

***2006 Demopolis Reservoir Report***  
*Rivers and Reservoirs Monitoring Program*

---



Field Operations Division  
Environmental Indicators Section  
Aquatic Assessment Unit  
May 2011

# **Rivers and Reservoirs Monitoring Program**

**2006**

## **Demopolis Reservoir**

Tombigbee River Basin

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

**May 2011**

## Table of Contents

<b>LIST OF FIGURES .....</b>	<b>4</b>
<b>LIST OF TABLES .....</b>	<b>5</b>
<b>INTRODUCTION.....</b>	<b>6</b>
<b>METHODS .....</b>	<b>7</b>
<b>RESULTS .....</b>	<b>10</b>
<b>REFERENCES.....</b>	<b>21</b>
<b>APPENDIX.....</b>	<b>23</b>

**LIST OF FIGURES**

**Figure 1. Demopolis Reservoir with 2006 sampling locations ..... 8**

**Figure 2. Mean total nitrogen (TN), mean total phosphorus (TP), mean chlorophyll *a* (chl *a*), and mean total suspended solids (TSS) measured throughout Demopolis Reservoir, April-October 2006 ..... 12**

**Figure 3. Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the upper station in Demopolis Reservoir, April-October 2006..... 13**

**Figure 4. Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the mid station in Demopolis Reservoir, April-October 2006..... 14**

**Figure 5. Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the dam forebay station in Demopolis Reservoir, April-October 2006 ..... 15**

**Figure 6. Mean chlorophyll *a* concentrations of mainstem Demopolis Reservoir, 2001 through 2006..... 16**

**Figure 7. Monthly depth profiles of dissolved oxygen (DO) and temperature (Temp) in Demopolis Reservoir, June-September 2006..... 17**

**Figure 8. Monthly Dissolved oxygen (DO) concentrations at 5 ft (1.5 m) for Demopolis Reservoir tributaries collected April-October 2006 ..... 18**

**Figure 9. Monthly Trophic State Index (TSI) values for mainstem and tributary stations using chlorophyll *a* concentrations and Carlson’s TSI calculation, April-October 2006..... 19**

**Figure 10. Trophic State Index values from critical period sampling (August sampling only) from 1985 to 2006..... 20**

**LIST OF TABLES**

**Table 1. Descriptions of the 2006 monitoring stations in Demopolis Reservoir..... 9**

**Table 2. Algal growth potential test results (expressed as mean Maximum Standing Crop (MSC) dry weights of *Selenastrum capricornutum* in mg/l) and limiting nutrient status..... 16**

**Appendix Table 1. Summary of water quality data collected April-October, 2006 ..... 24**

## INTRODUCTION

Demopolis Reservoir was constructed in the early 1950s by the U.S. Army Corps of Engineers. Located near the city of Demopolis in Marengo County, the 10,000 acre impoundment is the largest reservoir in the Tombigbee/Black Warrior system, extending 48 miles up the Black Warrior River and 53 miles up the Tombigbee River.

The Alabama Department of Environmental Management (ADEM) intensively monitored Demopolis Reservoir as part of the 2006 assessment of the Escatawpa, Mobile and Tombigbee River basins under the Rivers and Reservoirs Monitoring Program (RRMP). Implemented in 1990, the objectives of this program are 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. Descriptions of all RRMP monitoring activities are available in ADEM's 2005 monitoring strategy.

The ADEM implemented a specific water quality criterion for nutrient management in 2005 at one location on Demopolis Reservoir, which has been monitored by ADEM since the mid-80's. This criterion represents the maximum growing season (Apr-Oct) mean chlorophyll *a* (chl *a*) concentration allowable while still fully supporting the reservoir's Swimming and Fish and Wildlife [S/F&W] use classification.

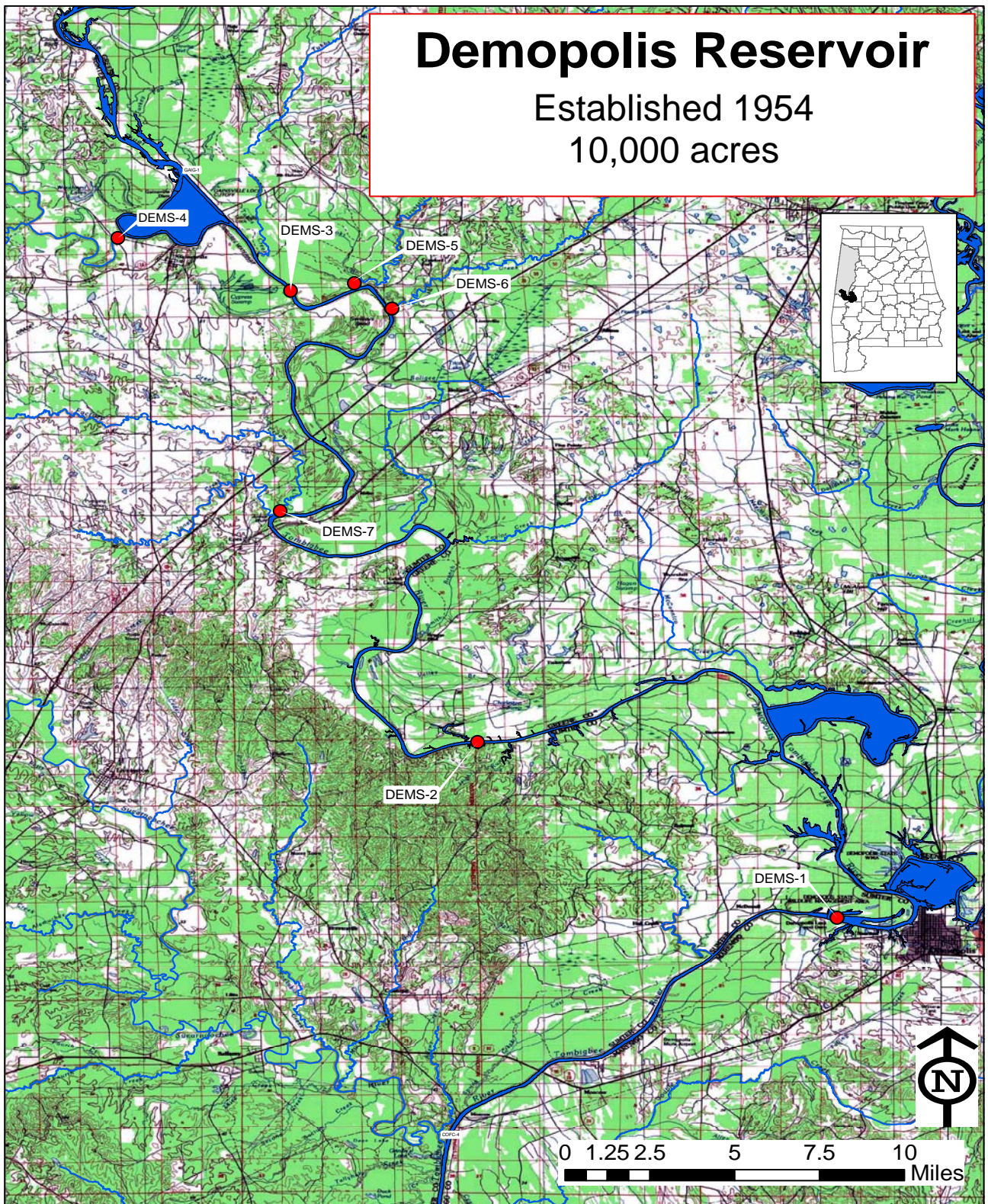
The purpose of this report is to summarize data collected at seven stations in Demopolis Reservoir during the 2006 growing season and to evaluate trends in mean lake trophic status and nutrient concentrations using ADEM's historic dataset. Monthly and mean concentrations of nutrients [total nitrogen (TN); total phosphorus (TP)], algal biomass/productivity [chl *a*; algal growth potential testing (AGPT)], sediment [total suspended solids (TSS)], and trophic state [Carlson's Trophic State Index (TSI)] were compared to ADEM's existing data and established criteria.

## METHODS

Sampling stations were determined using historical data and previous assessments ([Fig. 1](#)). Specific location information is listed in [Table 1](#). Demopolis was sampled in the dam forebay, mid and upper reservoir areas. Four stations within the Noxubee River, Trussels Creek, Brush Creek, and Factory Creek embayments were also sampled.

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 (ADEM 2007), Surface Water Quality Assurance Project Plan (ADEM 2005) and Quality Management Plan (ADEM 2003).

Mean growing season TN, TP, chl *a*, and TSS were calculated to evaluate water quality conditions at each site. For mainstem stations, monthly concentrations of these parameters were graphed with the closest available USGS flow data and ADEM's previously collected data to help interpret the 2006 results.



**Figure 1.** Demopolis Reservoir with 2006 sampling locations. A description of each sampling location is provided in Table 1.



**Table 1.** Descriptions of the 2006 monitoring stations in Demopolis Reservoir.

<b>Demopolis Reservoir</b>								
<b>HUC</b>	<b>County</b>	<b>Station Number</b>	<b>Report Designation</b>	<b>Waterbody Name</b>	<b>Station Description</b>	<b>Chl <i>a</i> Criteria</b>	<b>Latitude</b>	<b>Longitude</b>
0316-0201-0401	Sumter	DEMS-1*	Lower	Tombigbee R	Lower reservoir. Deepest point, main river channel, dam forebay.	10 µg/l	32.5201	-87.8748
0316-0106-0707	Greene	DEMS-2	Mid	Tombigbee R	Mid reservoir. Deepest point, main river channel. Downstream of Cobb Creek confluence.		32.5994	-88.0281
0316-0106-0609	Greene	DEMS-3	Upper	Tombigbee R	Upper reservoir. Deepest point and main river channel approx. two miles downstream of Tubbs Creek confluence.		32.8036	-88.1078
0316-0108-1102	Sumter	DEMS-4	Noxubee R	Noxubee R	Deepest point, Noxubee River channel, approx. 1 mile upstream of Tombigbee River confluence.		32.8274	-88.1816
0316-0106-0606	Greene	DEMS-5	Trussels Cr	Trussels Cr	Deepest point, main creek channel, Trussels Cr embayment, approx. 0.5 miles upstream of confluence with Tombigbee River.		32.8070	-88.0807
0316-0106-0607	Greene	DEMS-6	Brush Cr	Brush Cr	Deepest point, main creek channel, Brush Cr embayment, approx. 0.5 miles upstream of confluence with Tombigbee River.		32.7954	-88.0646
0316-0106-0702	Sumter	DEMS-7	Factory Cr	Factory Cr	Deepest point, main creek channel, Factory Cr embayment, approx. 0.5 miles upstream of confluence with Tombigbee River.		32.7040	-88.1122

\*Growing season mean chl *a* criteria established at this station in 2005

## RESULTS

Summary statistics of all data collected during 2006 are presented in [Appendix Table 1](#). The table contains the minimum, maximum, median, mean, and standard deviation of each parameter analyzed.

**Mainstem Stations:** Mean TN concentration was highest at the upper mainstem station and decreased downstream ([Fig. 2](#)). Monthly TN concentrations were generally similar Apr-Sep at all of the mainstem stations, however, concentrations in October more than doubled from the previous month, which parallels a marked increase in discharge ([Fig. 3, 4, & 5](#)).

Mean TP concentrations were highest at the upper reservoir location and decreased downstream ([Fig. 2](#)). Monthly TP concentrations were below historic means April through September for the mid and upper mainstem stations, and April through July for the lower station ([Fig. 3, 4, & 5](#)). Monthly TP concentrations in October were the highest of the season at all mainstem stations, when the reservoir experienced a late surge in discharge ([Fig. 3, 4, & 5](#)).

The mean chl *a* concentration measured at the upper station was almost double the concentration of either the mid or lower stations ([Fig. 2](#)), primarily due to the chl *a* concentration measured at the upper station in June (36.3 µg/l) ([Fig. 3](#)). Although growing season mean concentrations at the upper station increased each year sampled, the mid and lower stations were generally stable ([Fig. 6](#)). Specific water quality criteria for nutrient management was implemented at the lower station in 2005. The 2006 mean chl *a* concentration measured at the lower station was in compliance with the criteria limit ([Fig. 6](#)).

The mean TSS concentration was highest in the upper station and declined downstream ([Fig. 2](#)). When discharge surged in October, the monthly TSS concentration also spiked. The measured concentration in October was over seven times higher in the upper station and four times higher in the mid station than the concentrations in September ([Fig. 3 & 4](#)).

As in 2001, AGPT results for 2006 indicated that the upper and lower reservoir were nitrogen and phosphorus limited, respectively ([Table 2](#)). At mid reservoir however, AGPT results for the mid station indicated nitrogen as the limiting nutrient instead of phosphorus.

Dissolved oxygen profiles of the mainstem stations indicated the reservoir was stratified at the lower station during June and July ([Fig. 7](#)). The mid and upper stations remained well mixed throughout the sampling period. At the lower reservoir station, DO concentrations were just above the standard June, July, and August ([Fig. 7](#)). The warmest water temperatures were reached in July and August at all mainstem locations ([Fig. 7](#)).

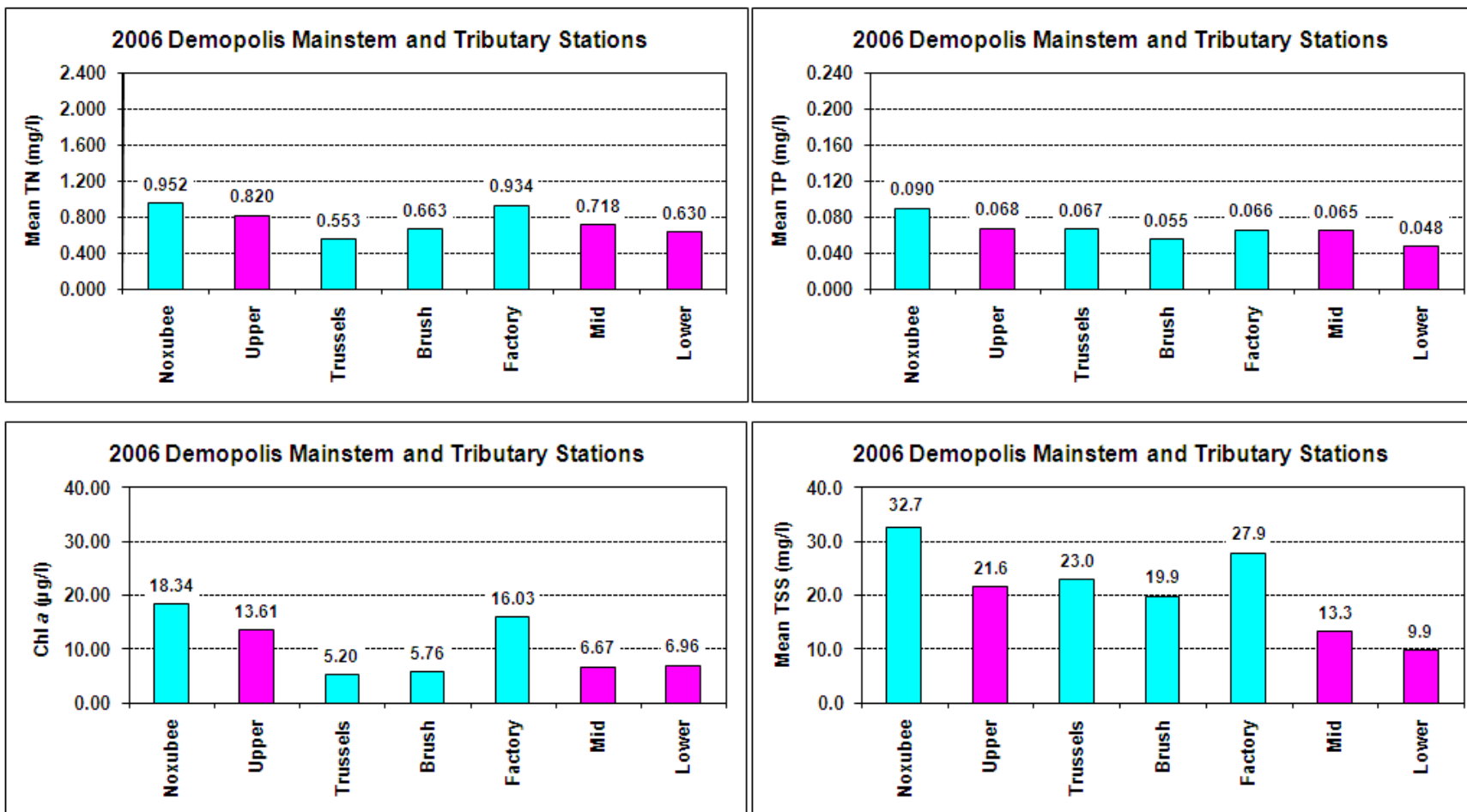
Monthly TSI values indicated mostly eutrophic conditions for most of the sampling season, with June being the month most variable among mainstem stations ([Fig. 9](#)). TSI values calculated from data collected at mainstem stations from 1985-2006 during the critical sampling period (August) are presented in [Fig. 10](#). August TSI values indicate an improving trend from 1997 to present.

**Tributaries:** The Noxubee R tributary embayment station measured the highest mean TN, TP, Chl *a*, and TSS of any tributary embayment in Demopolis Reservoir ([Fig. 2](#)). Lowest mean TN and chl *a* concentrations were measured in the Trussels Cr embayment station and lowest mean TP and TSS in the Brush Cr embayment ([Fig. 2](#)).

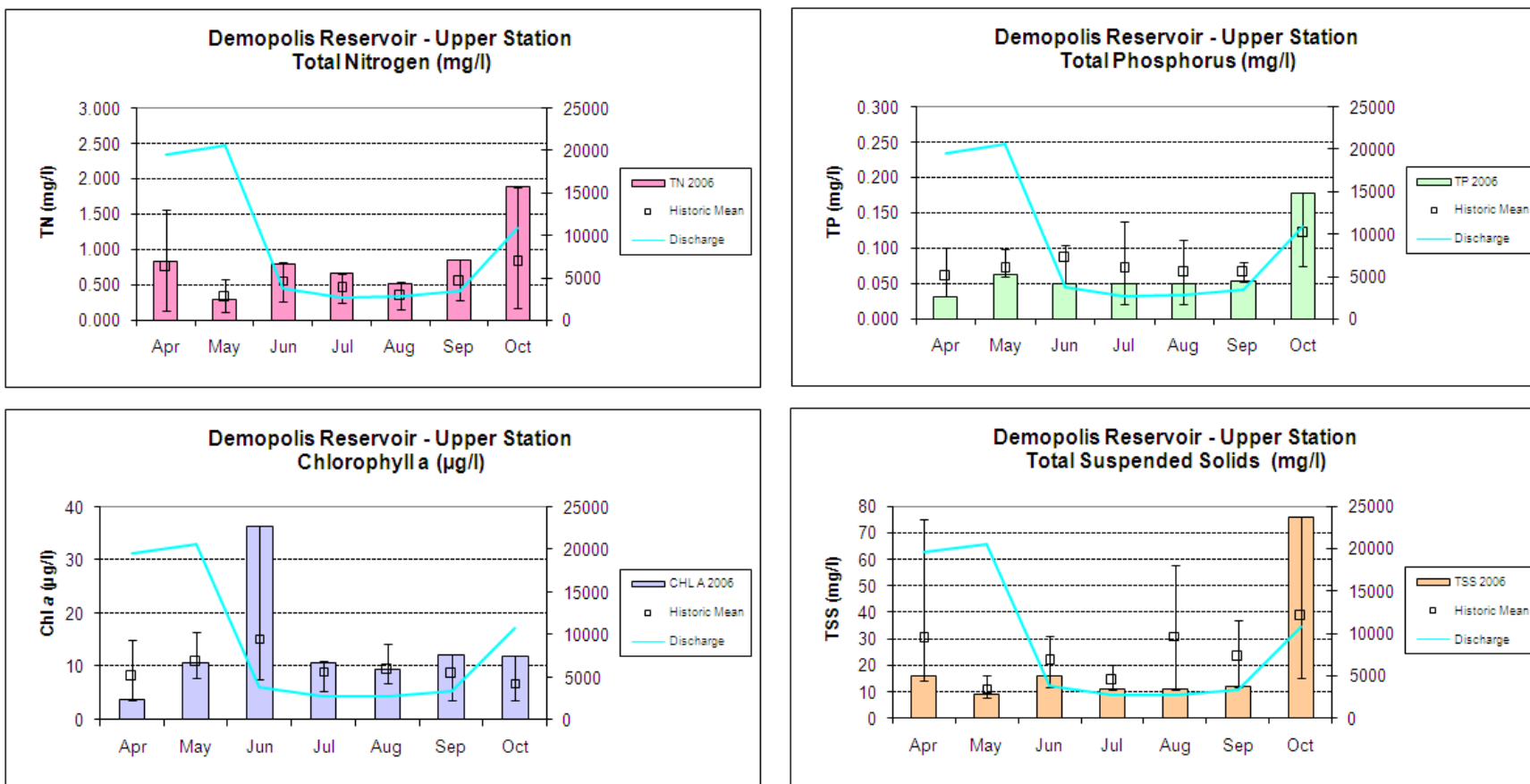
The dissolved oxygen concentration in Factory Cr was below the 5.0 mg/l criteria during April, May, and July. Trussels Cr fell below criteria in August. All other measurements of dissolved oxygen concentrations were above the ADEM criteria (ADEM Admin. Code R. 335-6-10-.09) limit of 5.0 mg/l. ([Fig. 8](#))

Monthly TSI values were calculated using chl *a* concentrations and Carlson's Trophic State Index. TSI values for all embayment stations were mesotrophic to eutrophic April-October with the exception of Trussels Cr in May and Brush Cr in July and October ([Fig. 9](#)). During these months, Trussels Cr and Brush Cr dropped to oligotrophic levels. During May, Factory Cr and Noxubee R were highly eutrophic ([Fig. 9](#)).

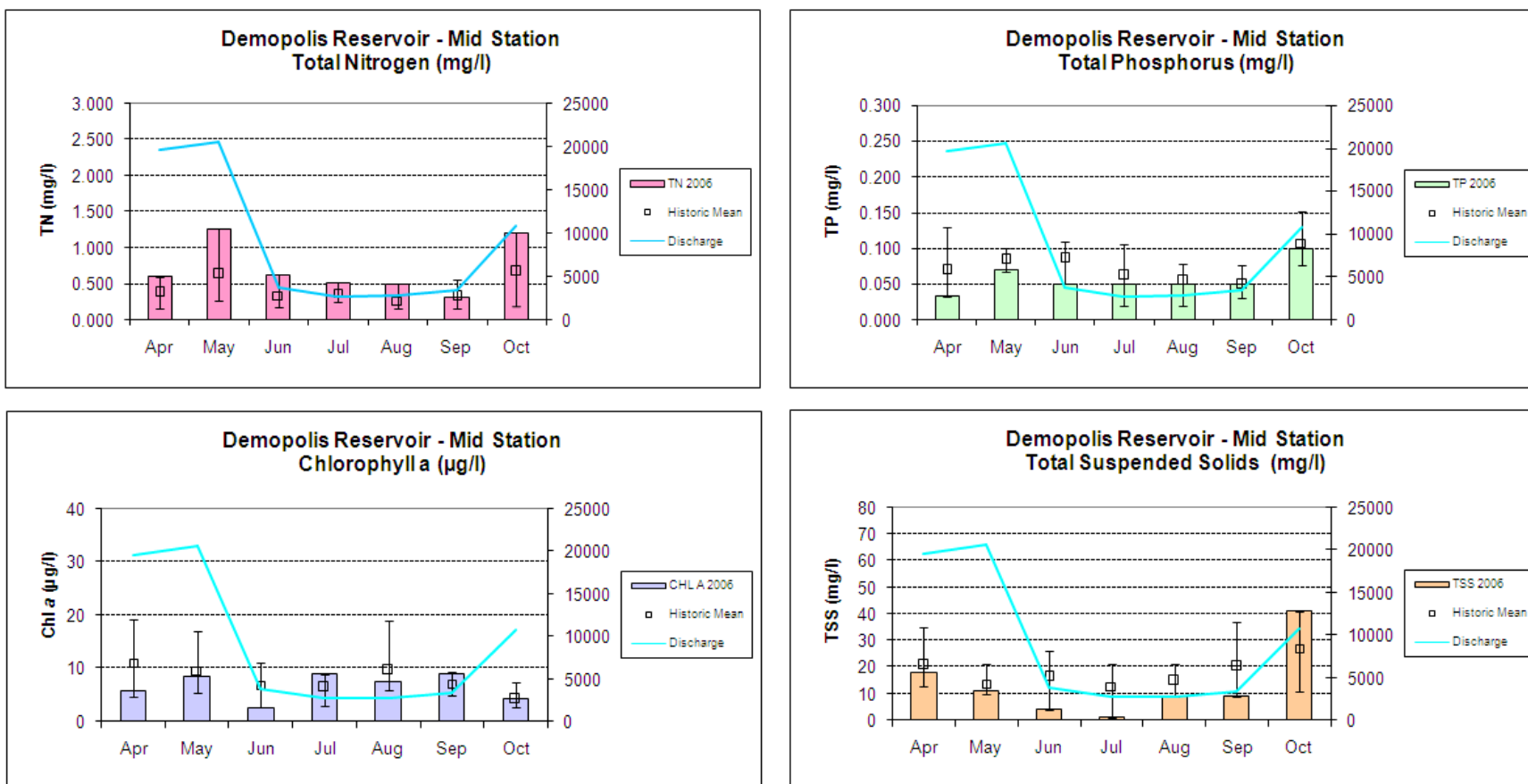
**Figure 2.** Mean total nitrogen (TN), mean total phosphorus (TP), mean chlorophyll *a* (chl *a*), and mean total suspended solids (TSS) measured throughout Demopolis Reservoir, April-October 2006. Bar graphs consist of mainstem (pink) and tributary embayment (blue) stations, illustrated from upstream to downstream as the graph is read from left to right.



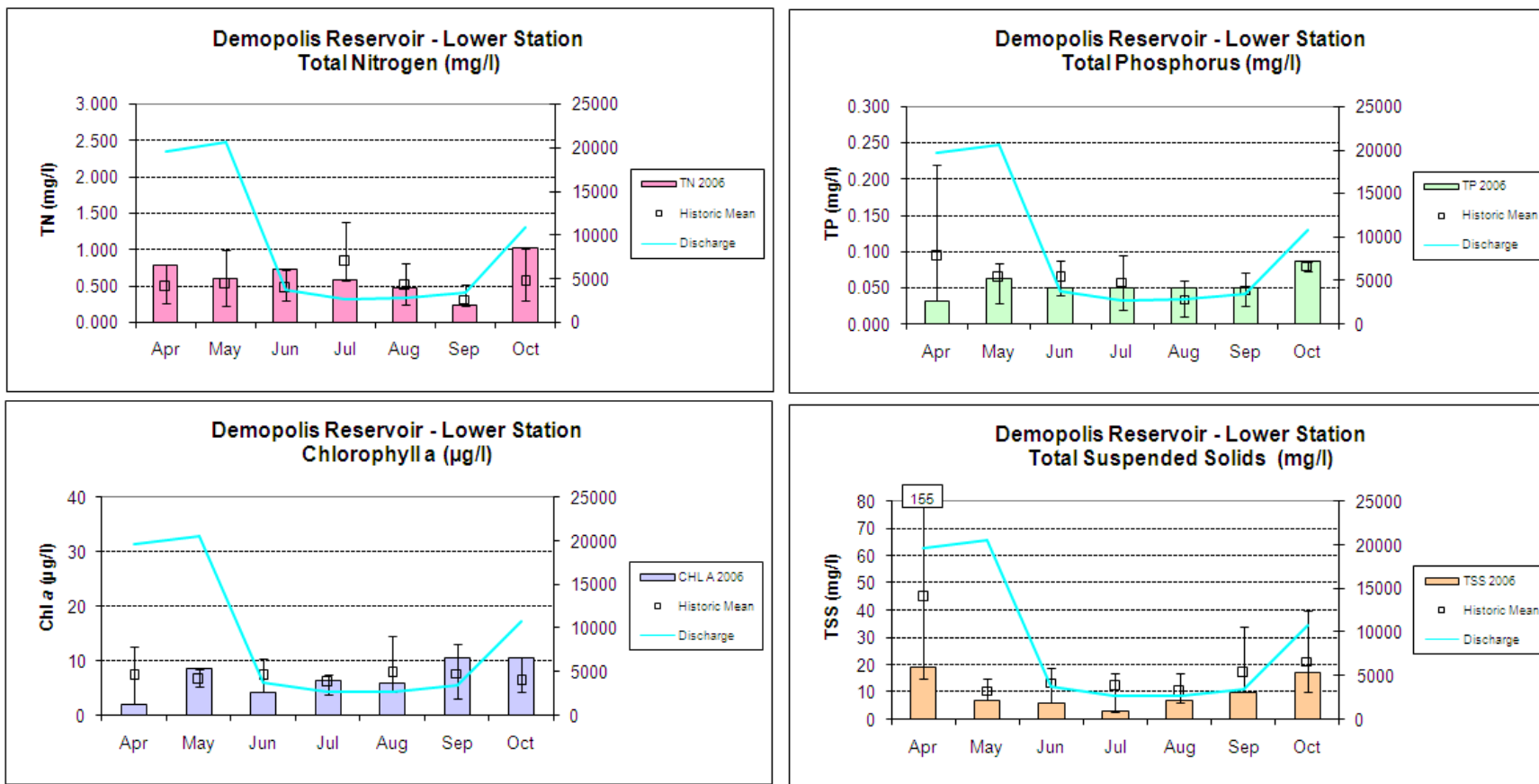
**Figure 3.** Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the upper station in Demopolis Reservoir, April-October 2006. Each bar graph depicts monthly changes in the variables at the upper station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS were plotted vs. discharge (USGS Tombigbee R gage at Demopolis Lock and Dam).



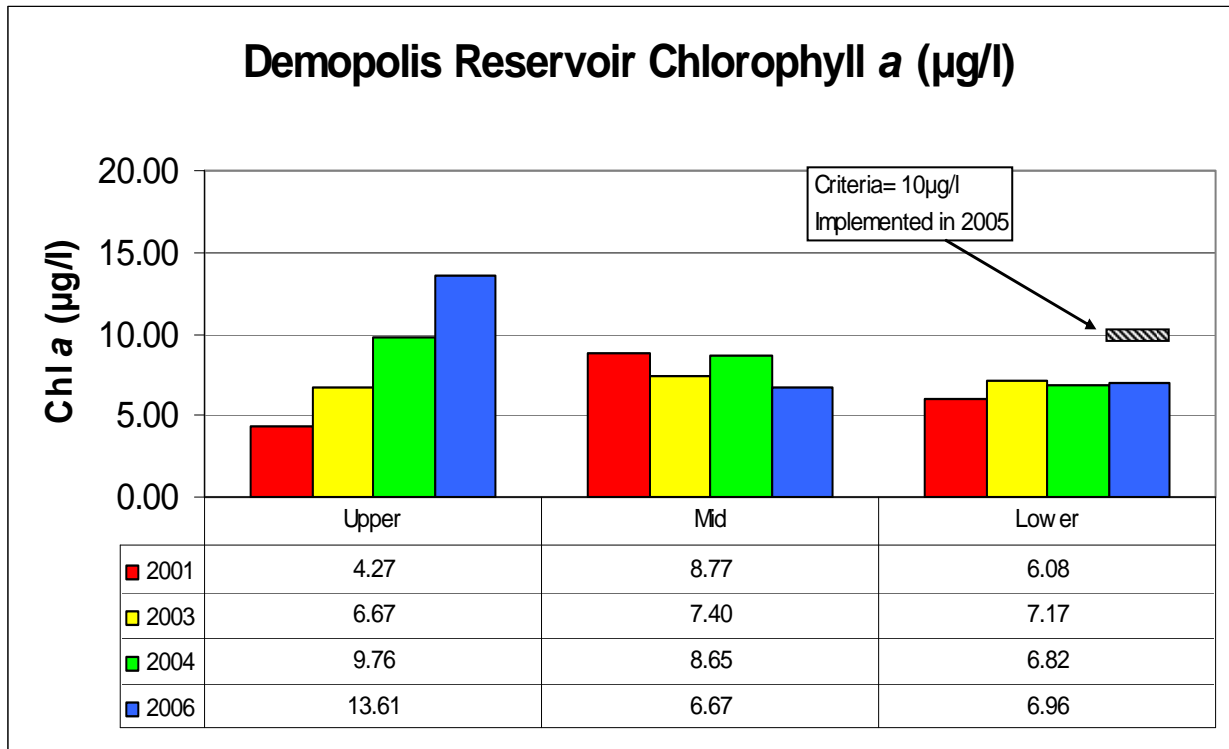
**Figure 4.** Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the mid station in Demopolis Reservoir, April-October 2006. Each bar graph depicts monthly changes in the variables at the mid-reservoir station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS were plotted vs. discharge (USGS Tombigbee R gage at Demopolis Lock and Dam).



**Figure 5.** Monthly total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (chl *a*), and total suspended solids (TSS) of the dam forebay station in Demopolis Reservoir, April-October 2006. 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 were plotted vs. discharge (USGS Tombigbee R gage at Demopolis Lock and Dam).



**Figure 6.** Mean chlorophyll *a* concentrations of mainstem Demopolis Reservoir, 2001 through 2006. Chlorophyll *a* criteria only apply to the growing season mean of the lower station.

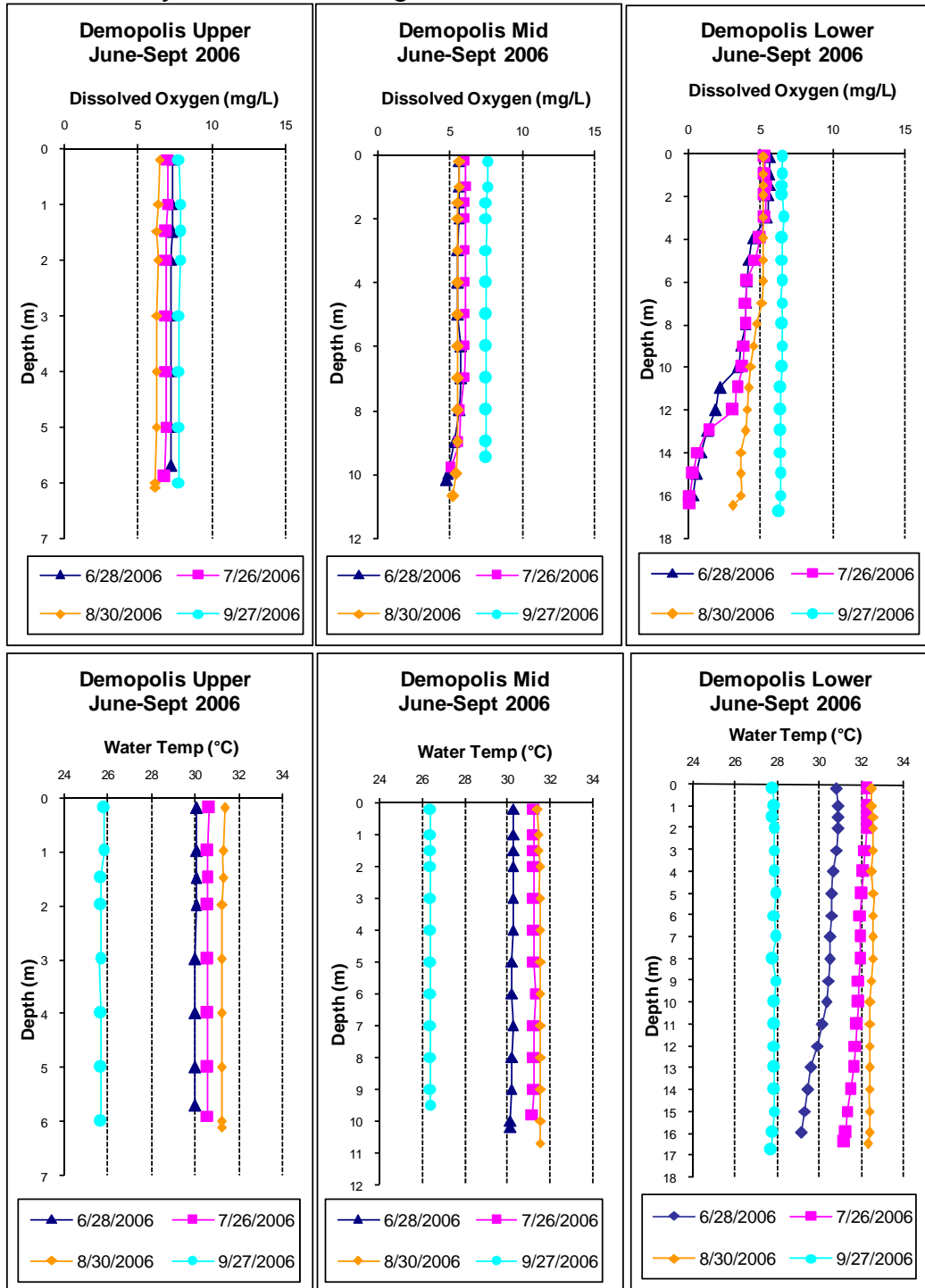


**Table 2.** Algal growth potential test results (expressed as mean Maximum Standing Crop (MSC) dry weights of *Selenastrum capricornutum* in mg/l) and limiting nutrient status. MSC values below 5 mg/l are considered to be protective in reservoirs and lakes; MSC values below 20 mg/l are considered protective of flowing streams and rivers. (Raschke and Schultz 1987).

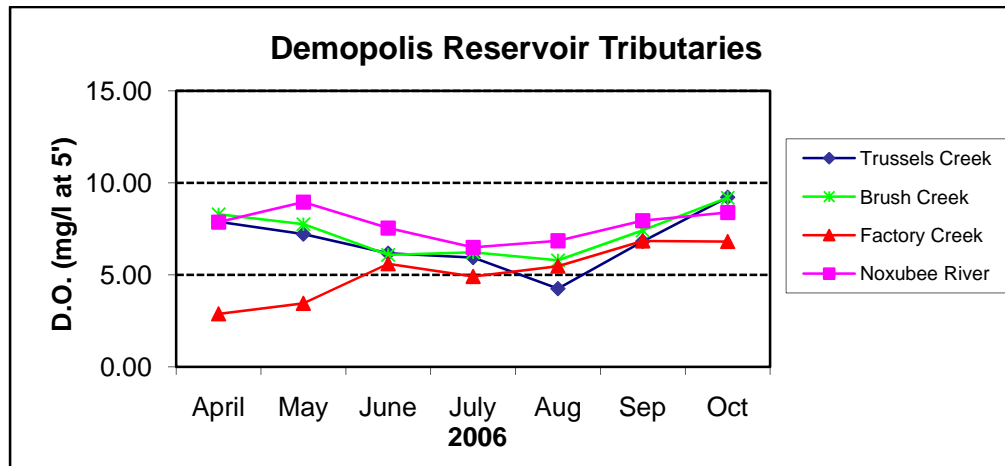
Station	2001 Control mean MSC	2001 Limiting Nutrient	2006 Control mean MSC	2006 Limiting Nutrient
Upper	3.53	Nitrogen	2.97	Nitrogen
Mid	3.57	Phosphorus	3.71	Nitrogen
Lower	3.91	Phosphorus	5.92	Phosphorus



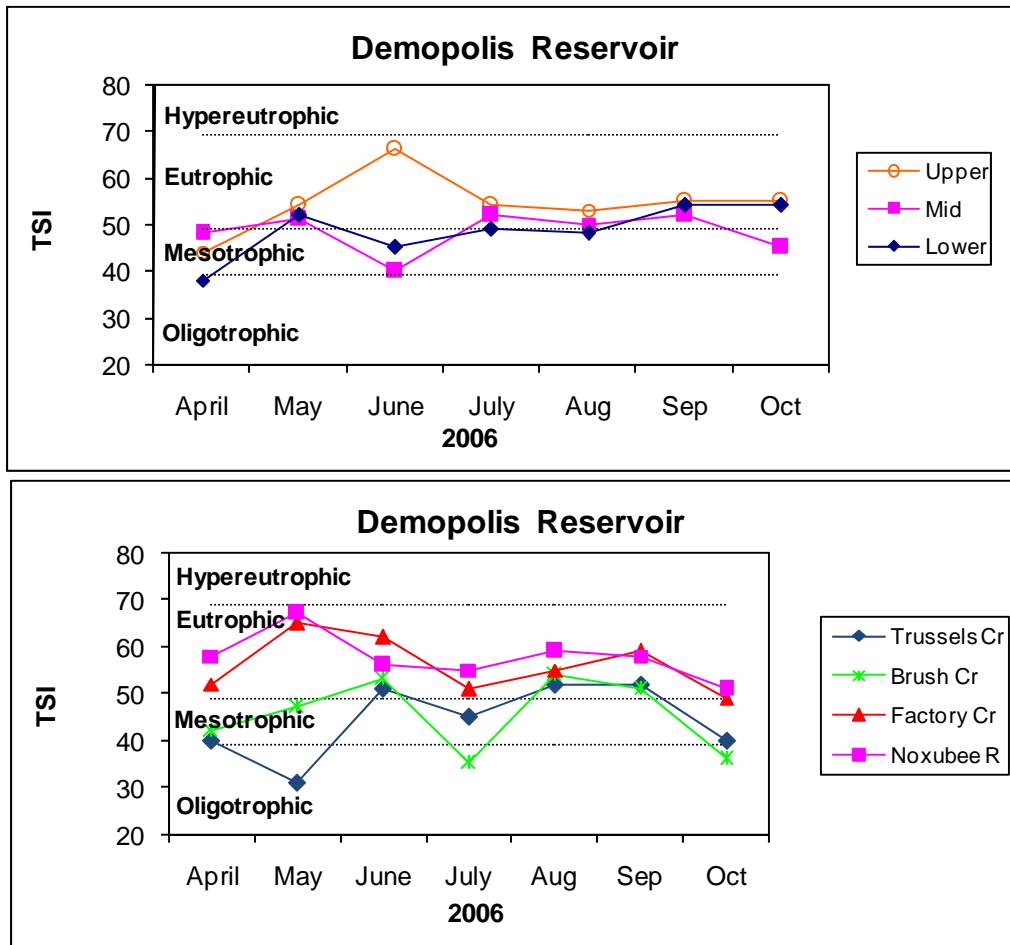
**Figure 7.** Monthly depth profiles of dissolved oxygen (DO) and temperature (Temp) in Demopolis Reservoir, June-September 2006. Although profiles were measured April-October, these select months were chosen as they represent the warmest water temperatures and most stratified dissolved oxygen concentrations. ADEM water quality criteria pertaining to non-wadeable river and reservoir waters require a DO concentration of 5.0 mg/l at 5.0 ft (1.5 m) (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.



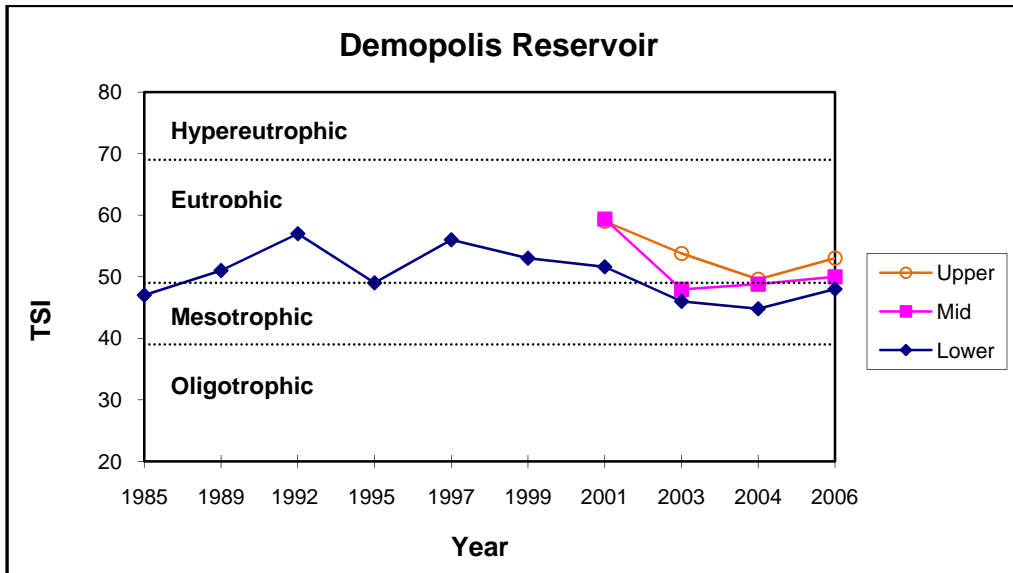
**Figure 8.** Monthly Dissolved oxygen (DO) concentrations at 5 ft (1.5 m) for Demopolis Reservoir tributaries collected April-October 2006. For tributary embayments, which are typically not as deep as mainstem stations and usually maintain a mixed water column throughout the season, profiles were collected, but only the monthly DO concentrations at a depth of 5 ft (1.5 m) or half depth (if <3m deep) were 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 Trophic State Index (TSI) values for mainstem and tributary stations using chlorophyll *a* concentrations and Carlson's TSI calculation, April-October 2006.



**Figure 10.** Trophic State Index values from critical period sampling (August sampling only) from 1985 to 2006.



## REFERENCES

- ADEM. 2003. Quality Assurance Management Plan For The Alabama Department Of Environmental Management (QMP). Alabama Department of Environmental Management (ADEM), Montgomery, AL. 25 pp.
- ADEM. 2005. Study Plan and Quality Assurance Project Plan (QAPP) for Surface Water Quality Monitoring of Non-Wadeable Rivers, Reservoirs, Tributary Embayments, and Estuarine/Marine Waters in Alabama. Alabama Department of Environmental Management (ADEM), Montgomery, AL. 110 pp.
- ADEM. 2007 (as amended). Standard Operating Procedures #2041 *In Situ* Surface Water Quality Field Measurements-Temperature, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (as amended). Standard Operating Procedures #2042 *In Situ* Surface Water Quality Field Measurements-pH, Alabama Department of Environmental Management (ADEM), Montgomery, AL.
- ADEM. 2007 (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. 2007 (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.
- Raschke, R. L., H. S. Howard, J. R. Maudsley, and R. J. Lewis. 1996. The Ecological Condition of Small Streams in the Savannah River Basin: A REMAP Progress Report. EPA Region 4, Science and Ecosystem Support Division, Ecological Assessment Branch, Athens, GA.
- U.S. Environmental Protection Agency. 1990. The lake and reservoir restoration guidance manual. 2<sup>nd</sup> 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. 2<sup>nd</sup> edition. Chapman and Hall Publishers. London, England. 425 pp.
- Wetzel, R.G. 1983. Limnology. 2<sup>nd</sup> edition. Saunders College Publishing. Philadelphia, Pennsylvania. 858 pp.

## APPENDIX

**Appendix Table 1.** Summary of water quality data collected April-October, 2006. Minimum (Min) and maximum (Max) values calculated using minimum detection limits when results were less than this value. Median, mean, and standard deviation (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Station	Parameter	N	Min	Max	Median	Mean	SD
<b>DEMS-1</b>	Alkalinity (mg/L)	7	39.2	64.8	49.2	51.9	8.3
	Total Dissolved Solids (mg/L)	7	97.0	207.0	136.0	148.4	38.4
	Total Suspended Solids (mg/L)	7	3.0	19.0	7.0	9.9	6.0
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.060	0.022	0.024	0.018
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.018	0.417	0.127	0.200	0.170
	Total Kjeldahl Nitrogen (mg/L)	7	0.213	0.606	0.430	0.431	0.156
	Total Nitrogen (mg/L)	7	0.230	1.020	0.600	0.630	0.250
	Total Phosphorus (mg/L)	7	< 0.004	0.100	0.050	0.048	0.026
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.020	0.002	0.006	0.007
	Chlorophyll a (mg/L)	7	2.14	10.68	6.49	6.96	3.21
	Turbidity (NTU)	7	6	19	9	11	5
	Secchi (m)	7	0.54	1.48	0.95	0.91	0.35
Fecal Coliform (col/100 mL) <sup>j</sup>	1	---	---	---	10	---	
<b>DEMS-2</b>	Alkalinity (mg/L)	7	39.1	58.9	46.6	48.9	7.4
	Total Dissolved Solids (mg/L)	7	75.0	187.0	109.0	119.1	39.2
	Total Suspended Solids (mg/L)	7	1.0	41.0	9.0	13.3	13.4
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.025	0.008	0.013	0.007
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.522	0.006	0.136	0.197
	Total Kjeldahl Nitrogen (mg/L)	7	0.313	1.008	0.518	0.582	0.224
	Total Nitrogen (mg/L)	7	0.320	1.260	0.600	0.720	0.366
	Total Phosphorus (mg/L)	7	0.033	0.152	0.050	0.065	0.040
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.055	0.002	0.011	0.020
	Chlorophyll a (mg/L)	7	2.67	9.08	7.48	6.67	2.49
	Turbidity (NTU)	7	6	47	14	17	14
	Secchi (m)	7	0.28	1.32	0.73	0.75	0.37
Fecal Coliform (col/100 mL) <sup>j</sup>	1	---	---	---	4	---	
<b>DEMS-3</b>	Alkalinity (mg/L)	7	32.7	55.4	46.8	45.4	9.2
	Total Dissolved Solids (mg/L)	7	79.0	204.0	104.0	117.7	44.9
	Total Suspended Solids (mg/L)	7	9.0	76.0	12.0	21.6	24.1
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.069	0.008	0.018	0.023
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.611	0.015	0.138	0.222
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	1.264	0.651	0.682	0.359
	Total Nitrogen (mg/L)	7	< 0.300	1.880	0.790	0.833	0.502
	Total Phosphorus (mg/L)	7	0.031	0.178	0.050	0.068	0.049
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.037	0.002	0.009	0.013
	Chlorophyll a (mg/L)	7	3.74	36.30	10.70	13.61	10.41
	Turbidity (NTU)	7	8	64	13	20	20
	Secchi (m)	7	0.27	1.11	0.67	0.69	0.31
Fecal Coliform (col/100 mL) <sup>j</sup>	1	---	---	---	1	---	



Station	Parameter	N	Min	Max	Median	Mean	SD
<b>DEMS-4</b>	Alkalinity (mg/L)	7	27.1	66.3	58.6	56.4	13.4
	Total Dissolved Solids (mg/L)	7	87.0	129.0	107.0	106.0	14.2
	Total Suspended Solids (mg/L)	7	16.0	88.0	25.0	32.7	25.2
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.556	0.096	0.209	0.237
	Total Kjeldahl Nitrogen (mg/L)	7	0.532	1.334	0.687	0.743	0.272
	Total Nitrogen (mg/L)	7	0.630	1.790	0.720	0.951	0.428
	Total Phosphorus (mg/L)	7	0.048	0.167	0.070	0.090	0.053
	Dissolved Reactive Phosphorus (mg/L)	7	0.006	0.033	0.019	0.019	0.010
	Chlorophyll a (mg/L)	7	8.01	42.72	16.55	18.34	11.33
	Turbidity (NTU)	7	2	83	23	31	26
	Secchi (m)	7	0.26	0.83	0.41	0.47	0.18
	Fecal Coliform (col/100 mL) <sup>J</sup>	1	---	---	---	3	---
<b>DEMS-5</b>	Alkalinity (mg/L)	7	30.7	80.3	66.3	61.5	18.4
	Total Dissolved Solids (mg/L)	7	92.0	166.0	115.0	116.6	25.1
	Total Suspended Solids (mg/L)	7	8.0	44.0	21.0	23.0	13.1
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.040	0.008	0.017	0.015
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.548	0.053	0.113	0.193
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.831	0.452	0.440	0.245
	Total Nitrogen (mg/L)	7	0.200	1.380	0.520	0.564	0.391
	Total Phosphorus (mg/L)	7	0.046	0.119	0.050	0.067	0.030
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.030	0.010	0.013	0.010
	Chlorophyll a (mg/L)	7	1.07	8.90	4.27	5.20	3.30
	Turbidity (NTU)	7	7	49	11	18	15
	Secchi (m)	7	0.30	0.93	0.53	0.58	0.23
	Fecal Coliform (col/100 mL) <sup>J</sup>	1	---	---	---	53	---
<b>DEMS-6</b>	Alkalinity (mg/L)	7	10.3	62.9	46.7	45.2	18.3
	Total Dissolved Solids (mg/L)	7	77.0	140.0	91.0	99.9	21.8
	Total Suspended Solids (mg/L)	7	10.0	41.0	17.0	19.9	10.3
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.064	0.017	0.025	0.022
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.040	0.269	0.195	0.165	0.089
	Total Kjeldahl Nitrogen (mg/L)	7	0.347	0.614	0.524	0.498	0.102
	Total Nitrogen (mg/L)	7	0.560	0.860	0.650	0.663	0.101
	Total Phosphorus (mg/L)	7	0.028	0.100	0.050	0.055	0.020
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.022	0.004	0.007	0.007
	Chlorophyll a (mg/L)	7	1.60	10.80	5.34	5.76	3.77
	Turbidity (NTU)	7	9	46	17	19	12
	Secchi (m)	7	0.27	0.84	0.46	0.52	0.18
	Fecal Coliform (col/100 mL)	1	---	---	---	67	---
<b>DEMS-7</b>	Alkalinity (mg/L)	7	54.6	151.1	70.4	84.1	33.5
	Total Dissolved Solids (mg/L)	7	59.0	194.0	136.0	135.3	47.0
	Total Suspended Solids (mg/L)	7	20.0	38.0	28.0	27.9	6.9
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.105	0.008	0.025	0.037
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.458	0.008	0.080	0.168
	Total Kjeldahl Nitrogen (mg/L)	7	0.556	1.518	0.741	0.854	0.329
	Total Nitrogen (mg/L)	7	0.560	1.980	0.800	0.936	0.486
	Total Phosphorus (mg/L)	7	0.044	0.142	0.050	0.066	0.035
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.049	0.004	0.011	0.017
	Chlorophyll a (mg/L)	7	6.68	33.11	12.50	16.03	10.06
	Turbidity (NTU)	7	11	42	26	28	11
	Secchi (m)	7	0.23	0.75	0.32	0.42	0.22
	Fecal Coliform (col/100 mL) <sup>J</sup>	1	---	---	---	10	---

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