2017 & 2021 Lewis Smith Reservoir Report

Rivers and Reservoirs Monitoring Program

Alabama Department of Environmental Management

Field Operations Division
Rivers and Reservoirs Unit
August 2025

Rivers and Reservoirs Monitoring Program

2021

Lewis Smith Reservoir

Black Warrior River Basin

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LIST OF ACRONYMS

ADPH	Alabama Department of Public Health
A&I	Agricultural and Industrial Water Supply
ADEM	Alabama Department of Environmental Management
AGPT	Algal Growth Potential Test
BW	Black Warrior
CHL *a*	Chlorophyll *a*
CWA	Clean Water Act
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

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INTRODUCTION

Lewis Smith Reservoir (Smith Reservoir) is a 21,200 acre waterbody that was established in 1961 by Alabama Power with the completion of Lewis Smith Dam as the first and largest reservoir in the Black Warrior system. Still owned and operated by Alabama Power, Smith Reservoir fulfills multiple purposes like fishing, recreation, drinking water, and power supply.

In 2010, the Alabama Department of Public Health (ADPH) issued a fish consumption advisory due to mercury found in fish tissue. As a result, several Smith Reservoir embayments—Clear Creek, Sipsey Fork, Rock Creek, and Ryan Creek—were placed on Alabama's 2010 CWA §303(d) list of impaired waters for not meeting its Public Water Supply/Swimming/Fish & Wildlife (PWS/S/F&W) water use classification for mercury caused by atmospheric deposition.

The Alabama Department of Environmental Management (ADEM) monitored Smith Reservoir as part of the assessment of the Black Warrior (BW) 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 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).

Specific water quality criteria for nutrient management were implemented in 2004 at three locations on Smith Reservoir. These criteria represent maximum growing season (April-October) mean chlorophyll *a* (chl *a*) concentrations that are protective of Smith Reservoir's Public Water Supply, Swimming, and Fish & Wildlife (PWS/S/F&W) use classifications.

The purpose of this report is to summarize data collected at eleven stations at Smith Reservoir during the 2017 and 2021 growing seasons and to evaluate growing season 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 selected using historical data and previous assessments (Figure 1). Specific station location information can be found in Table 1. Smith Reservoir was sampled at the dam forebay with additional stations in the mid and upper reservoir. Monitoring sites were also established in the Ryan Creek, Rock Creek, Brushy Creek, Clear Creek, Dismal Creek, Crooked Creek, Simpson Creek, and Sipsey River embayments.

Water quality sampling was conducted at monthly intervals, April-October in both 2017 and 2021. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operating Procedures (ADEM 2021), Surface Water Quality Assurance Project Plan (ADEM 2023), 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 Alabama Power Company (APCo) discharge data and ADEM's previously collected data to help interpret the 2017 and 2021 results.

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

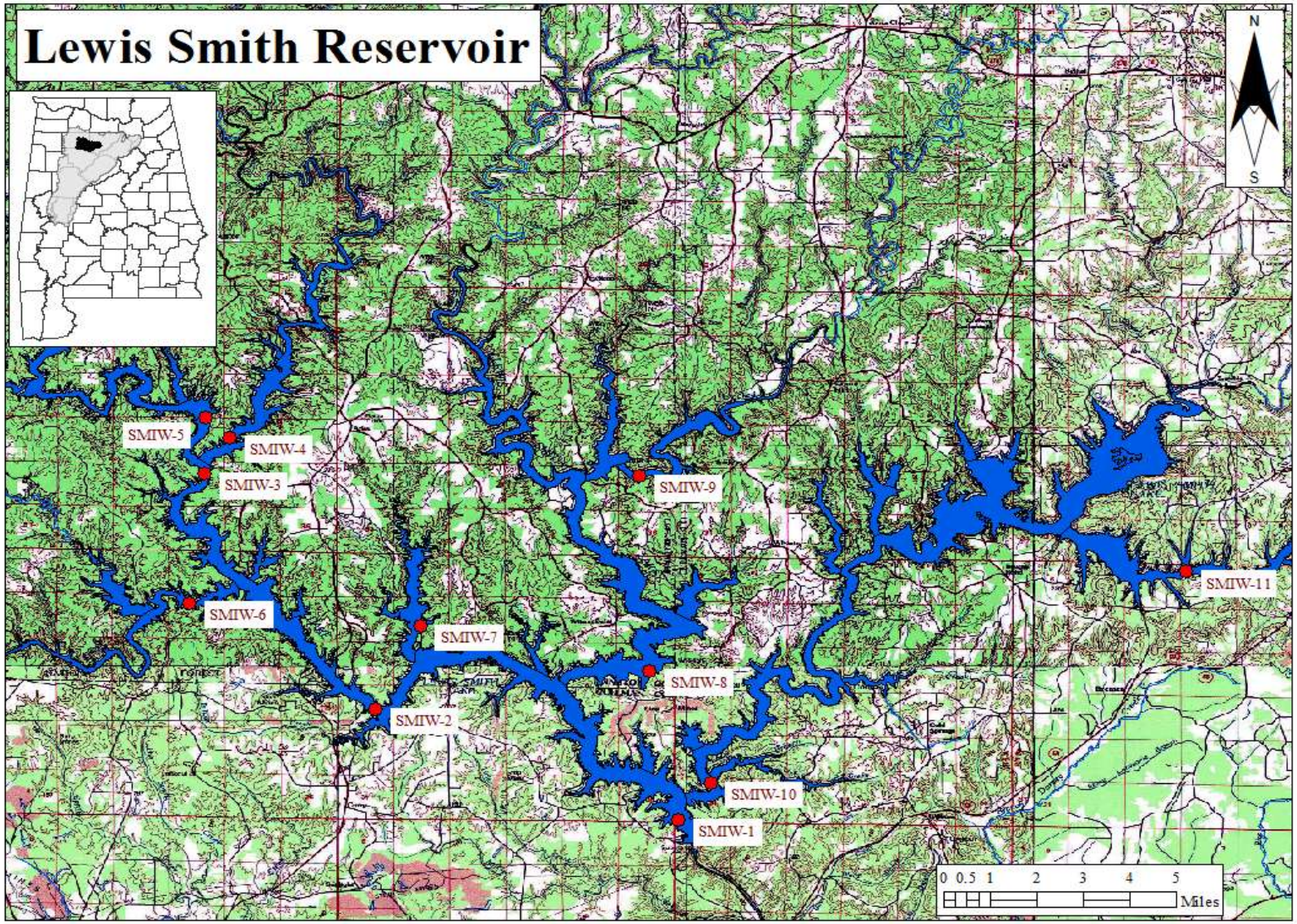


Table 1. Descriptions of the monitoring stations in Smith Reservoir.

HUC	County	Station Number	Report Designation	Waterbody Name	Station Description	Chl *a* Criteria	Latitude	Longitude
Smith Reservoir								
031601100507	Cullman	SMIW-1	Lower	Black Warrior R	Deepest point, main river channel, dam forebay.	5 µg/l*	33.9495	-87.1108
031601100306	Winston	SMIW-2	Mid	Black Warrior R	Deepest point, main river channel, at Duncan Creek/Sipsey River confluence. Downstream of Alabama Hwy 257 bridge.	5 µg/l*	33.9860	-87.2052
031601100203	Winston	SMIW-3	Upper	Black Warrior R	Deepest point, main river channel, immediately downstream of Brushy Creek confluence.	5 µg/l*	34.0635	-87.2584
031601100203	Winston	SMIW-4	Brushy Ck	Brushy Ck	Deepest point, main creek channel, Brushy Creek embayment.		34.0754	-87.2505
031601100105	Winston	SMIW-5	Sipsey Fk	Sipsey Fk	Deepest point, main river channel, approx. 0.5 miles downstream of the Sipsey Fork, Yellow Creek confluence.		34.0821	-87.2580
031601100305	Winston	SMIW-6	Clear Ck	Clear Ck	Deepest point, main creek channel, Clear Creek embayment.		34.0210	-87.2630
031601100306	Winston	SMIW-7	Dismal Ck	Dismal Ck	Deepest point, main creek channel, Dismal Creek embayment.		34.0135	-87.1912
031601100408	Winston	SMIW-8	Rock Ck	Rock Ck	Deepest point, main creek channel, Rock Creek embayment.		33.9987	-87.1197
031601100407	Winston	SMIW-9	Crooked Ck	Crooked Ck	Deepest point, main creek channel, Crooked Creek embayment. Approx. 1.5 miles upstream of Winston Co. Rd. 22 bridge.		34.0627	-87.1230
031601100505	Cullman	SMIW-10	Ryan Ck	Ryan Ck	Deepest point, main creek channel, Ryan Creek embayment.		33.9619	-87.1008
031601100504	Cullman	SMIW-11	Simpson Ck	Simpson Ck	Deepest point, main creek channel, Simpson Creek embayment, approx. 2.5 mi upstream of Ryan Creek.		34.0313	-86.9527

*Growing season mean chl *a* criteria implemented at this station in 2004.

RESULTS

Growing season mean graphs for TN, TP, chl *a*, and TSS are provided in this section (Figures 2 and 3). Monthly graphs for TN, TP, chl *a*, TSS, DO, and TSI are also provided (Figures 4-9 and 14-15). Mean monthly discharge is included as an indicator of flow and retention time in the months sampled. Algal growth potential test (AGPT) results appear in Table 2. Depth profile graphs of temperature, DO, and conductivity appear in Figures 10-13. Summary statistics of all data collected during 2017 and 2021 are presented in Appendix Table 1 and 2. The tables contain the minimum, maximum, median, mean, and standard deviation of each parameter analyzed.

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

The highest growing season mean TN concentrations were calculated for the Simpson Creek station in 2017 (Figure 2) and the Crooked Creek station in 2021. Mean TN concentrations increased between 2012 and 2021 at the Sipsey, Upper, Clear Creek, Dismal Creek, Crooked Creek, Rock Creek, and Lower stations. Monthly TN graphs are displayed in Figure 4.

The highest growing season mean TP concentrations were calculated for the Crooked Creek station in 2017 (Figure 2) and the Simpson Creek station in 2021. With the exception of Simpson Creek, mean TP concentrations were lower in 2021 at all stations than when monitoring began. Monthly TP graphs are displayed in Figure 5.

The growing season mean chl *a* concentration in both the mid and lower Smith Reservoir stations exceeded the established criteria in 2021. The highest growing season mean chl *a* concentrations among embayment stations were calculated for the Crooked Creek station in 2017 (Figure 3) and the Simpson Creek station in 2021. The mean chl *a* concentration at Rock Creek in 2021 was also considerably higher than previous sampling seasons. In 2021, Clear Creek, the mid station, Dismal Creek, Simpson Creek, Ryan Creek, and the lower station also had mean chl *a* values that were the highest observed since monitoring began. Monthly chl *a* graphs are displayed in Figure 6.

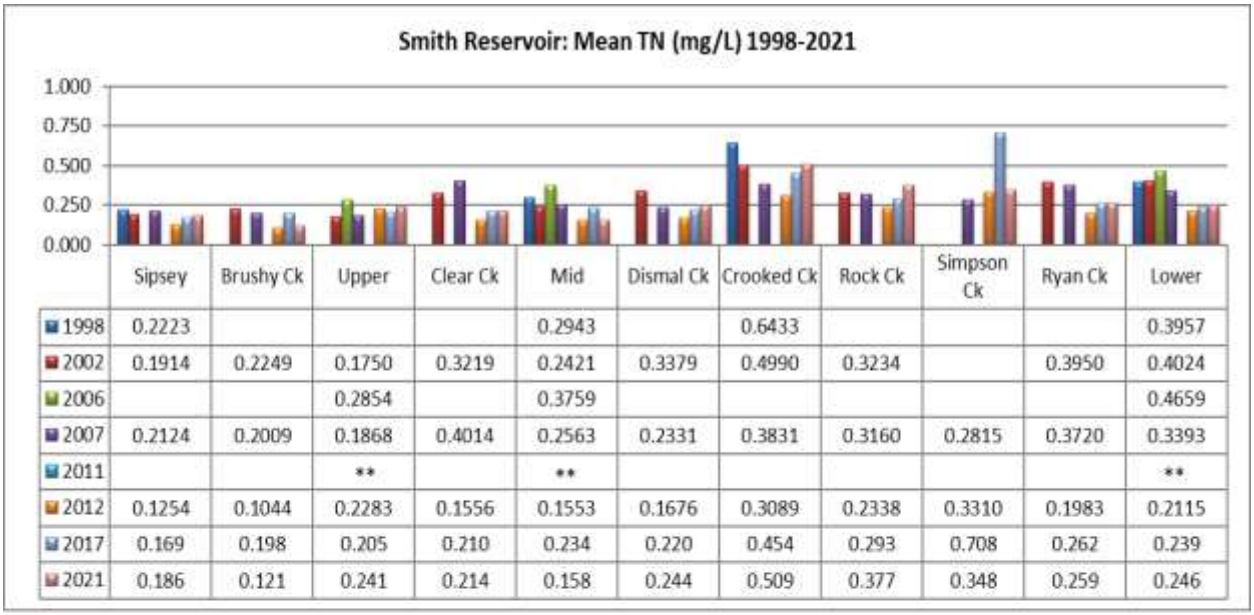
The highest growing season mean TSS concentrations were calculated for the Mid station in 2017 (Figure 3) and the Crooked and Simpson Creek stations in 2021. Mean TSS at all stations, except Simpson Creek, has declined since 2002. Monthly TSS graphs are displayed in Figure 7.

AGPT results for the Upper station indicated phosphorus-limited conditions in 2017 (Table 2). Mean standing crop at all mainstem stations has remained below 5.0 mg/L, the value that Raschke and Shultz (1987) defined as protective of reservoir and lake systems, since monitoring began. No AGPT samples were collected at the reservoir in 2021.

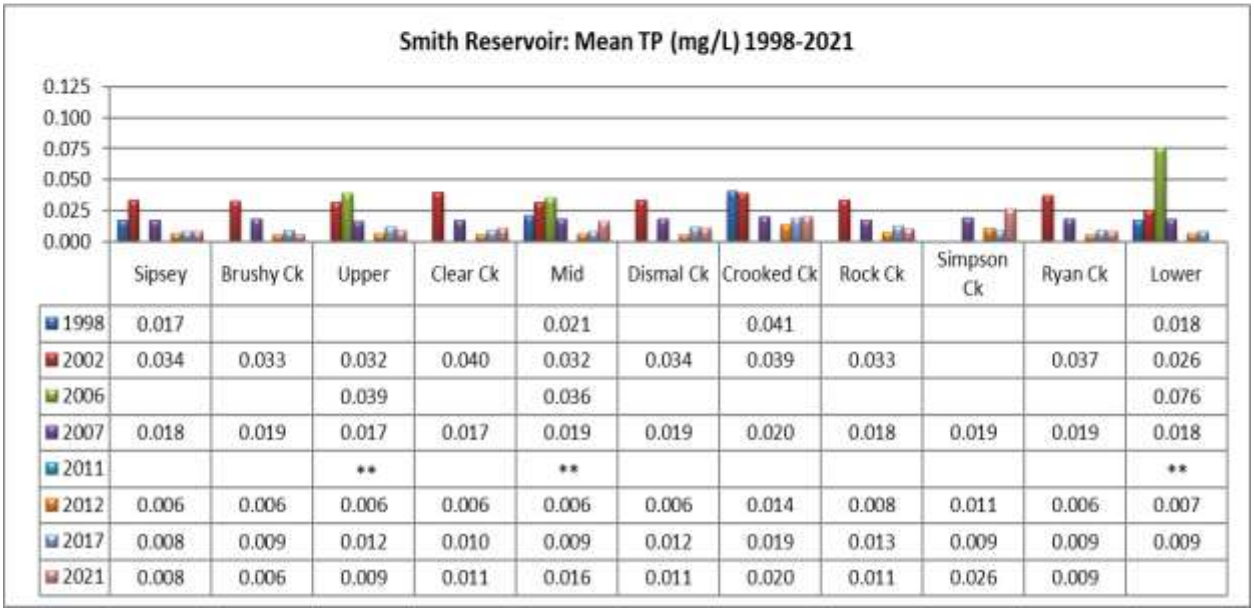
Dissolved oxygen concentrations at all Smith Reservoir stations were above the ADEM criteria limit of 5.0 mg/L at 5 ft (1.5m) throughout the April-October growing season in both 2017 and 2021 (ADEM Admin. Code R. 335-6-10-.09) (Figure 8). Profiles of the Lower and Mid mainstem stations show both locations were thermally and chemically stratified throughout the sampling season in both 2017 and 2021 (Figures 10-13). Highest water temperatures were reached in July-August both years.

TSI values were calculated using monthly chl *a* concentrations and Carlson's Trophic State Index. During 2017, the mainstem stations were oligotrophic to mesotrophic throughout the growing season (Figure 14). The embayment stations were generally oligotrophic to mesotrophic with the exception of Rock Creek, which reached eutrophic conditions in August, and Crooked Creek, which was eutrophic in April, May, and October (Figure 14). During 2021, eutrophic conditions were measured in the Lower station May-July, and in the Mid station in May (Figure 15). The Upper station was nearly eutrophic in June. During 2021, TSI values in the embayment stations were generally higher than in 2017 (Figure 15). Apart from Brushy Creek and Sipsey Fork, all embayment stations reached eutrophic conditions at some point during the growing season in 2021.

Figure 2. Growing season mean TN and TP concentrations measured in Smith Reservoir, April-October 1998-2021. Bar graphs consist of mainstem and embayment stations, illustrated from upstream to downstream as the graph is read from left to right.



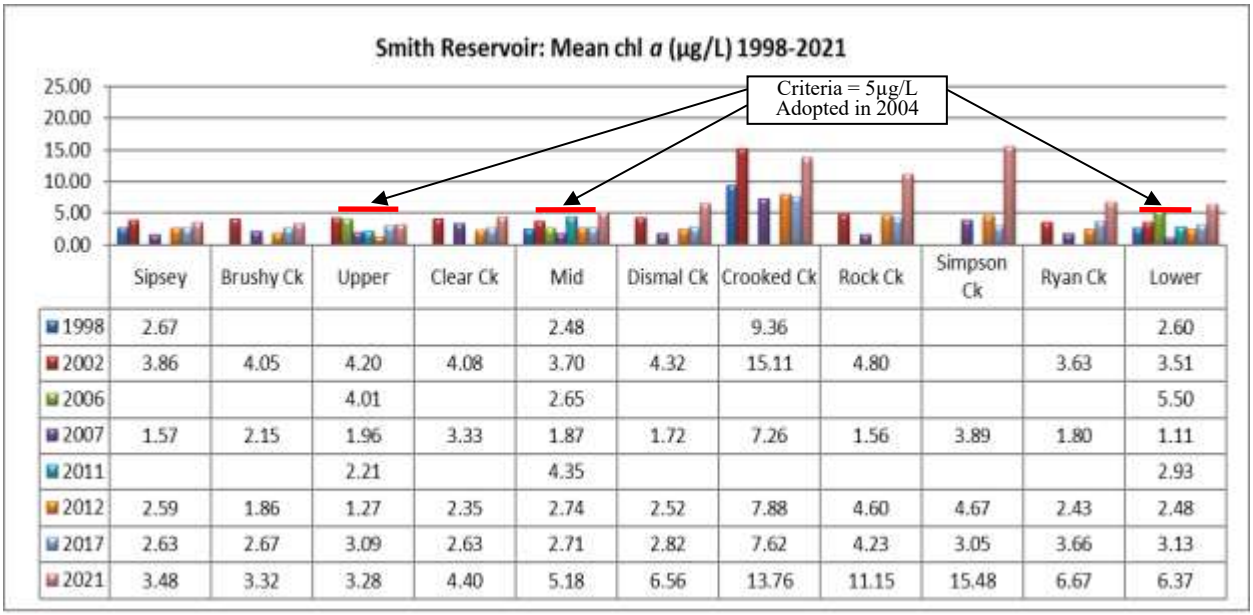
	Sipsey	Brushy Ck	Upper	Clear Ck	Mid	Dismal Ck	Crooked Ck	Rock Ck	Simpson Ck	Ryan Ck	Lower
1998	0.2223				0.2943		0.6433				0.3957
2002	0.1914	0.2249	0.1750	0.3219	0.2421	0.3379	0.4990	0.3234		0.3950	0.4024
2006			0.2854		0.3759						0.4659
2007	0.2124	0.2009	0.1868	0.4014	0.2563	0.2331	0.3831	0.3160	0.2815	0.3720	0.3393
2011			**		**						**
2012	0.1254	0.1044	0.2283	0.1556	0.1553	0.1676	0.3089	0.2338	0.3310	0.1983	0.2115
2017	0.169	0.198	0.205	0.210	0.234	0.220	0.454	0.293	0.708	0.262	0.239
2021	0.186	0.121	0.241	0.214	0.158	0.244	0.509	0.377	0.348	0.259	0.246



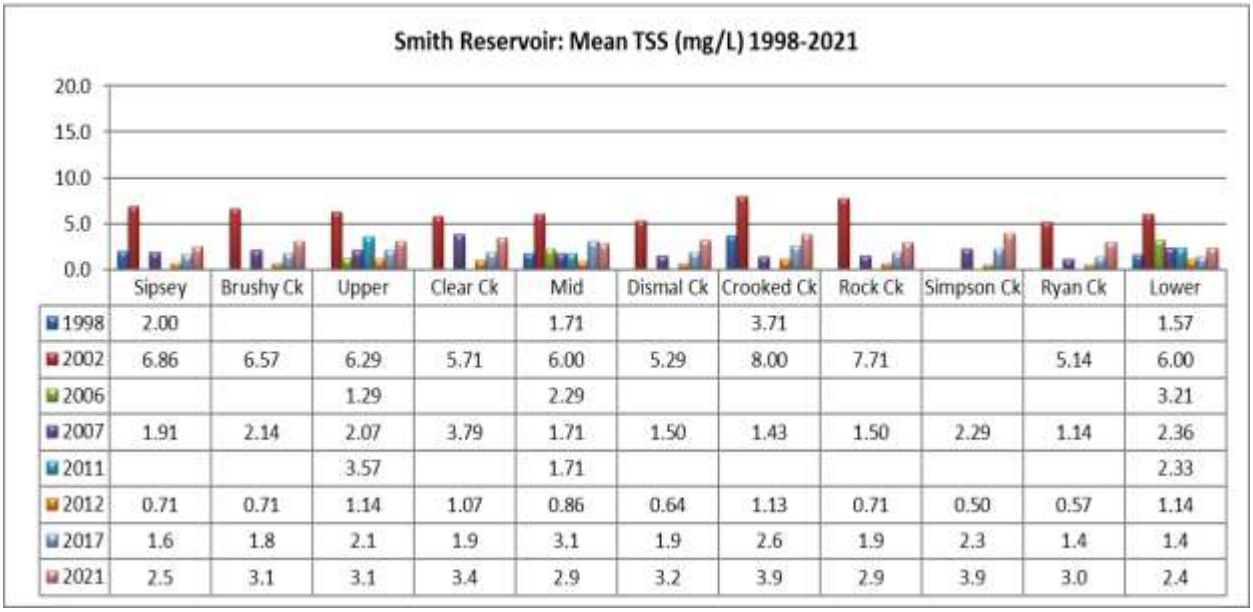
	Sipsey	Brushy Ck	Upper	Clear Ck	Mid	Dismal Ck	Crooked Ck	Rock Ck	Simpson Ck	Ryan Ck	Lower
1998	0.017				0.021		0.041				0.018
2002	0.034	0.033	0.032	0.040	0.032	0.034	0.039	0.033		0.037	0.026
2006			0.039		0.036						0.076
2007	0.018	0.019	0.017	0.017	0.019	0.019	0.020	0.018	0.019	0.019	0.018
2011			**		**						**
2012	0.006	0.006	0.006	0.006	0.006	0.006	0.014	0.008	0.011	0.006	0.007
2017	0.008	0.009	0.012	0.010	0.009	0.012	0.019	0.013	0.009	0.009	0.009
2021	0.008	0.006	0.009	0.011	0.016	0.011	0.020	0.011	0.026	0.009	

** Data did not meet ADEM's laboratory QC requirements.

Figure 3. Growing season mean chl *a* and TSS concentrations measured in Smith Reservoir, April-October 1998-2021. Bar graphs consist of mainstem and embayment stations, illustrated from upstream to downstream as the graph is read from left to right. Chl *a* criteria applies to the growing season mean of the Upper, Mid, and Lower stations only.



	Sipsey	Brushy Ck	Upper	Clear Ck	Mid	Dismal Ck	Crooked Ck	Rock Ck	Simpson Ck	Ryan Ck	Lower
1998	2.67				2.48		9.36				2.60
2002	3.86	4.05	4.20	4.08	3.70	4.32	15.11	4.80		3.63	3.51
2006			4.01		2.65						5.50
2007	1.57	2.15	1.96	3.33	1.87	1.72	7.26	1.56	3.89	1.80	1.11
2011			2.21		4.35						2.93
2012	2.59	1.86	1.27	2.35	2.74	2.52	7.88	4.60	4.67	2.43	2.48
2017	2.63	2.67	3.09	2.63	2.71	2.82	7.62	4.23	3.05	3.66	3.13
2021	3.48	3.32	3.28	4.40	5.18	6.56	13.76	11.15	15.48	6.67	6.37



	Sipsey	Brushy Ck	Upper	Clear Ck	Mid	Dismal Ck	Crooked Ck	Rock Ck	Simpson Ck	Ryan Ck	Lower
1998	2.00				1.71		3.71				1.57
2002	6.86	6.57	6.29	5.71	6.00	5.29	8.00	7.71		5.14	6.00
2006			1.29		2.29						3.21
2007	1.91	2.14	2.07	3.79	1.71	1.50	1.43	1.50	2.29	1.14	2.36
2011			3.57		1.71						2.33
2012	0.71	0.71	1.14	1.07	0.86	0.64	1.13	0.71	0.50	0.57	1.14
2017	1.6	1.8	2.1	1.9	3.1	1.9	2.6	1.9	2.3	1.4	1.4
2021	2.5	3.1	3.1	3.4	2.9	3.2	3.9	2.9	3.9	3.0	2.4

Figure 4. Monthly TN concentrations measured in Smith Reservoir mainstem stations, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) 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 (Smith Dam, information provided by Alabama Power).

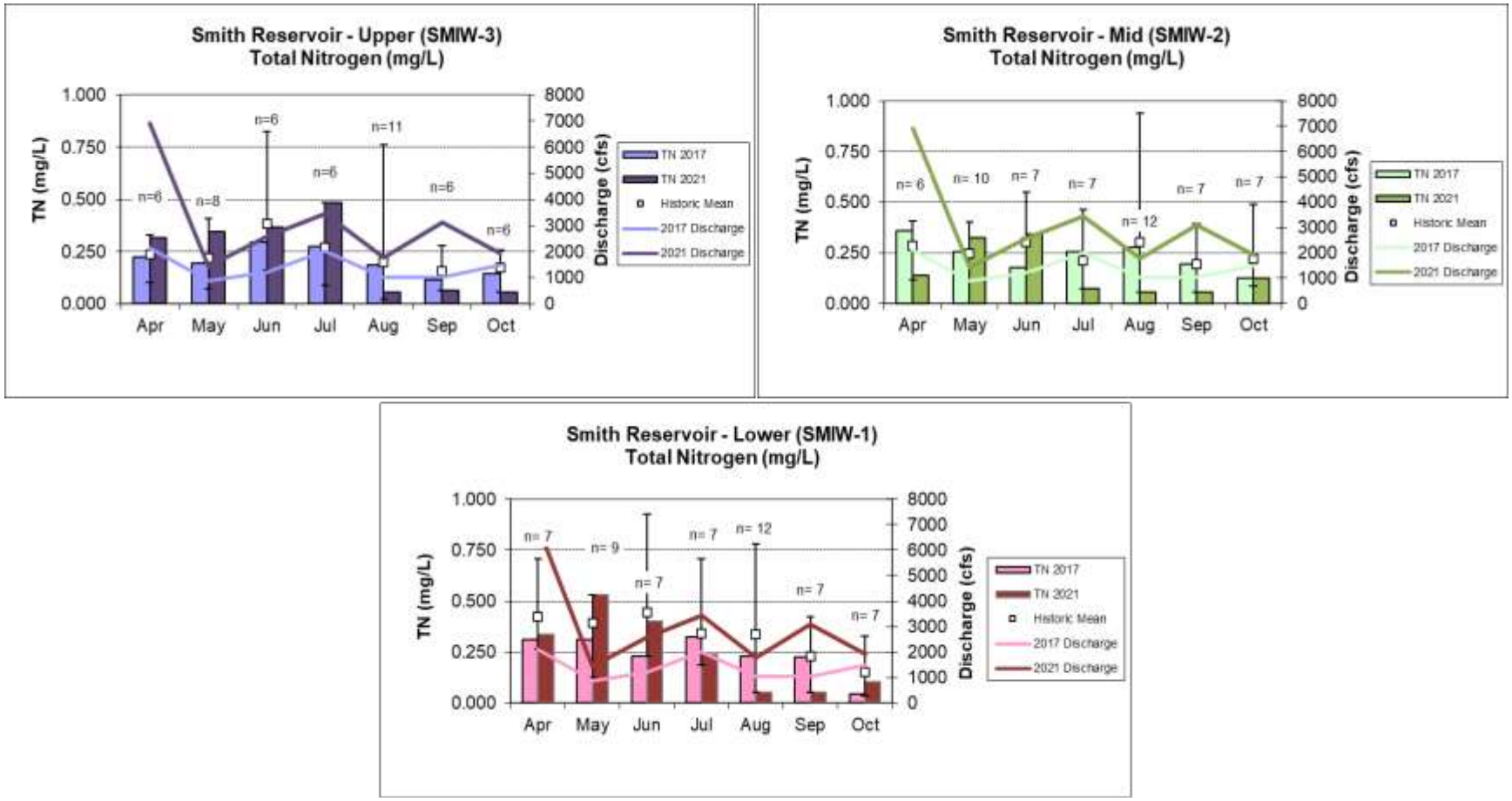


Figure 5. Monthly TP concentrations measured in Smith Reservoir mainstem stations, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. TP was plotted vs. the closest discharge (Smith Dam, information provided by Alabama Power).

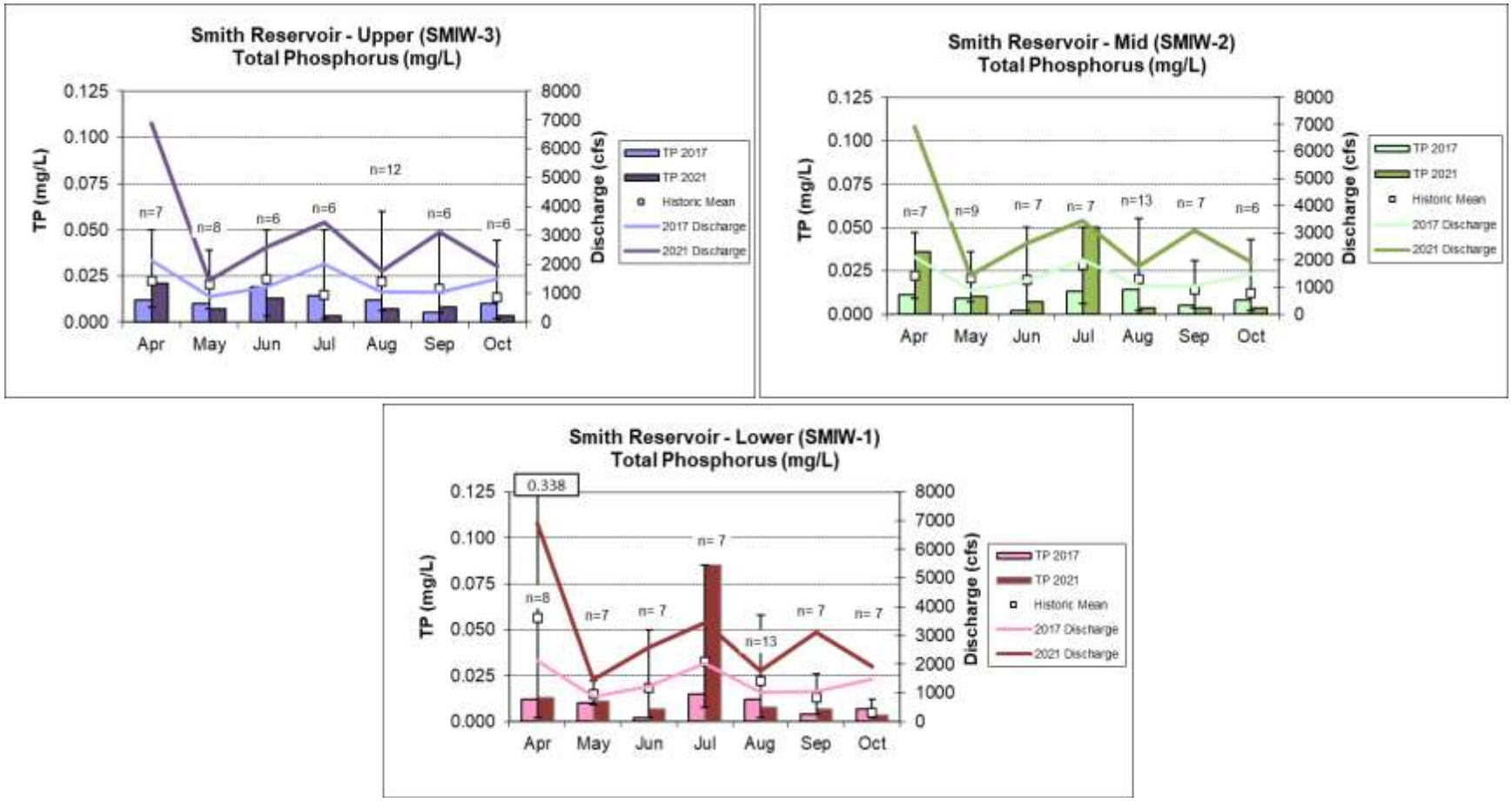


Figure 6. Monthly chl *a* concentrations measured in Smith Reservoir mainstem stations, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990 -2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. Chl *a* was plotted vs. the closest discharge (Smith Dam, information provided by Alabama Power).

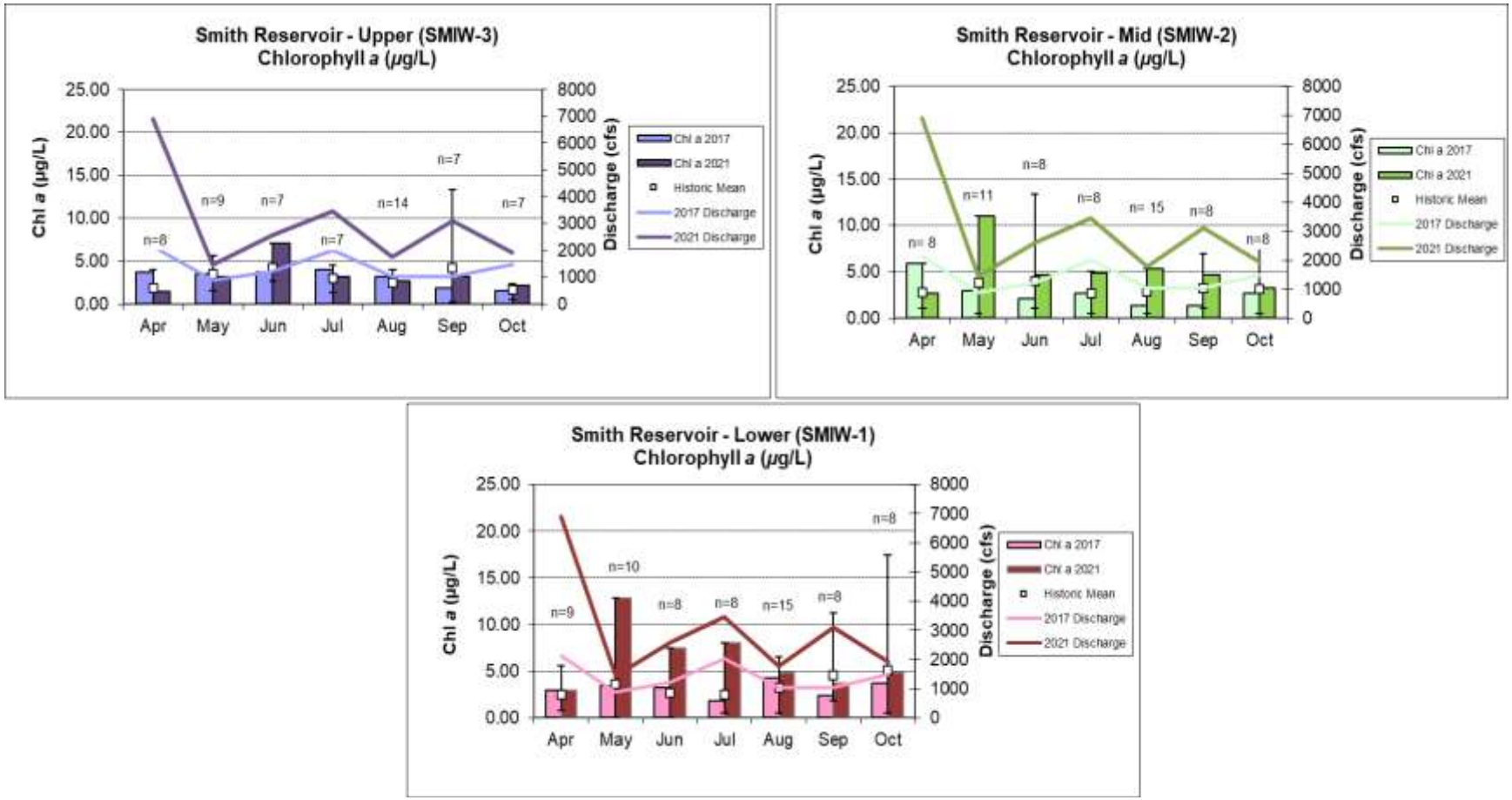


Figure 7. Monthly TSS concentrations measured in Smith Reservoir mainstem stations, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. TSS was plotted vs. the closest discharge (Smith Dam, information provided by Alabama Power).

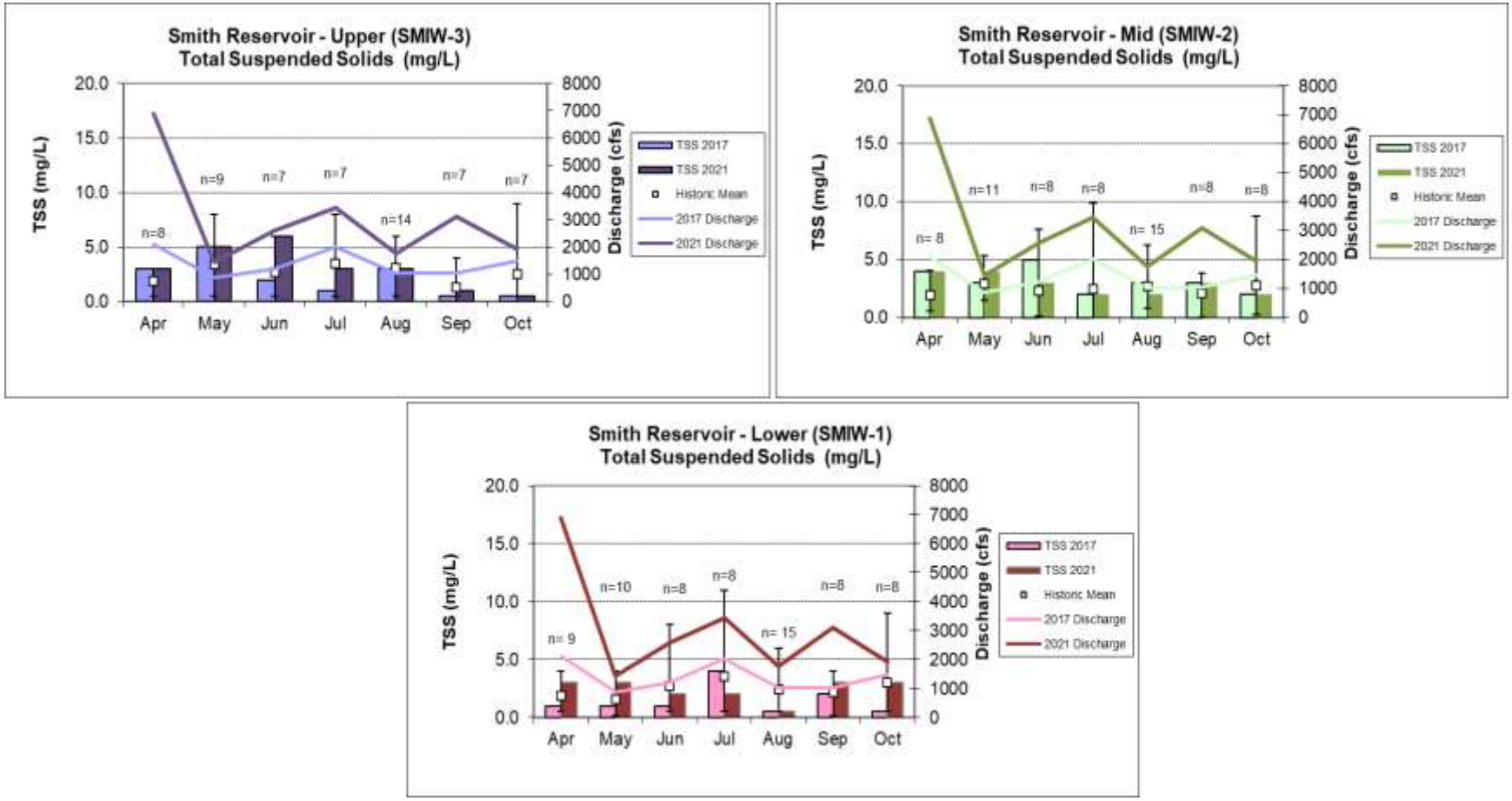


Table 2. Algal growth potential test results, Smith Reservoir, 1998-2017 (expressed as mean Maximum Standing Crop (MSC) dry weights of *Selenastrum capricornutum* in mg/L) and limiting nutrient status. MSC values below 5 mg/L are considered to be protective in reservoirs and lakes; values below 20 mg/L MSC 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
August 1998	----	----	1.62	Phosphorus	1.29	Phosphorus
August 2002	1.69	Co-limiting	1.41	Phosphorus	1.44	Phosphorus
June 2007	3.13	Phosphorus	3.28	Phosphorus	3.36	Phosphorus
July 2007	3.24	Phosphorus	3.37	Phosphorus	3.77	Phosphorus
August 2007	2.70	Phosphorus	3.03	Phosphorus	2.79	Phosphorus
August 2012	2.75	Non-limiting	2.08	Non-limiting	1.53	Phosphorus
August 2017	1.83	Phosphorus	----	----	----	----

Figure 8. Monthly DO concentrations at 1.5 m (5 ft) for Smith Reservoir stations collected April-October 2017. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth (ADEM Admin. Code R. 335-6-10-.09).

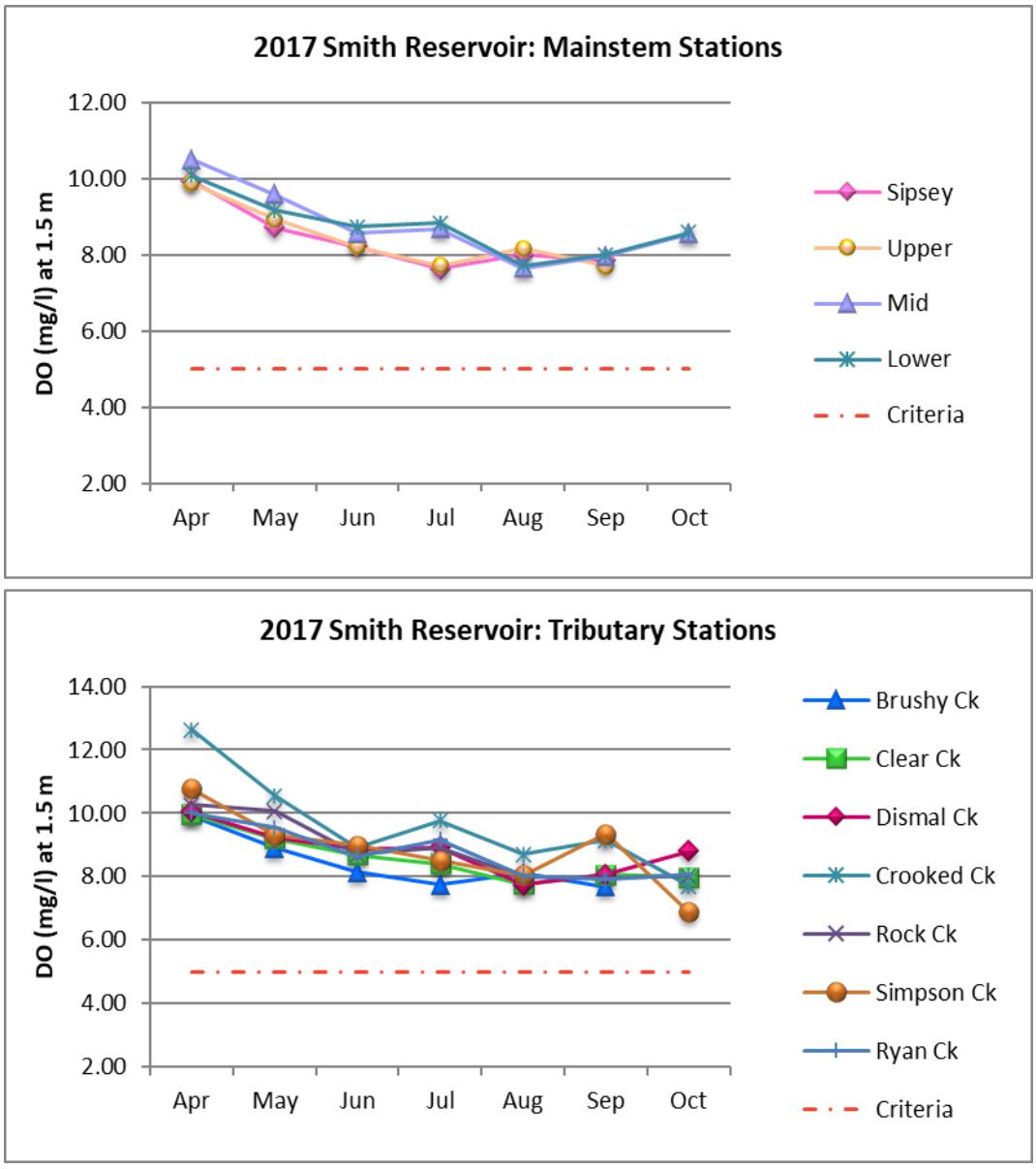


Figure 9. Monthly DO concentrations at 1.5 m (5 ft) for Smith Reservoir stations collected April-October 2021. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth (ADEM Admin. Code R. 335-6-10-.09).

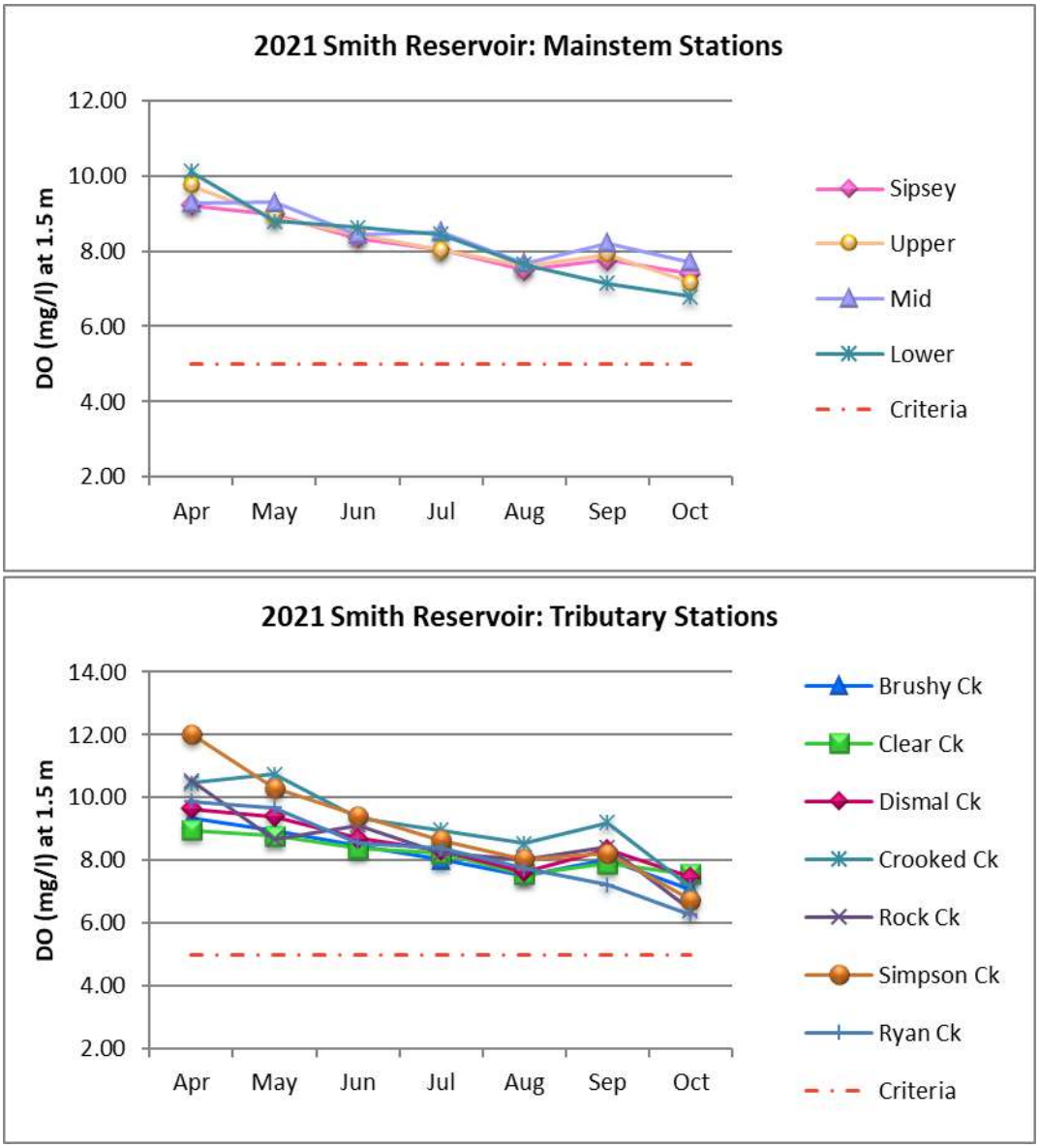


Figure 10. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in lower Smith Reservoir, April-October 2017.

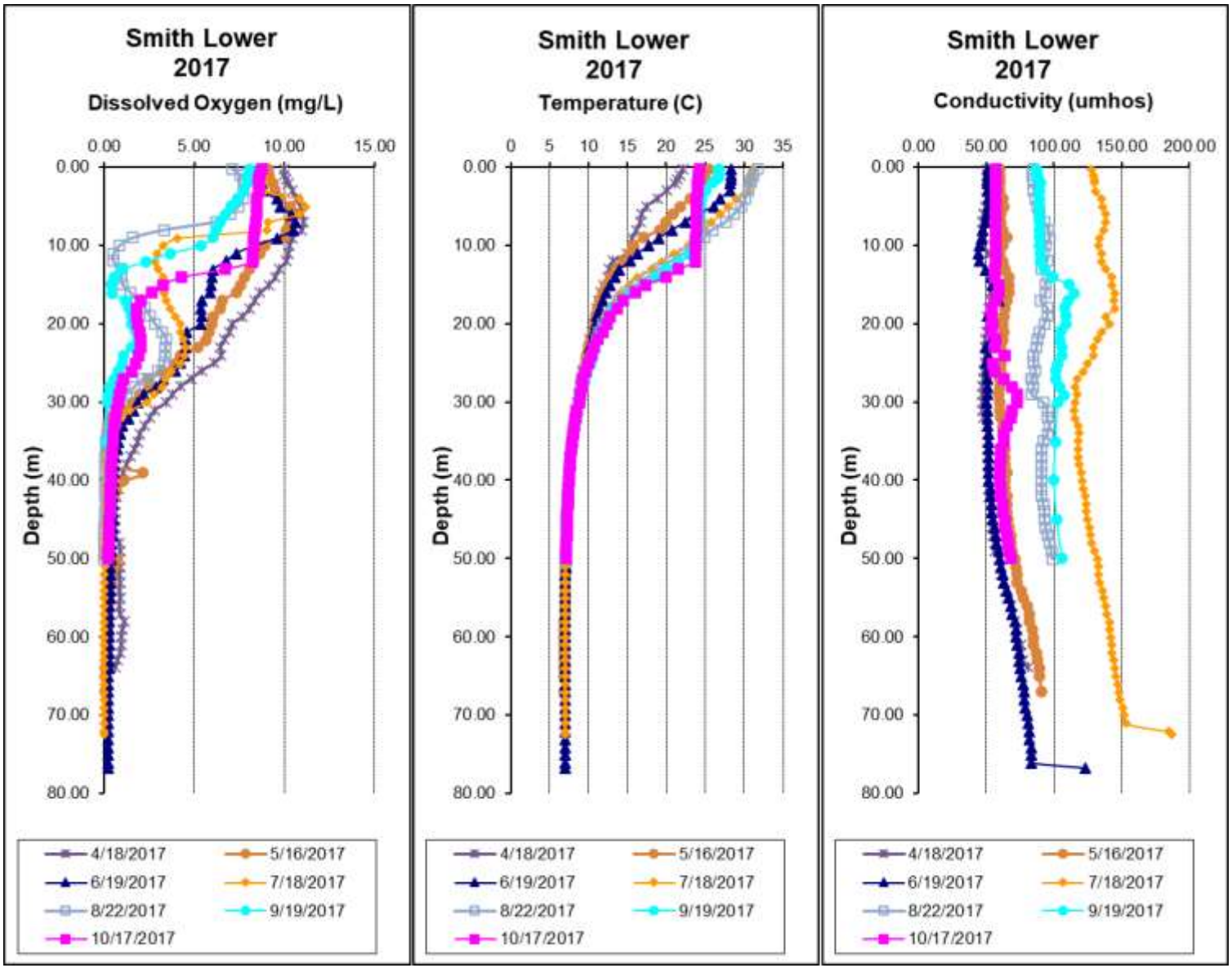


Figure 11. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in mid Smith Reservoir, April-October 2017.

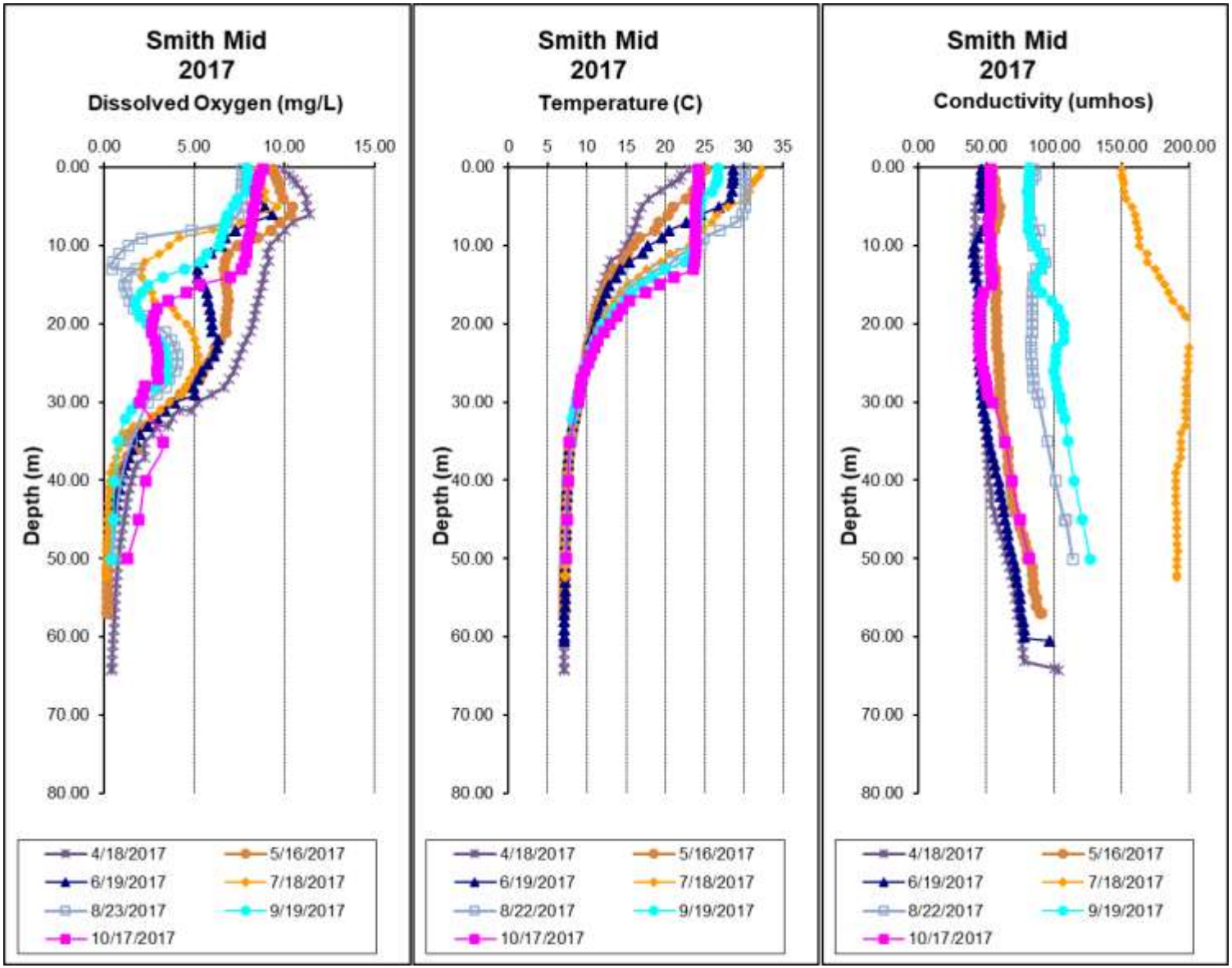


Figure 12. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in lower Smith Reservoir, April-October 2021.

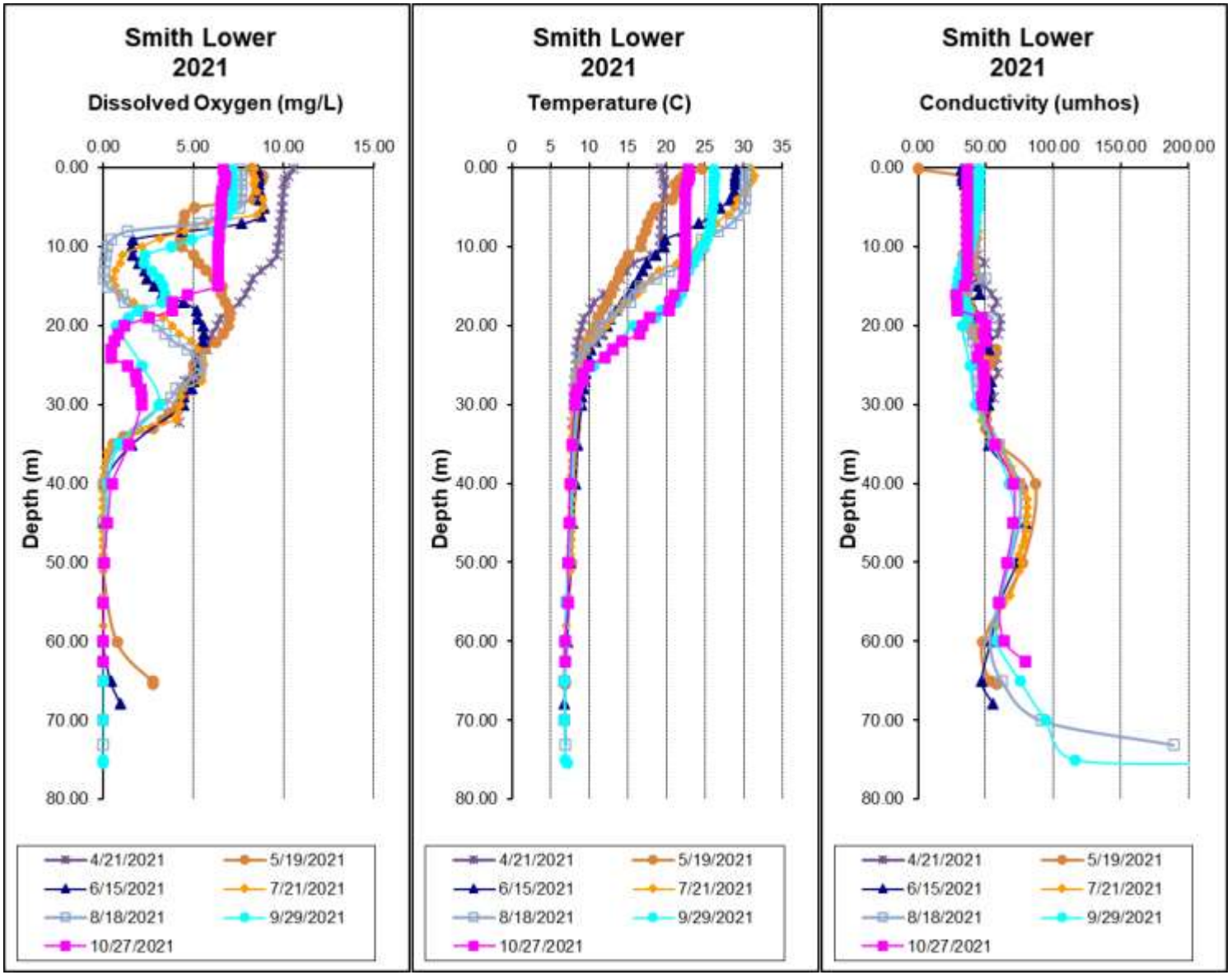


Figure 13. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in mid Smith Reservoir, April-October 2021.

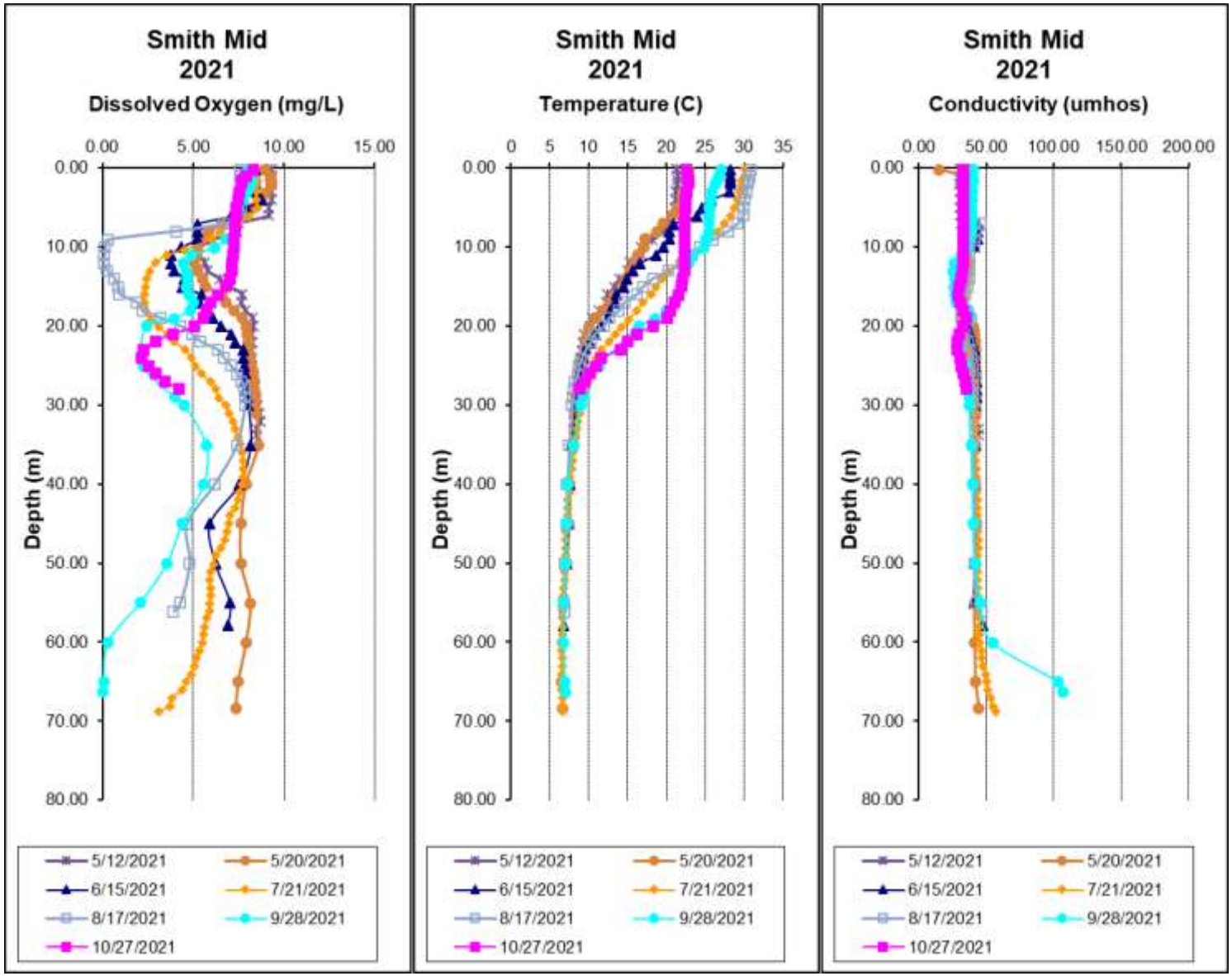


Figure 14. Monthly growing season TSI values calculated for mainstem and tributary Smith Reservoir stations in 2017 using chl a concentrations and Carlson's Trophic State Index calculation (Carlson 1977). Monthly discharge data for Smith Dam provided by Alabama Power.

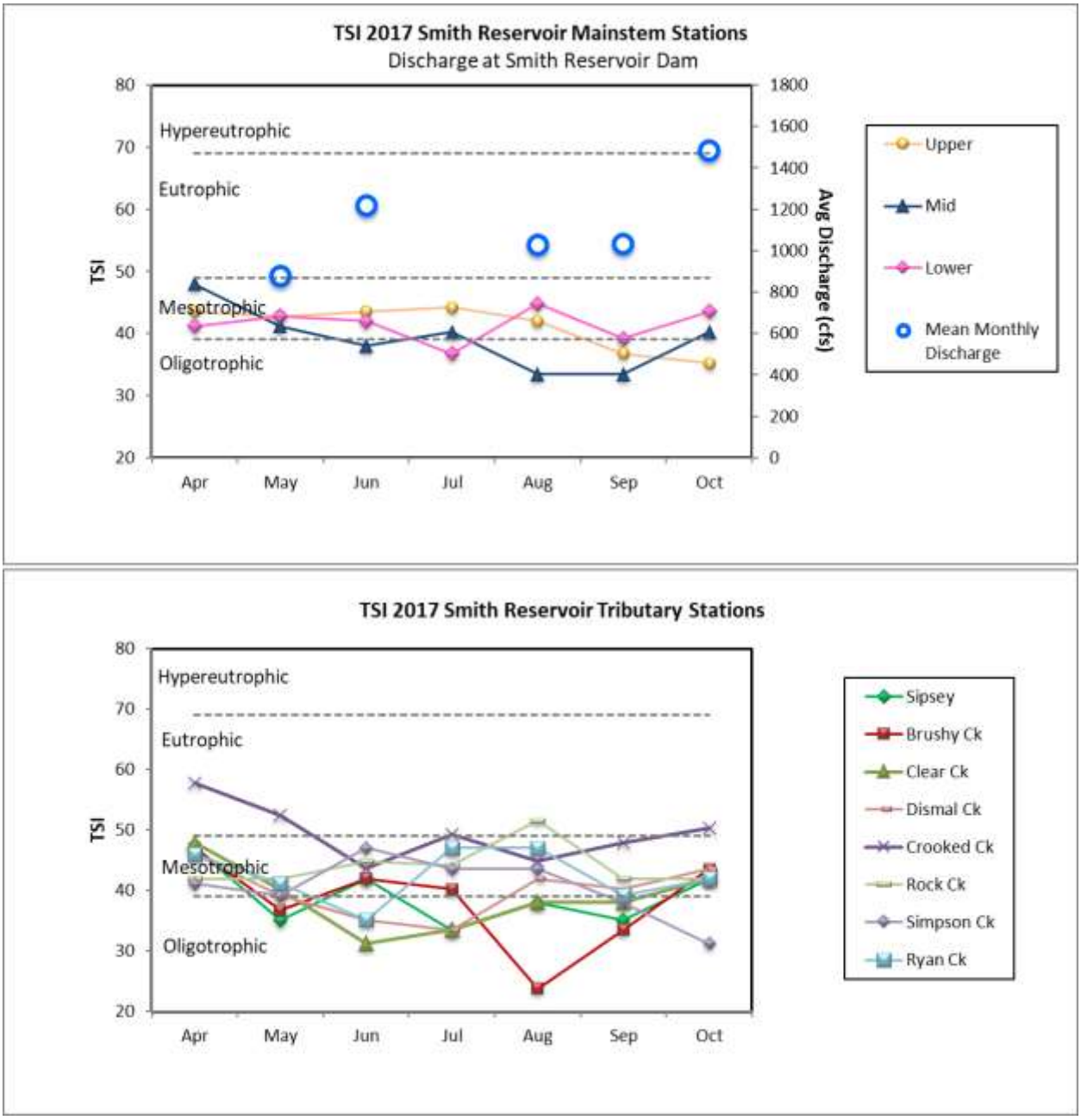
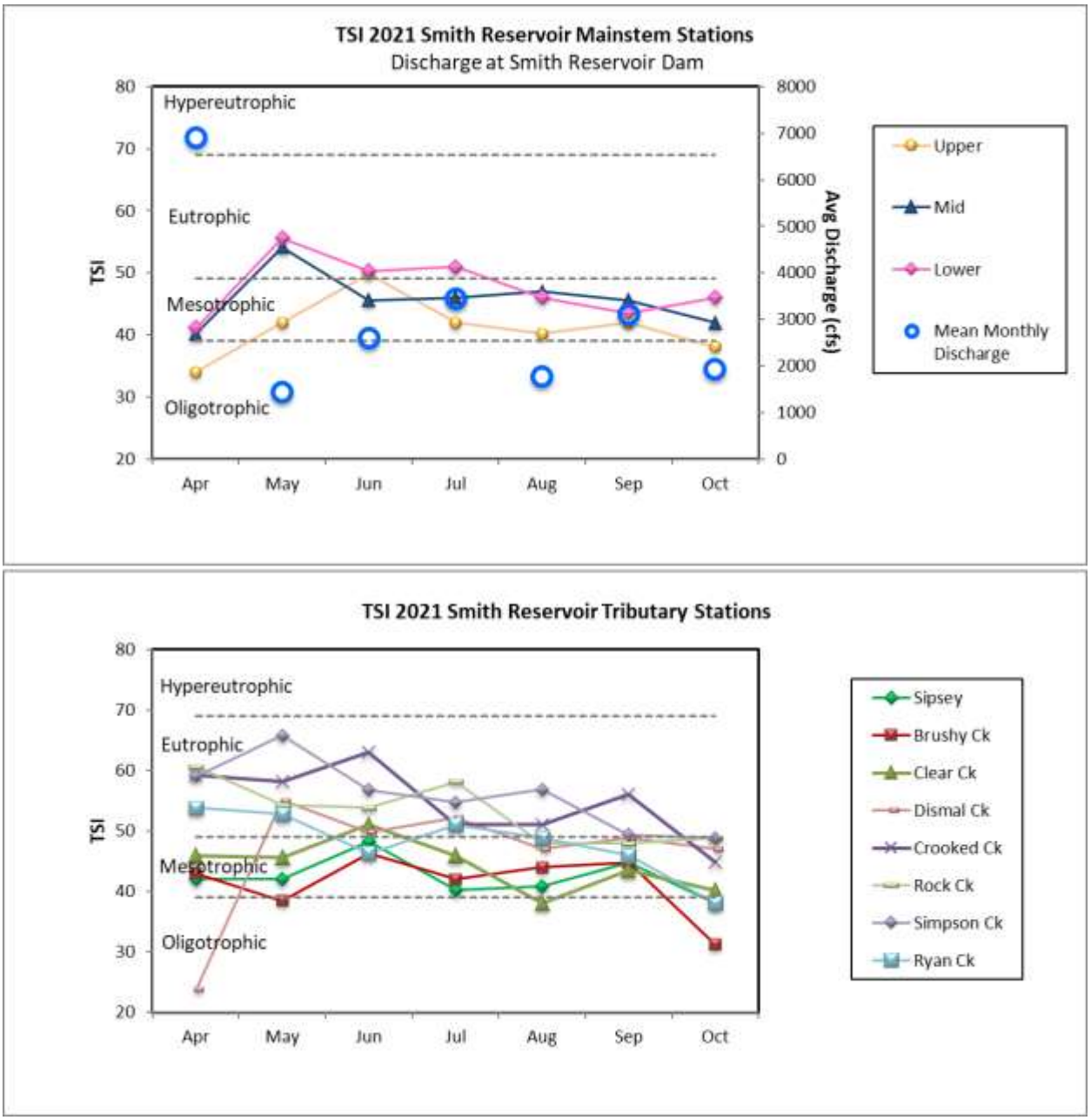


Figure 15. Monthly growing season TSI values calculated for mainstem and tributary Smith Reservoir stations in 2021 using chl *a* concentrations and Carlson's Trophic State Index calculation (Carlson 1977). Monthly discharge data for Smith Dam provided by Alabama Power.



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APPENDIX

Appendix Table 1. Summary of water quality data collected April-October, 2017. 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	Avg	SD
SMIW-1	**Physical**						
	Turbidity (NTU)	7	1.1	2.0	1.7	1.6	0.4
	Total Dissolved Solids (mg/L)	7	26.0	41.0	35.0	35.3	4.9
	Total Suspended Solids (mg/L)	7	< 1.0	4.0	1.0	1.4	1.2
	Hardness (mg/L)	4	17.9	20.3	18.8	19.0	1.2
	Alkalinity (mg/L)	7	14.1	16.6	14.7	15.1	1.0
	Photic Zone (m)	7	7.77	15.75	9.89	10.44	2.57
	Secchi (m)	7	2.55	4.81	4.05	3.97	0.74
	Bottom Depth (m)	7	63.9	76.7	71.0	70.9	4.4
	Chemical						
	Ammonia Nitrogen (mg/L)J	7	< 0.013	0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.010	0.080	0.018	0.029	0.029
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.058	0.320	0.220	0.210	0.088
	Total Nitrogen (mg/L)J	7	< 0.129	0.975	0.231	0.239	0.097
	Dis Reactive Phosphorus (mg/L)	7	< 0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7	< 0.004	0.015	0.010	0.009	0.005
	CBOD-5 (mg/L)	7	< 2.0	2.3	1.0	1.2	0.5
	COD (mg/L)	1				27.0	
	Chlorides (mg/L)J	7	0.7	1.7	1.4	1.3	0.4
	Biological						
	Chlorophyll a (mg/m³)	7	1.87	4.27	3.20	3.13	0.81
	E. coli (MPN/DL)J	4	< 1	1	1	1	0
SMIW-10	**Physical**						
	Turbidity (NTU)	7	0.9	6.1	1.4	2.1	1.8
	Total Dissolved Solids (mg/L)	7	29.0	40.0	35.0	35.1	3.9
	Total Suspended Solids (mg/L)	7	< 1.0	3.0	1.0	1.4	1.0
	Hardness (mg/L)	4	18.3	20.3	19.3	19.3	0.8
	Alkalinity (mg/L)	7	14.1	17.1	14.9	15.2	1.0
	Photic Zone (m)	7	7.83	11.61	10.56	10.13	1.36
	Secchi (m)	7	2.43	5.05	4.15	3.95	0.85
	Bottom Depth (m)	7	23.9	66.9	65.8	58.8	15.7
	Chemical						
	Ammonia Nitrogen (mg/L)J	7	< 0.013	0.028	0.006	0.010	0.005
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.009	0.091	0.005	0.031	0.040
	Total Kjeldahl Nitrogen (mg/L)J	7	0.100	0.340	0.230	0.231	0.080
	Total Nitrogen (mg/L)J	7	< 0.314	1.035	0.295	0.262	0.088
	Dis Reactive Phosphorus (mg/L)	7	< 0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7	< 0.004	0.016	0.009	0.009	0.004
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1				23.0	
	Chlorides (mg/L)J	7	< 0.7	1.6	1.6	1.2	0.5
	Biological						
	Chlorophyll a (mg/m³)	7	1.60	5.34	3.20	3.66	1.50
	E. coli (MPN/DL)	4	1	4	4	3	2

Station	Parameter	N	Min	Max	Med	Avg	SD
SMIW-11	**Physical**						
	Turbidity (NTU)	7	1.8	3.3	2.3	2.4	0.5
	Total Dissolved Solids (mg/L)	7	41.0	51.0	43.0	44.9	3.8
	Total Suspended Solids (mg/L)	7	1.0	3.0	2.0	2.3	0.8
	Hardness (mg/L)	4	22.5	26.2	25.6	25.0	1.7
	Alkalinity (mg/L)	7	23.2	24.9	23.7	23.9	0.7
	Photic Zone (m)	7	5.67	9.83	8.42	8.33	1.37
	Secchi (m)	7	2.01	3.62	2.99	2.98	0.52
	Bottom Depth (m)	7	17.1	19.9	19.3	18.9	1.0
	Chemical						
	Ammonia Nitrogen (mg/L)J	7	< 0.015	0.021	0.010	0.010	0.003
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.007	0.109	0.006	0.033	0.049
	Total Kjeldahl Nitrogen (mg/L)	7	0.210	2.250	0.467	0.675	0.704
	Total Nitrogen (mg/L)	7	< 0.640	7.047	0.473	0.708	0.731
	Dis Reactive Phosphorus (mg/L)J	7	< 0.004	0.006	0.002	0.004	0.002
	Total Phosphorus (mg/L)	7	< 0.004	0.014	0.010	0.009	0.005
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	1.7	2.4	2.2	2.1	0.2
	Biological						
	Chlorophyll a (mg/m³)	7	1.07	5.34	2.94	3.05	1.38
	E. coli (MPN/DL)	4	< 1	11	3	4	5
SMIW-2	**Physical**						
	Turbidity (NTU)	7	1.2	2.5	1.9	1.7	0.4
	Total Dissolved Solids (mg/L)	7	30.0	43.0	33.0	34.0	4.2
	Total Suspended Solids (mg/L)J	7	2.0	5.0	3.0	3.1	1.1
	Hardness (mg/L)	4	16.7	20.1	18.6	18.5	1.4
	Alkalinity (mg/L)	7	12.2	15.4	13.8	14.0	1.4
	Photic Zone (m)	7	7.53	10.01	8.33	8.56	0.86
	Secchi (m)	7	3.09	4.32	3.86	3.74	0.43
	Bottom Depth (m)	7	52.5	64.2	60.0	59.0	3.9
	Chemical						
	Ammonia Nitrogen (mg/L)J	7	< 0.013	0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.009	0.068	0.005	0.014	0.024
	Total Kjeldahl Nitrogen (mg/L)J	7	0.120	0.290	0.250	0.220	0.061
	Total Nitrogen (mg/L)J	7	< 0.374	1.074	0.255	0.234	0.076
	Dis Reactive Phosphorus (mg/L)	7	< 0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7	< 0.004	0.014	0.009	0.009	0.004
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1				25.0	
	Chlorides (mg/L)J	7	< 0.7	1.6	1.1	1.1	0.4
	Biological						
	Chlorophyll a (mg/m³)	7	1.34	5.87	2.67	2.71	1.53
	E. coli (MPN/DL)J	4	< 1	5	1	2	2

Station	Parameter	N		Min		Max	Med	Avg	SD
SMIW-3	**Physical**								
	Turbidity (NTU)	7		1.3		2.0	1.5	1.6	0.2
	Total Dissolved Solids (mg/L)	7		29.0		39.0	34.0	34.0	3.0
	Total Suspended Solids (mg/L)	7	<	1.0		5.0	2.0	2.1	1.6
	Hardness (mg/L)	4		15.7		19.1	17.9	17.6	1.5
	Alkalinity (mg/L)	7		11.5		16.5	15.0	14.1	1.9
	Photic Zone (m)	7		7.06		10.03	8.59	8.55	0.96
	Secchi (m)	7		2.43		4.32	3.52	3.47	0.63
	Bottom Depth (m)	7		40.0		49.1	45.3	45.2	3.4
	Chemical								
	Ammonia Nitrogen (mg/L)J	7	<	0.013		0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009		0.023	0.005	0.008	0.007
	Total Kjeldahl Nitrogen (mg/L)J	7		0.110		0.290	0.190	0.197	0.065
	Total Nitrogen (mg/L)J	7	<	0.345		0.885	0.195	0.205	0.065
	Dis Reactive Phosphorus (mg/L)	7	<	0.004		0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7		0.005		0.019	0.012	0.012	0.004
	CBOD-5 (mg/L)	7	<	2.0	<	2.0	1.0	1.0	0.0
	COD (mg/L)	1						23.0	
	Chlorides (mg/L)J	7	<	0.7		3.0	1.4	1.3	0.8
	Biological								
	Chlorophyll a (mg/m³)	7		1.60		4.00	3.47	3.09	0.96
	E. coli (MPN/DL)J	4	<	1		105	2	28	52
SMIW-4	**Physical**								
	Turbidity (NTU)	7		1.3		2.7	1.8	1.9	0.5
	Total Dissolved Solids (mg/L)	7		30.0		33.0	32.0	32.0	1.2
	Total Suspended Solids (mg/L)	7	<	1.0		4.0	1.0	1.8	1.5
	Hardness (mg/L)	4		14.4		17.8	15.4	15.8	1.4
	Alkalinity (mg/L)	7		9.3		14.5	12.2	12.4	1.8
	Photic Zone (m)	7		7.58		10.25	8.91	8.78	0.85
	Secchi (m)	7		2.58		3.87	3.48	3.37	0.45
	Bottom Depth (m)	7		32.1		42.1	37.4	38.0	3.4
	Chemical								
	Ammonia Nitrogen (mg/L)J	7	<	0.013		0.028	0.006	0.010	0.005
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009		0.038	0.005	0.010	0.012
	Total Kjeldahl Nitrogen (mg/L)J	7		0.130		0.240	0.190	0.189	0.039
	Total Nitrogen (mg/L)J	7	<	0.404		0.834	0.195	0.198	0.047
	Dis Reactive Phosphorus (mg/L)	7	<	0.004		0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7	<	0.004		0.014	0.009	0.009	0.005
	CBOD-5 (mg/L)	7	<	2.0	<	2.0	1.0	1.0	0.0
	COD (mg/L)	1						22.0	
	Chlorides (mg/L)J	7	<	0.7		2.2	1.3	1.2	0.6
	Biological								
	Chlorophyll a (mg/m³)	7	<	1.00		5.34	2.67	2.67	1.62
	E. coli (MPN/DL)J	4	<	1		3	2	2	1

Station	Parameter	N		Min	Max	Med	Avg	SD
SMIW-5	**Physical**							
	Turbidity (NTU)	7		1.3	2.5	2.0	1.9	0.4
	Total Dissolved Solids (mg/L)	7		31.0	37.0	34.0	33.9	2.5
	Total Suspended Solids (mg/L)	7	<	1.0	3.0	2.0	1.6	0.8
	Hardness (mg/L)	4		16.6	20.0	17.9	18.1	1.7
	Alkalinity (mg/L)	7		13.6	16.6	15.0	14.9	1.2
	Photic Zone (m)	7		7.91	10.58	8.54	8.71	0.92
	Secchi (m)	7		2.47	3.98	3.62	3.46	0.52
	Bottom Depth (m)	7		38.6	41.8	41.0	40.4	1.2
	Chemical							
	Ammonia Nitrogen (mg/L)J	7	<	0.013	0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009	0.034	0.005	0.012	0.012
	Total Kjeldahl Nitrogen (mg/L)J	7		0.068	0.230	0.160	0.157	0.060
	Total Nitrogen (mg/L)J	7	<	0.218	0.792	0.165	0.169	0.065
	Dis Reactive Phosphorus (mg/L)	7	<	0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7	<	0.004	0.014	0.009	0.008	0.005
	CBOD-5 (mg/L)	7	<	2.0	2.1	1.0	1.2	0.4
	COD (mg/L)	1					20.0	
	Chlorides (mg/L)J	7	<	0.7	1.6	1.3	1.1	0.4
	Biological							
	Chlorophyll a (mg/m³)	7		1.34	5.34	2.14	2.63	1.42
	E. coli (MPN/DL)J	4	<	1	3	1	1	1
SMIW-6	**Physical**							
	Turbidity (NTU)	7		1.6	3.3	2.6	2.5	0.5
	Total Dissolved Solids (mg/L)	7		31.0	40.0	37.0	36.7	3.2
	Total Suspended Solids (mg/L)	7		1.0	3.0	2.0	1.9	0.9
	Hardness (mg/L)	4		16.8	20.8	19.0	18.9	1.9
	Alkalinity (mg/L)	7		11.7	17.4	12.8	13.8	2.2
	Photic Zone (m)	7		5.52	7.63	6.96	6.93	0.68
	Secchi (m)	7		2.18	3.06	2.73	2.67	0.35
	Bottom Depth (m)	7		42.4	46.7	44.3	44.6	1.3
	Chemical							
	Ammonia Nitrogen (mg/L)J	7	<	0.013	0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009	0.042	0.005	0.014	0.014
	Total Kjeldahl Nitrogen (mg/L)J	7		0.140	0.240	0.200	0.196	0.039
	Total Nitrogen (mg/L)J	7	<	0.434	0.816	0.215	0.210	0.048
	Dis Reactive Phosphorus (mg/L)J	7	<	0.004	0.005	0.002	0.003	0.001
	Total Phosphorus (mg/L)J	7	<	0.004	0.016	0.010	0.010	0.005
	CBOD-5 (mg/L)	7	<	2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1					24.0	
	Chlorides (mg/L)J	7		0.7	1.6	1.3	1.2	0.3
	Biological							
	Chlorophyll a (mg/m³)	7		1.07	5.87	2.14	2.63	1.60
	E. coli (MPN/DL)J	4	<	1	20	1	6	10

Station	Parameter	N		Min	Max	Med	Avg	SD
SMIW-7	**Physical**							
	Turbidity (NTU)	7		1.1	2.6	1.5	1.6	0.5
	Total Dissolved Solids (mg/L)	7		32.0	42.0	35.0	35.6	3.2
	Total Suspended Solids (mg/L)	7	<	1.0	3.0	2.0	1.9	1.0
	Hardness (mg/L)	4		15.5	19.5	18.2	17.9	1.7
	Alkalinity (mg/L)	7		12.6	15.7	13.5	13.9	1.4
	Photic Zone (m)	7		6.62	10.48	9.39	8.87	1.38
	Secchi (m)	7		2.45	3.78	3.52	3.43	0.46
	Bottom Depth (m)	7		32.0	51.1	49.9	47.2	6.8
	Chemical							
	Ammonia Nitrogen (mg/L)J	7	<	0.013	0.028	0.006	0.008	0.003
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009	0.087	0.005	0.023	0.030
	Total Kjeldahl Nitrogen (mg/L)J	7		0.120	0.290	0.210	0.197	0.059
	Total Nitrogen (mg/L)J	7	<	0.375	0.981	0.215	0.220	0.073
	Dis Reactive Phosphorus (mg/L)	7	<	0.004	0.010	0.002	0.003	0.003
	Total Phosphorus (mg/L)J	7		0.005	0.020	0.012	0.012	0.005
	CBOD-5 (mg/L)	7	<	2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1					21.0	
	Chlorides (mg/L)J	7		0.8	1.6	1.2	1.2	0.3
	Biological							
	Chlorophyll a (mg/m³)	7		1.34	4.80	2.67	2.82	1.21
	E. coli (MPN/DL)J	4	<	1	2	2	1	1
SMIW-8	**Physical**							
	Turbidity (NTU)	7		0.9	1.7	1.4	1.4	0.3
	Total Dissolved Solids (mg/L)	7		33.0	39.0	36.0	36.0	2.2
	Total Suspended Solids (mg/L)	7	<	1.0	4.0	2.0	1.9	1.3
	Hardness (mg/L)	4		16.8	19.4	18.5	18.3	1.2
	Alkalinity (mg/L)	7		13.7	16.5	14.7	15.0	1.0
	Photic Zone (m)	7		7.84	16.02	8.82	9.93	2.78
	Secchi (m)	7		2.81	4.99	3.93	4.07	0.86
	Bottom Depth (m)	7		24.1	57.9	56.1	49.3	12.3
	Chemical							
	Ammonia Nitrogen (mg/L)J	7	<	0.013	0.028	0.006	0.010	0.005
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.009	0.148	0.005	0.044	0.059
	Total Kjeldahl Nitrogen (mg/L)J	7		0.130	0.330	0.270	0.249	0.071
	Total Nitrogen (mg/L)J	7	<	0.404	1.164	0.328	0.293	0.096
	Dis Reactive Phosphorus (mg/L)	7	<	0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)J	7		0.007	0.019	0.013	0.013	0.005
	CBOD-5 (mg/L)	7	<	2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1					26.0	
	Chlorides (mg/L)J	7		1.0	1.7	1.6	1.4	0.3
	Biological							
	Chlorophyll a (mg/m³)	7		3.20	8.54	3.20	4.23	1.95
	E. coli (MPN/DL)J	4	<	1	1	1	1	0

Station	Parameter	N		Min	Max	Med	Avg	SD
SMIW-9	**Physical**							
	Turbidity (NTU)	7		1.9	4.4	2.7	3.0	1.0
	Total Dissolved Solids (mg/L)	7		35.0	54.0	37.0	40.0	6.7
	Total Suspended Solids (mg/L)	7	<	1.0	5.0	2.0	2.6	1.5
	Hardness (mg/L)	4		17.2	21.2	19.3	19.2	1.7
	Alkalinity (mg/L)	7		14.6	21.1	15.8	16.8	2.2
	Photic Zone (m)	7		4.11	7.43	5.84	5.89	1.16
	Secchi (m)	7		1.44	2.82	2.09	2.08	0.44
	Bottom Depth (m)	7		24.2	34.3	32.1	31.0	3.4
	Chemical							
	Ammonia Nitrogen (mg/L)J	7	<	0.013	0.028	0.006	0.010	0.005
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.010	0.174	0.045	0.066	0.062
	Total Kjeldahl Nitrogen (mg/L)	7		0.250	0.550	0.390	0.389	0.111
	Total Nitrogen (mg/L)J	7	<	0.765	1.932	0.429	0.454	0.154
	Dis Reactive Phosphorus (mg/L)	7	<	0.004	0.005	0.002	0.002	0.000
	Total Phosphorus (mg/L)	7		0.014	0.024	0.019	0.019	0.004
	CBOD-5 (mg/L)	7	<	2.0	< 2.0	1.0	1.0	0.0
	COD (mg/L)	1					27.0	
	Chlorides (mg/L)J	7		1.3	2.5	2.0	2.0	0.4
	Biological							
	Chlorophyll a (mg/m³)	7		3.81	16.00	6.68	7.62	4.14
	E. coli (MPN/DL)J	4	<	1	2	1	1	1

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

Appendix Table 2. Summary of water quality data collected April-October, 2021. 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	Avg	SD
SMIW-1	**Physical**						
	Turbidity (NTU)	7	1.6	3.3	2.2	2.3	0.7
	Total Dissolved Solids (mg/L)	7	26.0	58.0	31.0	35.1	11.4
	Total Suspended Solids (mg/L)J	7	< 1.0	3.0	3.0	2.4	0.9
	Hardness (mg/L)	4	14.3	19.1	17.4	17.1	2.2
	Alkalinity (mg/L)J	7	9.1	35.9	11.4	14.5	9.6
	Photic Zone (m)	7	5.59	7.92	7.69	7.28	0.84
	Secchi (m)	7	2.00	4.46	2.73	2.99	0.90
	Bottom Depth (m)	7	59.9	77.4	67.9	68.8	6.7
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.079	0.032	0.034	0.030
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.098	0.452	0.207	0.212	0.171
	Total Nitrogen (mg/L)	7	< 0.162	1.593	0.239	0.246	0.186
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.085	0.008	0.019	0.029
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	1.6	14.9	2.0	3.8	4.9
	Biological						
	Chlorophyll a (mg/m³)	7	2.94	12.80	4.81	6.37	3.39
	E. coli (MPN/DL)J	4	< 1	1	1	1	0
SMIW-10	**Physical**						
	Turbidity (NTU)	7	1.4	3.3	2.3	2.2	0.7
	Total Dissolved Solids (mg/L)	7	24.0	38.0	30.0	30.9	4.9
	Total Suspended Solids (mg/L)J	7	1.0	5.0	3.0	3.0	1.4
	Hardness (mg/L)	4	14.3	19.9	18.6	17.8	2.6
	Alkalinity (mg/L)J	7	9.1	15.8	13.4	13.0	2.7
	Photic Zone (m)	7	5.52	7.92	7.26	6.98	0.88
	Secchi (m)	7	2.23	4.80	2.98	3.11	0.93
	Bottom Depth (m)	7	60.3	71.4	67.5	67.6	4.2
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.065	0.034	0.033	0.023
	Total Kjeldahl Nitrogen (mg/L)J	7	< 0.098	0.362	0.238	0.226	0.140
	Total Nitrogen (mg/L)J	7	< 0.249	1.263	0.243	0.259	0.143
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.013	0.009	0.009	0.003
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	1.4	2.2	1.9	1.8	0.2
	Biological						
	Chlorophyll a (mg/m³)	7	2.14	10.70	6.41	6.67	2.99
	E. coli (MPN/DL)J	4	< 1	4	2	2	2

Station	Parameter	N	Min	Max	Med	Avg	SD
SMIW-11	**Physical**						
	Turbidity (NTU)	7	1.7	14.2	3.3	5.7	5.4
	Total Dissolved Solids (mg/L)	7	28.0	52.0	38.0	38.1	8.6
	Total Suspended Solids (mg/L)	7	< 1.0	9.0	3.0	3.9	2.8
	Hardness (mg/L)	4	21.6	22.4	21.9	22.0	0.4
	Alkalinity (mg/L)J	7	8.6	20.6	18.3	16.1	4.1
	Photic Zone (m)	7	2.37	8.22	5.48	5.37	2.06
	Secchi (m)	7	0.85	2.95	2.30	2.03	0.74
	Bottom Depth (m)	7	16.8	19.7	18.8	18.4	1.3
	Chemical						
	Ammonia Nitrogen (mg/L)J	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.029	0.005	0.011	0.010
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.098	0.630	0.390	0.338	0.198
	Total Nitrogen (mg/L)	7	< 0.162	1.905	0.395	0.348	0.198
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	0.011	0.053	0.018	0.026	0.015
	CBOD-5 (mg/L)J	7	< 2.0	2.6	1.0	1.2	0.6
	Chlorides (mg/L)J	7	2.2	4.2	2.6	2.7	0.7
	Biological						
	Chlorophyll a (mg/m³)	7	6.41	36.30	14.40	15.48	10.13
	E. coli (MPN/DL)J	4	< 1	6	1	1	3
SMIW-2	**Physical**						
	Turbidity (NTU)	7	1.1	3.5	2.3	2.4	0.8
	Total Dissolved Solids (mg/L)	7	20.0	36.0	27.0	27.9	5.1
	Total Suspended Solids (mg/L)	7	2.0	4.0	3.0	2.9	0.9
	Hardness (mg/L)	4	5.3	17.1	14.7	13.0	5.4
	Alkalinity (mg/L)J	7	8.1	13.8	11.5	11.0	2.2
	Photic Zone (m)	7	6.05	8.19	7.18	7.06	0.79
	Secchi (m)	7	2.17	4.40	3.32	3.12	0.77
	Bottom Depth (m)	7	56.2	68.8	66.0	63.0	5.5
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.074	0.005	0.021	0.026
	Total Kjeldahl Nitrogen (mg/L)J	7	< 0.098	0.335	0.049	0.136	0.126
	Total Nitrogen (mg/L)J	7	< 0.162	1.020	0.123	0.158	0.123
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.050	0.007	0.016	0.019
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	< 1.1	2.0	1.8	1.6	0.5
	Biological						
	Chlorophyll a (mg/m³)	7	2.67	11.00	4.63	5.18	2.73
	E. coli (MPN/DL)J	5	< 1	7	2	3	3

Station	Parameter	N	Min	Max	Med	Avg	SD
SMIW-3	**Physical**						
	Turbidity (NTU)	7	1.6	4.6	2.7	2.7	0.9
	Total Dissolved Solids (mg/L)	7	22.0	110.0	28.0	51.6	36.1
	Total Suspended Solids (mg/L)J	7	< 1.0	6.0	3.0	3.1	2.0
	Hardness (mg/L)	4	13.8	15.9	14.6	14.8	0.9
	Alkalinity (mg/L)J	7	8.6	12.5	11.1	10.6	1.6
	Photic Zone (m)	7	5.33	9.60	7.52	7.32	1.46
	Secchi (m)	7	1.57	4.84	2.64	2.87	1.09
	Bottom Depth (m)	7	37.6	47.1	43.0	43.2	3.6
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.010	0.032	0.005	0.012	0.010
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.098	0.454	0.311	0.229	0.174
	Total Nitrogen (mg/L)J	7	< 0.162	1.458	0.316	0.241	0.179
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.021	0.007	0.009	0.006
	CBOD-5 (mg/L)J	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	< 1.1	2.2	1.6	1.6	0.6
	Biological						
	Chlorophyll a (mg/m³)	7	1.42	7.12	3.20	3.28	1.82
	E. coli (MPN/DL)J	4	1	5	3	3	2
SMIW-4	**Physical**						
	Turbidity (NTU)	7	1.8	5.8	2.8	3.1	1.3
	Total Dissolved Solids (mg/L)J	7	17.0	32.0	26.0	25.3	5.8
	Total Suspended Solids (mg/L)	7	< 1.0	6.0	4.0	3.1	2.0
	Hardness (mg/L)	4	14.0	15.3	14.4	14.6	0.6
	Alkalinity (mg/L)J	7	7.4	12.6	10.9	10.4	1.9
	Photic Zone (m)	7	4.35	10.11	6.42	6.85	1.75
	Secchi (m)	7	1.69	3.69	2.74	2.71	0.62
	Bottom Depth (m)	7	28.8	39.9	38.5	36.6	4.1
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.010	0.039	0.020	0.019	0.015
	Total Kjeldahl Nitrogen (mg/L)J	7	< 0.098	0.265	0.049	0.102	0.081
	Total Nitrogen (mg/L)J	7	< 0.162	0.855	0.084	0.121	0.084
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.013	0.004	0.006	0.004
	CBOD-5 (mg/L)J	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	< 1.1	2.1	1.4	1.5	0.5
	Biological						
	Chlorophyll a (mg/m³)	7	1.07	4.98	3.56	3.32	1.31
	E. coli (MPN/DL)J	4	< 1	4	2	2	2

Station	Parameter	N		Min		Max	Med	Avg	SD
SMIW-5	**Physical**								
	Turbidity (NTU)	7		1.8		4.8	2.8	3.0	0.9
	Total Dissolved Solids (mg/L)	7		17.0		33.0	29.0	27.7	5.6
	Total Suspended Solids (mg/L)	7	<	1.0		6.0	2.0	2.5	2.0
	Hardness (mg/L)	4		14.0		17.4	16.0	15.9	1.4
	Alkalinity (mg/L)J	7		7.0		13.9	12.6	11.2	2.5
	Photic Zone (m)	7		5.76		11.05	7.23	7.47	1.78
	Secchi (m)	7		1.59		3.79	2.83	2.76	0.73
	Bottom Depth (m)	7		36.1		41.4	38.9	38.6	2.2
	Chemical								
	Ammonia Nitrogen (mg/L)	7	<	0.015	<	0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)J	7	<	0.010		0.091	0.005	0.024	0.034
	Total Kjeldahl Nitrogen (mg/L)J	7	<	0.098		0.381	0.117	0.162	0.130
	Total Nitrogen (mg/L)J	7	<	0.162		1.302	0.140	0.186	0.136
	Dis Reactive Phosphorus (mg/L)	7	<	0.008	<	0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	<	0.007		0.014	0.008	0.008	0.003
	CBOD-5 (mg/L)J	7	<	2.0	<	2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	<	1.1		2.0	1.5	1.3	0.6
	Biological								
	Chlorophyll a (mg/m³)	7		2.14		6.05	3.20	3.48	1.31
	E. coli (MPN/DL)J	4	<	1	<	1	1	1	0
SMIW-6	**Physical**								
	Turbidity (NTU)	7		2.4		5.1	3.4	3.6	0.9
	Total Dissolved Solids (mg/L)	7		20.0		51.0	32.0	32.0	9.8
	Total Suspended Solids (mg/L)	7		2.0		5.0	3.0	3.4	1.0
	Hardness (mg/L)	4		14.8		18.0	16.8	16.6	1.4
	Alkalinity (mg/L)J	7	<	6.0		12.7	10.6	9.8	3.5
	Photic Zone (m)	7		5.38		8.54	6.56	6.57	1.10
	Secchi (m)	7		1.83		2.84	2.41	2.35	0.36
	Bottom Depth (m)	7		31.0		46.2	43.5	41.3	5.5
	Chemical								
	Ammonia Nitrogen (mg/L)	7	<	0.015	<	0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	<	0.010		0.049	0.005	0.014	0.017
	Total Kjeldahl Nitrogen (mg/L)J	7	<	0.098		0.662	0.148	0.200	0.211
	Total Nitrogen (mg/L)J	7	<	0.162		2.001	0.153	0.214	0.211
	Dis Reactive Phosphorus (mg/L)	7	<	0.008	<	0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	<	0.007		0.032	0.008	0.011	0.010
	CBOD-5 (mg/L)	7	<	2.0	<	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	<	1.1		9.5	1.9	2.8	3.0
	Biological								
	Chlorophyll a (mg/m³)	7		2.14		8.01	4.63	4.40	1.91
	E. coli (MPN/DL)J	5	<	1	<	1	1	1	0

Station	Parameter	N	Min	Max	Med	Avg	SD
SMIW-7	**Physical**						
	Turbidity (NTU)	7	1.4	3.1	2.5	2.4	0.6
	Total Dissolved Solids (mg/L)	7	18.0	41.0	30.0	28.4	7.7
	Total Suspended Solids (mg/L)	7	< 1.0	6.0	3.0	3.2	2.2
	Hardness (mg/L)	4	14.5	17.2	16.2	16.0	1.2
	Alkalinity (mg/L)J	7	8.5	14.0	11.3	11.1	2.1
	Photic Zone (m)	7	4.85	7.29	6.89	6.34	1.06
	Secchi (m)	7	2.09	3.93	2.90	2.83	0.67
	Bottom Depth (m)	7	40.8	51.8	48.5	48.3	3.6
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)J	7	< 0.010	0.068	0.005	0.021	0.026
	Total Kjeldahl Nitrogen (mg/L)J	7	< 0.098	0.430	0.244	0.223	0.138
	Total Nitrogen (mg/L)J	7	< 0.162	1.323	0.249	0.244	0.142
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	< 0.007	0.037	0.008	0.011	0.012
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	< 1.1	2.0	1.8	1.7	0.5
	Biological						
	Chlorophyll a (mg/m³)	7	< 1.00	12.10	6.41	6.56	3.58
	E. coli (MPN/DL)J	4	1	9	2	3	4
SMIW-8	**Physical**						
	Turbidity (NTU)	7	1.6	5.6	1.9	2.8	1.6
	Total Dissolved Solids (mg/L)	7	20.0	48.0	33.0	33.1	8.6
	Total Suspended Solids (mg/L)	7	< 1.0	6.0	2.0	2.9	2.1
	Hardness (mg/L)	4	14.9	18.1	17.0	16.8	1.4
	Alkalinity (mg/L)J	7	< 6.0	14.5	11.9	10.8	3.8
	Photic Zone (m)	7	4.40	9.36	5.93	6.52	1.82
	Secchi (m)	7	1.52	4.16	3.00	2.83	1.09
	Bottom Depth (m)	7	55.5	69.9	61.8	61.5	4.9
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.183	0.037	0.060	0.067
	Total Kjeldahl Nitrogen (mg/L)J	7	< 0.098	0.673	0.378	0.317	0.247
	Total Nitrogen (mg/L)J	7	< 0.162	2.568	0.383	0.377	0.282
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	0.008	0.014	0.011	0.011	0.002
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	1.3	2.2	1.9	1.8	0.3
	Biological						
	Chlorophyll a (mg/m³)	7	5.87	21.40	10.70	11.15	5.96
	E. coli (MPN/DL)	4	< 1	4	1	2	2

Station	Parameter	N	Min	Max	Med	Avg	SD
SMIW-9	**Physical**						
	Turbidity (NTU)	7	2.6	8.6	3.8	5.5	2.8
	Total Dissolved Solids (mg/L)J	7	29.0	226.0	33.0	60.6	73.0
	Total Suspended Solids (mg/L)	7	2.0	7.0	3.0	3.9	2.0
	Hardness (mg/L)	4	14.4	17.2	16.3	16.0	1.2
	Alkalinity (mg/L)J	7	< 6.0	15.2	11.9	10.9	4.1
	Photic Zone (m)	7	3.14	5.87	4.54	4.44	0.99
	Secchi (m)	7	1.17	2.05	1.79	1.67	0.37
	Bottom Depth (m)	7	21.1	33.4	27.5	28.4	4.5
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.046	0.008	0.013	0.015
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.010	0.152	0.046	0.058	0.058
	Total Kjeldahl Nitrogen (mg/L)J	7	0.106	0.807	0.329	0.451	0.265
	Total Nitrogen (mg/L)J	7	< 0.621	2.844	0.403	0.509	0.272
	Dis Reactive Phosphorus (mg/L)	7	< 0.008	< 0.008	0.004	0.004	0.000
	Total Phosphorus (mg/L)J	7	0.012	0.031	0.020	0.020	0.006
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)J	7	1.5	2.9	2.0	2.0	0.4
	Biological						
	Chlorophyll a (mg/m³)	7	4.27	27.20	13.40	13.76	7.85
	E. coli (MPN/DL)J	4	< 1	5	1	2	2

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