

***2016 Demopolis Reservoir Report***  
***Rivers and Reservoirs Monitoring Program***

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Field Operations Division  
Rivers & Reservoirs Unit  
August 2020

# **Rivers and Reservoirs Monitoring Program**

**2016**

## **Demopolis Reservoir**

**Tombigbee River Basin**

**Alabama Department of Environmental Management  
Field Operations Division  
Rivers & Reservoirs Unit**

**August 2020**

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## **LIST OF ACRONYMS**

A&I	Agriculture and Industry water supply use classification
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AGPT	Algal Growth Potential Test
APCo	Alabama Power Company
CHL <i>a</i>	Chlorophyll <i>a</i>
DO	Dissolved Oxygen
F&W	Fish and Wildlife
MAX	Maximum
MDL	Method Detection Limit
MIN	Minimum
MSC	Mean Standing Crop
NTU	Nephelometric Turbidity Units
OAW	Outstanding Alabama Waters
ONRW	Outstanding National Resource Water
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
RRMP	Rivers and Reservoirs Monitoring Program
S	Swimming and Other Whole Body Water-Contact Sports
SD	Standard Deviation
SOP	Standard Operating Procedures
TEMP	Temperature
TN	Total Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSI	Trophic State Index
TSS	Total Suspended Solids
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

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## 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) monitored Demopolis Reservoir as part of the 2016 assessment of the Escatawpa, Mobile, and Tombigbee River basins under the Rivers and Reservoirs Monitoring Program (RRMP). ADEM began monitoring lake water quality statewide in 1985, followed by a second statewide survey in 1989. In 1990, the Reservoir Water Quality Monitoring Program (now known as RRMP) was initiated by ADEM. The current objectives of this program are to provide data that can be used to assess current water quality conditions, to 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 2017 Monitoring Strategy (ADEM 2017).

A consumption advisory was issued for Demopolis Reservoir by the Alabama Department of Public Health (ADPH) in 2017 due to mercury found in fish tissue. As a result, Demopolis Reservoir was placed on Alabama's 2018 Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its Public Water Supply (PWS), Swimming (S), and Fish and Wildlife (F&W) water use classifications for mercury caused by atmospheric deposition.

Specific water quality criteria for nutrient management was implemented in 2005 at one location on Demopolis Reservoir. This criterion represents the maximum growing season mean (April-October) chlorophyll *a* (chl *a*) concentration allowable while still fully supporting the reservoir's Public Water Supply, Swimming, and Fish and Wildlife [(PWS/S/F&W)] use classifications.

The purpose of this report is to summarize data collected at seven stations in Demopolis Reservoir during the 2016 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 ([Figure 1](#)). Specific location information is listed in [Table 1](#). Demopolis Reservoir was sampled in the dam forebay, mid, and upper reservoir areas. Tributary embayment stations monitored include: Noxubee River, Trussels Creek, Brush Creek, and Factory Creek.

Water quality assessments were conducted at monthly intervals through the growing season, April-October. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operating Procedures (ADEM 2017), Surface Water Quality Assurance Project Plan (ADEM 2017) and Quality Management Plan (ADEM 2018).

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 2016 results.



Figure 1. Demopolis Reservoir with 2016 sampling locations. A description of each sampling locations provided in Table 1.



**Table 1.** Descriptions of the 2016 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>
031602010401	Sumter	DEMS-1*	Lower	Tombigbee R	Lower reservoir. Deepest point, main river channel, dam forebay.	10 µg/l	32.5201	-87.8748
031601060707	Greene	DEMS-2	Mid	Tombigbee R	Mid reservoir. Deepest point, main river channel. Downstream of Cobb Creek confluence.		32.5994	-88.0281
031601060609	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
031601081102	Sumter	DEMS-4	Noxubee R	Noxubee R	Deepest point, Noxubee River channel, approx. 1 mile upstream of Tombigbee River confluence.		32.8274	-88.1816
031601060606	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
031601060607	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
031601060702	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* criterion established at this station in 2005



## RESULTS

Growing season mean graphs for TN, TP, chl *a* and TSS are provided in this section ([Figures 2-5](#)). Monthly graphs for TN, TP, chl *a*, TSS, dissolved oxygen (DO), and TSI are also provided ([Figures 6-10, Figure 13](#)), with mean monthly discharge included as an indicator of flow and retention time in the months sampled. AGPT results appear in [Table 2](#). Depth profile graphs of temperature, conductivity, and DO appear in [Figures 11-12](#). Summary statistics of all data collected during 2016 are presented in [Appendix Table 1](#). The table contains the minimum, maximum, median, mean, and standard deviation (SD) of each parameter analyzed.

Stations with the highest concentrations of nutrients, chlorophyll *a*, and TSS are noted in the paragraphs to follow. Though stations with lowest concentrations may not be mentioned, review of the graphs included in this report will indicate these stations that may be potential candidates for reference waterbodies and watersheds.

In 2016, the highest growing season mean TN among mainstem stations was the mid station, while the highest value among tributary stations was the Noxubee R station ([Figure 2](#)). With the exception of the lower station, which was only slightly higher, mean TN concentrations at all stations were lower in 2016 than the previous growing season they were sampled. Highest monthly TN concentrations occurred in July at the upper station, in August at the mid station, and in May at the lower station ([Figure 6](#)). Historic high monthly TN concentrations occurred at the upper station in July and at the mid station in April, June, and August.

In 2016, the highest growing season mean TP among mainstem stations was the upper station, while the highest value among tributary stations was the Noxubee R station ([Figure 3](#)). All stations had lower growing season mean TP concentrations than the previous growing season that were sampled except the lower station, which was only slightly higher. Highest monthly TP concentrations occurred in April for the upper station, in April and May for the mid station, and in May for the lower station ([Figure 7](#)). Monthly TP concentrations at mainstem stations were below historic mean values, except for April in the upper station and May in the lower station.

Specific water quality criterion for nutrient management has been established for the lower station in Demopolis Reservoir. The mean growing season chl *a* value for the lower

station exceeded the criteria limit in 2016 ([Figure 4](#)) (ADEM Admin. Code R. 335-6-10-.11). The highest growing season mean chl *a* among mainstem stations was in the lower station, while the highest value among tributary stations was in the Factory Creek station. All growing season mean chl *a* concentrations increased from the previous growing season sampled, except for Brush Creek, which decreased. Highest monthly chl *a* concentrations occurred in June at the lower station and in June and August at the upper and mid stations. Historic high monthly chl *a* concentrations occurred at the mid station in June and at the lower station in June, July, and August ([Figure 8](#)).

The highest mean growing season TSS values calculated among Demopolis Reservoir mainstem stations were in the upper station ([Figure 5](#)). Among tributary stations, the highest mean value was in Noxubee River. Monthly TSS concentrations at the mainstem stations were similar to or below the mean historic values, except for April at the upper and mid stations ([Figure 9](#)). Highest TSS values were reached in April at all mainstem stations.

AGPT results for the upper station indicated a change from phosphorus-limited to nitrogen-limited conditions, while the lower station remained nitrogen-limited in 2016 ([Table 2](#)). The mean standing crop (MSC) at the lower station was above 5.0 mg/L, the value that Raschke and Schultz (1987) defined as protective of reservoir and lake systems. The more riverine upper station was also above 5mg/L MSC, but below 20 mg/L MSC, the value that Raschke et al. (1996) defined as protective of flowing stream and river systems.

Dissolved oxygen concentrations at Factory Creek did not meet the ADEM criteria limit of 5.0 mg/L at 5.0 ft (1.5 m) (ADEM Admin. Code R. 335-6-10-.09) in April or May 2016 ([Figure 10](#)). Dissolved oxygen concentrations met the criteria limit at all other Demopolis Reservoir stations. Profiles of the mainstem stations show some stratification in July and August at both stations. However, the water column was generally mixed throughout the sampling season ([Figures 11-12](#)). Highest temperatures were also reached in July and August.

TSI values were calculated using monthly chl *a* concentrations and Carlson's Trophic State Index. Factory Creek had the highest trophic state, reaching upper eutrophic conditions in May ([Figure 13](#)). The mainstem stations varied between mesotrophic and eutrophic conditions, but the mid station did reach oligotrophic conditions in May.

Figure 2. Mean growing season TN measured in Demopolis Reservoir, April-October, 2001-2016. Stations are illustrated from upstream to downstream as the graph is read from left to right.

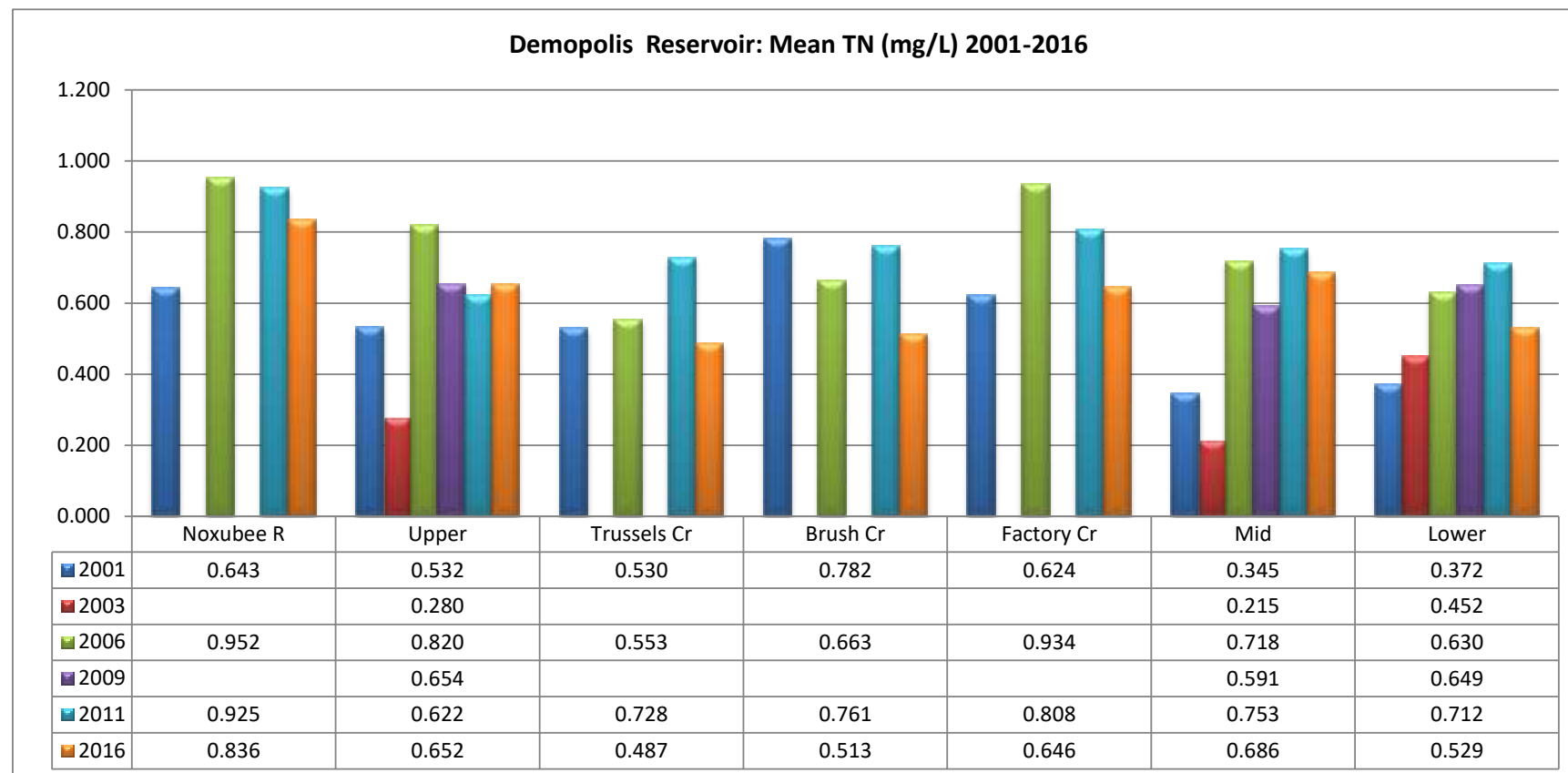


Figure 3. Mean growing season TP measured in Demopolis Reservoir, April-October, 2001-2016. Stations are illustrated from upstream to downstream as the graph is read from left to right.

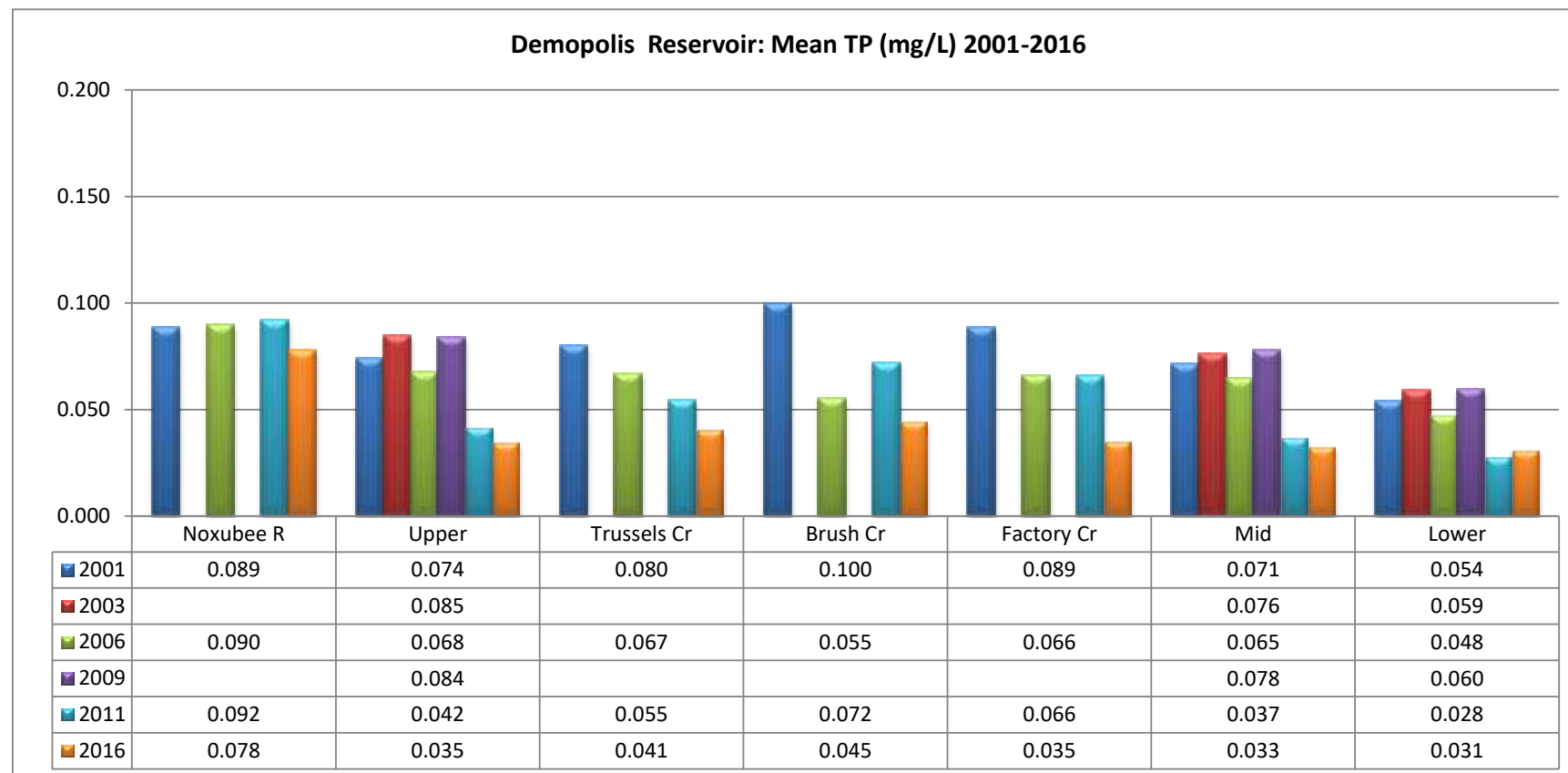


Figure 4. Mean growing season chl *a* measured in Demopolis Reservoir, April-October, 2001-2016. Stations are illustrated from upstream to downstream as the graph is read from left to right.

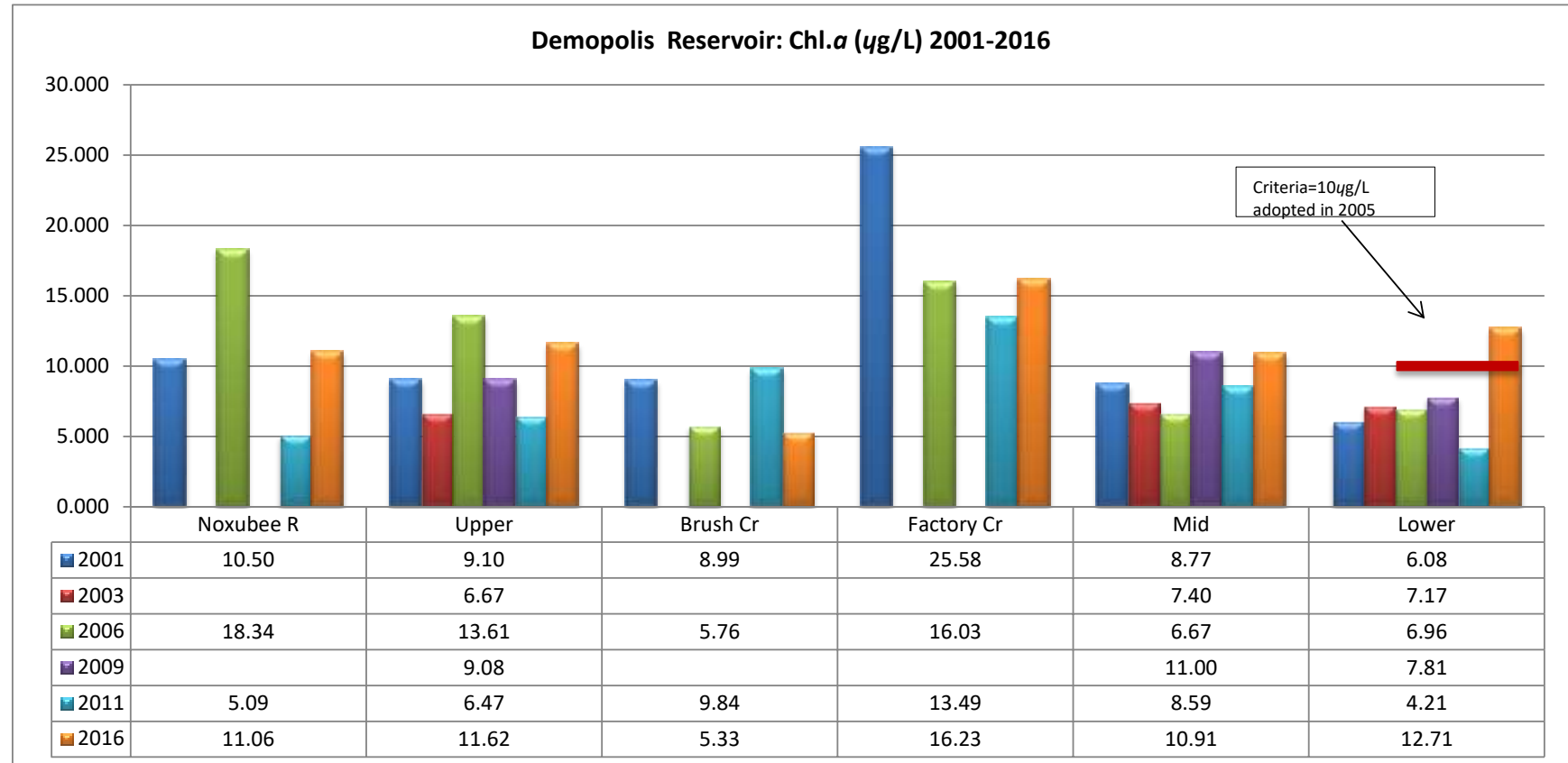


Figure 5. Mean growing season TSS measured in Demopolis Reservoir, April-October, 2001-2016. Stations are illustrated from upstream to downstream as the graph is read from left to right.

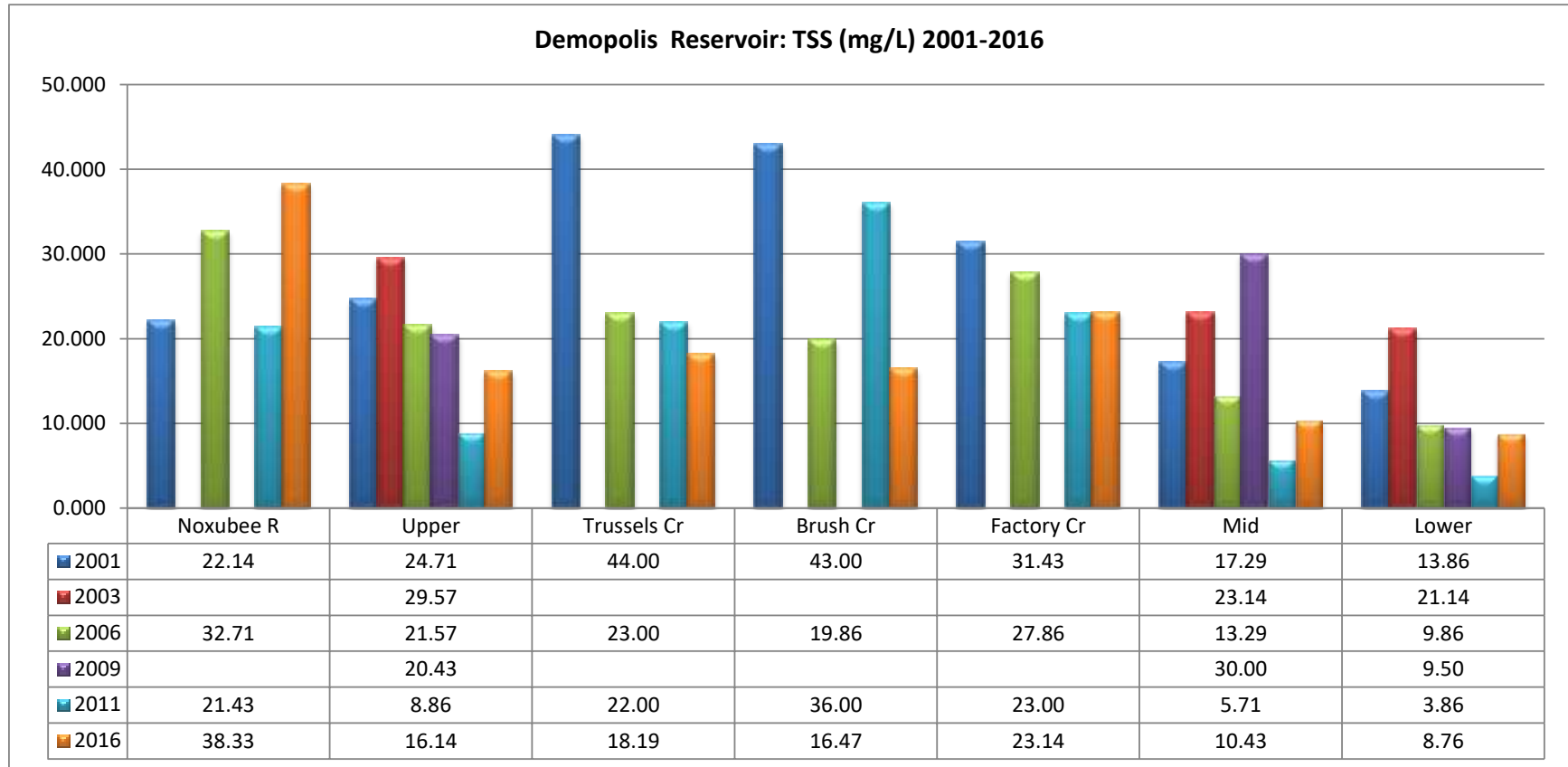




Figure 6. Monthly TN concentrations measured at upper, mid, and lower station in Demopolis Reservoir, April-October 2016 vs. average monthly discharge. Monthly discharge acquired from USGS Tombigbee River gage at Demopolis Reservoir Dam. Each bar graph depicts monthly changes in each station. The historic mean (1992-2016) and min/max ranges are also displayed for comparison. The “n” value equals the number of datapoints included in the monthly historic calculations.

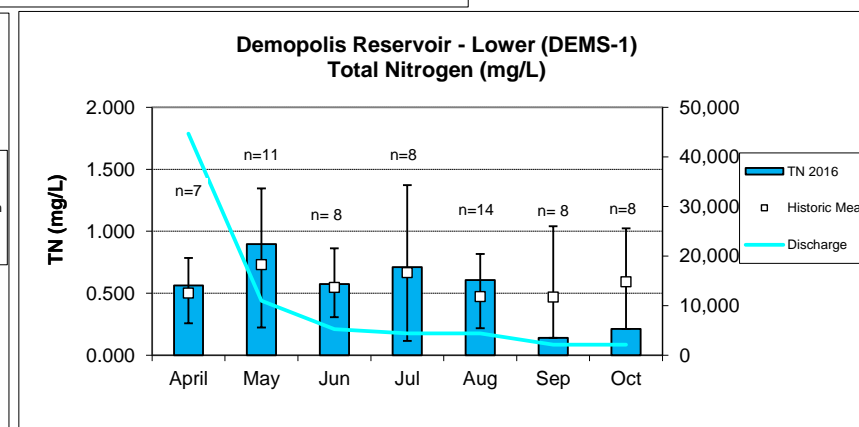
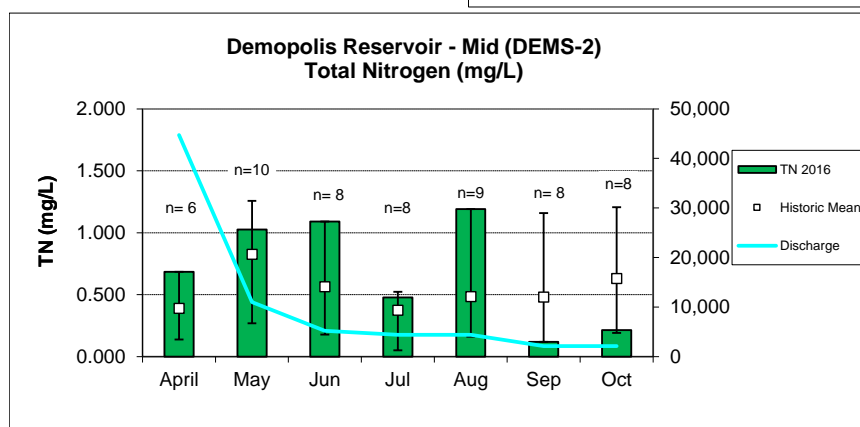
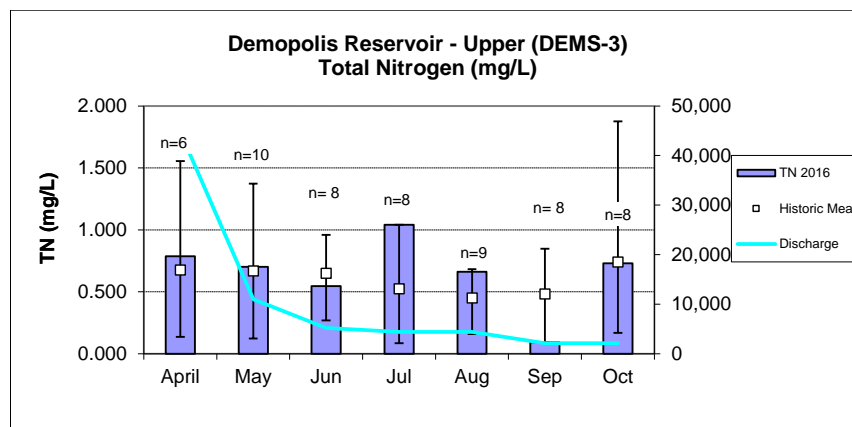


Figure 7. Monthly TP concentrations measured at upper, mid, and lower station in Demopolis Reservoir, April-October 2016 vs. average monthly discharge. Monthly discharge acquired from USGS Tombigbee River gage at Demopolis Reservoir Dam. Each bar graph depicts monthly changes in each station. The historic mean (1992-2016) and min/max ranges are also displayed for comparison. The “n” value equals the number of datapoints included in the monthly historic calculations.

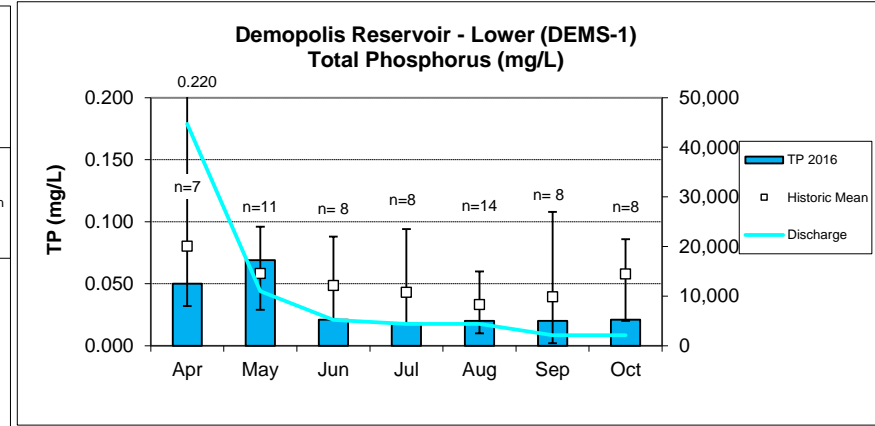
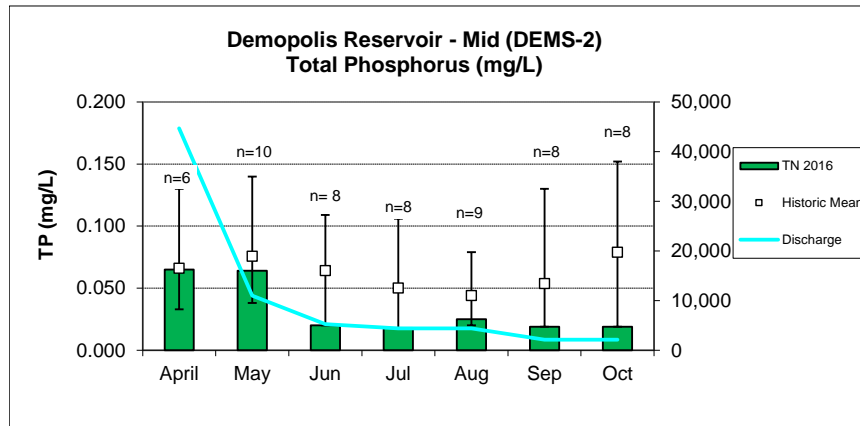
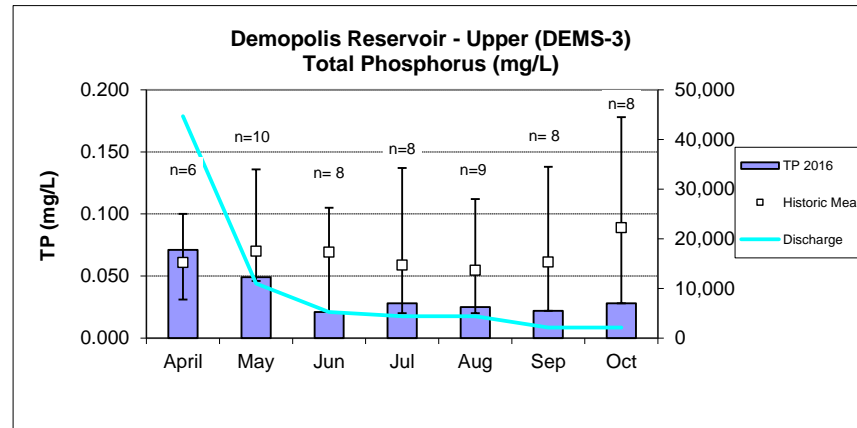


Figure 8. Monthly chl *a* concentrations measured at upper, mid, and lower station in Demopolis Reservoir, April-October 2016 vs. average monthly discharge. Monthly discharge acquired from USGS Tombigbee River gage at Demopolis Reservoir Dam. Each bar graph depicts monthly changes in each station. The historic mean (1992-2016) and min/max ranges are also displayed for comparison. The “n” value equals the number of datapoints included in the monthly historic calculations.

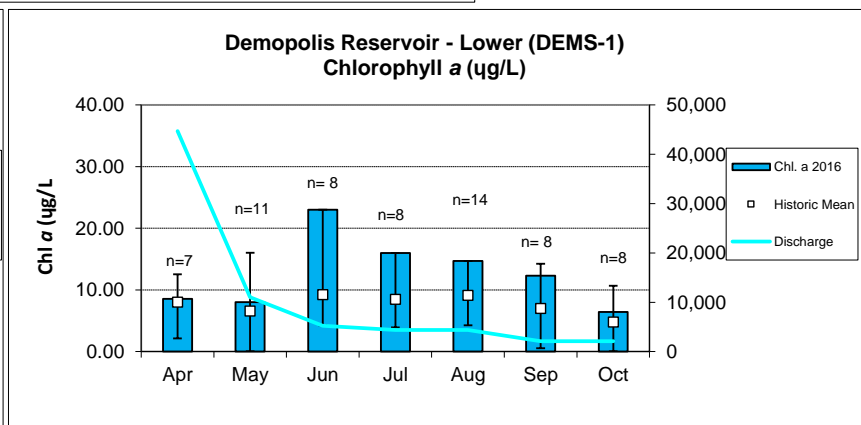
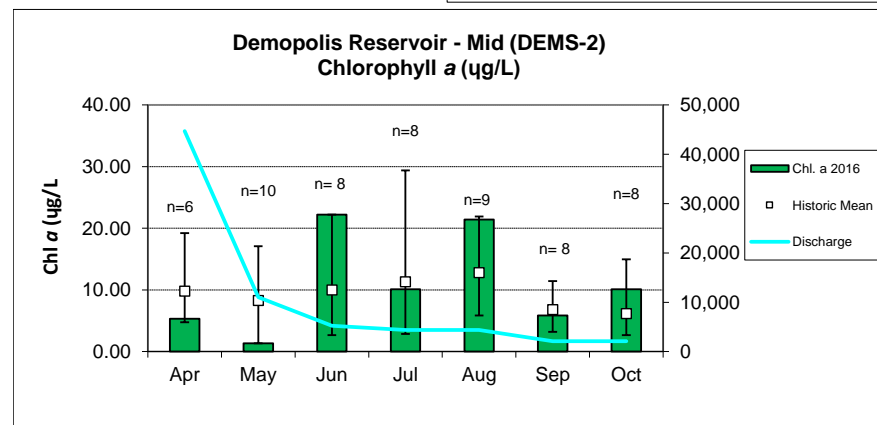
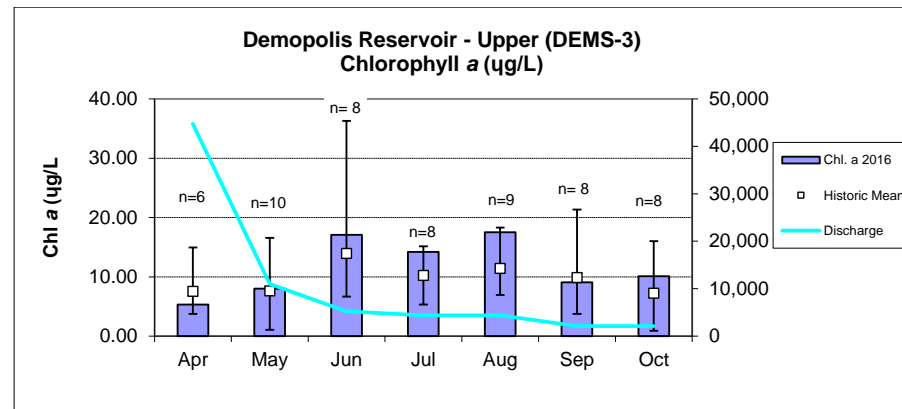


Figure 9. Monthly TSS concentrations measured at upper, mid, and lower station in Demopolis Reservoir, April-October 2016 vs. average monthly discharge. Monthly discharge acquired from USGS Tombigbee River gage at Demopolis Reservoir Dam. Each bar graph depicts monthly changes in each station. The historic mean (1992-2016) and min/max ranges are also displayed for comparison. The “n” value equals the number of datapoints included in the monthly historic calculations.

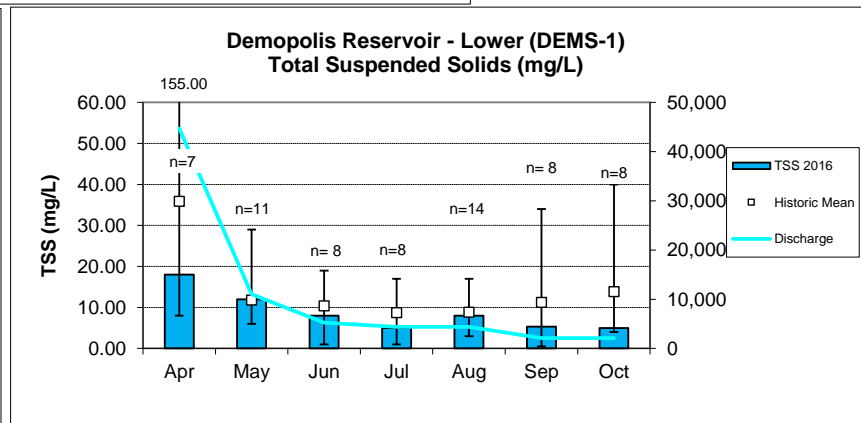
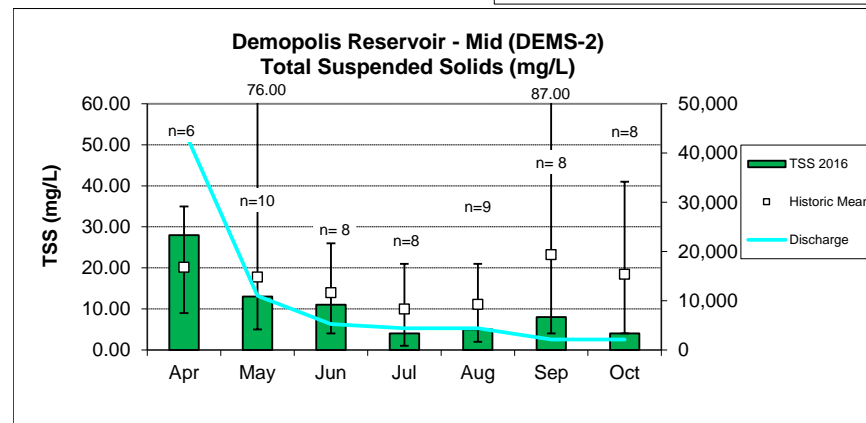
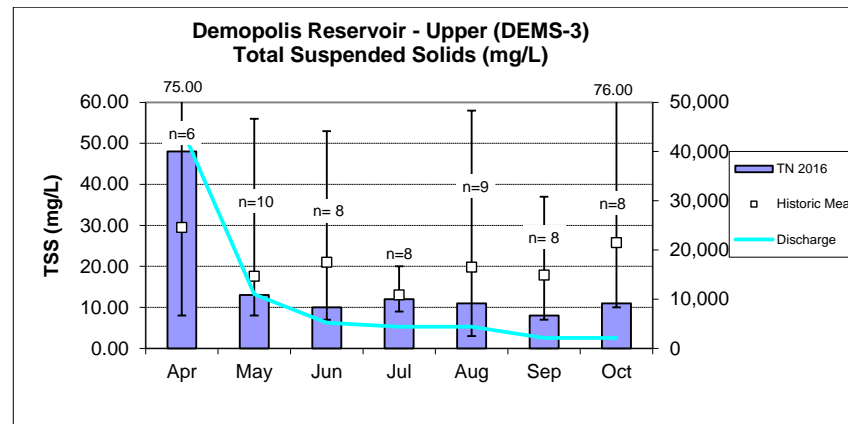


Table 2. Algal growth potential test results (expressed as mean Maximum Standing Crop (MSC) dry weights of *Selenastrum capricornutum* in mg/L) and limiting nutrient status. MSC values below 5 mg/l are considered to be protective in reservoirs and lakes; MSC values below 20 mg/L are considered protective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

Station	Upper		Mid		Lower	
	MSC	Limiting Nutrient	MSC	Limiting Nutrient	MSC	Limiting Nutrient
2001	3.53	Nitrogen	3.57	Phosphorus	3.91	Phosphorus
2006	2.97	Nitrogen	3.71	Nitrogen	5.92	Phosphorus
2011	1.28	Phosphorus	2.39	Phosphorus	7.76	Nitrogen
2016	7.16	Nitrogen	*	*	8.71	Nitrogen

\*AGPT sample not collected at this station

Figure 10. Monthly DO concentrations at 1.5 m (5 ft) for Demopolis Reservoir stations collected April-October 2016. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth (ADEM 2019).

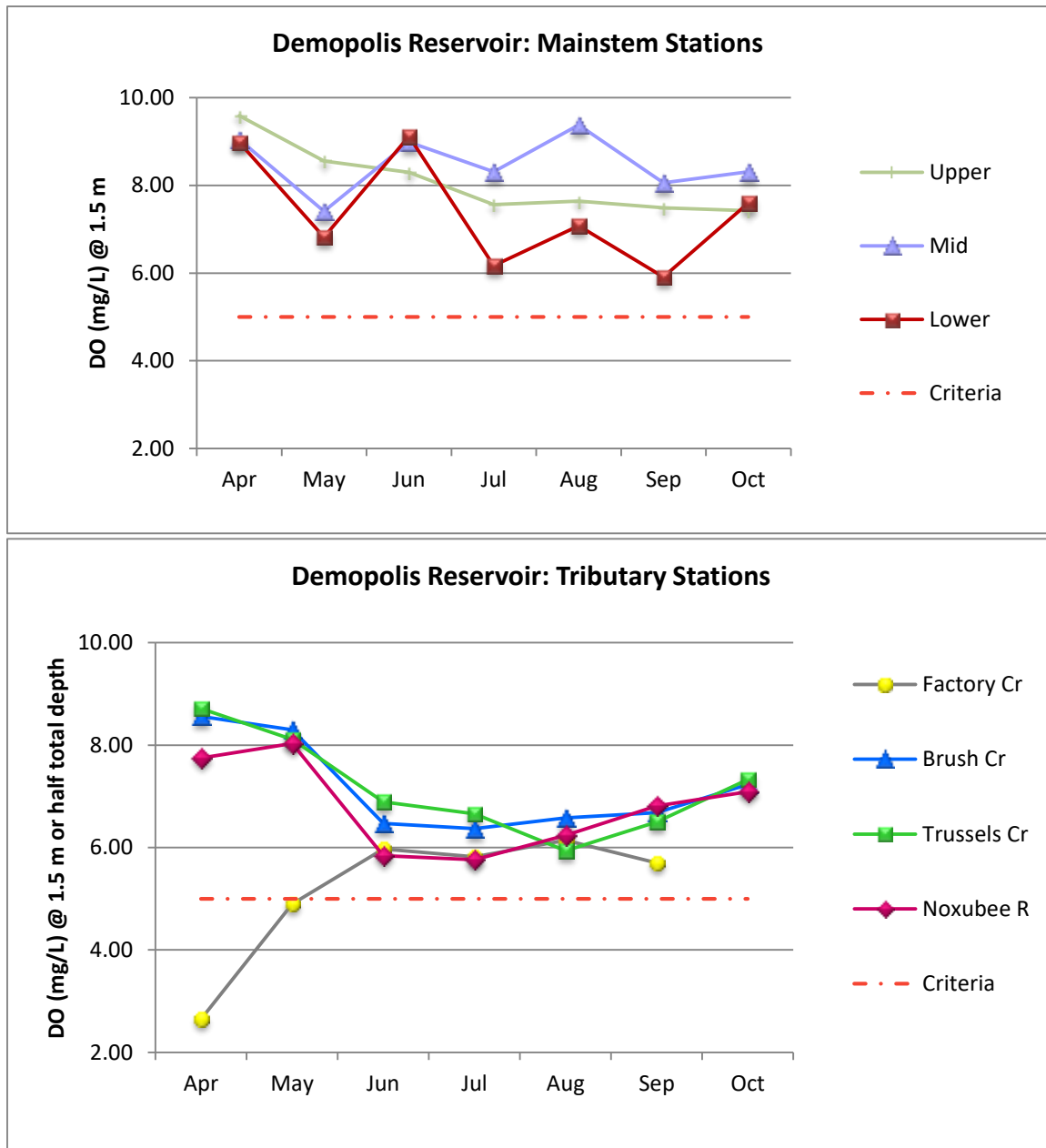


Figure 11. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the mid Demopolis Reservoir station, April-October 2016.

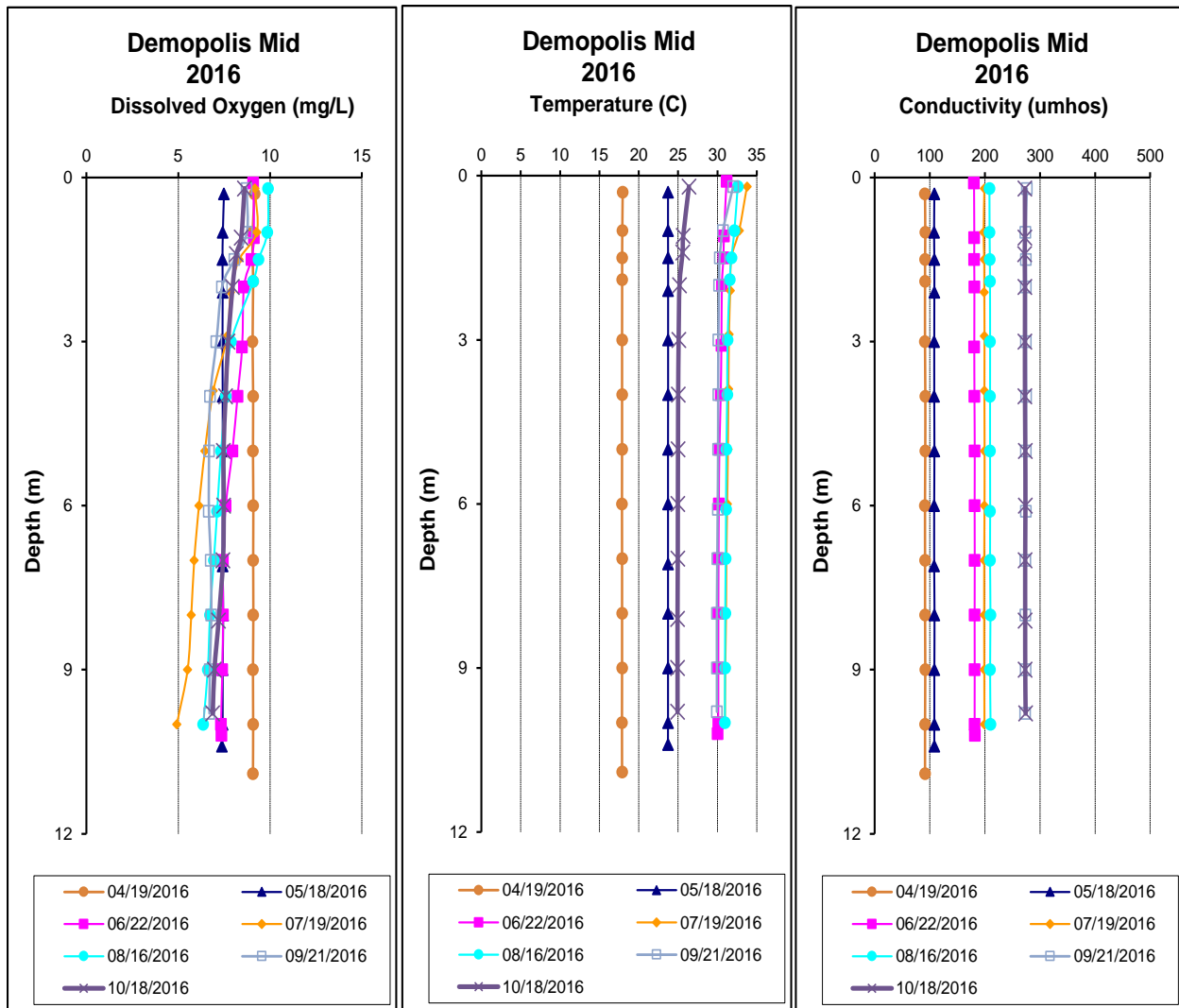


Figure 12. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the lower Demopolis Reservoir station, April-October 2016.

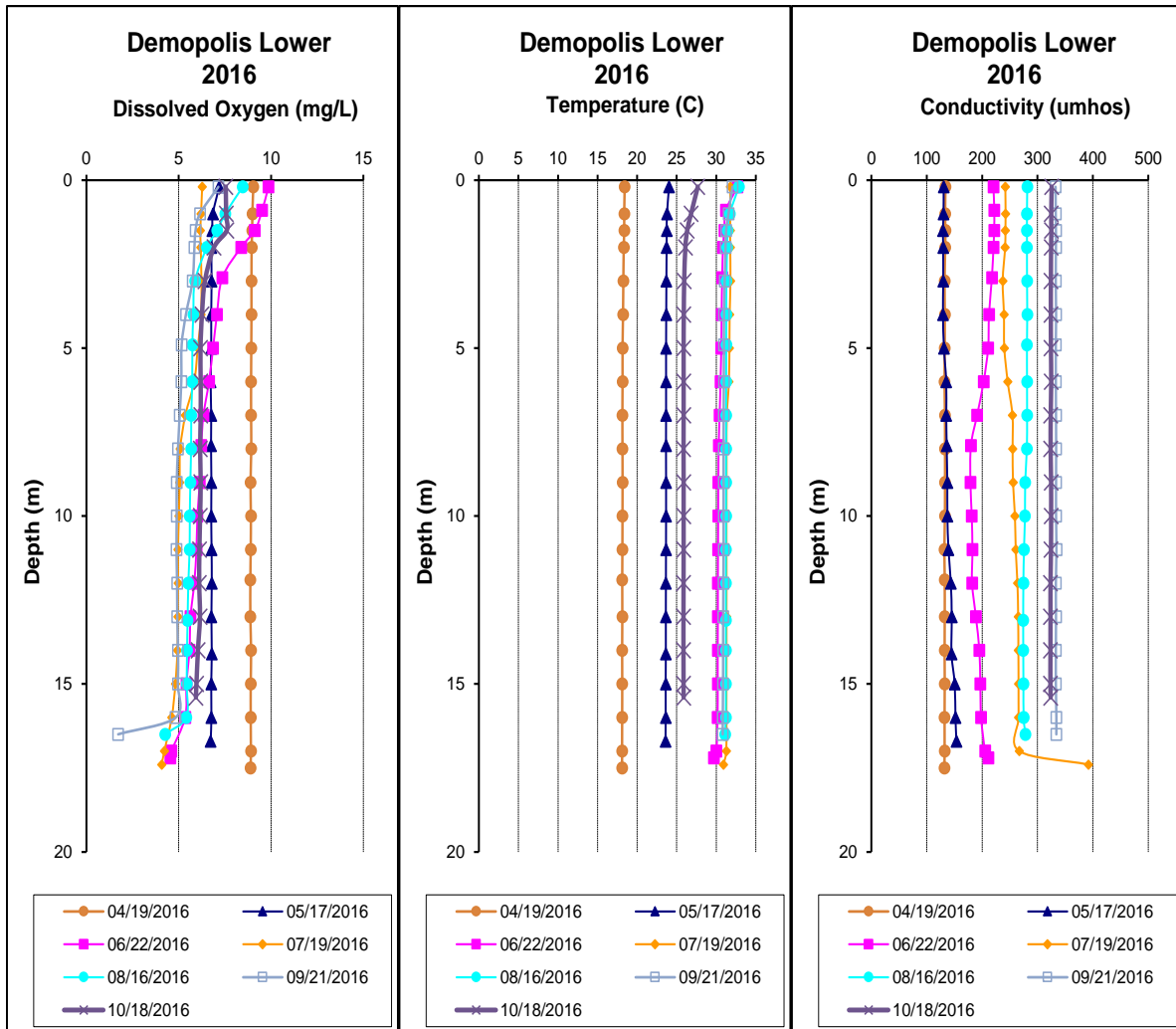
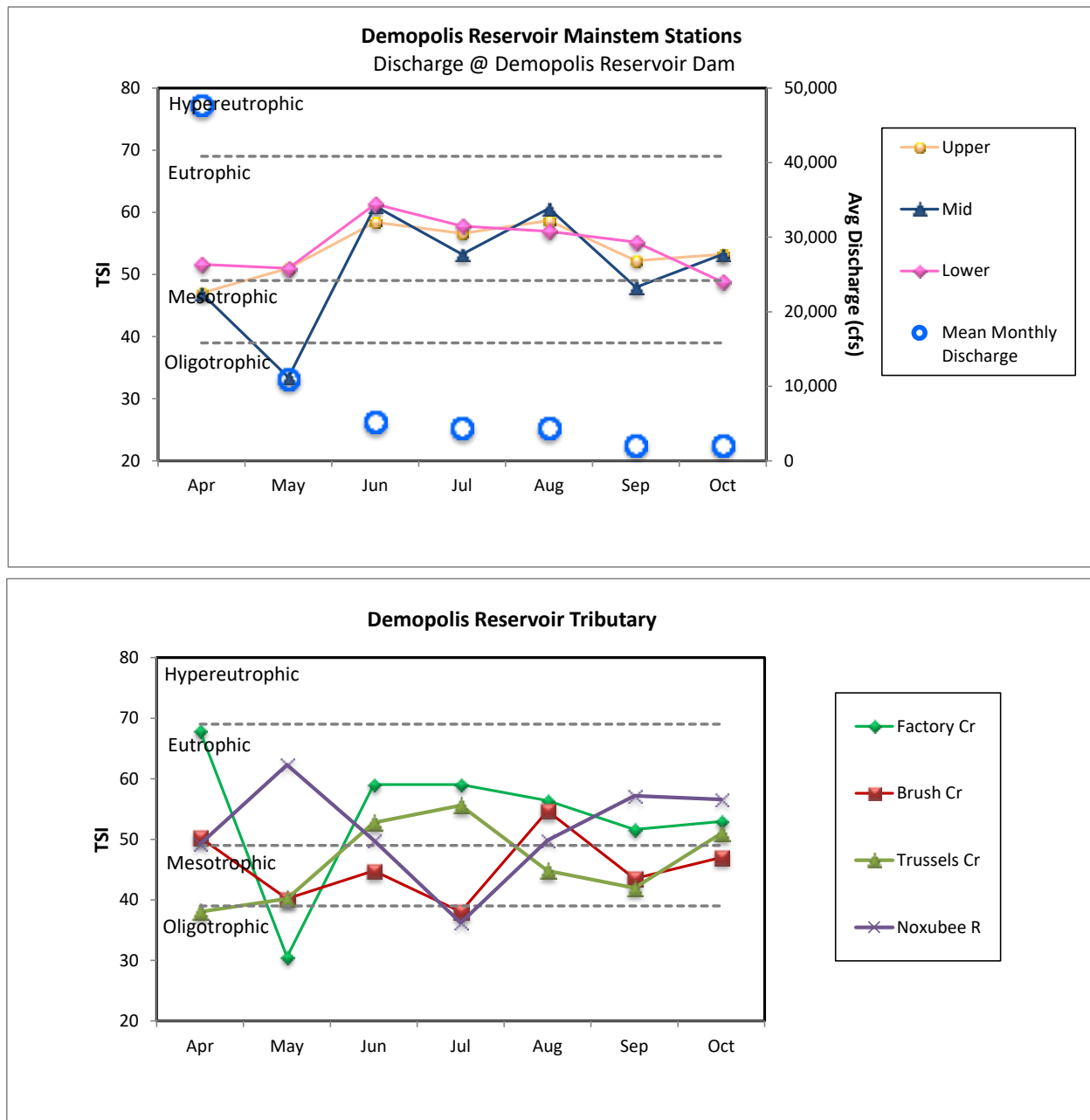




Figure 13. Monthly TSI values calculated for mainstem and tributary Demopolis Reservoir stations using chl *a* concentrations and Carlson's Trophic State Index calculation. Monthly discharge acquired from USGS Tombigbee River gage station at Demopolis Dam.



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## APPENDIX

**Appendix Table 1.** Summary of water quality data collected April-October, 2016. 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	Med	Mean	SD
DEMS-1	<b>Physical</b>						
	Turbidity (NTU)	7	5.5	30.9	8.6	13.3	9.8
	Total Dissolved Solids (mg/L)	7	91.0	193.0	145.0	140.7	37.9
	Total Suspended Solids (mg/L)	7	5.0	18.0	8.0	8.8	4.8
	Hardness (mg/L)	4	68.6	104.0	84.6	85.4	16.0
	Alkalinity (mg/L)	7	39.3	73.7	55.4	57.3	13.4
	Photic Zone (m)	7	1.51	4.30	3.26	3.03	1.06
	Secchi (m)	7	0.41	1.40	1.00	0.90	0.35
	Bottom Depth (m)	7	15.4	17.5	16.7	16.7	0.7
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L) <sup>J</sup>	7	< 0.007	0.060	0.015	0.018	0.020
	Nitrate+Nitrite Nitrogen (mg/L) <sup>J</sup>	7	0.007	0.267	0.034	0.084	0.101
	Total Kjeldahl Nitrogen (mg/L)	7	0.106	0.688	0.549	0.445	0.221
	Total Nitrogen (mg/L) <sup>J</sup>	7	0.140	0.897	0.574	0.529	0.268
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	< 0.003	0.015	0.005	0.007	0.006
	Total Phosphorus (mg/L)	7	0.018	0.069	0.021	0.031	0.020
	CBOD-5 (mg/L)	7	< 2.0	2.4	1.0	1.2	0.5
	Chlorides (mg/L)	7	5.0	26.4	18.7	16.6	8.3
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	6.41	23.00	12.30	12.71	5.77
	E. coli (MPN/DL) <sup>J</sup>	4	1	49	7	16	22
DEMS-2	<b>Physical</b>						
	Turbidity (NTU)	7	5.4	45.4	8.2	16.3	15.6
	Total Dissolved Solids (mg/L)	7	83.0	192.0	140.0	137.5	45.3
	Total Suspended Solids (mg/L) <sup>J</sup>	7	4.0	28.0	8.0	10.4	8.5
	Hardness (mg/L)	4	64.5	89.8	72.2	74.6	10.9
	Alkalinity (mg/L)	7	33.3	55.6	50.1	47.8	8.6
	Photic Zone (m)	7	1.22	4.21	3.18	3.00	1.25
	Secchi (m)	7	0.38	1.31	0.88	0.85	0.37
	Bottom Depth (m)	7	9.8	10.9	10.0	10.2	0.4
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L)	7	< 0.007	0.060	0.004	0.020	0.024
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.431	0.002	0.111	0.168
	Total Kjeldahl Nitrogen (mg/L) <sup>J</sup>	7	0.118	1.190	0.588	0.575	0.360
	Total Nitrogen (mg/L) <sup>J</sup>	7	< 0.119	1.191	0.684	0.686	0.432
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	< 0.002	0.016	0.003	0.006	0.007
	Total Phosphorus (mg/L)	7	0.018	0.065	0.020	0.033	0.022
	CBOD-5 (mg/L)	7	< 2.0	2.1	1.0	1.2	0.4
	Chlorides (mg/L)	7	4.7	41.4	23.0	22.2	14.8
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	1.34	22.20	10.10	10.91	8.03
	E. coli (MPN/DL) <sup>J</sup>	4	1	6	2	3	3

Station	Parameter	N	Min	Max	Med	Mean	SD
DEMS-3	<b>Physical</b>						
	Turbidity (NTU)	7	6.0	47.4	12.5	19.5	14.1
	Total Dissolved Solids (mg/L)	7	75.0	173.3	110.0	118.2	37.4
	Total Suspended Solids (mg/L)	7	8.0	48.0	11.0	16.1	14.1
	Hardness (mg/L)	4	64.5	83.7	78.7	76.4	8.4
	Alkalinity (mg/L)	7	36.4	55.6	49.6	47.3	7.7
	Photic Zone (m)	7	1.26	3.79	2.59	2.45	0.89
	Secchi (m)	7	0.40	1.10	0.70	0.70	0.24
	Bottom Depth (m)	7	5.8	7.4	6.5	6.6	0.6
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L)	7	< 0.007	0.070	0.004	0.024	0.030
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.212	0.041	0.086	0.091
	Total Kjeldahl Nitrogen (mg/L) <sup>J</sup>	7	0.091	0.847	0.620	0.565	0.242
	Total Nitrogen (mg/L) <sup>J</sup>	7	< 0.092	1.042	0.702	0.652	0.290
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	< 0.003	0.017	0.006	0.007	0.006
	Total Phosphorus (mg/L)	7	0.021	0.071	0.028	0.035	0.018
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.2	42.3	24.1	23.3	14.2
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	5.34	17.50	10.10	11.62	4.70
	E. coli (MPN/DL) <sup>J</sup>	4	< 1	8	4	4	2
DEMS-4	<b>Physical</b>						
	Turbidity (NTU)	7	26.0	73.8	54.2	50.6	19.0
	Total Dissolved Solids (mg/L) <sup>J</sup>	7	101.0	147.0	109.3	117.3	16.0
	Total Suspended Solids (mg/L)	7	21.3	94.0	31.0	38.3	25.1
	Hardness (mg/L)	4	67.3	76.3	70.0	70.9	4.0
	Alkalinity (mg/L) <sup>J</sup>	7	47.3	75.3	68.2	66.5	9.6
	Photic Zone (m)	7	0.86	1.70	1.12	1.27	0.34
	Secchi (m)	7	0.23	0.54	0.40	0.39	0.12
	Bottom Depth (m)	7	2.9	4.5	3.4	3.5	0.5
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L)	7	< 0.007	0.053	0.004	0.014	0.018
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.785	0.259	0.294	0.271
	Total Kjeldahl Nitrogen (mg/L)	7	0.295	1.210	0.431	0.542	0.319
	Total Nitrogen (mg/L)	7	< 0.359	1.594	0.819	0.836	0.453
	Dis Reactive Phosphorus (mg/L)	7	0.013	0.038	0.028	0.027	0.010
	Total Phosphorus (mg/L)	7	0.047	0.104	0.086	0.078	0.022
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	3.7	17.2	8.1	9.2	5.0
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	1.78	25.40	7.12	11.06	7.83
	E. coli (MPN/DL)	4	23	66	35	39	20

Station	Parameter	N	Min	Max	Med	Mean	SD
DEMS-5	<b>Physical</b>						
	Turbidity (NTU)	7	7.0	23.4	14.6	14.1	5.6
	Total Dissolved Solids (mg/L) <sup>J</sup>	7	62.0	135.0	113.0	105.9	28.1
	Total Suspended Solids (mg/L)	7	5.3	49.0	11.0	18.2	15.6
	Hardness (mg/L)	4	59.6	78.5	70.5	69.8	8.0
	Alkalinity (mg/L)	7	43.3	72.9	55.8	57.8	9.6
	Photic Zone (m)	7	0.40	1.86	0.50	0.67	0.53
	Secchi (m)	7	0.40	0.64	0.50	0.48	0.09
	Bottom Depth (m)	7	0.4	2.3	0.5	0.7	0.7
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L) <sup>J</sup>	7	< 0.007	0.060	0.004	0.022	0.023
	Nitrate+Nitrite Nitrogen (mg/L) <sup>J</sup>	7	< 0.002	0.097	0.063	0.055	0.039
	Total Kjeldahl Nitrogen (mg/L) <sup>J</sup>	7	0.136	0.782	0.290	0.431	0.302
	Total Nitrogen (mg/L) <sup>J</sup>	7	< 0.137	0.879	0.384	0.487	0.316
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	< 0.003	0.013	0.010	0.009	0.004
	Total Phosphorus (mg/L)	7	0.021	0.050	0.045	0.041	0.011
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	3.2	30.9	12.2	16.2	11.1
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	2.14	12.80	4.27	6.10	4.08
	E. coli (MPN/DL)	4	4	111	78	68	50

DEMS-6	DEMS-6	N	Min	Max	Med	Mean	SD
	<b>Physical</b>						
	Turbidity (NTU)	7	14.0	28.0	23.0	21.5	5.3
	Total Dissolved Solids (mg/L)	7	48.0	158.6	100.0	98.8	36.3
	Total Suspended Solids (mg/L)	7	9.3	23.0	16.0	16.5	5.0
	Hardness (mg/L)	4	38.1	82.8	57.8	59.1	23.2
	Alkalinity (mg/L)	7	31.1	65.0	49.3	47.1	11.2
	Photic Zone (m)	7	0.40	0.80	0.60	0.63	0.12
	Secchi (m)	7	0.40	0.64	0.45	0.50	0.11
	Bottom Depth (m)	7	0.4	0.8	0.6	0.6	0.1
	<b>Chemical</b>						
	Ammonia Nitrogen (mg/L)	7	< 0.007	0.070	0.004	0.025	0.029
	Nitrate+Nitrite Nitrogen (mg/L) <sup>J</sup>	7	0.014	0.299	0.127	0.141	0.095
	Total Kjeldahl Nitrogen (mg/L) <sup>J</sup>	7	< 0.050	0.936	0.430	0.372	0.328
	Total Nitrogen (mg/L) <sup>J</sup>	7	< 0.118	1.027	0.614	0.513	0.374
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	0.006	0.017	0.007	0.010	0.004
	Total Phosphorus (mg/L)	7	0.026	0.071	0.048	0.045	0.016
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.8	36.8	19.1	18.0	13.0
	<b>Biological</b>						
	Chlorophyll a (mg/m <sup>3</sup> )	7	2.14	11.70	4.27	5.33	3.32
	E. coli (MPN/DL)	4	2	387	26	110	185

Station	Parameter	N	Min	Max	Med	Mean	SD	
DEMS-7	Physical							
	Turbidity (NTU)	7	13.1	46.2	21.1	23.1	10.8	
	Total Dissolved Solids (mg/L)	7	106.0	178.6	161.0	151.7	26.7	
	Total Suspended Solids (mg/L)	7	16.0	41.0	20.0	23.1	8.6	
	Hardness (mg/L)	4	70.0	91.6	85.7	83.2	10.2	
	Alkalinity (mg/L)	7	56.3	148.0	63.3	84.8	39.2	
	Photic Zone (m)	7	0.80	1.48	1.00	1.01	0.22	
	Secchi (m)	7	0.29	0.73	0.53	0.50	0.14	
	Bottom Depth (m)	7	0.8	3.0	1.0	1.2	0.8	
	Chemical							
	Ammonia Nitrogen (mg/L)	7	<	0.007	0.110	0.004	0.024	0.039
	Nitrate+Nitrite Nitrogen (mg/L) <sup>J</sup>	7	<	0.002	0.069	0.005	0.018	0.024
	Total Kjeldahl Nitrogen (mg/L)	7		0.182	1.060	0.560	0.629	0.278
	Total Nitrogen (mg/L) <sup>J</sup>	7	<	0.185	1.062	0.579	0.646	0.288
	Dis Reactive Phosphorus (mg/L) <sup>J</sup>	7	<	0.003	0.008	0.006	0.005	0.002
	Total Phosphorus (mg/L)	7		0.023	0.067	0.031	0.035	0.015
	CBOD-5 (mg/L)	7	<	2.0	3.0	1.0	1.3	0.8
	Chlorides (mg/L)	7		7.3	40.1	24.3	23.4	11.9
	Biological							
	Chlorophyll a (mg/m³)	7	<	0.10	44.90	13.90	16.23	14.13
	E. coli (MPN/DL)	4		4	62	12	22	27

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