

2005 Neely Henry Reservoir Report
Rivers and Reservoirs Monitoring Program



Field Operations Division
Environmental Indicators Section
Aquatic Assessment Unit
January 12, 2010

Rivers and Reservoirs Monitoring Program

2005

Neely Henry Reservoir

Coosa River Basin

**Alabama Department of Environmental Management
Field Operations Division
Environmental Indicators Section
Aquatic Assessment Unit**

January 2010

Table of Contents

LIST OF FIGURES	4
LIST OF TABLES	5
INTRODUCTION.....	6
METHODS	6
RESULTS	9
REFERENCES.....	20
APPENDIX.....	22

LIST OF FIGURES

Figure 1. Neely Henry Reservoir with 2005 sampling locations. A description of each sampling location is provided in Table 1 7

Figure 2. Mean total nitrogen (TN), mean total phosphorus (TP), mean chlorophyll a (Chl *a*) and mean total suspended solids (TSS) of all stations in Neely Henry Reservoir, April-October 2005 11

Figure 3. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the upper station in Neely Henry Reservoir, April-October 2005..... 12

Figure 4. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the mid station in Neely Henry Reservoir, April-October 2005..... 13

Figure 5. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the dam forebay station in Neely Henry Reservoir, April-October 2005 14

Figure 6. Growing season ean chlorophyll *a* concentrations of mainstem Neely Henry Reservoir, 1993 through 2000 15

Figure 7. Depth profiles of dissolved oxygen (DO) and temperature (Temp) in Neely Henry Reservoir, June-September 2005 16

Figure 8. DO concentrations at 5 ft. for Neely Henry Reservoir tributaries collected April-October 2005 17

Figure 9. Monthly TSI values for mainstem and tributary stations using chlorophyll a concentrations and the Carlson’s Trophic State Index calculation, April-October 2005..... 18

Figure 10. Trophic State Index values from critical period sampling (August sampling only) from 1985 to 2005..... 19

LIST OF TABLES

Table 1. Descriptions for the monitoring stations in 2005 for Neely Henry Reservoir..... 8

Table 2. Algal growth potential test results (expressed as mean Maximum Standing Crop (MSC) or dry weights of *Selenastrum capricornutum* in mg/L) and limiting nutrient status from 2000 and 2005..... 15

Appendix Table 1. Summary of water quality data collected April-October, 2005. 23

INTRODUCTION

The Alabama Department of Environmental Management (ADEM) monitored Neely-Henry Reservoir as part of the 2005 assessment of the Alabama, Coosa, and Tallapoosa (ACT) River basins under the [Rivers and Reservoirs Monitoring Program \(RRMP\)](#). Implemented in 1990, the objectives of this program were to provide data that can be used to assess current water quality condition, identify trends in water quality conditions, and to develop Total Maximum Daily Loads (TMDLs) and water quality criteria.

Neely-Henry Reservoir was placed on Alabama's [1996 Clean Water Act \(CWA\) §303\(d\) list](#) of impaired waters for not meeting its Public Water Supply (PWS)/Swimming (S)/Fish & Wildlife (F&W) water [use classifications](#). The reservoir was listed for impairments caused by priority organics (PCBs), nutrients, pH and organic enrichment/dissolved oxygen (OE/DO). A [TMDL](#) developed to address the nutrient, pH, and OE/DO impairment was approved by the USEPA in 2008.

The purpose of this report is to summarize data collected at 10 stations in Neely-Henry reservoir during the 2005 growing season and to evaluate trends in mean lake trophic status and nutrient concentrations using ADEM's 20 year dataset. Monthly and mean concentrations of nutrients (total nitrogen (TN); total phosphorus (TP)), algal biomass/productivity (chlorophyll *a* (chl *a*); algal growth potential testing (AGPT)), sediment (total suspended solids (TSS)), and trophic state (Carlson's trophic state index (TSI)) are compared to ADEM's historical data and proposed criteria.

METHODS

Sampling stations were determined using historical data and previous assessments ([Fig. 1; Table 1](#)). Neely Henry was sampled in the dam forebay, mid reservoir, and upper reservoir. Tributary embayment stations were established in larger embayments and/or those with larger inflows. They were also selected to monitor watersheds representing a range in upstream landuses.

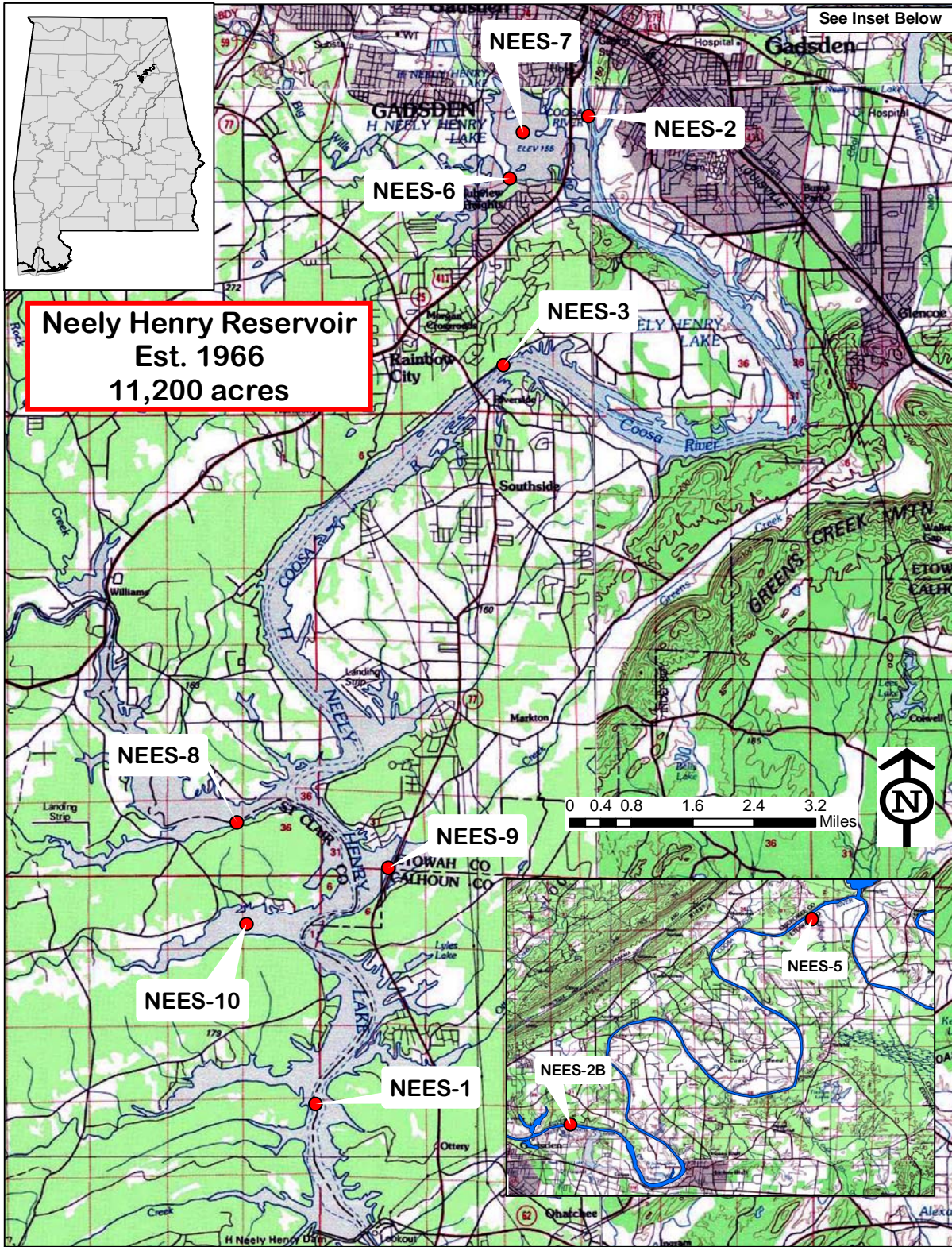


Figure 1. Neely Henry Reservoir with 2005 sampling locations. A description of each sampling location is provided in Table 1.

Table 1. Descriptions for the monitoring stations in 2005 for Neely Henry Reservoir.

Neely Henry Reservoir							
Sub-watershed	County	Station Number	Report Designation	Waterbody Name	Station Description	Latitude	Longitude
Middle Coosa (0315-0106)							
0309	Calhoun	NEES-1**	Lower	Coosa R	Lower reservoir. Deepest point, main river channel, dam forebay.	33.8084	-86.0645
0104	Etowah	NEES-2	Upper	Coosa R	Upper reservoir. Deepest point, main river channel, immediately upstream of I-759 hwy bridge. Reservoir mile 22.0.	33.9945	-86.0004
0104	Etowah	NEES-2B	Above Gadsden	Coosa R	Deepest point, main river channel, reservoir mile 28.0, above Gadsden.	33.9945	-86.0004
0309	Etowah	NEES-3**	Mid	Coosa R	Mid reservoir. Deepest point, main river channel, immediately upstream of Alabama Hwy 77 bridge. Reservoir mile 16.0.	33.9476	-86.0202
011	Etowah	NEES-5	Ballplay Cr	Ballplay Cr	Deepest point, main creek channel, Ballplay Creek embayment, approximately 0.5 miles upstream of Coosa River confluence.	34.1179	-85.8175
0207	Etowah	NEES-6	Big Wills Cr	Big Wills Cr	Deepest point, main creek channel, Big Wills Creek embayment, approximately 1.0 miles upstream of US Hwy. 411 bridge.	33.9829	-86.0184
0103	Etowah	NEES-7	Black Cr	Black Cr	Deepest point, main creek channel, Black Creek embayment, immediately upstream of Interstate 759 bridge.	33.9916	-86.0153
0306	Etowah	NEES-8	Big Canoe Cr	Big Canoe Cr	Deepest point, main creek channel, Big Canoe Creek embayment, downstream of Canoe Creek Campground.	33.8617	-86.0817
0309	Etowah	NEES-9	Greens Cr	Greens Cr	Deepest point, main creek channel, Greens Creek embayment, immediately upstream of AL Hwy. 77 bridge.	33.8529	-86.0474
0307	St. Clair	NEES-10	Beaver Cr	Beaver Cr	Deepest point, main creek channel, Beaver Creek embayment, upstream of Greensport Marina.	33.8425	-86.0797

**Growing season mean Chl a criteria will be established at this station in 2010

Water quality assessments were conducted at monthly intervals, April-October. All samples were collected, preserved, stored, and transported according to procedures in the [ADEM Field Operations Division Standard Operating Procedures \(SOP\)](#), [Surface Water Quality Assurance Project Plan \(QAPP\)](#), and [Quality Management Plan \(QMP\)](#).

RESULTS

Summary statistics of all data collected in 2005 are presented in [Appendix Table 1](#). The table contains the min, max, median, average, and standard deviation of each parameter analyzed. [Fig. 2](#) summarizes the 2005 mean concentrations of TN, TP, chl *a* and TSS for all stations in Neely Henry Reservoir. Monthly values for each of these parameters are presented in [Figs. 3 \(upper reservoir\)](#), [4 \(mid-reservoir\)](#), and [5 \(lower reservoir\)](#).

At the mainstem stations, mean TN concentrations increased from upstream to downstream ([Fig. 2](#)). Big Wills Creek had the highest concentration of mean TN in the reservoir.

The mean TP concentration in Big Wills Creek was 0.246 mg/l. Mean TP concentrations at all other stations ranged from 0.049 to 0.079 mg/l ([Fig. 2](#)). Concentrations greater than 0.025 mg/l can indicate eutrophic conditions within a lake or reservoir (Carlson 1977).

Mean chl *a* concentrations were >20 ug/L at 8 of the 10 stations, indicating highly eutrophic conditions across much of the reservoir and its embayments ([Fig. 2](#)). Mean chl *a* concentrations were lowest in Ballplay Creek (13.32 ug/L) and highest in Big Wills Creek (24.56 ug/L). By month, concentrations were lowest during the months of May and June when discharge remained the most stable ([Fig. 3, 4 & 5](#)). The ADEM monitored growing season mean chl *a* concentrations at mainstem reservoir stations in 1993, 1994, 1997, 2000, and 2005 ([Fig. 6](#)). Mean chl *a* was higher at all three stations in 1997 and 2000.

Mean TSS concentrations were highest at Ballplay and Big Wills Creeks ([Fig. 2](#)). Monthly TSS concentrations were lower than historic means ([Fig. 3, 4 & 5](#)).

Algal growth potential testing (AGPT) results showed no limiting nutrient in the upper and mid reservoir samples. The lower station was nitrogen limited ([Table 2](#)). Mean standing crop (MSC)

values were above the 5 mg/l limit considered to be protective in reservoirs and lakes at both the mid and lower stations (Raschke and Schultz 1987).

The ADEM Water Criteria (ADEM Admin. Code R. 335-6-10-.09) limit for dissolved oxygen is 5.0 mg/l at a depth of 5.0 ft. The dissolved oxygen concentrations of Ballplay Creek and the lower reservoir station were <5.0 mg/l at 5.0 ft. during August ([Fig. 7 & 8](#)). At the lower reservoir station in August, the dissolved oxygen concentrations were <5.0 mg/l from surface to bottom. Profiles of the mainstem station also show the reservoir to be thoroughly mixed at all stations ([Fig. 7](#)). Water temperatures in August were over 30°C from top to bottom at all mainstem stations, at least three degrees warmer than any other month.

Carlson's TSI was calculated from the corrected chl *a* concentrations. TSI values for mainstem stations were highly eutrophic July-October ([Fig.9](#)). Tributaries to Neely Henry Reservoir showed similar trends, with Big Wills Creek reaching hypereutrophic conditions in August and September.

August TSI values calculated from data collected at mainstem stations, 1985-2005, are presented in [Fig. 10](#). August TSI increased to highly eutrophic levels, 1995-2005, with hypereutrophic conditions observed at the mid and lower mainstem stations in 1997.

Figure 2. Mean total nitrogen (TN), mean total phosphorus (TP), mean chlorophyll a (Chl *a*) and mean total suspended solids (TSS) of all stations in Neely Henry Reservoir, April-October 2005. Bar graphs consist of multiple stations, illustrated from upstream to downstream as the graph is read from left to right.

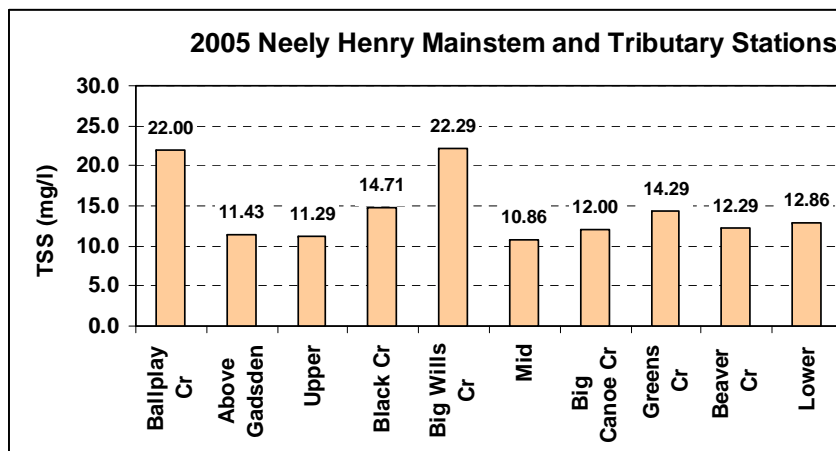
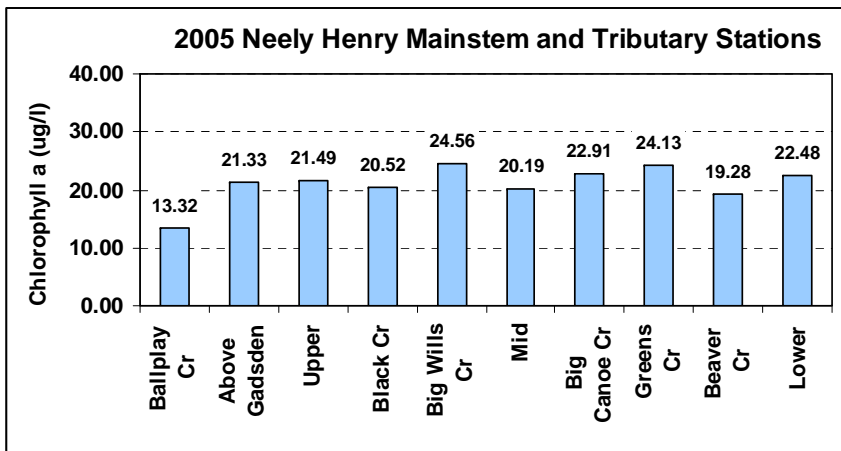
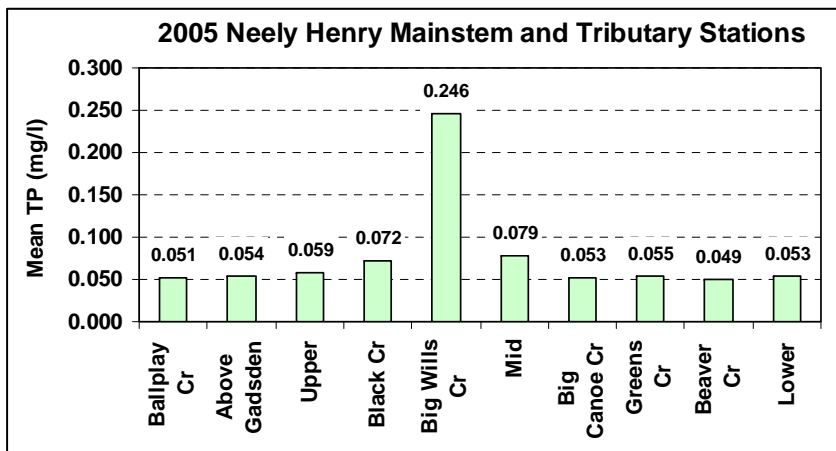
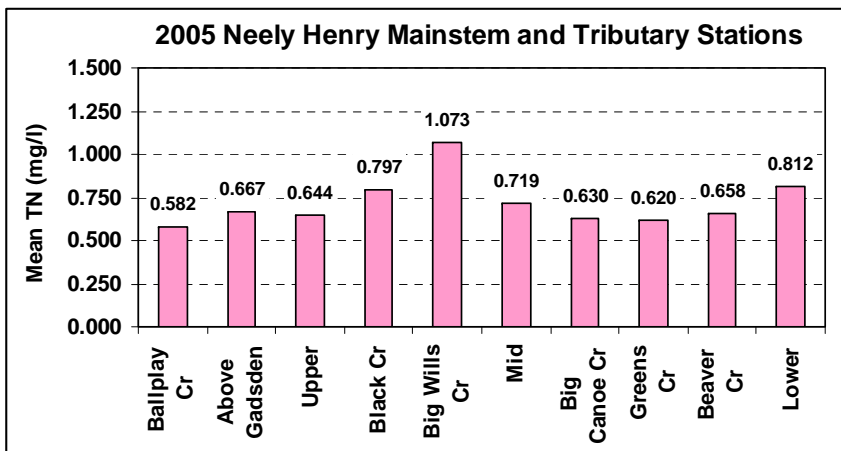


Figure 3. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the upper station in Neely Henry Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the upper station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS are plotted vs. discharge (USGS Coosa R gauge near Rome, GA).

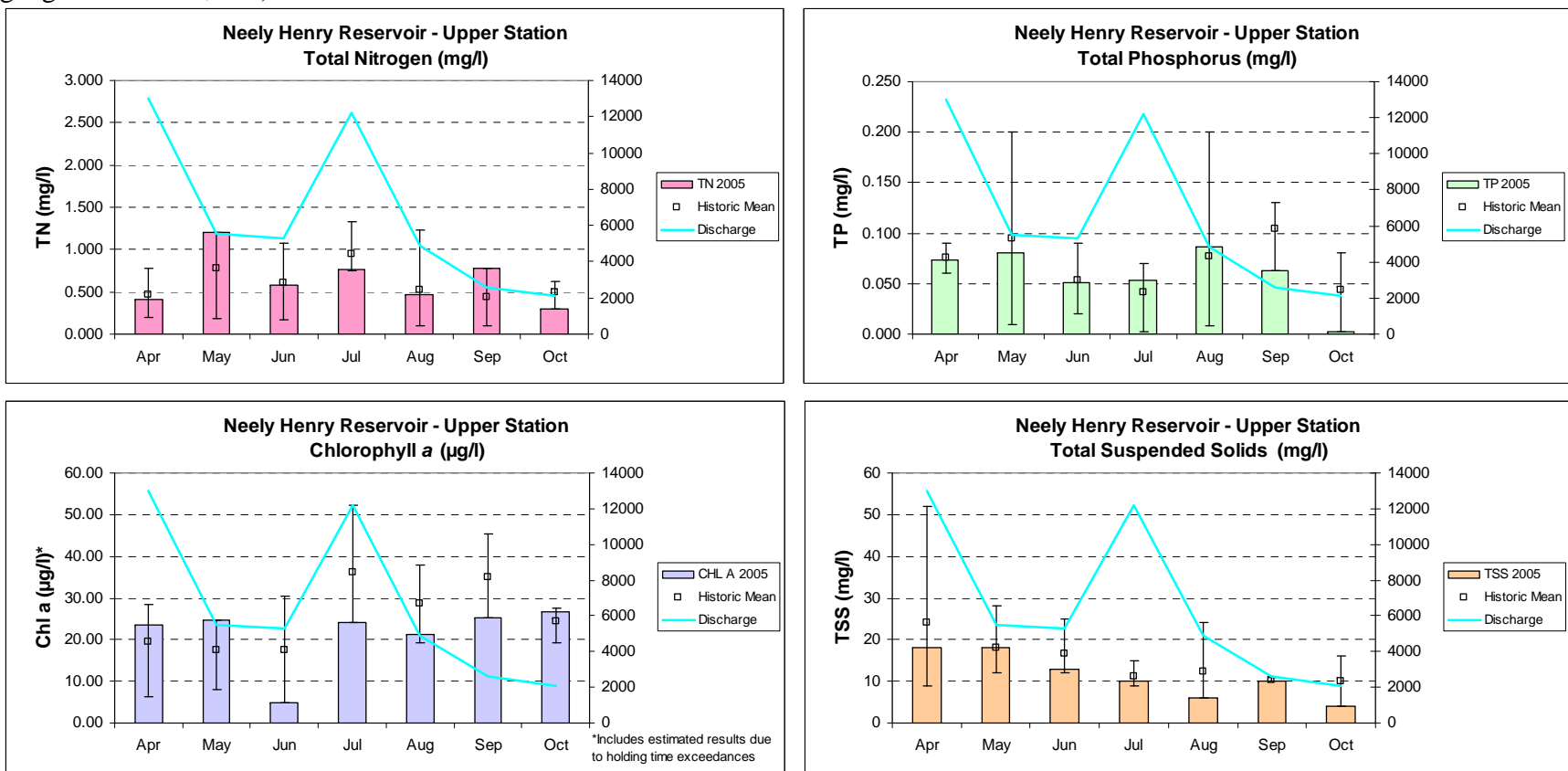


Figure 4. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the mid station in Neely Henry Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the mid-reservoir station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS are plotted vs. discharge (USGS Coosa R gauge near Rome, GA).

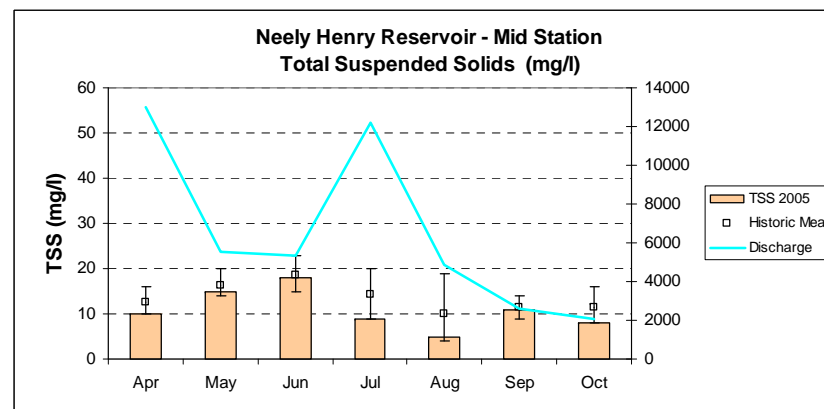
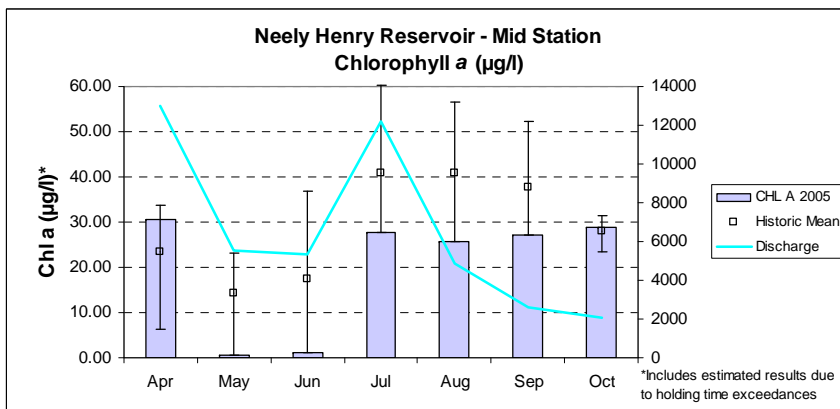
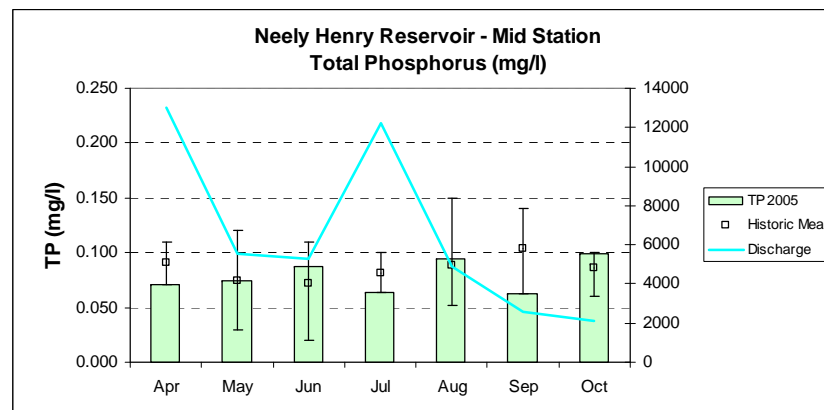
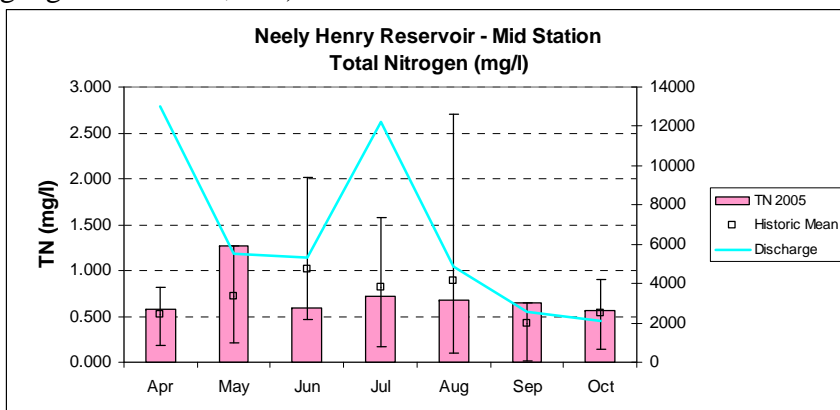


Figure 5. Total nitrogen (TN), total phosphorus (TP), chlorophyll a (Chl *a*) and total suspended solids (TSS) of the dam forebay station in Neely Henry Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the lower reservoir station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS are plotted vs. discharge (USGS Coosa R gauge near Rome, GA).

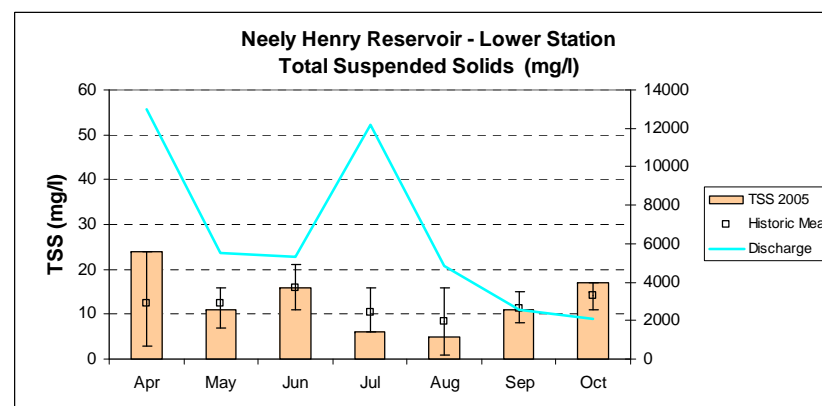
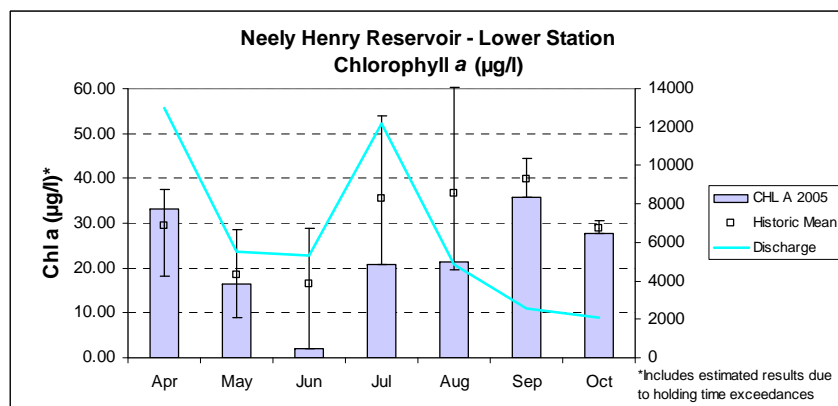
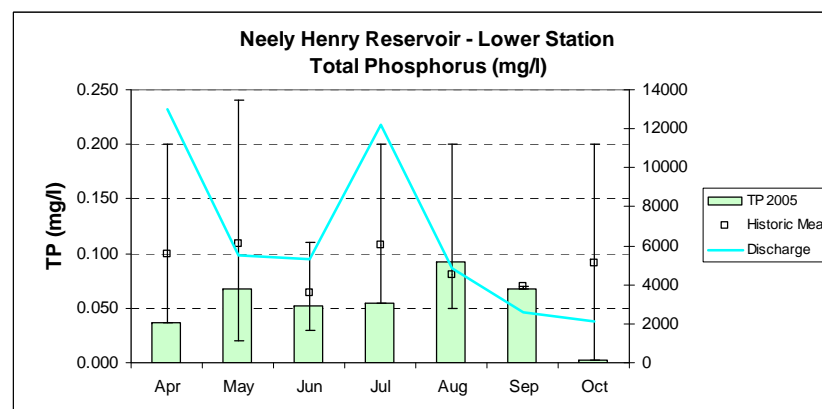
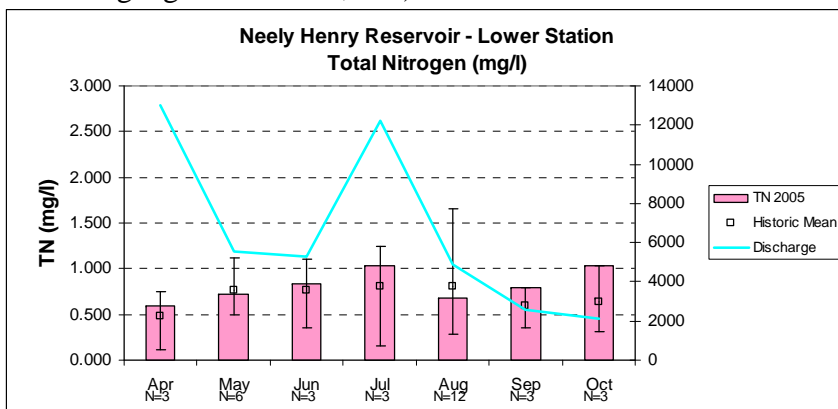


Figure 6. Growing season mean chlorophyll *a* concentrations of mainstem Neely Henry Reservoir, 1993 through 2005.

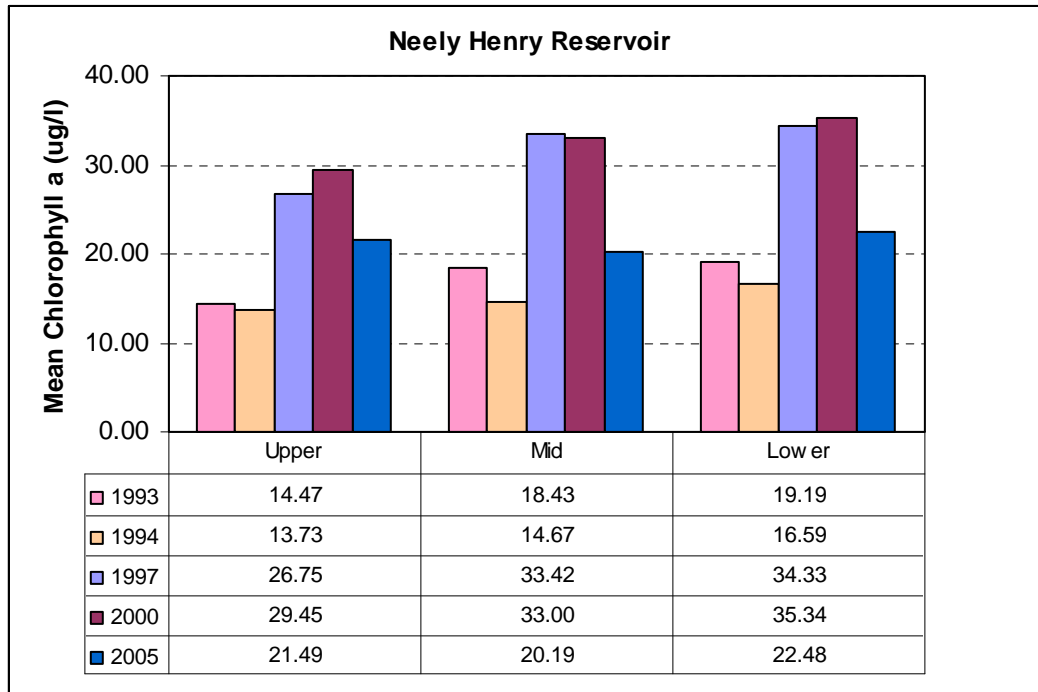


Table 2. Algal growth potential test results (expressed as mean Maximum Standing Crop (MSC) or dry weights of *Selenastrum capricornutum* in mg/L) and limiting nutrient status from 2000 and 2005. Mean standing crop (MSC) values below 5 mg/l are considered to be protective in reservoirs and lakes (Raschke and Schultz 1987).

Station	2000 Control mean MSC	2000 Limiting Nutrient	2005 Control mean MSC	2005 Limiting Nutrient
Upper	3.55	Co-Limit	4.20	Non Limiting
Mid	8.10	Nitrogen	5.56	Non Limiting
Lower	4.35	None	7.07	Nitrogen

Figure 7. Depth profiles of dissolved oxygen (DO) and temperature (Temp) in Neely Henry Reservoir, June-September 2005. Although profiles were measured April-October, these select months were chosen as they represent the warmest water temperatures and most stratified dissolved oxygen concentrations. ADEM Water Quality Criteria pertaining to non-wadeable river and reservoir waters require a DO concentration of 5.0 mg/l at 5.0ft (1.5m)(ADEM Admin. Code R. 335-6-10-09). Under extreme natural conditions such as drought, the DO concentration may be as low as 4.0 mg/l.

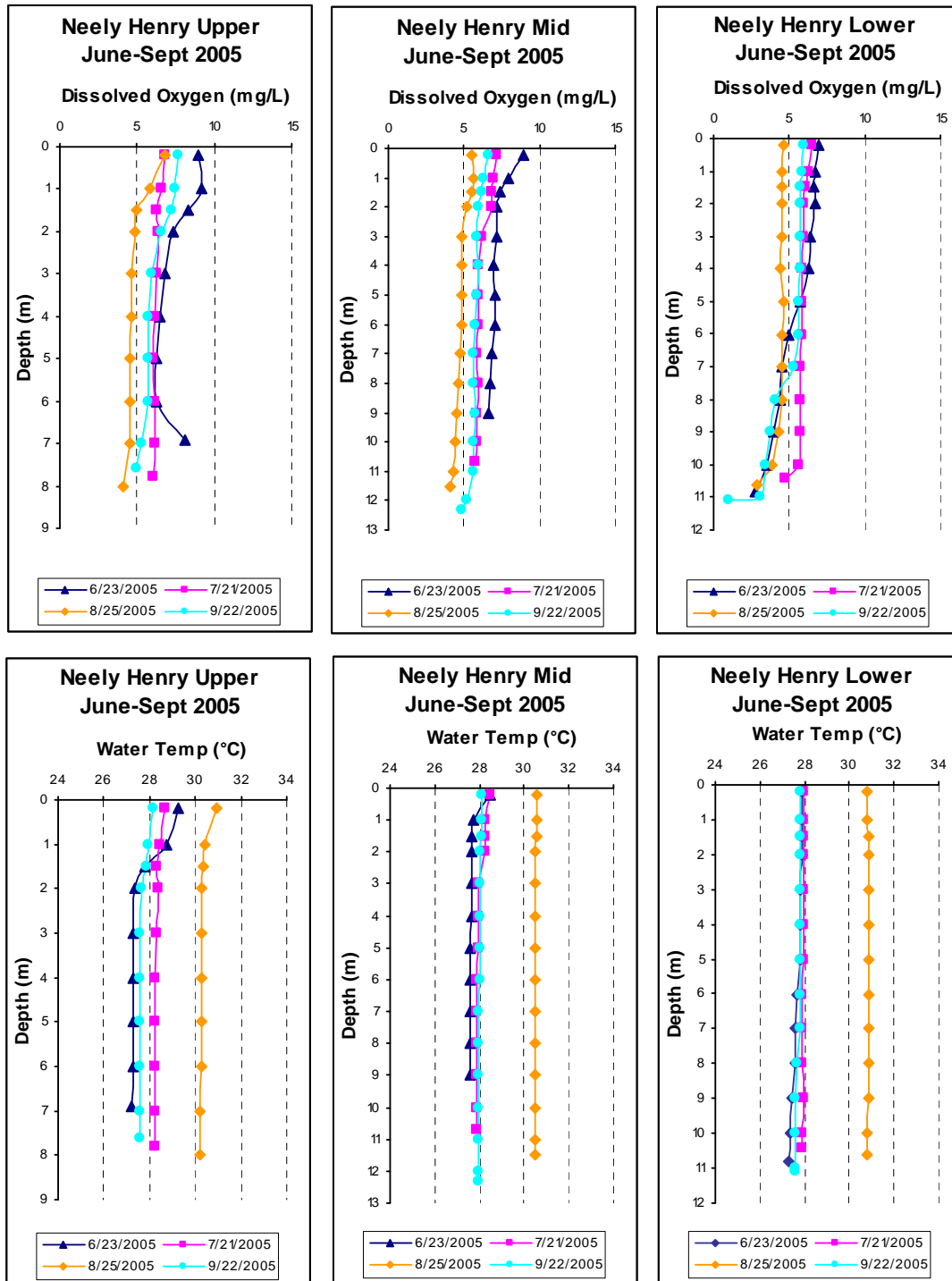


Figure 8. DO concentrations at 5 ft. for Neely Henry Reservoir tributaries collected April-October 2005. For tributary embayments, which are typically not as deep as mainstem stations and usually maintain a mixed water column throughout the season, profiles were collected but only the monthly DO concentrations at a depth of 5ft (1.5m) are graphed. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/l at this depth (ADEM 2005).

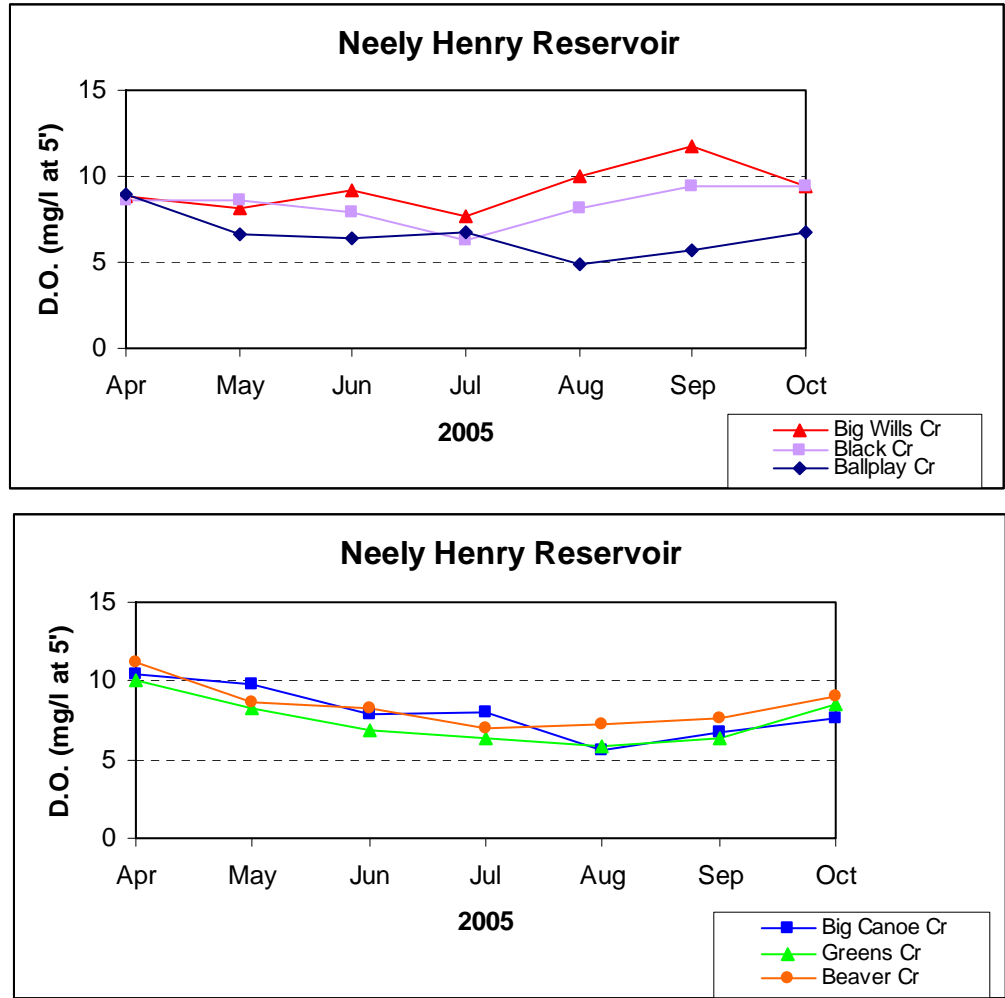


Figure 9. Monthly TSI values for mainstem and tributary stations using chlorophyll a concentrations and the Carlson's Trophic State Index calculation, April-October 2005.

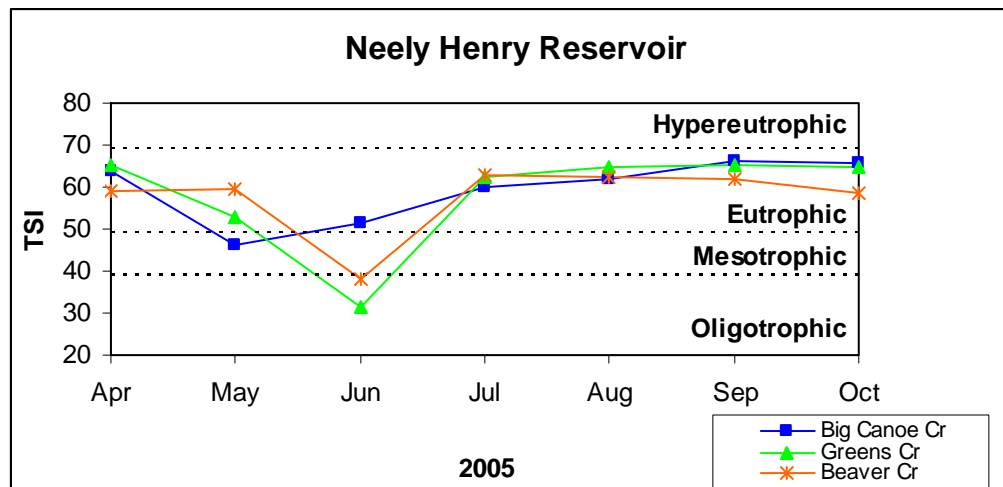
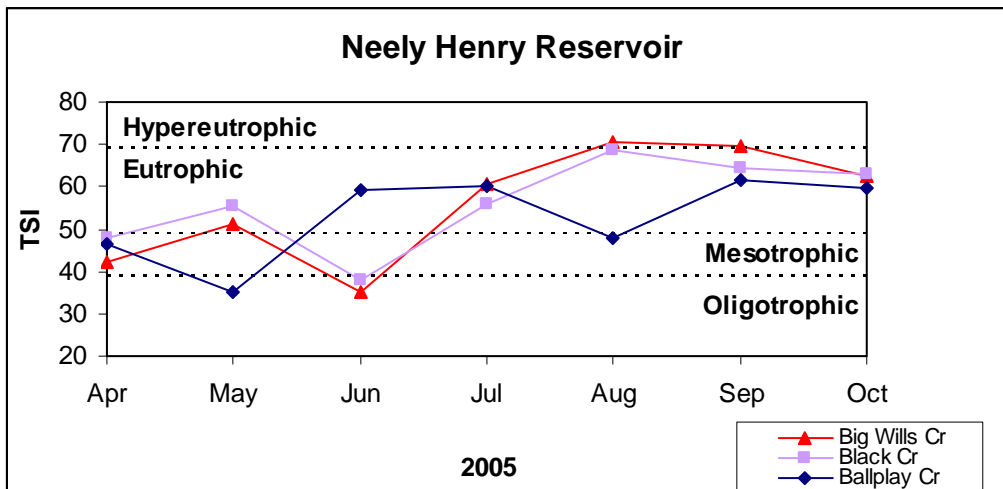
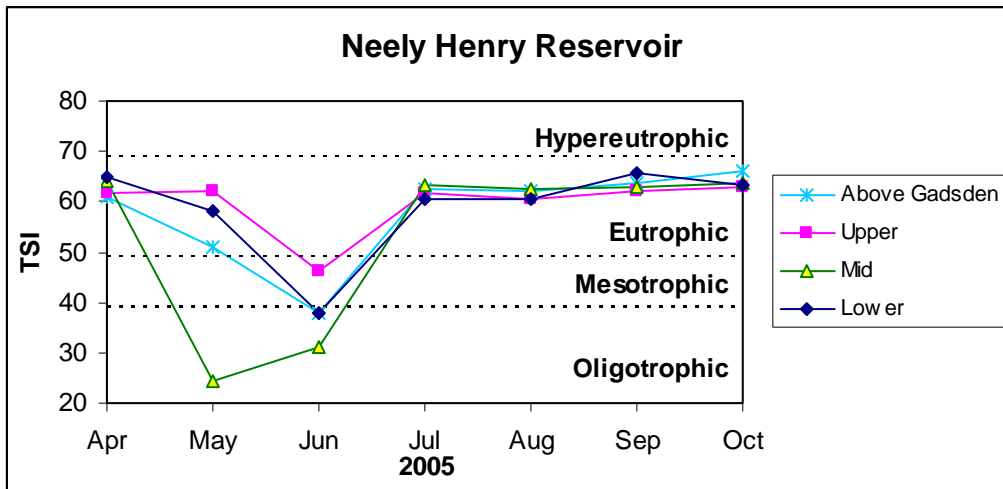
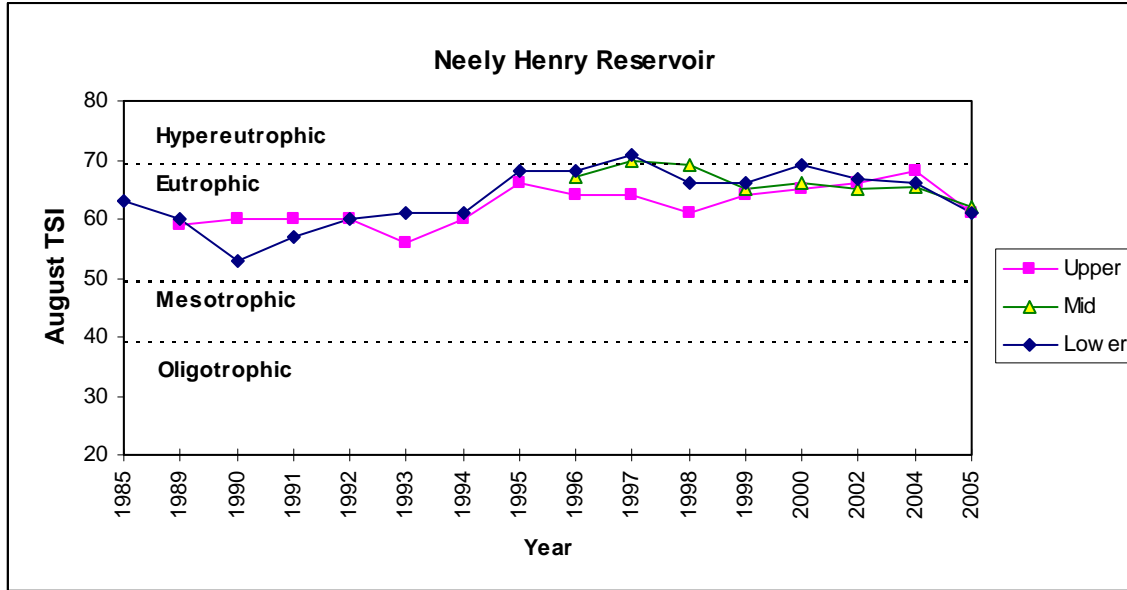


Figure 10. Trophic State Index values from critical period sampling (August sampling only) from 1985 to 2005.



REFERENCES

- ADEM. 2008 (as amended). Standard Operating Procedures #2041 *In Situ* Surface Water Quality Field Measurements-Temperature, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2008 (as amended). Standard Operating Procedures #2042 *In Situ* Surface Water Quality Field Measurements-pH, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2008 (as amended). Standard Operating Procedures #2043 *In Situ* Surface Water Quality Field Measurements-Conductivity, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2044 *In Situ* Surface Water Quality Field Measurements-Turbidity, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2008 (as amended). Standard Operating Procedures #2045 *In Situ* Surface Water Quality Field Measurements-Dissolved Oxygen, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2046 Photic Zone Measurement and Visibility Determination, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2061 General Surface Water Sample Collection, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2062 Dissolved Reactive Phosphorus (DRP) Surface Water Sample Collection and Field Processing, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2063 Water Column Chlorophyll *a* Sample Collection and Field Processing, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- Alabama Department of Environmental Management Water Division (ADEM Admin. Code R. 335-6-10-.09). 2005. Specific Water Quality Criteria. Water Quality Program. Chapter 10. Volume 1. Division 335-6.
- Alabama Department of Environmental Management Water Division (ADEM Admin. Code R. 335-6-10-.11). 2005. Water Quality Criteria Applicable to Specific Lakes. Water Quality Program. Chapter 10. Volume 1. Division 335-6.
- American Public Health Association, American Water Works Association and Water Pollution Control Federation. 1998. Standard methods for the examination of water and wastewater. 20th edition. APHA, Washington, D.C.

- Carlson, R.E. 1977. A trophic state index. *Limnology and Oceanography*. 22(2):361-369.
- Lind, O.T. 1979. *Handbook of common methods in limnology*. The C.V. Mosby Co., St. Louis, Missouri. 199 pp.
- Raschke, R.L. and D.A. Schultz. 1987. The use of the algal growth potential test for data assessment. *Journal of Water Pollution Control Federation* 59(4):222-227.
- U.S. Environmental Protection Agency. 1990. *The lake and reservoir restoration guidance manual*. 2nd edition. EPA-440/4-90-006. U.S.E.P.A. Office of Water. Washington, D.C. 326 pp.
- Welch, E.B. 1992. *Ecological Effects of Wastewater*. 2nd edition. Chapman and Hall Publishers. London, England. 425 pp.
- Wetzel, R.G. 1983. *Limnology*. 2nd edition. Saunders College Publishing. Philadelphia, Pennsylvania. 858 pp.

APPENDIX

Appendix Table 1. Summary of water quality data collected April-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median (Med), average (Ave), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Station	Parameter	N	Min	Max	Median	Avg	SD
NEES-1	Alkalinity (mg/L)	7	38.8	65.1	52.2	53.5	9.4
	Hardness (mg/L)	4	49.9	70.9	56.1	58.2	9.7
	Total Dissolved Solids (mg/L)	7	27.0	94.0	68.0	61.7	25.9
	Total Suspended Solids (mg/L)	7	5.0	24.0	11.0	12.9	6.7
	Ammonia Nitrogen (mg/L)	7	0.015	0.060	0.008	0.022	0.021
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.002	0.664	0.098	0.147	0.236
	Total Kjeldahl Nitrogen (mg/L)	7	0.375	0.882	0.680	0.665	0.178
	Total Nitrogen (mg/L)	7	0.594	1.039	0.789	0.812	0.170
	Total Phosphorus (mg/L)	7	< 0.004	0.092	0.055	0.053	0.028
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.016	0.007	0.008	0.006
	Chlorophyll a (mg/L) ^d	7	2.14	35.78	21.36	22.48	11.35
	Turbidity (NTU)	7	9	18	11	13	3
	Secchi (m)	7	0.63	0.90	0.69	0.71	0.09
	Fecal Coliform (col/100 mL) ^d	1	---	---	---	2	---
NEES-2	Alkalinity (mg/L)	7	37.9	71.8	49.1	52.7	12.5
	Hardness (mg/L)	4	38.5	67.9	51.6	52.4	12.4
	Total Dissolved Solids (mg/L)	7	27.0	112.0	79.0	69.7	33.1
	Total Suspended Solids (mg/L)	7	4.0	18.0	10.0	11.3	5.4
	Ammonia Nitrogen (mg/L)	7	0.015	0.036	0.008	0.015	0.012
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.006	0.163	0.087	0.082	0.055
	Total Kjeldahl Nitrogen (mg/L)	7	0.205	1.201	0.551	0.562	0.335
	Total Nitrogen (mg/L)	7	0.292	1.207	0.576	0.644	0.306
	Total Phosphorus (mg/L)	7	< 0.004	0.087	0.063	0.059	0.028
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.028	0.005	0.008	0.009
	Chlorophyll a (mg/L) ^d	7	4.98	26.70	24.03	21.49	7.46
	Turbidity (NTU)	7	9	15	10	11	2
	Secchi (m)	7	0.68	0.97	0.77	0.77	0.09
	Fecal Coliform (col/100 mL)	1	---	---	---	24	---
NEES-2B	Alkalinity (mg/L)	7	37.6	69.3	49.7	52.9	11.3
	Hardness (mg/L)	4	40.4	63.8	53.0	52.6	10.0
	Total Dissolved Solids (mg/L)	7	41.0	111.0	87.0	84.4	21.6
	Total Suspended Solids (mg/L)	7	5.0	21.0	9.0	11.4	6.0
	Ammonia Nitrogen (mg/L)	7	0.015	0.049	0.008	0.016	0.016
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.002	0.179	0.030	0.061	0.068
	Total Kjeldahl Nitrogen (mg/L)	7	0.271	1.097	0.509	0.605	0.260
	Total Nitrogen (mg/L)	7	0.450	1.100	0.609	0.667	0.222
	Total Phosphorus (mg/L)	7	< 0.004	0.082	0.067	0.054	0.028
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.023	0.002	0.006	0.008
	Chlorophyll a (mg/L) ^d	7	2.14	37.38	24.56	21.33	12.29
	Turbidity (NTU)	7	8	15	8	9	2
	Secchi (m)	7	0.66	1.03	0.73	0.78	0.12
	Fecal Coliform (col/100 mL) ^d	1	---	---	---	1	---

Station	Parameter	N	Min	Max	Median	Avg	SD
NEES-3	Alkalinity (mg/L)	7	38.4	69.4	55.7	55.0	10.9
	Hardness (mg/L)	4	46.3	66.4	57.3	56.8	8.7
	Total Dissolved Solids (mg/L)	7	56.0	100.0	88.0	87.4	15.2
	Total Suspended Solids (mg/L)	7	5.0	18.0	10.0	10.9	4.4
	Ammonia Nitrogen (mg/L)	7	0.015	0.054	0.008	0.020	0.022
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.039	0.148	0.124	0.097	0.051
	Total Kjeldahl Nitrogen (mg/L)	7	0.428	1.223	0.543	0.623	0.269
	Total Nitrogen (mg/L)	7	0.567	1.268	0.651	0.719	0.248
	Total Phosphorus (mg/L)	7	< 0.062	0.099	0.074	0.079	0.015
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.030	0.009	0.012	0.010
	Chlorophyll a (mg/L) ^d	7	0.53	30.44	27.06	20.19	13.33
	Turbidity (NTU)	7	11	18	12	13	2
	Secchi (m)	7	0.57	0.89	0.62	0.67	0.11
	Fecal Coliform (col/100 mL) ^d	1	---	---	---	10	---
NEES-5	Alkalinity (mg/L)	7	49.2	70.9	61.8	61.0	7.5
	Hardness (mg/L)	4	58.9	73.5	65.0	65.6	6.0
	Total Dissolved Solids (mg/L)	7	51.0	139.0	90.0	94.9	27.1
	Total Suspended Solids (mg/L)	7	7.0	33.0	24.0	22.0	8.2
	Ammonia Nitrogen (mg/L)	7	0.015	0.073	0.008	0.019	0.025
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.002	0.113	0.064	0.050	0.040
	Total Kjeldahl Nitrogen (mg/L)	7	0.173	0.807	0.543	0.531	0.193
	Total Nitrogen (mg/L)	7	0.238	0.851	0.607	0.582	0.198
	Total Phosphorus (mg/L)	7	< 0.025	0.077	0.043	0.051	0.022
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.079	0.009	0.018	0.027
	Chlorophyll a (mg/L) ^d	7	1.60	23.14	18.16	13.32	8.81
	Turbidity (NTU)	7	8	29	21	19	8
	Secchi (m)	7	0.39	1.20	0.49	0.63	0.28
	Fecal Coliform (col/100 mL) ^d	1	---	---	---	12	---
NEES-6	Alkalinity (mg/L)	7	107.4	140.9	123.5	122.5	11.7
	Hardness (mg/L)	4	114.0	147.0	124.0	127.3	14.8
	Total Dissolved Solids (mg/L)	7	31.0	204.0	137.0	141.7	62.8
	Total Suspended Solids (mg/L)	7	3.0	47.0	22.0	22.3	13.0
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.026	0.008	0.010	0.007
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.139	0.672	0.505	0.446	0.208
	Total Kjeldahl Nitrogen (mg/L)	7	0.150	1.190	0.575	0.616	0.348
	Total Nitrogen (mg/L)	7	0.663	1.329	1.030	1.073	0.234
	Total Phosphorus (mg/L)	7	0.144	0.415	0.231	0.246	0.091
	Dissolved Reactive Phosphorus (mg/L)	7	0.077	0.350	0.182	0.184	0.089
	Chlorophyll a (mg/L) ^d	7	1.60	58.21	21.36	24.56	23.32
	Turbidity (NTU)	7	17	40	22	24	7
	Secchi (m)	7	0.40	0.60	0.48	0.49	0.08
	Fecal Coliform (col/100 mL)	1	---	---	---	73	---
NEES-7	Alkalinity (mg/L)	7	32.8	96.1	61.9	59.4	23.0
	Hardness (mg/L)	4	38.6	99.1	71.2	70.0	26.2
	Total Dissolved Solids (mg/L)	7	42.0	162.0	100.0	97.7	39.9
	Total Suspended Solids (mg/L)	7	4.0	22.0	14.0	14.7	6.6
	Ammonia Nitrogen (mg/L)	7	0.015	0.073	0.008	0.020	0.025
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.002	0.261	0.061	0.088	0.094
	Total Kjeldahl Nitrogen (mg/L)	7	0.300	0.925	0.702	0.708	0.208
	Total Nitrogen (mg/L)	7	0.428	0.990	0.877	0.797	0.196
	Total Phosphorus (mg/L)	7	< 0.029	0.099	0.080	0.072	0.026

Station	Parameter	N	Min	Max	Median	Avg	SD
NEES-7	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.019	0.007	0.008	0.006
	Chlorophyll a (mg/L) ^J	7	2.14	49.66	13.35	20.52	16.82
	Turbidity (NTU)	7	11	21	16	17	3
	Secchi (m)	7	0.41	0.74	0.51	0.55	0.12
	Fecal Coliform (col/100 mL)	1	---	---	---	36	---
NEES-8	Alkalinity (mg/L)	7	54.3	90.9	62.7	64.3	12.9
	Hardness (mg/L)	4	57.2	74.8	64.8	65.4	7.2
	Total Dissolved Solids (mg/L)	7	43.0	135.0	89.0	88.4	28.6
	Total Suspended Solids (mg/L)	7	4.0	18.0	11.0	12.0	5.0
	Ammonia Nitrogen (mg/L)	7	0.015	0.032	0.008	0.014	0.011
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.002	0.104	0.001	0.030	0.041
	Total Kjeldahl Nitrogen (mg/L)	7	0.412	0.738	0.633	0.598	0.131
	Total Nitrogen (mg/L)	7	0.434	0.741	0.688	0.630	0.124
	Total Phosphorus (mg/L)	7	< 0.004	0.083	0.060	0.053	0.026
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.008	0.002	0.004	0.003
	Chlorophyll a (mg/L) ^J	7	4.81	36.85	24.56	22.91	12.61
	Turbidity (NTU)	7	7	11	9	9	1
	Secchi (m)	7	0.66	0.99	0.81	0.82	0.14
	Fecal Coliform (col/100 mL)	1	---	---	---	1	---
NEES-9	Alkalinity (mg/L)	7	43.0	71.0	54.5	55.8	10.3
	Hardness (mg/L)	4	50.0	69.2	55.8	57.7	8.4
	Total Dissolved Solids (mg/L)	7	40.0	105.0	75.0	73.7	23.5
	Total Suspended Solids (mg/L)	7	7.0	19.0	16.0	14.3	4.5
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.029	0.008	0.014	0.009
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.122	0.001	0.041	0.052
	Total Kjeldahl Nitrogen (mg/L)	7	0.422	0.990	0.544	0.578	0.190
	Total Nitrogen (mg/L)	7	0.480	0.993	0.584	0.620	0.180
	Total Phosphorus (mg/L)	7	< 0.004	0.090	0.058	0.055	0.028
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.017	0.002	0.006	0.006
	Chlorophyll a (mg/L) ^J	7	1.07	34.18	32.24	24.13	13.37
	Turbidity (NTU)	7	12	17	16	15	2
	Secchi (m)	7	0.47	0.86	0.59	0.60	0.12
	Fecal Coliform (col/100 mL) ^J	1	---	---	---	5	---
NEES-10	Alkalinity (mg/L)	7	49.9	80.8	65.0	65.3	10.2
	Hardness (mg/L)	4	57.5	80.9	73.5	71.4	9.9
	Total Dissolved Solids (mg/L)	7	70.0	116.0	78.0	84.4	16.8
	Total Suspended Solids (mg/L)	7	5.0	26.0	11.0	12.3	7.0
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.024	0.008	0.010	0.006
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.103	0.001	0.026	0.039
	Total Kjeldahl Nitrogen (mg/L)	7	0.293	1.065	0.490	0.631	0.278
	Total Nitrogen (mg/L)	7	0.318	1.115	0.593	0.658	0.280
	Total Phosphorus (mg/L)	7	< 0.004	0.083	0.056	0.049	0.031
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.017	0.002	0.006	0.006
	Chlorophyll a (mg/L) ^J	7	2.14	27.23	18.69	19.28	8.57
	Turbidity (NTU)	7	7	12	8	9	2
	Secchi (m)	7	0.74	0.96	0.88	0.85	0.09
	Fecal Coliform (col/100 mL)	1	---	---	---	1	---

J=one or more of the values provided are estimated; < = Actual value is less than the detection limit