C+N	C+P	Limiting Nutrient
LTN006C	0.51	0.61	4.32	P
LTN008C	0.54	0.54	3.86	P
LTN008E	0.46	0.46	3.02	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
FW - Freshwater AGPT using *Selenastrum* as test alga

Based on the calculated North Carolina Trophic State Index Scores for 2009, Lake Sequoyah was determined to have elevated biological productivity in May (eutrophic) and low biological productivity in June through September (oligotrophic). Lake Sequoyah was last determined to be eutrophic in 1988.

Nantahala Lake

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

Nantahala Lake was monitored five times from May through September 2009 by DWQ field staff. Surface dissolved oxygen values were similar to those observed in previous years, with the highest concentrations measured in May (9.0 to 9.2 mg/L) when water temperatures were still low (range = 18.5 to 19.3°C). Secchi depths ranged from 2.6 meters to 5.8 meters in 2009. The lowest Secchi depths were

observed in June on a very cloudy day following a heavy rainfall event. Overall, water clarity in Nantahala remained very good.

Nutrient concentrations were very low as were chlorophyll *a* values in 2009 (range = <1.0 to 2.2 µg/L) and were similar to those observed in this reservoir since 1981 when it was first monitored by DWQ. Based on the calculated NCTSI scores, Nantahala Lake demonstrates very low biological productivity (oligotrophic) and has exhibited these trophic conditions since 1981. Due to a combination of low rainfall and hydrological dam operations later in the summer, the lake level dropped an estimated 15 to 20 feet by October. Despite the lower water level in 2009, Nantahala Lake continued to support all of its designated uses.

Bear Creek Reservoir

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. Bear Creek Reservoir is classified WS-III B Tr.

DWQ field staff monitored Bear Creek Lake five times from May through September in 2009. The lowest water temperatures and highest dissolved oxygen concentrations were observed on May 5th. No obvious thermocline was observed in the reservoir on that sampling date. The Secchi depths in May ranged from 5.0 to 5.5 meters, indicating very good water clarity. From June through August, surface dissolved oxygen ranged from 7.4 to 8.0 mg/L with dissolved oxygen concentrations near the lake bottom ranging from 4.9 to 7.6 mg/L. Secchi depths ranged from 3.2 to 4.6 meters, indicating that the clarity of the water was still very good. The thermocline in June near the dam was at a depth of approximately four meters from the surface and dropped to a depth of approximately four meters in July and August.

Total phosphorus concentrations were less than the DWQ water quality laboratory detection level in 2009. Total Kjeldahl nitrogen and ammonia values were also very low. Nitrite plus nitrate values were moderate in May, then very low in June through September. In response to the low nutrient concentrations, chlorophyll *a* values for Bear Creek Lake in 2009 were also very low.

Based on the calculated NCTSI scores, Bear Creek Lake was determined to have very low biological productivity (oligotrophic). This reservoir has remained oligotrophic since it was first monitored by DWQ in 1994. In past evaluations of Bear Creek Reservoir, it was observed that the shoreline was

predominantly forested with a relatively undisturbed drainage area that helped to maintain the reservoir's low nutrient concentration and very clear water. It was noted in 2009 that residential development has significantly increased along the shoreline and in the watershed of this reservoir.

Cedar Cliff Reservoir

Cedar Cliff Reservoir is a picturesque mountain lake on the Tuckasegee River. The lake is owned by Duke Energy and was built in 1952. The volume of the lake is 7.2 x $10^6 m^3$ with a maximum depth of 53 meters. The watershed measures 210 km^2 and is mostly forested. Water quality in the lake supports swimming, boating, and trout fishing. The name of the lake was probably derived from a sheer rock cliff, which faces it from the north. Cedar Cliff Reservoir is classified WS-III B Tr.

This lake was sampled monthly from May through September by DWQ staff. Secchi depths ranged from 3.2 to 6.5 meters, indicating that the water clarity was very good. Surface dissolved oxygen was greatest in May (range = 9.0 to 9.2 mg/L) due to the colder water temperatures. From June through September, surface dissolved oxygen ranged from 7.1 to 7.9 mg/L. Surface pH values ranged from 6.9 s.u in May to 7.8 s.u in July.

Total phosphorus values were consistently less than the DWQ Water Quality Laboratory detection level. Total Kjeldahl nitrogen and ammonia were also very low. Nitrite plus nitrate concentrations ranged from elevated in May to low in July and August. Chlorophyll *a* values were very low (range = <1.0 to 2.9 µg/L

Based on the calculated NCTSI scores for 2009, Cedar Cliff Reservoir was determined to have very low biological productivity (oligotrophic). Cedar Cliff Reservoir has been consistently oligotrophic since it was first monitored by DWQ in 1988 and continues to demonstrate very good water quality.

Wolf Creek Reservoir

Wolf Creek Reservoir is a small hydroelectric reservoir built by Nantahala Power and Light Company in 1955 on the Tuckasegee River and is currently owned by Duke Energy. Wolf Creek Reservoir has a forested watershed. The shoreline of the lake has a relatively low density of private homes, however evidence of possible new construction was observed in 2009. Wolf Creek Reservoir is classified WS-III B Tr.

This reservoir was sampled five times in 2009 by DWQ field staff. In May, surface dissolved oxygen ranged from 8.1 mg/L to 8.8 mg/L and the surface water temperature was 18°C. From June through September, surface dissolved oxygen values ranged from 7.0 to 8.1 mg/L. The entire water column of Wolf Creek Reservoir was well oxygenated with the exception of August when concentrations of oxygen dropped below 4.0 mg/L at a depth below 20 meters near the dam (depth to bottom = 25 meters). Secchi depths ranged from 3.6 to 7.5 meters, indicating very good water clarity. The lower Secchi depths measured on each sampling trip were at the site located near the mid-section of the lake (LTN015A).

Nutrient concentrations were very low in 2009 as were concentrations of chlorophyll a. Based on the calculated NCTSI scores, Wolf Creek Reservoir was determined to have very low biological productivity (oligotrophic). This reservoir has been oligotrophic since it was first monitored by DWQ in 1988.

Thorpe Reservoir

Thorpe Reservoir, also known as Glenville Lake, is a man-made impoundment on the Tuckasegee River located in Jackson County. 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. Volume of the lake is 82.6 x $10^6 m^3$ with a mean retention time of 294 days. Most of the 95 km^2 drainage area is forested with scattered residences. Tributaries include West Fork Tuckasegee River, Norton Creek, Hurricane Creek, Cedar Creek, Mill Creek, and Pine Creek. Thorpe Reservoir is classified WS-III B Tr HQW.

Thorpe Reservoir was monitored monthly from May through September by DWQ staff. Surface physical measurements of dissolved oxygen, water temperature, pH and conductivity in 2009 were similar to those values observed since 1988 when DWQ first sampled this reservoir. Secchi depths ranged from 2.1 to 4.5 meters, indicating very good water clarity. Total phosphorus concentrations were consistently less than the DWQ laboratory detection level as were ammonia and nitrite plus nitrate concentrations. Total Kjeldahl nitrogen values were generally less than detection levels. In response to the very low nutrient levels in Thorpe Reservoir, chlorophyll *a* values were also very low (range = 1.3 to 7.4 µg/L). Turbidity values at each of the four lake sampling sites were very low in 2009 and indicate that sediment loading within the mainstem of the reservoir is very limited.

Based on the calculated NCTSI scores for 2009, Thorpe Reservoir was determined to exhibit very low biological productivity (oligotrophic). This reservoir has been consistently oligotrophic since 1988 when it was first monitored.

LAKE & RESERVOIR ASSESSMENTS

HUC 06010204

Fontana Lake

Fontana Lake is located along the southern boundary of the Great Smoky Mountain National Park. It provides power and flood control on the Little Tennessee River. Fontana Lake is owned by the Federal Government and operated by the Tennessee Valley Authority. Construction on the dam was begun 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 is classified WS-IV B CA.

Fontana Lake was sampled monthly from May through September 2009. Dissolved oxygen and water temperature readings in 2009 were similar to readings measured by DWQ staff on previous sampling trips. The thermocline near the dam (sampling site LTN031J) generally occurred at a depth of 15 meters from the lake surface. An oxygen maxima was observed at this sampling site at a depth of approximately 7.0 to 8.0 meters, suggesting that increased algal productivity was present at this location within the water column. Secchi depths in Fontana Lake ranged from a low of 2.6 meters downstream of Hazel Creek in September at to 8.0 meters near the dam in May, indicating very good lake water clarity.

Concentrations of total phosphorus and total Kjeldahl nitrogen were less than the DWQ Water Quality laboratory detection limits. Ammonia nitrogen ranged from very low to moderate and nitrite plus nitrate nitrogen was very elevated in May and dropped to below detection level by July. Overall, nutrient concentrations in Fontana Lake remained similar to those previously observed since 1981 when the lake was first monitored by DWQ.

Chlorophyll *a* values in 2009 were low (range = <1.0 to 5.6 ug/L). An analysis of a routine phytoplankton samples collected an LTN031H on July 7, 2009 indicated that the dominant algal group consisted of centric diatoms. Total unit density and biovolume were well below levels indicative of an algal bloom. Diatoms may form blooms at discrete depths (subsurface blooms).

Based on the calculated NCTSI scores, the biological productivity for Fontana Lake was determined to be very low (oligotrophic). Since 1981, the trophic state of this lake has been consistently oligotrophic.

In September 2008, a lake fish consumption advisory was announced for Fontana Lake based on high levels of mercury found in walleye fish. Fontana Lake is also under a statewide consumption advisory for largemouth bass due to mercury contamination.

The Tennessee Valley Authority (TVA) began a monitoring program for its reservoirs in 1990 as a means of collecting data to provide assess the integrity or "health" of the aquatic ecosystems of these reservoirs. The TVA monitored Fontana Reservoir in 2006 and 2008. Data results from this monitoring determined that the Ecological Health Rating was Fair. This reservoir has had this rating since1995. The bottom life, one of the parameters used in the TVA's monitoring program, has consistently rated Poor and this may be the reason for the overall Fair rating. Three locations were sampled: the forebay, the mid reservoir in the Little Tennessee River arm and the mid-reservoir in the Tuckasegee River arm. The TVA determined that chlorophyll *a* concentrations in the mid-reservoir locations appear to be increasing, and this trend could indicate that Fontana Reservoir is beginning to experience nutrient enrichment (www.tva.com/environment/ecohealth/fontana.htm.

Lake Cheoah

Lake Cheoah was constructed by the Aluminum Company of America (ALCOA) and is currently owned by Tallassee Power Company (TAPOCO). Lake Cheoah is a narrow, 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 discharge and temperatures in Lake Cheoah are generally low. This reservoir is classified C Tr.

Lake Cheoah was monitored by DWQ field staff monthly from June through August 2009. Surface water temperatures were cool in this lake, ranging from 7.8 C to 21.1 C. Surface dissolved oxygen ranged from 8.4 mg/L to 9.9 mg/L and were elevated to the low water temperatures which allowed more oxygen to dissolve into the water. Surface pH values ranged from 6.6 s.u to 7.5 s.u. Secchi depths, which ranged from 1.8 meters on an overcast day following a rain event to 7.6 meters, indicated that the water clarity was very good.

Total phosphorus, total Kjeldahl nitrogen and ammonia were generally less than the DWQ Water Quality Laboratory detection levels in 2009. Nitrite plus nitrate values were extremely elevated, however and may have been associated with the exceptionally low phytoplankton productivity in this reservoir. As nitrate is assimilated by algae, it is reduced to ammonia. If algal biovolume is very low, nitrate and nitrite concentrations may be elevated while ammonia levels are low. Chlorophyll *a* values in Lake Cheoah ranged from <1.0 ug/L to 3 µg/L. Overall, nutrient and chlorophyll *a* values observed in 2009 were either similar to or less than values previously measure since 1988 when this lake was first monitored by DWQ. Based on the calculated NCTSI scores, Lake Cheoah was determined to have very low biological productivity (oligotrophic) in 2009. This lake has been found to be consistently oligotrophic since 1988.

Santeetlah Lake

Santeetlah Lake is located on the Cheoah River in the mountains of western North Carolina. The lake is owned by the Aluminum Company of America (ALCOA) and is used to generate hydroelectric power as well as for recreational purposes. Santeetlah Lake is a deep lake with a maximum depth of 213 feet (65 meters) and a mean depth of 56 feet (17 meters). The lake has a volume of 195 x $10^6 m^3$ 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 covers 174 mi^2 (450 km^2) and consists of rugged, mountainous terrain, almost all of which is forested. Santeetlah Lake is designated B Tr.

Surface dissolved oxygen and water temperature values in 2009 were similar to those values previously observed by DWQ for this reservoir. Values for surface pH were near neutral from May through July, then rose slightly in August and September, suggesting that algal productivity may have been increasing in the lake. Nutrient concentrations were low as were chlorophyll *a* values.

In August, 2008, the Asheville Regional Office reported an algal bloom in the Cheoah River arm of Santeetlah Lake downstream of the US Hwy 129 bridge. An analysis of a phytoplankton sample from the bloom indicated that the dominant algae were filamentous blue greens *Anabaena plantonica*, *Anabaena spirodes* and/or *Anabaena circinalis*. Filamentous blue-green algae form significant blooms that discolor the water and produce taste and odor problems in drinking water. In 2009, no surface blooms of *Anabaena sp.* were observed in the Cheoah River by DWQ staff.

Based on the calculated NCTSI scores for 2009, Santeetlah Lake continues to demonstrate low biological productivity (oligotrophic). In September 2008, a fish consumption advisory was announced for Santeetlah Lake due to high levels of mercury found in walleye fish. Santeetlah Lake is also under the statewide consumption advisory for largemouth bass – also associated with elevated levels of mercury found in this fish.

In response to a request from the DWQ Planning Section in early 2009, the Intensive Survey Unit also conducted a water quality study of the Cheoah River Arm of Santeetlah Lake to assess current water quality conditions near the site of the proposed relocation and expansion of the Robbinsville Wastewater Treatment Plant (WWTP) and outfall. Robbinsville proposed a relocation of the existing WWTP (NPDES Permit NC0025879) to a larger 12-acre site on the Cheoah River, approximately 0.2 mile downstream of the present location on Long Creek. DWQ field staff sampled sites located upstream and downstream of the current Robbinsville WWTP outfall on Long Creek, upstream of the confluence of Long Creek and the Cheoah River, at the vicinity of the proposed new outfall on the Cheoah River and upstream of US Hwy 129 on the Cheoah River. Study results indicated that the current discharge does affect nutrient concentrations in Long Creek, but its effect appears to be negligible downstream in the Cheoah River and in the lake (NCDWQ-ESS Interoffice Memorandum, January 5, 2010).

Calderwood Lake

Calderwood Lake, completed in 1930 by the Aluminum Company of America (ALCOA) to produce power for their plant in Tennessee, is currently owned by a subsidiary of ALCOA called the Tallassee Power Company (TAPOCO). It is located on the edge of the Great Smoky Mountains on the North Carolina/Tennessee border. Calderwood Lake is a narrow, but deeply channeled reservoir surrounded forests. The upstream drainage area is 1,856 square miles with the Little Tennessee River (Lake Cheoah discharge) as the major inflow. Calderwood Lake is classified C Tr

Calderwood Lake was sampled monthly from June through September in 2009. Surface dissolved oxygen was elevated due to the cold temperature of the lake water. Surface water temperatures ranged from 11.8C to 21.2°C and surface dissolved oxygen ranged from 8.8 mg/L to 10.1 mg/L. Secchi depths ranged from 3.2 to 7.8 meters, indicating that the clarity of the water of Calderwood Lake is very good. Nutrient concentrations were very low as were chlorophyll *a* concentrations. Based on the calculated NCTSI scores for 2009, Calderwood Lake was determined to exhibit very low biological productivity (oligotrophic). This lake has been consistently oligotrophic since it was first monitored by DWQ in 1988.

References

NCDENR. April 2005. Little Tennessee River basinwide assessment report. Biological Assessment Unit. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Environmental Sciences Branch. Raleigh, NC.

NCDWQ-ESS. January 5, 2010. Interoffice Memorandum from Jim Fisher and Sam Whitaker to Kathy Stecker, Subject: Lake Santeetlah/Cheoah River Study.

APPENDIX A

LITTLE TENNESSEE RIVER BASIN AMBIENT LAKES USE SUPPORT MATRIX FOR 10/1/2005 - 9/31/2009

8-Digit HUC		06010202		06010203		
Lakes Ambient Program Name		**Lake Sequoyah**	**Nantahala Lake**	**Bear Creek Resevoir**	**Cedar Cliff Reservoir**	**Wolf Creek Reservoir**
Trophic Status (NC TSI)		Mesotrophic	Oligotrophic	Oligotrophic	Oligotrophic	Oligotrophic
Mean Depth (meters)		2.1	38.1	33.0	27.1	27.1
Volume ($10^6 m^3$)		0.1	160.0	5.6	7.2	2.1
Watershed Area (km^2)		36	280	194	210	104
Assessment Unit Name		From Macon County SR 1545 to dam at Lake Sequoyah	From roaring Fork to Nantahala River Arm of Fontana Lake, Little Tennessee River	From Tennessee Creek to West Fork Tuckasegee River		From source to Wolf Creek Dam
Classification		WS-III B Tr	B Tr	WS-III B Tr	WS-III B Tr	WS-III B Tr
Assessment Unit		2-21-(3.5)	2-57-(22.5)	2-79-(5.5)		2-79-9-(1)
Stations in Assessment Unit		LTN006C, LTN008C, LTN008E	LTN013B, LTN013C, LTN013D	LTN015B, LTN015D	LTN015F, LTN015H	LTN015A. LTN015A1
Number of Sampling Trips		5	5	5	5	5
Water Quality Standards						
Chlorophyll *a*	>40 ug/L or > 15 for Tr Waters	NCE	NCE	NCE	NCE	NCE
Dissolved Oxygen	<4.0 mg/L and <6.0 mg/L for Tr Waters	NCE	NCE	NCE	NCE	NCE
pH	<6 s.u. or > 9 s.u.	NCE	NCE	NCE	NCE	NCE
Turbidity	>25 NTU or >10 NTU for Tr Waters	E 20%	NCE	NCE	NCE	NCE
Temperature	>29°C Mountains and Upper Piedmont	NCE	NCE	NCE	NCE	NCE
Metals (excluding copper, iron & zinc)	15A NCAC 2B .0211	NCE	NE	NCE	NCE	NCE
Other Data						
% Saturation DO	>120%	N	N	N	N	N
Algae	Documented blooms during 2 or more sampling events in 1 year with historic blooms	N	N	N	N	N
Fish	Kills related to eutrophication	N	N	N	N	N
Chemically/Biologically Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.	N	N	N	N	N
Aesthetics complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state	N	N	N	N	N
TSI	Increase of 2 trophic levels from one 5-yr period to next	N	N	N	N	N
303(d)	Listed on 303(d) [year listed]	N	N	N	N	N
AGPT	Algal Growth Potential Test 5-9 mg/L = concern 10 mg/L or more = problematic	NCE	NE	NE	NE	NE
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat	N	N	N	N	N
Taste and Odor	Public complaints or taste and odor causing algal species are dominant	N	N	N	N	N
Sediments	Clogging intakes – dredging program necessary; Frequent public/agency complaints - visual observation	N	N	N	N	N
	Rating:	**S**	**S**	**S**	**S**	**S**

RATING KEY:

S = Supporting
I = Impaired
NR = Not Rated

Not Rated is used where there are <10 samples <u>and</u> other data indicate potential problems.

KEY:

E = Criteria is exceeded in less than 10% of the measurements **<u>or</u>** criteria exceeded but n<10
CE = Criteria Exceeded - parameter is problematic, highly productive or exceeds the standard in >10% of samples
NCE = No Criteria Exceeded
- = Standard not applicable based on Classification
ND = No Data - sample not taken for this parameter
Y = In Other Data portion, indicates that the parameter has exceeded target or has occurred
N = In Other Data portion, indicates that the parameter is within target or has not occurred per available information
NE = Not Evaluated

APPENDIX A

LITTLE TENNESSEE RIVER BASIN AMBIENT LAKES USE SUPPORT MATRIX FOR 10/1/2005 - 9/31/2009

8-Digit HUC		06010203	06010204		
Lakes Ambient Program Name		**Thorpe Reservoir**	**Fontana Lake**		
Trophic Status (NC TSI)		Oligotrophic	Oligotrophic		
Mean Depth (meters)		23.2	41.2		
Volume ($10^6 m^3$)		82.6	1782.0		
Watershed Area (km^2)		96	4020		
Assessment Unit Name		From source in Thorpe Lake backwater at elevation 3492 MSL to Thorpe Dam	From Nantahala River Arm of Fontana Lake to the upstream side of mouth of Shoal Branch	Tuckasegee River Arm of Fontana Lake below the upstream side of the mouth of Noland Creek	From the upstream side of Shoal Branch to Fontana Dam
Classification		WS-III B Tr HQW	B	B	WS-IV B CA,
Assessment Unit		2-79- 23-(1)	2-(66)	2-(89)	2-(140.5)
Stations in Assessment Unit		LTN015L, LTN015N, LTN015P, LTN015R	LTN031B, LTN031D	LTN031A	LTN031H. LTN031J
Number of Sampling Trips		5	5	5	5
Water Quality Standards					
Chlorophyll *a*	>40 ug/L or > 15 for Tr Waters	NCE	NCE	NCE	NCE
Dissolved Oxygen	<4.0 mg/L and <6.0 mg/L for Tr Waters	NCE	NCE	NCE	NCE
pH	<6 s.u. or > 9 s.u.	NCE	NCE	NCE	NCE
Turbidity	>25 NTU or >10 NTU for Tr Waters	NCE	NCE	NCE	NCE
Temperature	>29°C Mountains and Upper Piedmont	NCE	NCE	NCE	NCE
Metals (excluding copper, iron & zinc)	15A NCAC 2B .0211	NCE	NR	NR	NCE
Other Data					
% Saturation DO	>120%	N	N	N	N
Algae	Documented blooms during 2 or more sampling events in 1 year with historic blooms	N	N	N	N
Fish	Kills related to eutrophication	N	N	N	N
Chemically/Biologically Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.	N	N	N	N
Aesthetics complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state	N	N	N	N
TSI	Increase of 2 trophic levels from one 5-yr period to next	N	N	N	N
303(d)	Listed on 303(d) [year listed]	N	N	N	N
AGPT	Algal Growth Potential Test 5-9 mg/L = concern 10 mg/L or more = problematic	NR	NR	ND	ND
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat	N	N	N	N
Taste and Odor	Public complaints or taste and odor causing algal species are dominant	N	N	N	N
Sediments	Clogging intakes – dredging program necessary; Frequent public/agency complaints - visual observation	N	N	N	N
	Rating:	**S**	**S**	**S**	**S**

RATING KEY:

S = Supporting
I = Impaired
NR = Not Rated

Not Rated is used where there are <10 samples <u>and</u> other data indicate potential problems.

KEY:

E = Criteria is exceeded in less than 10% of the measurements **<u>or</u>** criteria exceeded but n<10
CE = Criteria Exceeded - parameter is problematic, highly productive or exceeds the standard in >10% of samples
NCE = No Criteria Exceeded
- = Standard not applicable based on Classification
ND = No Data - sample not taken for this parameter
Y = In Other Data portion, indicates that the parameter has exceeded target or has occurred
N = In Other Data portion, indicates that the parameter is within target or has not occurred per available information
NE = Not Evaluated

APPENDIX A

LITTLE TENNESSEE RIVER BASIN AMBIENT LAKES USE SUPPORT MATRIX FOR 10/1/2005 - 9/31/2009

8-Digit HUC		**06010204**		
Lakes Ambient Program Name		**Lake Cheoah**	**Santeetlah Lake**	**Calderwood Lake**
Trophic Status (NC TSI)		Oligotrophic	Oligotrophic	Oligotrophic
Mean Depth (meters)		40.0	17.1	29.0
Volume ($10^6 m^3$)		287.5	195.0	1.6
Watershed Area (km^2)		4165	451	4807
Assessment Unit Name		From Fontana Dam to North Carolina-Tennessee State Line	From Mountain Creek to Santeetlah Dam	From Santeetlah Dam to Calderwood Lake, Little Tennessee River
Classification		C Tr	B Tr	C Tr
Assessment Unit		2-167	2-190-(5)	2-190-(22)
Stations in Assessment Unit		LTN032B, LTN032D. LTN032F	LTN037B, LTN037D, LTN037E	LTN040, LTN041
Number of Sampling Trips		4	5	4
Water Quality Standards				
Chlorophyll *a*	>40 ug/L or > 15 for Tr Waters	NCE	NCE	NCE
Dissolved Oxygen	<4.0 mg/L and <6.0 mg/L for Tr Waters	NCE	NCE	NCE
pH	<6 s.u. or > 9 s.u.	NCE	NCE	NCE
Turbidity	>25 NTU or >10 NTU for Tr Waters	NCE	NCE	NCE
Temperature	>29°C Mountains and Upper Piedmont	NCE	NCE	NCE
Metals (excluding copper, iron & zinc)	15A NCAC 2B .0211	NE	NE	NE
Other Data				
% Saturation DO	>120%	N	N	N
Algae	Documented blooms during 2 or more sampling events in 1 year with historic blooms	N	N	N
Fish	Kills related to eutrophication	N	N	N
Chemically/Biologically Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.	N	N	N
Aesthetics complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state	N	N	N
TSI	Increase of 2 trophic levels from one 5 yr period to next	N	N	N
303(d)	Listed on 303(d) [year listed]	N	N	N
AGPT	Algal Growth Potential Test 5-9 mg/L = concern 10 mg/L or more = problematic	NE	NE	NE
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat	N	N	N
Taste and Odor	Public complaints or taste and odor causing algal species are dominant	N	N	N
Sediments	Clogging intakes – dredging program necessary; Frequent public/agency complaints - visual observation	N	N	N
	Rating:	**S**	**S**	**S**

Appendix B

Little Tennessee River Basin Lakes 2009 Use Support Data

State Water Quality Standards

MOUNTAIN and UPPER PIEDMONT	DO mg/L	Water Temp C	pH s.u.	Percent SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardness mg/L
C & B Criteria	**<4.0**	**29**	**<6 or >9**	**120%**	**40**	**25.0**	**-**	**-**
Tr if different than C&B	**<6.0**				**15**	**10.0**		
WS II - WS V Criteria if different than C&B							**250**	**100**

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	May 18, 2009	LTN006C	8.1	17.2	7.3	84.2%	2.8	19.0		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	May 18, 2009	LTN008C	8.4	16.6	7.6	86.2%	2.0	50.0		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	May 18, 2009	LTN008E	8.0	13.4	7.4	76.6%	2.1	12.0		7.6
					8.2	**15.7**	**7.4**	**82.3%**	**2.3**	**27.0**		**7.6**
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	June 9, 2009	LTN006C	9.7	20.1	8.2	106.9%	1.2	D		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	June 9, 2009	LTN008C	7.7	20.0	7.5	84.7%	3.0	13.9		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	June 9, 2009	LTN008E	8.4	19.0	7.3	90.6%	2.7	2.7	5.2	7.5
					8.6	**19.7**	**7.7**	**94.1%**	**2.3**	**8.3**	**5.2**	**7.5**
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	July 13, 2009	LTN006C	7.3	23.6	8.6	86.1%	2.9	7.0		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	July 13, 2009	LTN008C	7.3	23.3	8.5	85.6%	3.4	4.0		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	July 13, 2009	LTN008E	7.3	23.0	8.0	85.1%	2.1	4.0	5.3	7.8
					7.3	**23.3**	**8.4**	**85.6%**	**2.8**	**5.0**	**5.3**	**7.8**
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	August 10, 2009	LTN006C	7.8	25.5	7.9	95.3%	5.1	5.2		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	August 10, 2009	LTN008C	7.4	25.2	7.8	89.9%	6.2	13.0		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	August 10, 2009	LTN008E	7.9	24.9	7.6	95.9%	6.7	3.3	6.2	8.5
					7.7	**25.2**	**7.8**	**93.7%**	**6.0**	**7.2**	**6.2**	**8.5**
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	September 8, 2009	LTN006C	7.8	21.7	7.3	88.7%	5.7	2.7		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	September 8, 2009	LTN008C	7.6	22.1	8.3	87.1%	5.1	2.7		
MOUNTAIN	LAKE SEQUOYAH	2-21-(3.5)	September 8, 2009	LTN008E	7.4	20.8	8.0	82.7%	6.1	2.0	7.1	8.6
					7.6	**21.5**	**7.9**	**86.2%**	**5.6**	**2.5**	**7.1**	**8.6**
				N=	5	5		5	5	5	4	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	E 20%	NCE	NCE

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	May 12, 2009	LTN013B	9.2	18.5	7.1	98.2%	0.5	1.6		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	May 12, 2009	LTN013C	9.1	18.6	7.2	97.3%	1.4	2.4		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	May 12, 2009	LTN013D	9.0	19.3	7.0	97.6%		1.9		
					9.1	**18.8**	**7.1**	**97.7%**	**1.0**	**2.0**		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	June 15, 2009	LTN013B	8.2	24.3	7.1	98.0%	1.5	2.4		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	June 15, 2009	LTN013C	8.2	24.4	6.4	98.2%	1.4	3.4		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	June 15, 2009	LTN013D	8.2	24.5	6.9	98.4%	1.3	2.2		
					8.2	**24.4**	**6.8**	**98.2%**	**1.4**	**2.7**		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	July 20, 2009	LTN013B	7.5	24.7	7.0	90.3%	1.0	1.5		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	July 20, 2009	LTN013C	7.7	24.3	7.5	92.0%	0.5	1.6		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	July 20, 2009	LTN013D	7.6	25.3	6.9	92.5%	1.1	1.9		
					7.6	**24.8**	**7.1**	**91.6%**	**0.9**	**1.7**		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	August 17, 2009	LTN013B	7.4	26.0	7.1	91.2%	1.8	2.8		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	August 17, 2009	LTN013C	7.2	26.1	7.0	88.9%	1.8	2.8		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	August 17, 2009	LTN013D	7.3	26.6	6.9	91.0%	1.6	1.3		
					7.3	**26.2**	**7.0**	**90.4%**	**1.7**	**2.3**		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	September 14, 2009	LTN013B	7.5	23.6	6.8	88.5%	1.8	2.0		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	September 14, 2009	LTN013C	7.6	23.7	6.4	89.8%	2.2	2.0		
MOUNTAIN	NANTAHALA LAKE	2-57-(22.5)	September 14, 2009	LTN013D	7.4	24.1	6.8	88.1%	2.1	<1.0		
					7.5	**23.8**	**6.7**	**88.8%**	**2.0**	**2.0**		
				N=	5	5	5	5	5	5		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		

Appendix B

Little Tennessee River Basin Lakes 2009 Use Support Data

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	May 19, 2009	LTN0015B	9.0	17.7	7.7	94.5%	0.5	3.9		
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	May 19, 2009	LTN015D	8.8	18.4	7.4	93.8%	0.5	1.4	1.3	3.4
					8.9	**18.1**	**7.6**	**94.2%**	**0.5**	**2.7**	**1.3**	**3.4**
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	June 9, 2009	LTN0015B	7.6	22.6	6.9	88.0%	2.7	2.7		
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	June 9, 2009	LTN015D	7.4	23.5	7.1	87.1%	1.6	1.3	1.4	3.2
					7.5	**23.1**	**7.0**	**87.6%**	**2.2**	**2.0**	**1.4**	**3.2**
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	July 14, 2009	LTN0015B	7.5	25.8	7.8	92.1%	2.6	1.2		
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	July 14, 2009	LTN015D	7.8	26.3	7.7	96.7%	3.3	1.5	1.4	3.6
					7.7	**26.1**	**7.8**	**94.4%**	**3.0**	**1.4**	**1.4**	**3.6**
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	August 11, 2009	LTN0015B	8.0	26.7	7.5	99.9%	5.0	1.5		
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	August 11, 2009	LTN015D	7.7	26.5	7.1	95.8%	4.1	1.4		3.6
					7.9	**26.6**	**7.3**	**97.9%**	**4.6**	**1.5**		**3.6**
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	September 9, 2009	LTN0015B	7.8	23.3	7.7	91.5%	3.3	1.1		
MOUNTAIN	BEAR CREEK RESERVOIR	2-79-(5.5)	September 9, 2009	LTN015D	8.0	23.4	7.3	94.0%	1.6	1.2	2.6	3.8
					7.9	**23.4**	**7.5**	**92.8%**	**2.5**	**1.2**	**2.6**	**3.8**
				N=	5	5	5	5	5	5	4	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE	NCE	NCE

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	May 19, 2009	LTN015F	9.2	16.1	6.9	93.4%	0.5	3.1		
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	May 19, 2009	LTN015H	9.0	17.0	7.3	93.2%	1.6	3.1		5.1
					9.1	**16.6**	**7.1**	**93.3%**	**1.1**	**3.1**		**5.1**
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	June 9, 2009	LTN015F	7.7	22.0	7.3	88.1%	1.2	3.1		
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	June 9, 2009	LTN015H	7.6	23.3	7.1	89.1%	1.8	3.1	1.2	4.7
					7.7	**22.7**	**7.2**	**88.6%**	**1.5**	**3.1**	**1.2**	**4.7**
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	July 14, 2009	LTN015F	7.8	26.2	7.7	96.5%	2.8	3.1		
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	July 14, 2009	LTN015H	7.9	25.9	7.8	97.2%	1.6	6.0	1.2	4.8
					7.9	**26.1**	**7.8**	**96.9%**	**2.2**	**4.6**	**1.2**	**4.8**
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	August 11, 2009	LTN015F								
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	August 11, 2009	LTN015H	7.9	26.9	7.6	99.0%	2.7	3.1		4.8
					7.9	**26.9**	**7.6**	**99.0%**	**2.7**	**3.1**		**4.8**
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	September 9, 2009	LTN015F	7.8	23.6	6.7	92.0%	1.1	3.1		
MOUNTAIN	CEDAR CLIFF RESERVOIR	2-79-(5.5)	September 9, 2009	LTN015H	7.8	23.4	7.7	91.6%	1.1	3.1	2.4	4.5
					7.8	**23.5**	**7.2**	**91.8%**	**1.1**	**3.1**	**2.4**	**4.5**
				N=	5	5	5	5	5	5	3	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE	NCE	NCE

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	May 19, 2009	LTN015A	8.1	18.0	7.1	85.6%	0.5	1.3		
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	May 19, 2009	LTN015A1	8.8	18.0	7.5	93.0%	0.5	0.5		3.2
					8.5	**18.0**	**7.3**	**89.3%**	**0.5**	**0.9**		**3.2**
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	June 9, 2009	LTN015A	7.9	22.0	7.3	90.4%	0.5	2.0		
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	June 9, 2009	LTN015A1	7.7	21.9	7.2	87.9%	2.3	1.1	<1.0	3.1
					7.8	**22.0**	**7.3**	**89.2%**	**1.4**	**1.6**	**<1.0**	**3.1**
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	July 14, 2009	LTN015A	7.6	24.8	8.1	91.7%	1.7	1.5		
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	July 14, 2009	LTN015A1	7.6	24.7	7.9	91.5%	1.5	2.0	<1.0	3.2
					7.6	**24.8**	**8.0**	**91.6%**	**1.6**	**1.8**	**<1.0**	**3.2**

Appendix B

Little Tennessee River Basin Lakes 2009 Use Support Data

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	August 11, 2009	LTN015A	7.6	25.7	7.0	93.2%	0.5	0.5		
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	August 11, 2009	LTN015A1	7.4	25.8	7.0	90.9%	1.3	0.5		3.3
					7.5	**25.8**	**7.0**	**92.1%**	**0.9**	**0.5**		**3.3**
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	September 9, 2009	LTN015A	7.4	23.0	7.9	86.3%	2.6	0.5		
MOUNTAIN	WOLF CREEK RESERVOIR	2-79-9-(1)	September 9, 2009	LTN015A1	7.8	22.8	8.3	90.6%	1.2	0.5	2.1	3.4
					7.6	**22.9**	**8.1**	**88.5%**	**1.9**	**0.5**	**2.1**	**3.4**
				N=	5	5	5	5	5	5	3	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE	NCE	NCE

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	May 19, 2009	LTN015L	8.7	17.8	6.9	91.6%	5.3	1.9		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	May 19, 2009	LTN015N	8.7	17.6	6.9	91.2%	6.8	2.3		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	May 19, 2009	LTN015P	8.8	17.3	6.9	91.7%	4.9	3.4		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	May 19, 2009	LTN015R	8.6	17.3	7.6	89.6%	1.3	2.4		5.5
					8.7	**17.5**	**7.1**	**91.0%**	**4.6**	**2.5**		**5.5**
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	June 9, 2009	LTN015L	7.5	23.6	6.6	88.5%	3.5	1.9		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	June 9, 2009	LTN015N	7.6	23.4	6.6	89.3%	5.7	1.8		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	June 9, 2009	LTN015P	7.7	24.1	6.9	91.7%	3.6	2.1		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	June 9, 2009	LTN015R	7.8	23.7	7.2	92.2%	4.9	2.5	2.3	5.2
					7.7	**23.7**	**6.8**	**90.4%**	**4.4**	**2.1**	**2.3**	**5.2**
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	July 14, 2009	LTN015L	7.7	24.2	7.3	91.8%	5.8	2.8		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	July 14, 2009	LTN015N	7.7	24.4	7.7	92.2%	6.0	2.6		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	July 14, 2009	LTN015P	7.9	24.2	7.3	94.2%	7.4	2.3		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	July 14, 2009	LTN015R	7.9	24.0	7.8	93.9%	7.3	3.1	2.3	5.6
					7.8	**24.2**	**7.5**	**93.0%**	**6.6**	**2.7**	**2.3**	**5.6**
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	August 11, 2009	LTN015L	7.4	25.2	7.0	89.9%	2.9	2.0		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	August 11, 2009	LTN015N	7.5	25.3	7.0	91.3%	2.8	2.0		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	August 11, 2009	LTN015P	8.3	26.4	7.3	103.1%	2.4	1.9		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	August 11, 2009	LTN015R	7.2	25.5	7.1	88.0%	2.6	2.4		5.6
					7.6	**25.6**	**7.1**	**93.1%**	**2.7**	**2.1**		**5.6**
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	September 9, 2009	LTN015L	7.9	22.8	7.8	91.8%	3.2	1.4		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	September 9, 2009	LTN015N	7.6	22.9	7.4	88.5%	3.8	1.1		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	September 9, 2009	LTN015P	7.5	22.8	7.3	87.1%	5.1	1.2		
MOUNTAIN	THORPE RESERVOIR	2-79-23-(1)	September 9, 2009	LTN015R	7.6	22.8	7.1	88.3%	4.1	1.1	5.6	5.5
					7.7	**22.8**	**7.4**	**88.9%**	**4.1**	**1.2**	**5.6**	**5.5**
				N=	5	5	5	5	5	5	3	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE	NCE	NCE

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	FONTANA LAKE	2-(66)	May 7, 2009	LTN031B	9.1	19.7	7.3	99.5%	1.5	1.7		
MOUNTAIN	FONTANA LAKE	2-(66)	May 7, 2009	LTN031D	9.5	18.9	7.3	102.2%	1.3	1.1		
					9.3	**19.3**	**7.3**	**100.9%**	**1.4**	**1.4**		
MOUNTAIN	FONTANA LAKE	2-(66)	June 3, 2009	LTN031B	8.9	24.5	7.9	106.7%	3.2	3.1		
MOUNTAIN	FONTANA LAKE	2-(66)	June 3, 2009	LTN031D	8.6	24.1	7.6	102.4%	2.9	1.6		
					8.8	**24.3**	**7.8**	**104.6%**	**3.1**	**2.4**		
MOUNTAIN	FONTANA LAKE	2-(66)	July 7, 2009	LTN031B	8.0	27.1	8.4	100.6%	2.7	1.4		
MOUNTAIN	FONTANA LAKE	2-(66)	July 7, 2009	LTN031D	8.0	26.8	8.2	100.1%	3.0	1.9		
					8.0	**27.0**	**8.3**	**100.4%**	**2.9**	**1.7**		

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Little Tennessee River Basin Lakes 2009 Use Support Data

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	FONTANA LAKE	2-(66)	August 4, 2009	LTN031B	8.2	27.0	8.4	102.9%	3.8	1.0		
MOUNTAIN	FONTANA LAKE	2-(66)	August 4, 2009	LTN031D	8.1	27.0	8.1	101.7%	1.9	0.5		
					8.2	**27.0**	**8.3**	**102.3%**	**2.9**	**0.8**		
MOUNTAIN	FONTANA LAKE	2-(66)	September 1, 2009	LTN031B	8.0	26.2	8.2	99.0%	3.4	1.0		
MOUNTAIN	FONTANA LAKE	2-(66)	September 1, 2009	LTN031D	8.0	26.1	8.1	98.8%	2.7	1.1		
					8.1	**26.7**	**8.2**	**100.9%**	**2.9**	**1.1**		
				N=	5	5	5	5	5	5		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	FONTANA LAKE	2-(89)	May 7, 2009	LTN031A	9.4	19.8	7.6	103.0%	2.2	2.2		
					9.4	**19.8**	**7.6**	**103.0%**	**2.2**	**2.2**		
MOUNTAIN	FONTANA LAKE	2-(89)	June 3, 2009	LTN031A	8.5	24.8	7.9	102.5%	5.6	1.8		
					8.5	**24.8**	**7.9**	**102.5%**	**5.6**	**1.8**		
MOUNTAIN	FONTANA LAKE	2-(89)	July 7, 2009	LTN031A	8.0	27.1	8.5	100.6%	3.1	1.0		
					8.0	**27.1**	**8.5**	**100.6%**	**3.1**	**1.0**		
MOUNTAIN	FONTANA LAKE	2-(89)	August 4, 2009	LTN031A	8.2	27.6	8.5	104.0%	3.0	1.1		
					8.2	**27.6**	**8.5**	**104.0%**	**3.0**	**1.1**		
MOUNTAIN	FONTANA LAKE	2-(89)	September 1, 2009	LTN031A	8.1	26.5	8.5	100.8%	3.9	1.7		
					8.1	**26.5**	**8.5**	**100.8%**	**3.9**	**1.7**		
				N=	5	5	5	5	5	5		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	FONTANA LAKE	2-(140.5)	May 7, 2009	LTN031H	9.4	18.5	7.3	100.3%		1.0		
MOUNTAIN	FONTANA LAKE	2-(140.5)	May 7, 2009	LTN031J	9.2	18.9	7.3	99.0%		0.5	1.4	6.6
					9.3	**18.7**	**7.3**	**99.7%**		**0.8**	**1.4**	**6.6**
MOUNTAIN	FONTANA LAKE	2-(140.5)	June 3, 2009	LTN031H	8.7	22.7	7.1	100.9%	1.4	0.5		
MOUNTAIN	FONTANA LAKE	2-(140.5)	June 3, 2009	LTN031J	8.6	22.8	7.4	99.9%	0.5	0.5		6.3
					8.7	**22.8**	**7.3**	**100.4%**	**1.0**	**0.5**		**6.3**
MOUNTAIN	FONTANA LAKE	2-(140.5)	July 7, 2009	LTN031H	8.3	25.6	8.4	101.6%	2.6	0.5		
MOUNTAIN	FONTANA LAKE	2-(140.5)	July 7, 2009	LTN031J	8.4	25.5	8.3	102.6%	2.6	0.5	1.3	6.3
					8.4	**25.6**	**8.4**	**102.1%**	**2.6**	**0.5**	**1.3**	**6.3**
MOUNTAIN	FONTANA LAKE	2-(140.5)	August 4, 2009	LTN031H	8.2	26.1	8.1	101.3%	2.6	1.7		
MOUNTAIN	FONTANA LAKE	2-(140.5)	August 4, 2009	LTN031J	8.1	26.2	8.1	100.2%	2.5	1.0	1.1	6.2
					8.2	**26.2**	**8.1**	**100.8%**	**2.6**	**1.4**		
MOUNTAIN	FONTANA LAKE	2-(140.5)	September 1, 2009	LTN031H	8.0	25.8	8.1	98.3%	3.0	0.5		
MOUNTAIN	FONTANA LAKE	2-(140.5)	September 1, 2009	LTN031J	8.0	25.8	7.9	98.3%	2.1	0.5	1.6	6.2
					8.0	**25.8**	**8.0**	**98.3%**	**2.6**	**0.5**	**1.6**	**6.2**
				N=	5	5	5	5	4	5	4	5
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE	NCE	NCE

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					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	LAKE CHEOAH	2-167	June 2, 2009	LTN032B	9.7	7.8	6.6	81.5%	0.5	1.2		
MOUNTAIN	LAKE CHEOAH	2-167	June 2, 2009	LTN032D	9.9	8.5	6.8	84.6%	0.5	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	June 2, 2009	LTN032F	9.4	20.0	6.9	103.4%	0.5	0.5		
					9.7	**12.1**	**6.8**	**89.8%**	**0.5**	**0.7**		
MOUNTAIN	LAKE CHEOAH	2-167	July 8, 2009	LTN032B	9.1	9.9	7.5	80.5%	0.5	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	July 8, 2009	LTN032D	9.4	16.7	7.1	96.7%	1.8	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	July 8, 2009	LTN032F	9.8	17.3	7.1	102.1%	2.5	0.5		
					9.4	**14.6**	**7.2**	**93.1%**	**1.6**	**0.5**		
MOUNTAIN	LAKE CHEOAH	2-167	August 5, 2007	LTN032B	8.7	10.6	6.7	78.2%	0.5	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	August 5, 2007	LTN032D	8.8	16.6	6.7	90.3%	2.1	3.7		
MOUNTAIN	LAKE CHEOAH	2-167	August 5, 2007	LTN032F	9.1	21.1	7.1	102.3%	3.3	0.5		
					8.9	**16.1**	**6.8**	**90.3%**	**2.0**	**1.6**		
MOUNTAIN	LAKE CHEOAH	2-167	September 2, 2009	LTN032B	8.7	11.3	6.7	79.5%	0.5	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	September 2, 2009	LTN032D	8.4	11.4	6.7	76.9%	0.5	0.5		
MOUNTAIN	LAKE CHEOAH	2-167	September 2, 2009	LTN032F	9.0	16.2	6.8	91.6%	0.5	0.5		
					8.7	**13.0**	**6.7**	**82.7%**	**0.5**	**0.5**		
				N=	4	4	4	4	4.0	4		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		

					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	May 6, 2009	LTN037B	8.9	19.6	7.3	97.1%	2.8	5.0		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	May 6, 2009	LTN037D	9.2	19.2	7.4	99.6%	1.5	0.5		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	May 6, 2009	LTN037E	9.1	18.9	7.3	97.9%	2.8	1.2		
					9.1	**19.2**	**7.3**	**98.2%**	**2.4**	**2.2**		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	June 1, 2009	LTN037B	8.2	25.7	7.1	100.5%		1.1		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	June 1, 2009	LTN037D	8.4	25.1	7.2	101.9%	1.1	0.5		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	June 1, 2009	LTN037E	8.4	23.8	7.2	99.4%	1.2	0.5		
					8.3	**24.9**	**7.2**	**100.6%**	**1.2**	**0.7**		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	July 6, 2009	LTN037B	8.0	27.6	7.4	101.5%	3.3	1.3		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	July 6, 2009	LTN037D	8.1	26.7	7.6	101.1%	2.6	0.5		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	July 6, 2009	LTN037E	8.2	26.4	7.7	101.8%	2.8	2.4		
					8.1	**26.9**	**7.6**	**101.5%**	**2.9**	**1.4**		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 3, 2009	LTN037B	8.5	27.8	8.1	108.2%	3.3	3.2		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 3, 2009	LTN037D	8.2	26.7	7.8	102.4%	2.1	2.8		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 3, 2009	LTN037E	8.3	26.1	8.0	102.5%	2.5	1.1		
					8.3	**26.9**	**8.0**	**104.4%**	**2.6**	**2.4**		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 31, 2009	LTN037B	8.6	26.3	8.3	106.6%	3.6	1.4		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 31, 2009	LTN037D	8.4	25.6	8.1	102.8%	2.7	2.0		
MOUNTAIN	SANTEETLAH LAKE	2-190-(5)	August 31, 2009	LTN037E	8.4	25.3	8.1	102.2%	3.1	0.5		
					8.5	**25.7**	**8.2**	**103.9%**	**3.1**	**1.3**		
				N=	5	5	5	5	5	5		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		

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					SURFACE PHYSICAL DATA				PHOTIC ZONE		SURFACE METALS	
Region	Lake	AU	Date m/d/yr	Sampling Station	DO mg/L	Water Temp C	pH s.u.	Percent DO SAT	Chla µg/L	Turbidity NTU	Chloride mg/L	Total Hardnes Calculated mg/L
MOUNTAIN	CALDERWOOD LAKE	2-167	June 2, 2009	LTN040	10.1	12.1	6.9	94.0%	0.5	0.5		
MOUNTAIN	CALDERWOOD LAKE	2-167	June 2, 2009	LTN041	9.7	16.4	7.0	99.1%	0.5	0.5		
					9.9	**14.3**	**7.0**	**96.6%**	**0.5**	**0.5**		
MOUNTAIN	CALDERWOOD LAKE	2-167	July 7, 2009	LTN040	9.5	11.8	6.7	87.8%	0.5	0.5		
MOUNTAIN	CALDERWOOD LAKE	2-167	July 7, 2009	LTN041	9.2	21.6	7.1	104.4%	1.8	0.5		
					9.4	**16.7**	**6.9**	**96.1%**	**1.2**	**0.5**		
MOUNTAIN	CALDERWOOD LAKE	2-167	August 5, 2009	LTN040	9.0	17.2	7.0	93.5%	1.1	0.5		
MOUNTAIN	CALDERWOOD LAKE	2-167	August 5, 2009	LTN041	8.9	21.2	7.0	100.3%	1.9	0.5		
					9.0	**19.2**	**7.0**	**96.9%**	**1.5**	**0.5**		
MOUNTAIN	CALDERWOOD LAKE	2-167	September 2, 2009	LTN040	8.8	14.2	7.0	85.8%	0.5	1.2		
MOUNTAIN	CALDERWOOD LAKE	2-167	September 2, 2009	LTN041	9.0	17.6	6.9	94.3%	1.0	0.5		
					8.9	**15.9**	**7.0**	**90.1%**	**0.8**	**0.9**		
				N=	4	4	4	4	4	4		
				% EXCEED =	NCE	NCE	NCE	NCE	NCE	NCE		