2015 Woodruff Reservoir Report

Rivers and Reservoirs Monitoring Program

Alabama Department of Environmental Management

Field Operations Division
Environmental Indicators Section
Aquatic Assessment Unit
January 2018

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LIST OF ACRONYMS

A&I	Agriculture and Industry water supply use classification
ADEM	Alabama Department of Environmental Management
AGPT	Algal growth Potential Test
CHL *a*	Chlorophyll *a*
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
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
COE	United States Army Corp of Engineers

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INTRODUCTION

Woodruff Reservoir was created with the construction of Robert F. Henry Lock and Dam in the early 1970s by the United States Army Corps of Engineers (COE). The reservoir covers approximately 12,500 acres and stretches from just north of Montgomery to Benton, Alabama. Woodruff serves a key role in hydroelectricity generation and also provides a number of recreational opportunities such as camping, hiking, fishing, and hunting.

The Alabama Department of Environmental Management (ADEM) monitored Woodruff Reservoir as part of the 2015 assessment of the Alabama River basin 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 the Field Operations Division of the ADEM. The current objectives of this program are to provide data that can be used to assess current water quality conditions, 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 2012 Monitoring Strategy (ADEM 2012).

The purpose of this report is to summarize data collected at seven stations in Woodruff Reservoir during the 2015 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 [chlorophyll *a* (chl *a*)], sediment [total suspended solids (TSS)], and trophic state [Carlson's trophic state index (TSI)] were compared to ADEM's historical data.

METHODS

Sample sites were determined using historical data and previous assessments (Fig. 1). Woodruff Reservoir was sampled in the dam forebay, mid reservoir, and upper reservoir. Four tributary embayments representing a range of watershed conditions and landuse patterns were also monitored. Specific station location information is listed in Table 1.

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 2015), Surface Water Quality Assurance Project Plan (ADEM 2012), and Quality Management Plan (ADEM 2013).

Growing season mean 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 COE flow data and ADEM's previously collected data to help interpret the 2015 results.

Figure 1. Woodruff Reservoir with 2015 sampling locations. A description of each sampling location is provided in Table 1.

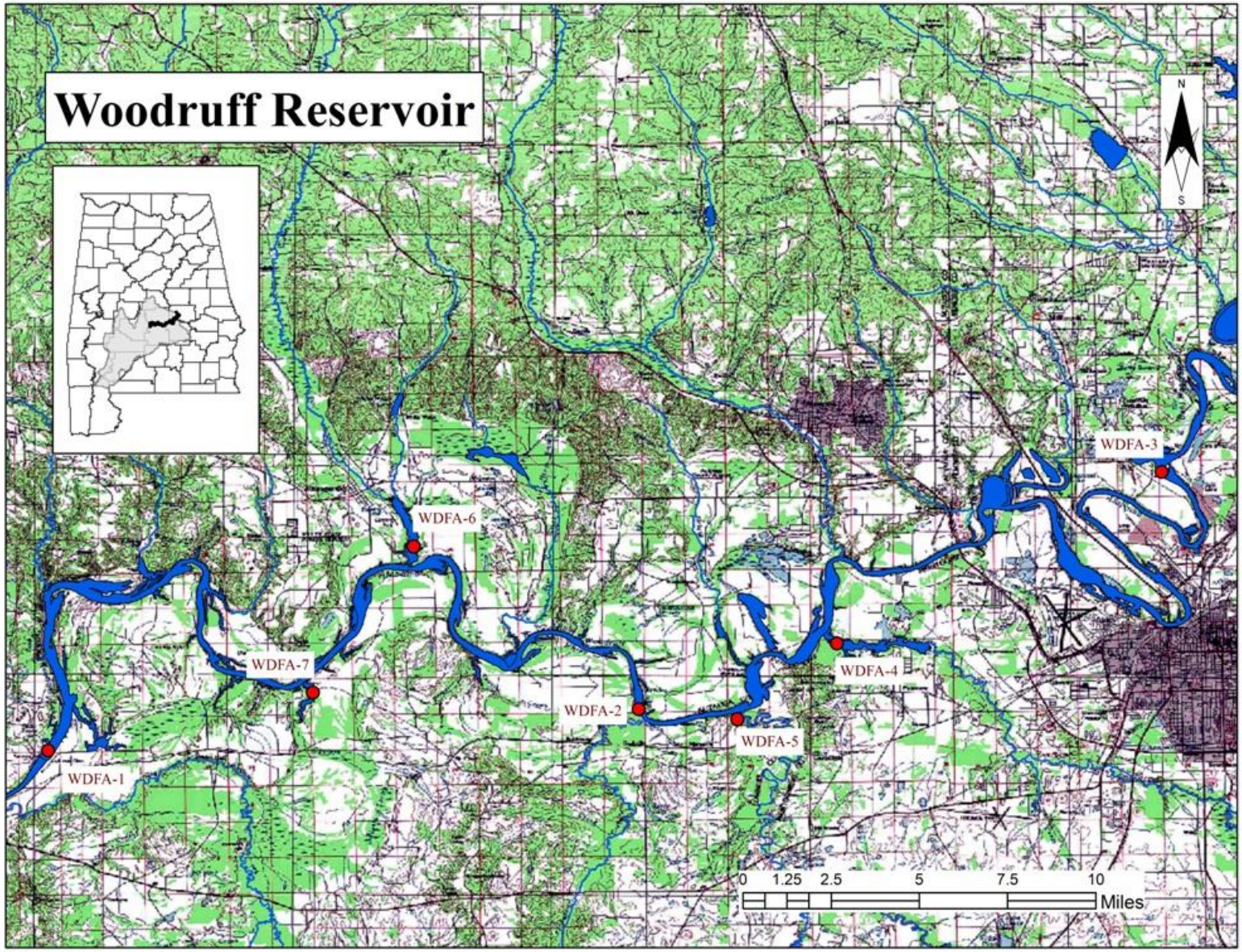


Table 1. Descriptions of the 2015 monitoring stations in Woodruff Reservoir.

HUC	County	Station Number	Report Designation	Waterbody Name	Station Description	Latitude	Longitude
Woodruff Reservoir							
031502015706	Autauga	WDFA-1	Lower	Alabama R	Deepest point, main river channel, dam forebay.	32.3273	-86.7820
031502015503	Lowndes	WDFA-2	Mid	Alabama R	Deepest point, main river channel, immediately downstream of Tallawassee Creek confluence.	32.3443	-86.5397
031502015106	Montgomery	WDFA-3	Upper	Alabama R	Deepest point, main river channel, immediately downstream of Jackson Lake.	32.4414	-86.3251
031502015309	Montgomery	WDFA-4	Catoma Cr	Catoma Cr	Deepest point, main creek channel, Catoma Creek embayment, approximately 0.5 miles upstream of lake confluence.	32.3711	-86.4584
031502015407	Montgomery	WDFA-5	Pintlalla Cr	Pintlalla Cr	Deepest point, main creek channel, Pintlalla Creek embayment, approximately 0.5 miles upstream of lake confluence.	32.3402	-86.4992
031502015603	Autauga	WDFA-6	Swift Cr	Swift Cr	Deepest point, main creek channel, Swift Creek embayment, approximately 0.5 miles upstream of lake confluence.	32.4111	-86.6321
031502015702	Lowndes	WDFA-7	Cypress Cr	Cypress Cr	Deepest point, main creek channel, Cypress Creek embayment, approximately 0.5 miles upstream of lake confluence.	32.3521	-86.6796

RESULTS

Growing season mean graphs for TN, TP, chl *a* and TSS are provided in this section (Figs. 2 and 3). Monthly graphs for TN, TP, chl *a*, TSS, DO and TSI are also provided (Figs. 4-8 and 11). Mean monthly discharge is included in monthly graphs for TN, TP, chl *a*, TSS and TSI as an indicator of flow and retention time in the months sampled. Depth profile graphs of temperature, DO and conductivity appear in Figures 9-10. Summary statistics of all data collected during 2015 are presented in Appendix Table 1. The table contains the minimum, maximum, median, mean and standard deviation of each parameter analyzed

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

In 2015, the highest growing season mean TN values were calculated for the Catoma Ck station (Fig. 2). Growing season mean TN values were some of the highest since 2000 at many of the stations. Swift Ck showed a decrease in mean TN concentrations from 2010 while all other stations increased. Monthly TN graphs show highest concentrations occurred in July at the upper station, September at the mid station and August at the lower station (Fig. 4). Concentrations were generally below historic means April-June and above historic means the remainder of the sampling season. Historical highs were measured in September at the mid station and in September and October at the upper station.

In 2015, the highest growing season mean TP value was calculated for the Catoma Ck station (Fig. 2). Mean TP concentrations at most stations were similar to 2010 except for the Catoma Ck and Pintlalla Ck stations, which increased. The highest monthly TP concentration was measured in July at the mid station (Fig. 5). Historic lows occurred every month, except for May at all mainstem stations and July at the lower station, where historic highs occurred.

In 2015, the highest growing season mean chl *a* value was calculated for the Catoma Ck station (Fig. 3). Mean concentrations at all stations were the lowest measured since 2000. Monthly chl *a* concentrations peaked in August at the upper and mid mainstem locations while the highest

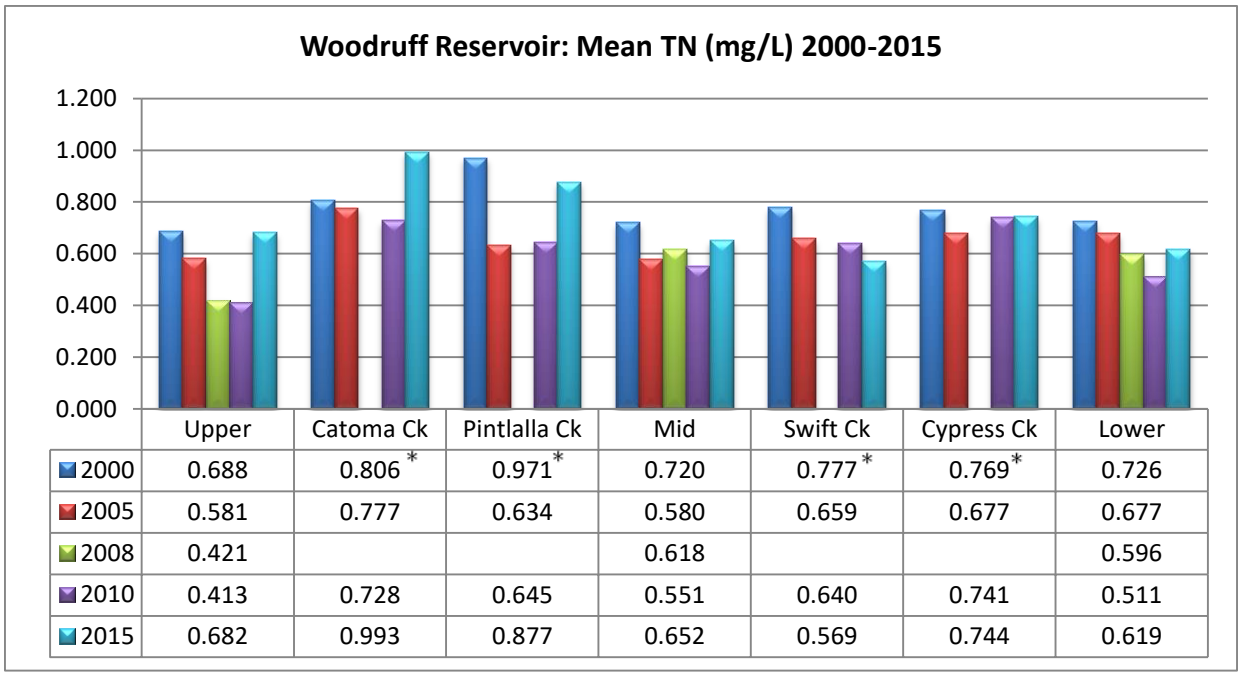
concentration at the lower station occurred in September (Fig. 6). The highest overall monthly concentration occurred at the upper station. Concentrations were below historic means at all stations in all months except for August at the upper station.

In 2015, the highest growing season mean TSS value was calculated for the Catoma Ck station (Fig. 3). Mean concentrations increased at the upper and all tributary stations compared to 2010. The highest monthly TSS concentration occurred in May at the upper station which was also a historic high for that month (Fig. 7). Monthly concentrations were below historic mean at each station much of the growing season.

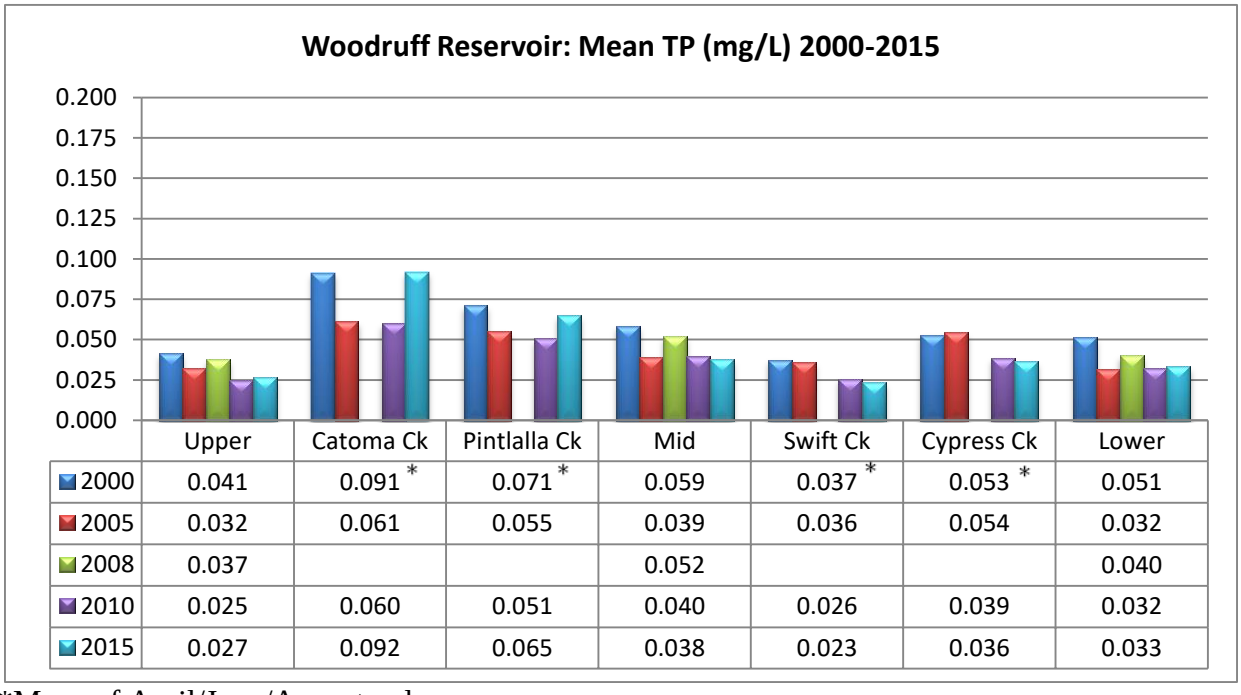
The DO concentrations in Pintlalla Creek were below the criteria limit in April and May (ADEM Admin. Code R. 335-6-10-.09) (Fig. 8). All other measurements in the mainstem and tributary stations met the ADEM criteria limit of 5.0 mg/L at 5.0 ft (1.5 m). The reservoir's depth profiles of temperature and DO show the water column generally was mixed (Fig. 9 & 10). Profiles show highest temperatures were reached in July.

TSI values were calculated using monthly chl a concentrations and Carlson's Trophic State Index. Each mainstem station showed similar results April-October, TSI values were eutrophic in August and September (Fig. 11). TSI values for the tributaries varied April-October with mostly eutrophic conditions occurring July-September.

Figure 2. Growing season mean TN and TP measured in Woodruff Reservoir, April-October, 2000-2015. Bar graphs consist of mainstem and embayment stations, illustrated from upstream to downstream as the graph is read from left to right.



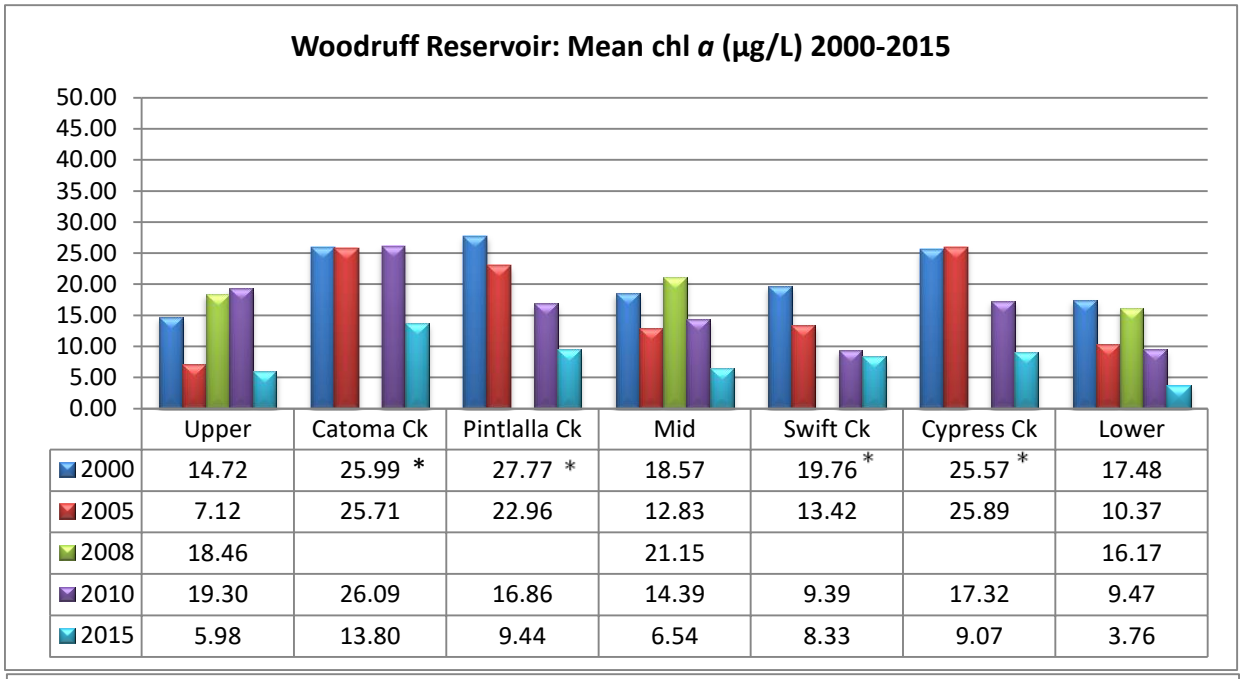
	Upper	Catoma Ck	Pintlalla Ck	Mid	Swift Ck	Cypress Ck	Lower
2000	0.688	0.806 *	0.971 *	0.720	0.777 *	0.769 *	0.726
2005	0.581	0.777	0.634	0.580	0.659	0.677	0.677
2008	0.421			0.618			0.596
2010	0.413	0.728	0.645	0.551	0.640	0.741	0.511
2015	0.682	0.993	0.877	0.652	0.569	0.744	0.619



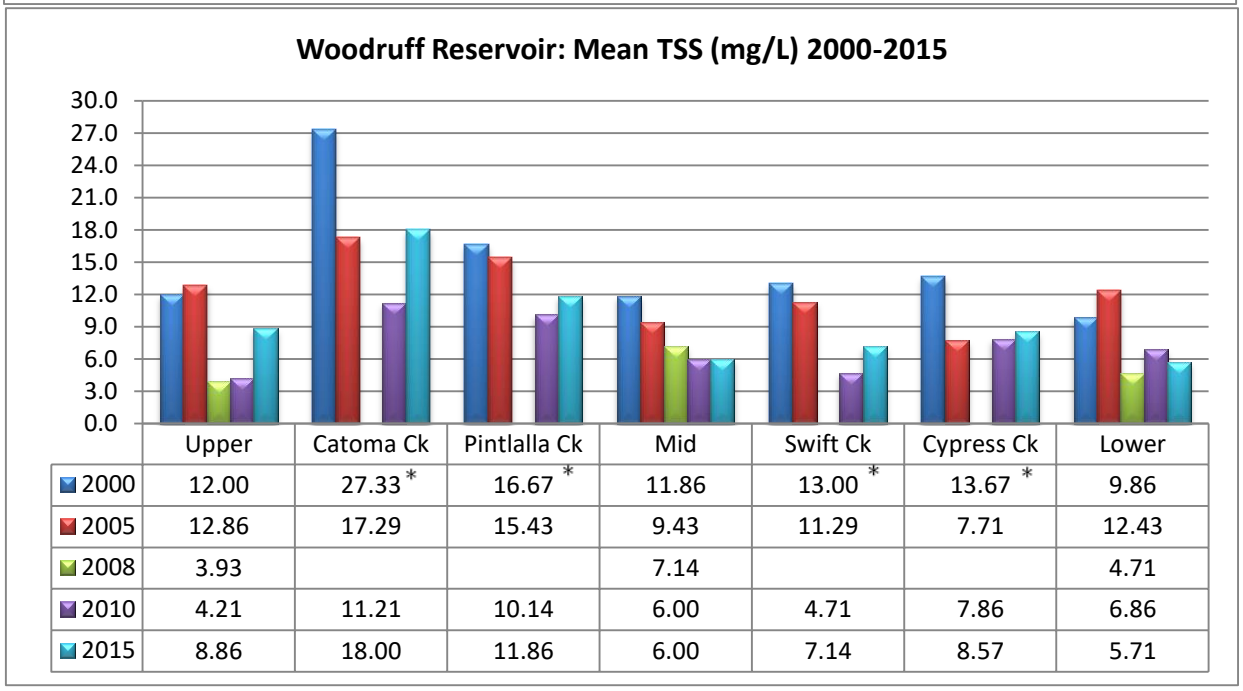
	Upper	Catoma Ck	Pintlalla Ck	Mid	Swift Ck	Cypress Ck	Lower
2000	0.041	0.091 *	0.071 *	0.059	0.037 *	0.053 *	0.051
2005	0.032	0.061	0.055	0.039	0.036	0.054	0.032
2008	0.037			0.052			0.040
2010	0.025	0.060	0.051	0.040	0.026	0.039	0.032
2015	0.027	0.092	0.065	0.038	0.023	0.036	0.033

*Mean of April/June/August only.

Figure 3. Growing season mean chl *a* and TSS measured in Woodruff Reservoir, April-October, 2000-2015. Bar graphs consist of mainstem and embayment stations, illustrated from upstream to downstream as the graph is read from left to right.



	Upper	Catoma Ck	Pintlalla Ck	Mid	Swift Ck	Cypress Ck	Lower
2000	14.72	25.99 *	27.77 *	18.57	19.76 *	25.57 *	17.48
2005	7.12	25.71	22.96	12.83	13.42	25.89	10.37
2008	18.46			21.15			16.17
2010	19.30	26.09	16.86	14.39	9.39	17.32	9.47
2015	5.98	13.80	9.44	6.54	8.33	9.07	3.76



	Upper	Catoma Ck	Pintlalla Ck	Mid	Swift Ck	Cypress Ck	Lower
2000	12.00	27.33 *	16.67 *	11.86	13.00 *	13.67 *	9.86
2005	12.86	17.29	15.43	9.43	11.29	7.71	12.43
2008	3.93			7.14			4.71
2010	4.21	11.21	10.14	6.00	4.71	7.86	6.86
2015	8.86	18.00	11.86	6.00	7.14	8.57	5.71

*Mean of April/June/August only.

Figure 4. Monthly TN of the mainstem stations in Woodruff Reservoir, April-October 2015. Each bar graph depicts monthly changes in each station. The historic mean and min/max range are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. TN was plotted vs. the closest discharge (COE Alabama River at Robert F. Henry L&D near Benton, AL).

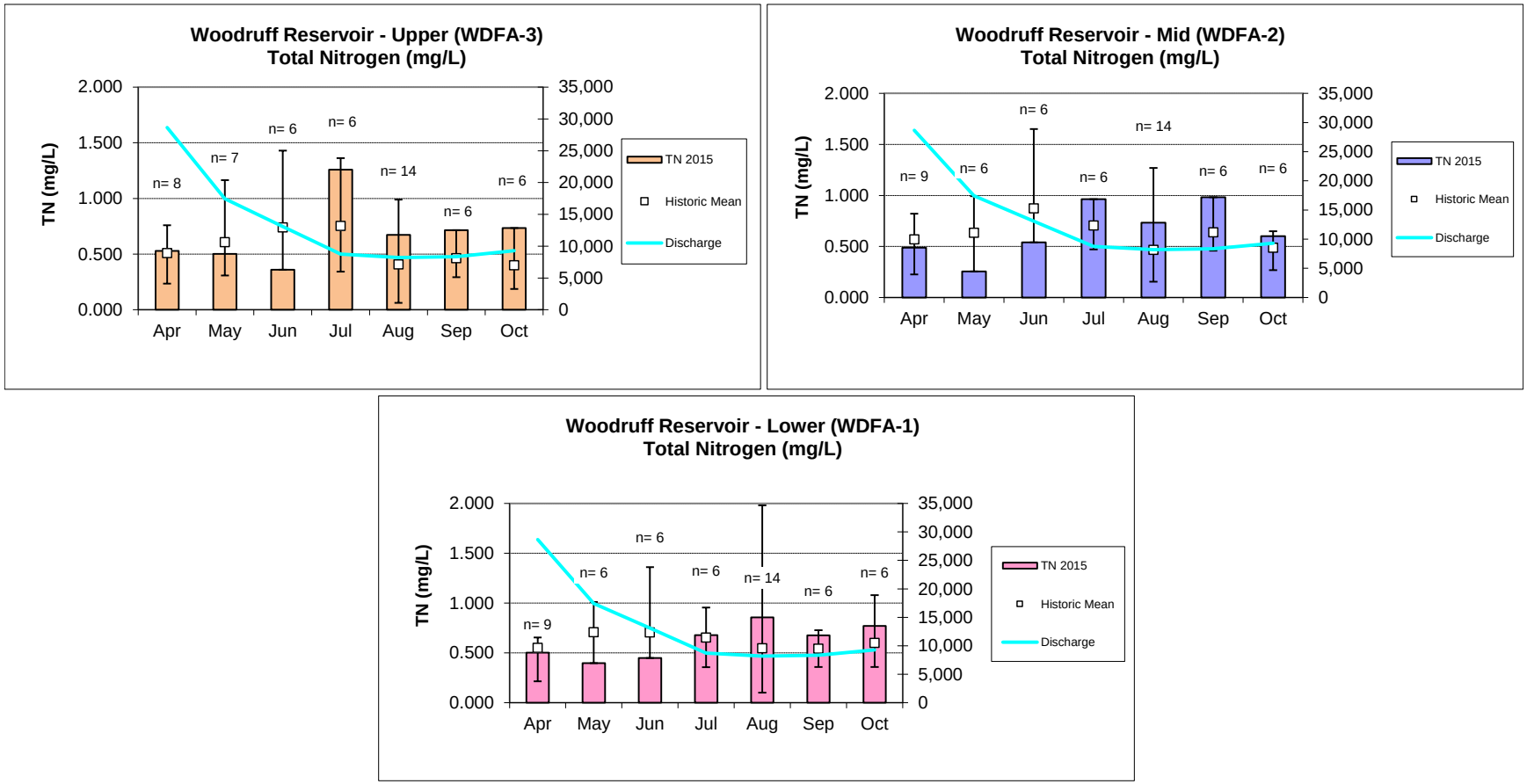
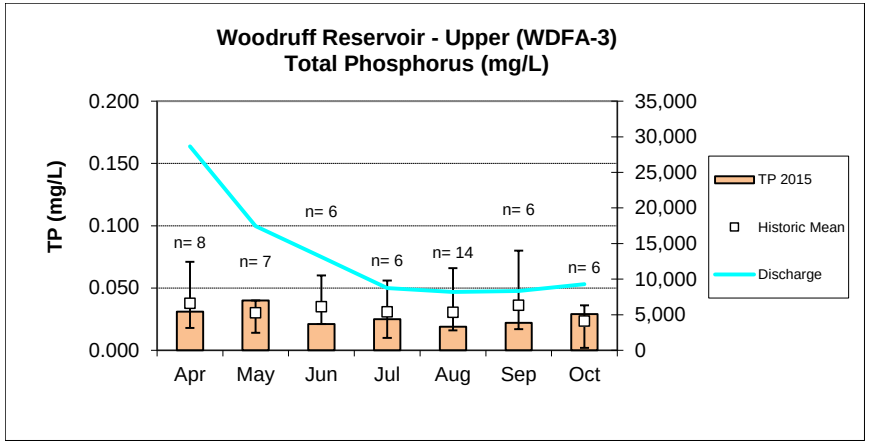
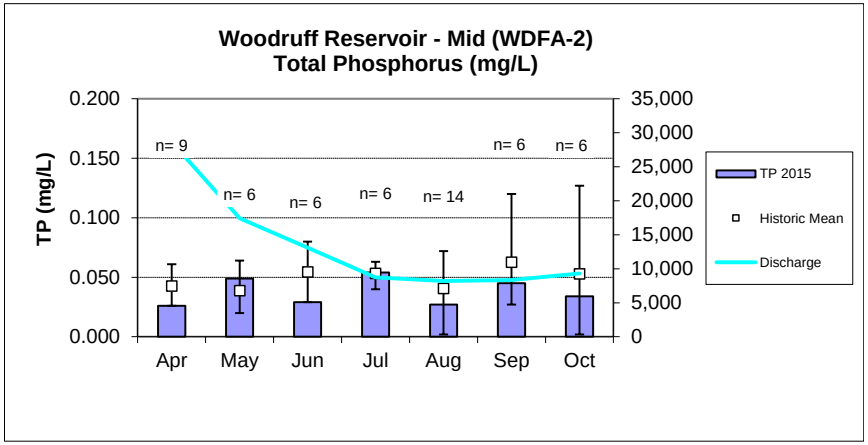


Figure 5. Monthly TP of the mainstem stations in Woodruff Reservoir, April-October 2015. Each bar graph depicts monthly changes in each station. The historic mean and min/max range are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. TP was plotted vs. the closest discharge (COE Alabama River at Robert F. Henry L&D near Benton, AL).





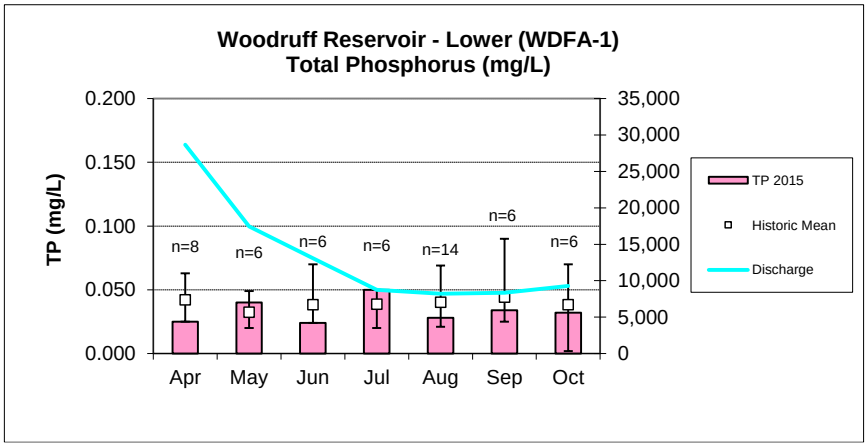
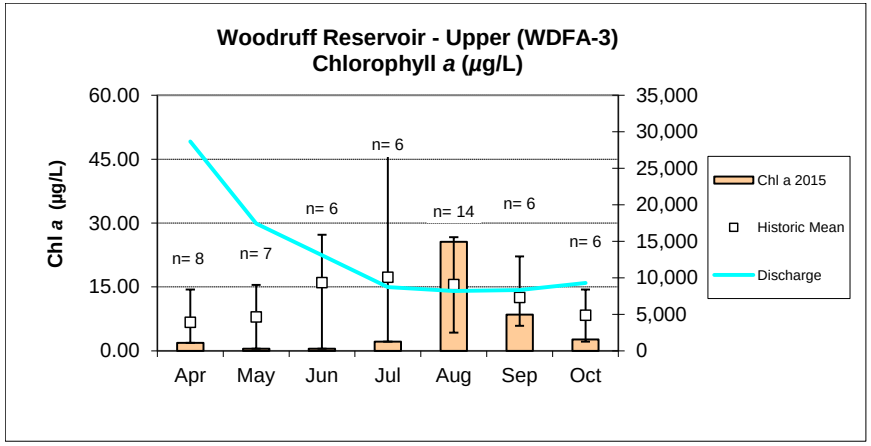
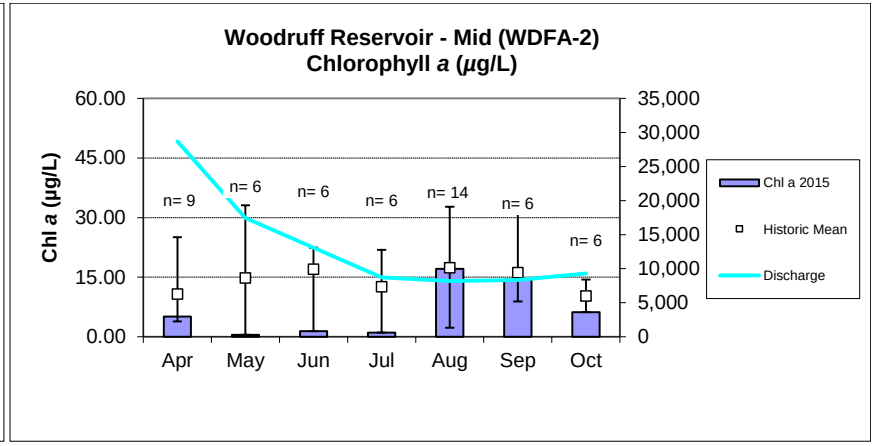


Figure 6. Monthly chl a of the mainstem stations in Woodruff Reservoir, April-October 2015. Each bar graph depicts monthly changes in each station. The historic mean and min/max range are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Chl a was plotted vs. the closest discharge (COE Alabama River at Robert F. Henry L&D near Benton, AL).





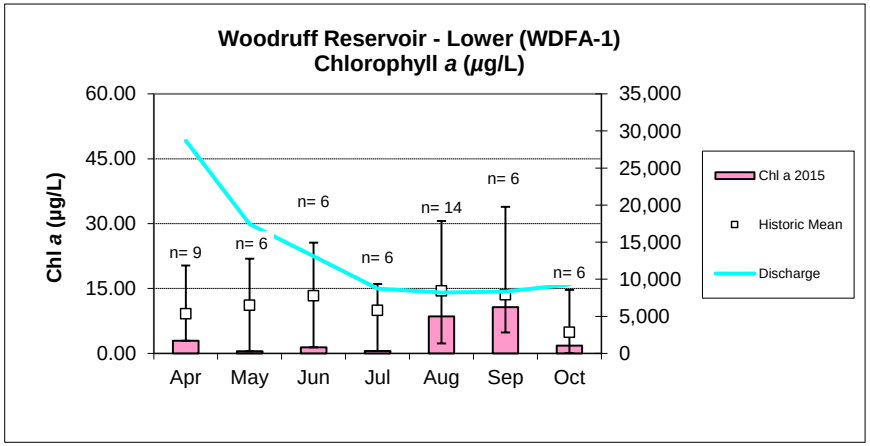
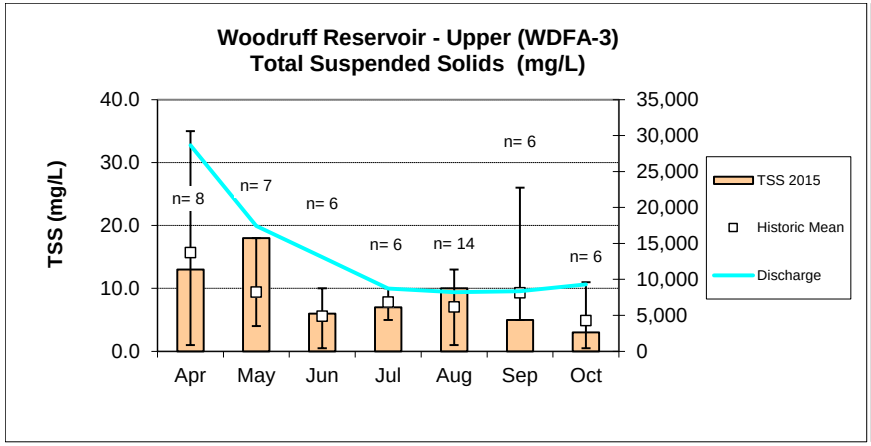
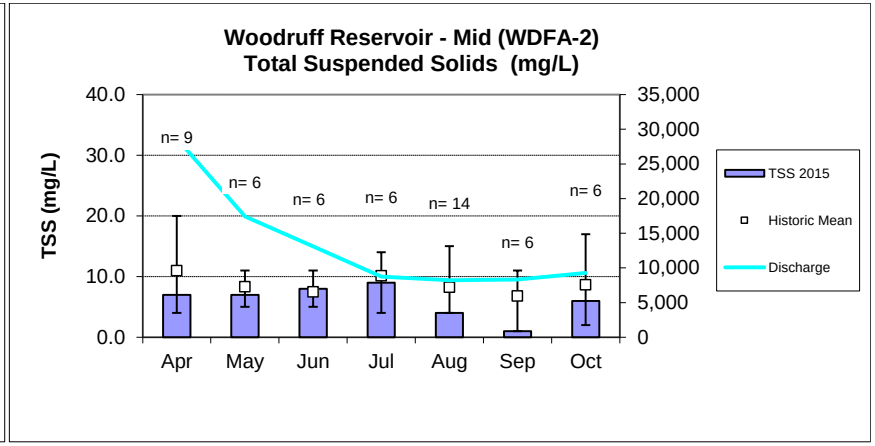


Figure 7. Monthly TSS of the mainstem stations in Woodruff Reservoir, April-October 2015. Each bar graph depicts monthly changes in each station. The historic mean and min/max range are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. TSS was plotted vs. the closest discharge (COE Alabama River at Robert F. Henry L&D near Benton, AL).





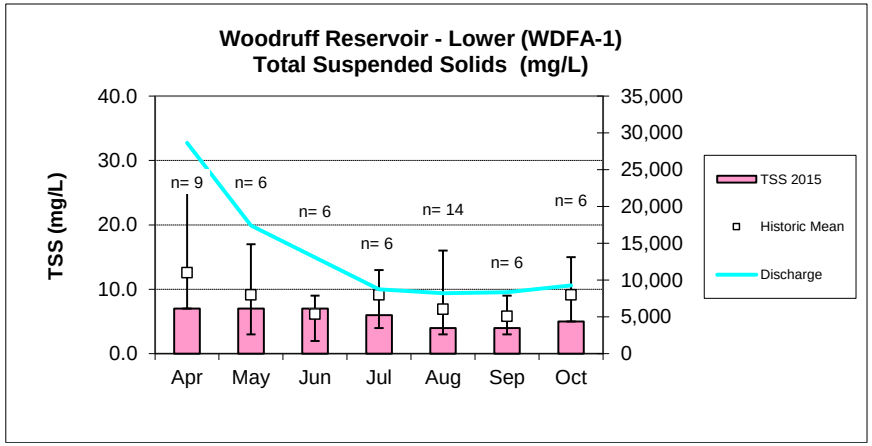
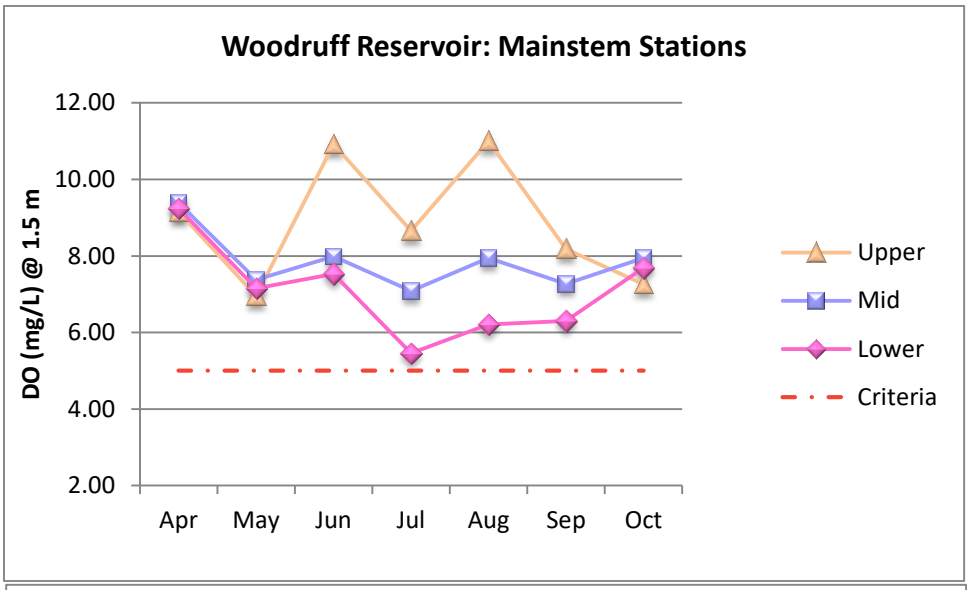


Figure 8. Monthly DO concentrations at 1.5 m (5 ft) for Woodruff Reservoir stations collected April-October 2015. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth (ADEM 2010). In tributaries, when total depth was less than 3 m, criteria apply to the mid-depth reading.



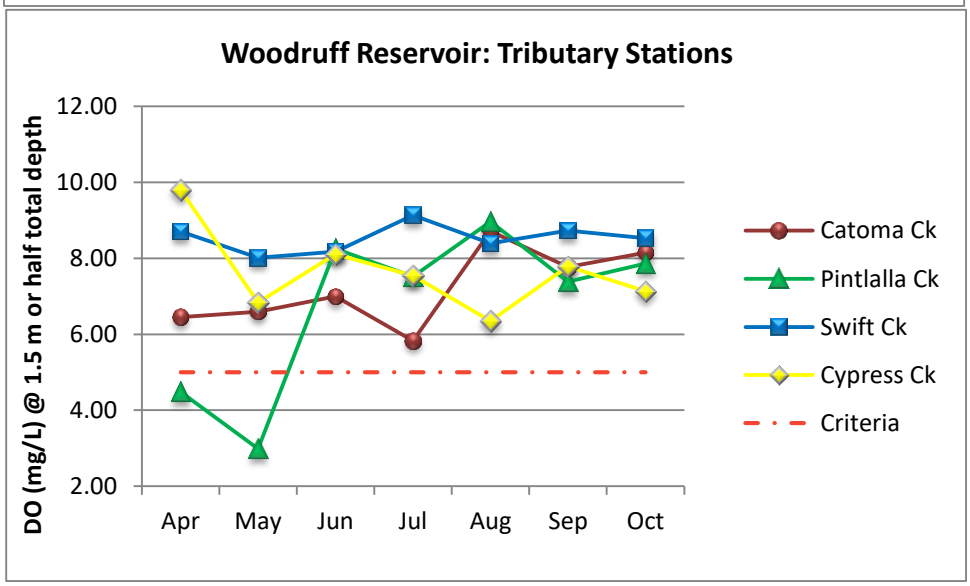


Figure 9. Monthly depth profiles of dissolved oxygen (mg/L), temperature (C), and conductivity (umhos) in lower Woodruff Reservoir, April-October 2015.

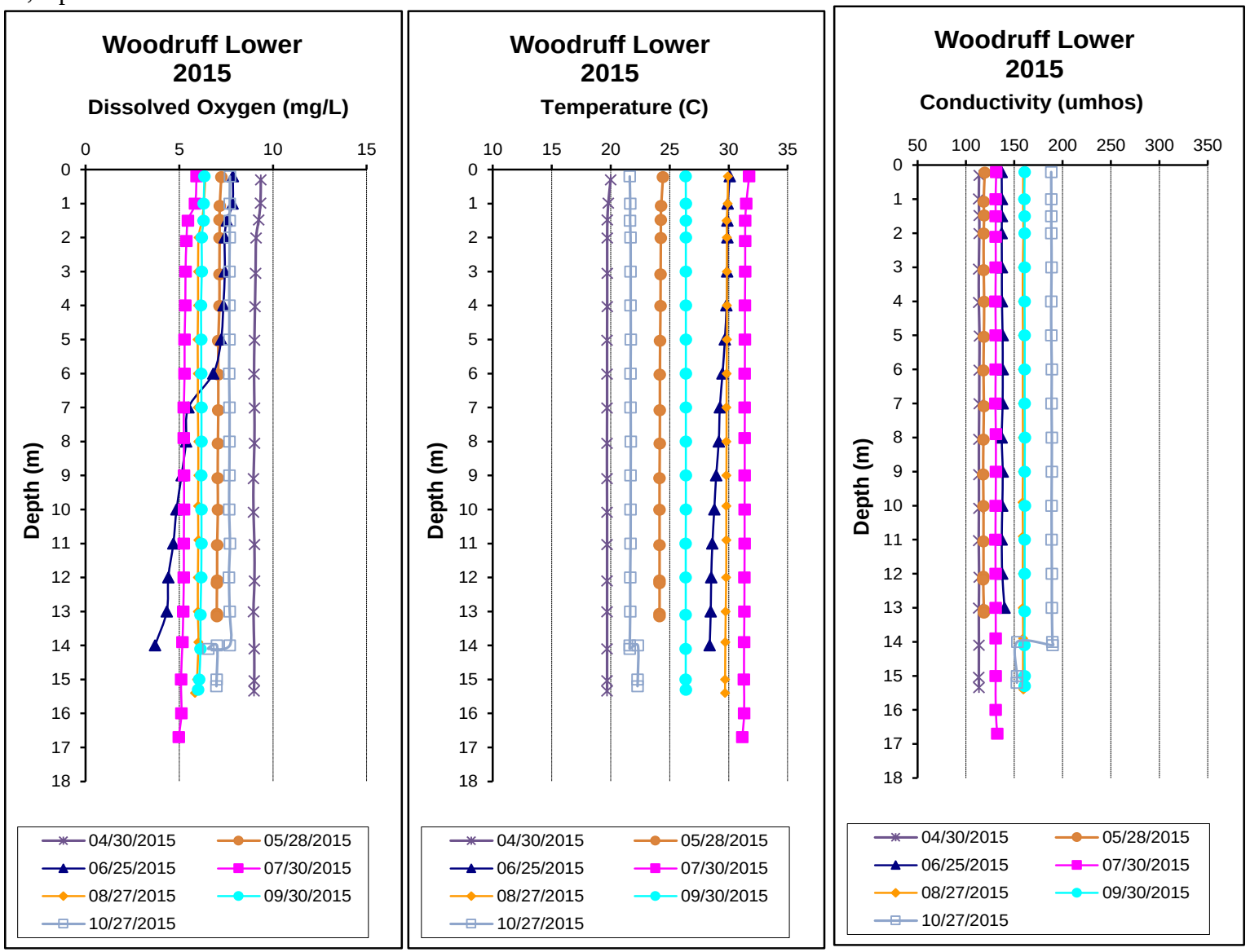


Figure 10. Monthly depth profiles of dissolved oxygen (mg/L), temperature (C), and conductivity (umhos) in mid Woodruff Reservoir, April-October 2015.

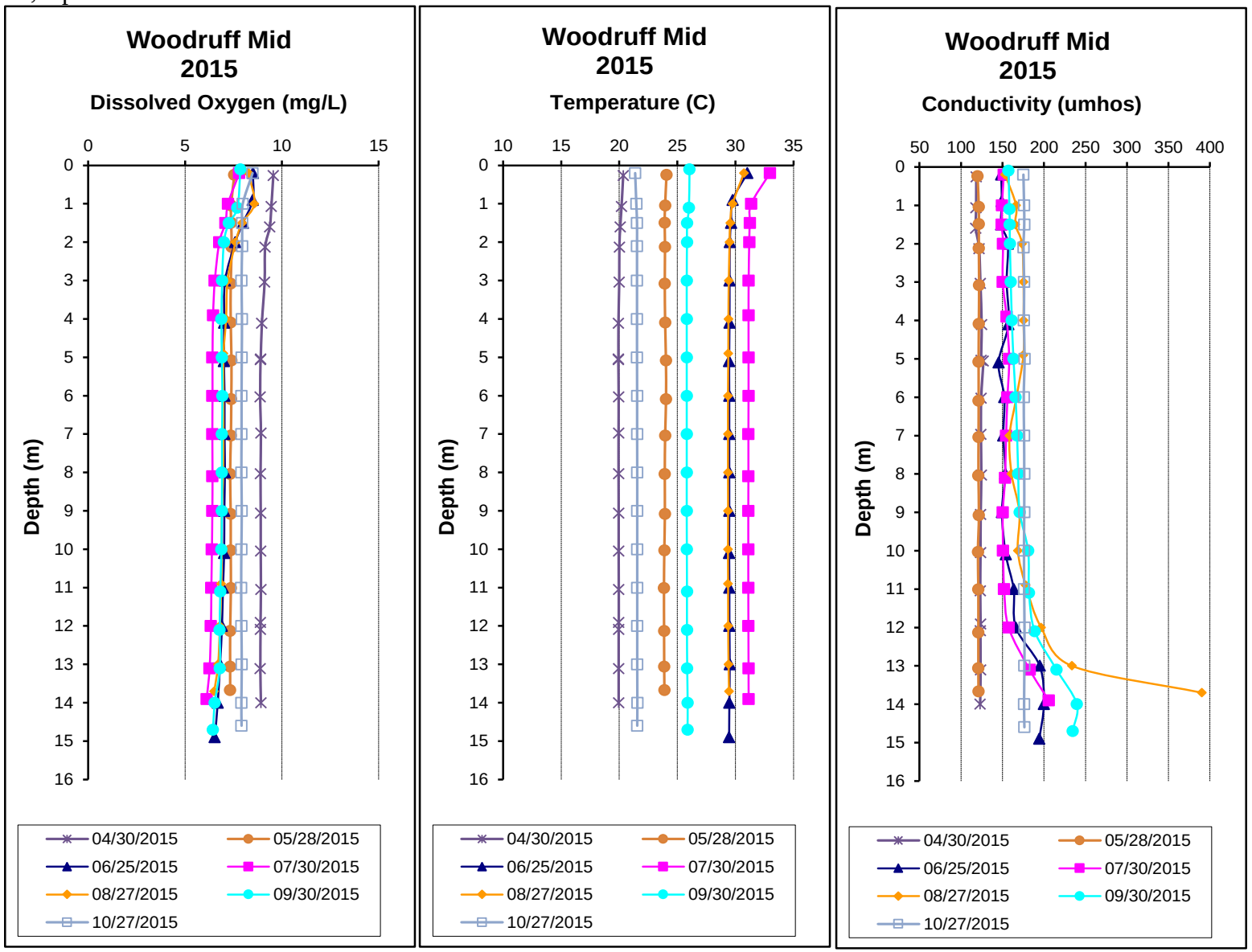
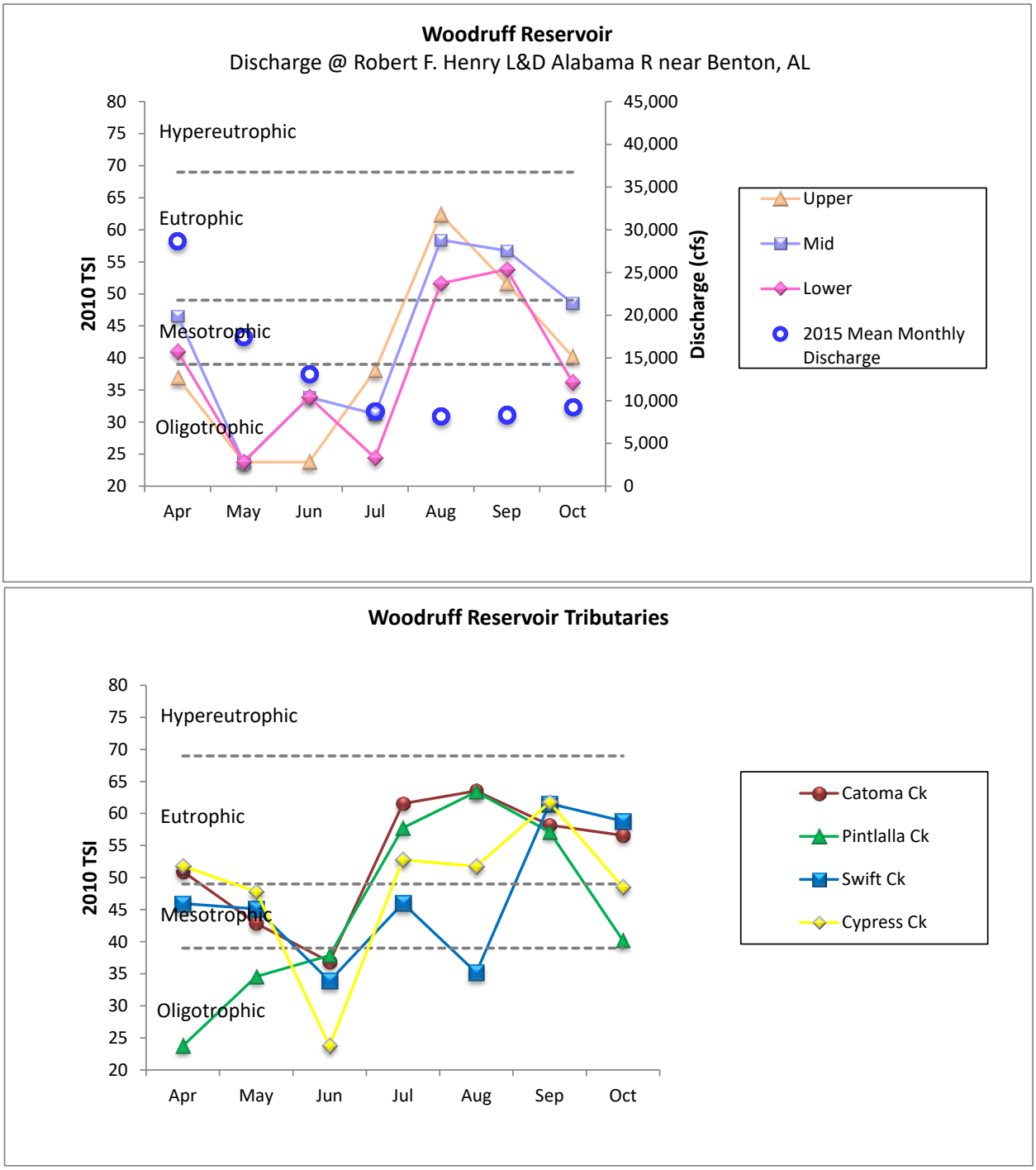


Figure 11. Monthly growing season TSI values for mainstem and tributary stations using chl a concentrations and Carlson's Trophic State Index calculation. TSI for mainstem stations were plotted vs. closest discharge (COE Alabama River at Robert F. Henry L&D near Benton, AL).



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APPENDIX

Appendix Table 1. Summary of water quality data collected April-October, 2015. Minimum (min) and maximum (max) values calculated using minimum detection limits when results were less than this value. Median (med), 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
WDFA-1	**Physical**						
	Turbidity (NTU)	7	5.4	9.0	6.8	7.1	1.4
	Total Dissolved Solids (mg/L)	7	56.0	115.0	84.0	83.7	18.1
	Total Suspended Solids (mg/L)	7	4.0	7.0	6.0	5.7	1.4
	Hardness (mg/L)	4	42.2	61.6	48.8	50.4	8.9
	Alkalinity (mg/L)	7	38.9	62.5	48.9	50.0	8.6
	Photic Zone (m)	7	2.92	4.05	3.27	3.29	0.39
	Secchi (m)	7	0.80	1.80	1.31	1.25	0.36
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.010	0.109	0.044	0.052	0.033
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.040	0.195	0.131	0.132	0.048
	Total Kjeldahl Nitrogen (mg/L)	7	0.202	0.735	0.521	0.487	0.176
	Total Nitrogen (mg/L)	7	0.397	0.856	0.677	0.619	0.172
	Dissolved Reactive Phosphorus (mg/	7	0.003	0.021	0.010	0.011	0.007
	Total Phosphorus (mg/L)	7	0.024	0.050	0.032	0.033	0.009
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.6	12.0	7.2	8.3	2.6
	Biological						
	Chlorophyll a (mg/m³)	7	< 0.53	10.70	1.78	3.76	4.13
	E. coli (MPN/DL)[J]	3	< 1	1	1	1	1
WDFA-2	**Physical**						
	Turbidity (NTU)	7	5.5	9.8	7.4	7.4	1.6
	Total Dissolved Solids (mg/L)	7	54.0	110.0	84.0	84.4	20.0
	Total Suspended Solids (mg/L)[J]	7	1.0	9.0	7.0	6.0	2.7
	Hardness (mg/L)	4	45.4	63.8	48.4	51.5	8.6
	Alkalinity (mg/L)	7	45.6	63.1	52.3	52.4	7.0
	Photic Zone (m)	7	2.55	3.76	3.19	3.20	0.41
	Secchi (m)	7	0.66	1.44	1.15	1.12	0.26
	Chemical						
	Ammonia Nitrogen (mg/L)[J]	7	< 0.010	0.128	0.018	0.041	0.043
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.077	0.223	0.135	0.148	0.052
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.064	0.853	0.421	0.503	0.284
	Total Nitrogen (mg/L)	7	< 0.255	0.982	0.600	0.652	0.262
	Dissolved Reactive Phosphorus (mg/	7	0.004	0.027	0.011	0.013	0.008
	Total Phosphorus (mg/L)	7	0.026	0.054	0.034	0.038	0.012
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.2	14.2	8.4	8.2	3.4
	Biological						
	Chlorophyll a (mg/m³)	7	< 1.00	17.10	5.10	6.54	6.69
	E. coli (MPN/DL)[J]	3	< 1	16	3	7	8

Station	Parameter	N		Min	Max	Med	Mean	SD
WDFA-3	**Physical**							
	Turbidity (NTU)	7		4.5	17.3	5.6	8.2	4.9
	Total Dissolved Solids (mg/L)	7		51.0	104.0	73.0	75.0	18.7
	Total Suspended Solids (mg/L)	7		3.0	18.0	7.0	8.9	5.2
	Hardness (mg/L)	4		40.6	69.9	50.9	53.1	12.9
	Alkalinity (mg/L)	7		39.5	70.5	49.2	52.2	11.2
	Photic Zone (m)	7		2.23	4.52	3.59	3.44	0.83
	Secchi (m)	7		0.71	1.58	1.12	1.15	0.28
	Chemical							
	Ammonia Nitrogen (mg/L)	7	<	0.007	0.101	0.005	0.026	0.036
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7		0.009	0.165	0.134	0.101	0.059
	Total Kjeldahl Nitrogen (mg/L)	7		0.302	1.200	0.582	0.581	0.306
	Total Nitrogen (mg/L)[J]	7		0.359	1.259	0.673	0.682	0.288
	Dissolved Reactive Phosphorus (mg/	7	<	0.003	0.015	0.006	0.006	0.004
	Total Phosphorus (mg/L)	7		0.019	0.040	0.025	0.027	0.007
	CBOD-5 (mg/L)	7	<	2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7		3.6	9.5	4.6	5.4	2.1
	Biological							
	Chlorophyll a (mg/m³)	7	<	1.00	25.60	2.14	5.98	9.07
	E. coli (MPN/DL)	3		11	78	24	38	35
WDFA-4	**Physical**							
	Turbidity (NTU)	8		14.1	25.0	16.4	17.4	3.6
	Total Dissolved Solids (mg/L)	7		67.0	155.0	91.0	100.0	30.0
	Total Suspended Solids (mg/L)[J]	7		14.0	23.0	17.0	18.0	3.7
	Hardness (mg/L)	4		53.0	89.1	60.6	65.8	16.0
	Alkalinity (mg/L)	7		53.8	82.0	62.5	64.4	10.1
	Photic Zone (m)	7		1.28	2.55	1.88	1.89	0.40
	Secchi (m)	7		0.30	1.02	0.58	0.61	0.21
	Chemical							
	Ammonia Nitrogen (mg/L)	7	<	0.010	0.065	0.022	0.028	0.026
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7		0.001	0.129	0.077	0.064	0.053
	Total Kjeldahl Nitrogen (mg/L)	7		0.370	1.900	0.754	0.929	0.512
	Total Nitrogen (mg/L)[J]	7		0.485	1.929	0.806	0.993	0.480
	Dissolved Reactive Phosphorus (mg/	7		0.009	0.026	0.012	0.014	0.006
	Total Phosphorus (mg/L)	7		0.036	0.180	0.054	0.092	0.062
	CBOD-5 (mg/L)	7	<	2.0	3.2	1.0	1.3	0.8
	Chlorides (mg/L)	7		4.2	8.0	5.6	5.6	1.2
	Biological							
	Chlorophyll a (mg/m³)	7		1.90	28.80	14.20	13.80	10.08
	E. coli (MPN/DL)[J]	3	<	1	155	6	54	88

Station	Parameter	N		Min	Max	Med	Mean	SD
WDFA-5	**Physical**							
	Turbidity (NTU)	7		6.7	30.4	11.2	12.9	8.4
	Total Dissolved Solids (mg/L)	7		72.0	170.0	90.0	107.6	38.8
	Total Suspended Solids (mg/L)	7		4.0	22.0	11.0	11.9	5.9
	Hardness (mg/L)	4		45.5	99.5	57.2	64.8	24.9
	Alkalinity (mg/L)	7		45.5	120.0	60.5	68.2	25.2
	Photic Zone (m)	7		1.05	3.31	2.70	2.52	0.74
	Secchi (m)	7		0.31	1.12	0.85	0.84	0.27
	Chemical							
	Ammonia Nitrogen (mg/L)[J]	7	<	0.010	0.267	0.061	0.087	0.092
	Nitrate+Nitrite Nitrogen (mg/L)	7		0.051	0.158	0.109	0.106	0.038
	Total Kjeldahl Nitrogen (mg/L)	7		0.249	1.870	0.558	0.770	0.567
	Total Nitrogen (mg/L)	7		0.407	1.931	0.690	0.877	0.548
	Dissolved Reactive Phosphorus (mg/	7		0.006	0.085	0.016	0.024	0.028
	Total Phosphorus (mg/L)	7		0.034	0.162	0.057	0.065	0.045
	CBOD-5 (mg/L)	7	<	2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7		3.6	8.9	5.4	5.6	1.7
	Biological							
	Chlorophyll a (mg/m³)	7	<	1.00	28.30	2.67	9.44	10.59
	E. coli (MPN/DL)	3		1	23	2	9	13
WDFA-6	**Physical**							
	Turbidity (NTU)	7		5.6	13.9	8.3	8.6	2.6
	Total Dissolved Solids (mg/L)	7		51.0	85.0	66.0	65.0	12.9
	Total Suspended Solids (mg/L)	7		3.0	13.0	8.0	7.1	3.5
	Hardness (mg/L)	4		17.9	48.8	31.1	32.2	13.7
	Alkalinity (mg/L)	7		12.9	52.7	40.2	35.0	14.6
	Photic Zone (m)	7		1.98	3.56	2.88	2.84	0.47
	Secchi (m)	7		0.63	1.12	0.89	0.90	0.17
	Chemical							
	Ammonia Nitrogen (mg/L)	7	<	0.010	0.113	0.024	0.033	0.037
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7		0.001	0.116	0.024	0.045	0.048
	Total Kjeldahl Nitrogen (mg/L)	7		0.151	0.798	0.566	0.524	0.228
	Total Nitrogen (mg/L)[J]	7		0.264	0.806	0.586	0.569	0.189
	Dissolved Reactive Phosphorus (mg/	7	<	0.002	0.005	0.003	0.003	0.001
	Total Phosphorus (mg/L)	7		0.017	0.036	0.020	0.023	0.007
	CBOD-5 (mg/L)	7	<	2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7		2.8	8.3	5.9	6.0	2.2
	Biological							
	Chlorophyll a (mg/m³)	7		1.40	23.50	4.80	8.33	8.69
	E. coli (MPN/DL)[J]	3	<	1	10	1	4	5

Station	Parameter	N	Min	Max	Med	Mean	SD
WDFA-7	**Physical**						
	Turbidity (NTU)	7	6.7	12.0	7.8	8.3	1.8
	Total Dissolved Solids (mg/L)	7	56.0	116.0	81.0	83.0	17.9
	Total Suspended Solids (mg/L)[J]	7	5.0	16.0	8.0	8.6	3.7
	Hardness (mg/L)	4	43.4	62.5	54.2	53.6	9.0
	Alkalinity (mg/L)	7	42.2	62.4	51.5	51.4	7.2
	Photic Zone (m)	7	1.66	3.30	2.80	2.71	0.51
	Secchi (m)	7	0.71	1.05	0.91	0.91	0.12
	Chemical						
	Ammonia Nitrogen (mg/L)[J]	7	< 0.007	0.138	0.005	0.027	0.049
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	0.006	0.109	0.014	0.040	0.042
	Total Kjeldahl Nitrogen (mg/L)	7	0.349	1.330	0.566	0.703	0.330
	Total Nitrogen (mg/L)[J]	7	0.458	1.343	0.633	0.744	0.307
	Dissolved Reactive Phosphorus (mg/	7	0.002	0.010	0.003	0.004	0.003
	Total Phosphorus (mg/L)[J]	7	0.023	0.070	0.031	0.036	0.016
	CBOD-5 (mg/L)	7	< 2.0	2.4	1.0	1.2	0.5
	Chlorides (mg/L)	7	4.4	10.6	6.8	7.6	2.2
	Biological						
	Chlorophyll a (mg/m³)	7	< 1.00	24.00	8.68	9.07	7.25
	E. coli (MPN/DL)	3	1	10	2	4	5

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