2017 & 2021 Tuscaloosa Reservoir Report

Rivers and Reservoirs Monitoring Program

Alabama Department of Environmental Management

Field Operations Division
River and Reservoirs Unit
August 2025

Rivers and Reservoirs Monitoring Program

2021

Tuscaloosa Reservoir

Black Warrior River Basin

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LIST OF ACRONYMS

A&I	Agricultural and Industrial Water Supply
ADEM	Alabama Department of Environmental Management
AGPT	Algal Growth Potential Test
BWC	Black Warrior and Cahaba Rivers
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

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INTRODUCTION

Lake Tuscaloosa is located five miles north of the cities of Tuscaloosa and Northport in west central Alabama. The 5,885 acre lake was impounded in 1971 to provide drinking and industrial water for the city of Tuscaloosa. The major waterbodies flowing into Lake Tuscaloosa include Binion Creek and the North River, while the tailrace empties into the Black Warrior River at Oliver Reservoir, east of Tuscaloosa.

In 2010, the Alabama Department of Public Health (ADPH) issued a fish consumption advisory due to mercury found in fish tissue based on data collected in 2009. As a result, the Binion Creek and North River embayments of Tuscaloosa Reservoir were placed on Alabama's 2010 CWA §303(d) list of impaired waters for not meeting their Fish & Wildlife (F&W) and Public Water Supply/Swimming/Fish & Wildlife (PWS/S/F&W) water use classifications, respectively, for mercury caused by atmospheric deposition. Additionally, the Binion Creek embayment was added to the 2024 §303(d) list for not meeting its Fish & Wildlife (F&W) water use classification for pathogens (*E. coli*) caused by agriculture and onsite wastewater systems.

The Alabama Department of Environmental Management (ADEM) monitored Tuscaloosa Reservoir as part of the 2017 and 2021 assessments 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 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, 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 specific water quality criterion for nutrient management was implemented in 2004 at the lower reservoir station (TUST-1) on Tuscaloosa Reservoir. This criterion represents a maximum growing season (April-October) mean chlorophyll *a* (chl *a*) concentration that is protective of Tuscaloosa Reservoir's Public Water Supply, Swimming, and Fish and Wildlife (PWS/S/F&W) use classifications. This criterion limit is denoted in Table 1.

The purpose of this report is to summarize data collected at five stations on Tuscaloosa Reservoir during the 2017 and 2021 growing seasons and to evaluate trends in mean lake trophic status and nutrient concentrations using ADEM's historic dataset. Monthly and/or 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 location information can be found in Table 1. Lake Tuscaloosa was sampled in the dam forebay, mid reservoir, and upper reservoir. Monitoring sites were also established in the Binion Creek and North River embayments.

Water quality sampling was 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 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 flow data and ADEM's previously collected data to help interpret the 2017 and 2021 results.

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

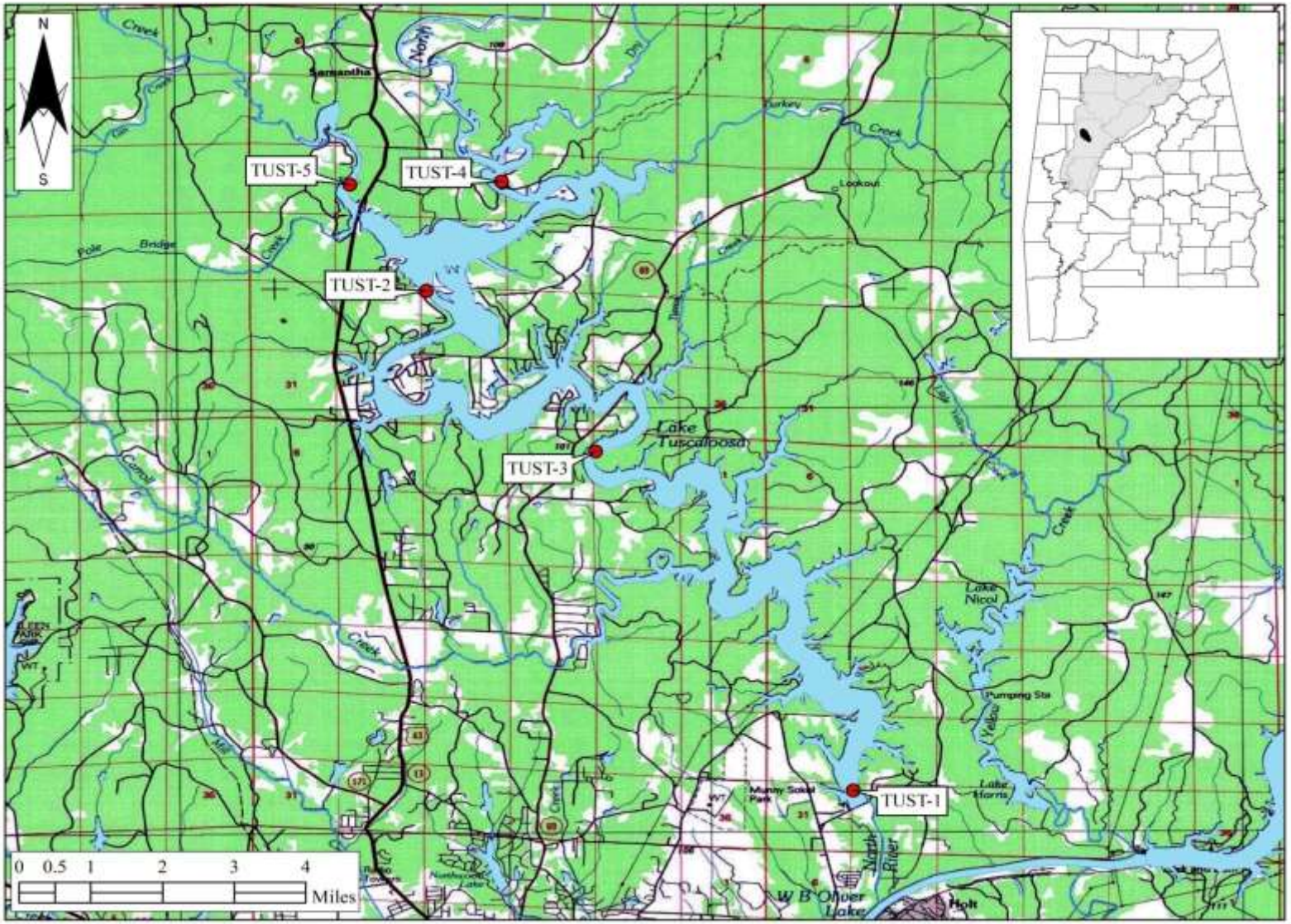


Table 1. Descriptions for the monitoring stations in 2017 and 2021 in Tuscaloosa Reservoir.

HUC	County	Station Number	Report Designation	Waterbody Name	Station Description	Chl *a* Criteria	Latitude	Longitude
Smith Reservoir								
031601120413	Tuscaloosa	TUST-1	Lower	North R	Deepest point, main river channel, dam forebay.	8 µg/l*	33.2685	-87.5084
031601120413	Tuscaloosa	TUST-2	Upper	North R	Deepest point, main river channel, immediately downstream of Binion Creek confluence		33.3747	-87.5946
031601120413	Tuscaloosa	TUST-3	Mid	North R	Deepest point, main river channel, approximately one mile downstream of Alabama Hwy 69 bridge		33.3405	-87.5604
031601120411	Tuscaloosa	TUST-4	North River	North R	North River immediately upstream of Bull Slough crossing, deepest point, main channel.		33.3979	-87.5795
031601120410	Tuscaloosa	TUST-5	Binion Creek	Binion Creek	Binion Creek, deepest point, main channel, immediately upstream of Hwy 43		33.3972	-87.6101

*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 16-17). 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. AGPT results appear in Table 2. Depth profile graphs of temperature, DO, and conductivity are provided in Figures 10-15. Summary statistics of all data collected during 2017 and 2021 are presented in Appendix Table 1 and Appendix Table 2, respectively. 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 graphs that follow will indicate these stations that may be potential candidates for reference waterbodies and watersheds.

In 2017 and 2021, the highest mean growing season TN value calculated among Tuscaloosa Reservoir mainstem stations was in the mid station (Figure 2). In 2017, the highest mean growing season TN value between tributary stations was in the North River. However, in 2021 the Binion Creek station was the highest. Mean TN values were lower in 2021 than 2017 at all stations sampled. Monthly TN graphs are displayed in Figure 4.

In 2017 and 2021, the highest mean growing season TP value calculated among Tuscaloosa Reservoir mainstem stations was in the upper station (Figure 2). The highest mean growing season TP value among tributary stations in 2017 was in the North River station. In 2021, the Binion Creek tributary station had the highest mean growing season TP. Mean growing season TP values in all Tuscaloosa Reservoir stations decreased since monitoring began in 1998; however, 2021 mean TP values showed a slight increase at all stations. Monthly TP graphs are displayed in Figure 5.

The growing season mean chl *a* concentration in the lower Tuscaloosa Reservoir station (TUST-1) was below the established criterion (8 µg/L) in both 2017 and 2021. The highest growing season mean chl *a* concentrations were calculated for the North River station in 2017 and

the Binion Creek station in 2021 (Figure 3). Mean chl *a* concentrations at all stations, except for North River, have increased steadily since 2012. Monthly chl *a* graphs are displayed in Figure 6.

In both 2017 and 2021, the highest mean growing season TSS value among all Tuscaloosa Reservoir stations was assessed for the North River station (Figure 3). Mean TSS concentrations decreased from 2002-2012 to values <1.0 mg/L at all stations, then increased in 2017 and again in 2021. Mean values in 2021 were more than twice those calculated for 2017 at all locations except the mid reservoir station. Monthly TSS graphs are displayed in Figure 7.

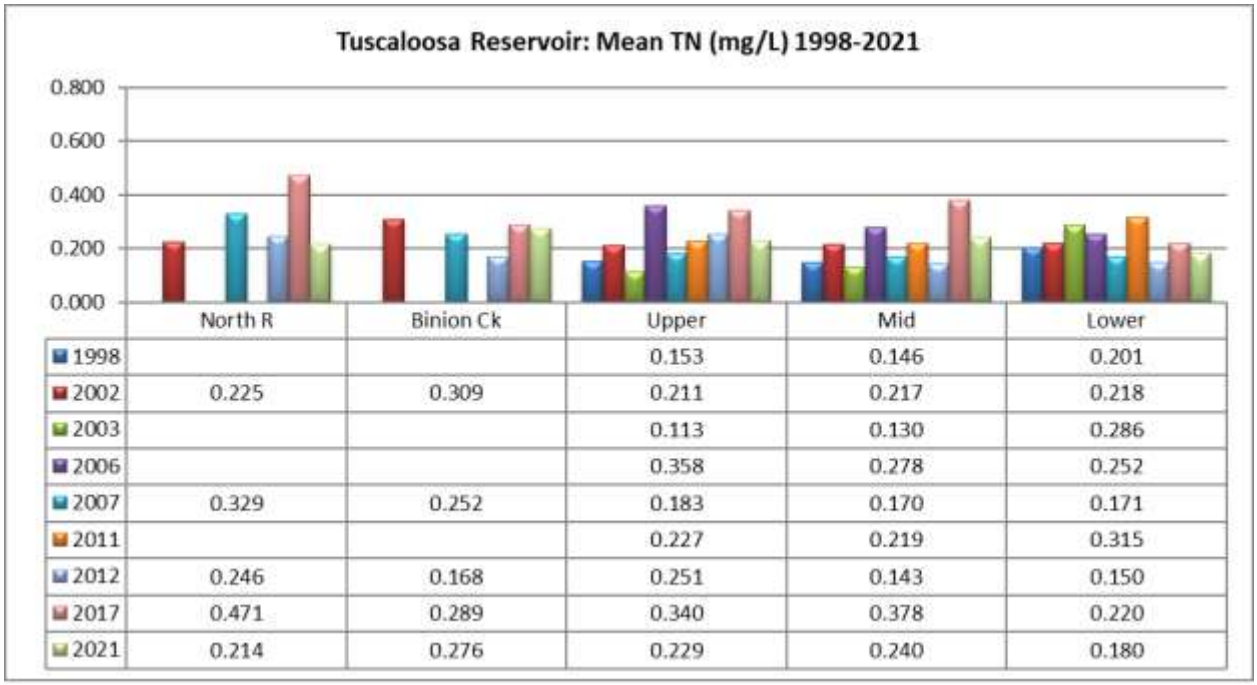
AGPT results for the mid and upper Tuscaloosa Reservoir stations have consistently changed between phosphorus-limited, nitrogen-limited, and co-limited since AGPT testing began in 1998 (Table 2). AGPT results in the lower station have been more consistent, indicating phosphorus limited conditions since 2002. AGPT results indicate all mainstem Tuscaloosa Reservoir stations remained below 5 mg/L MSC, the value that Raschke and Schultz (1987) defined as protective of reservoir and lake systems. No AGPT samples were collected from the Tuscaloosa Reservoir in 2021.

All measurements of dissolved oxygen concentrations in Tuscaloosa Reservoir mainstem and tributary stations were at or above ADEM's DO criteria limit of 5.0 mg/L at 5.0 ft (1.5 m) in all months sampled during both the 2017 and 2021 growing seasons (ADEM Admin. Code R. 335-6-10-.09) (Figures 8-9). Based on monthly profiles in 2017 and 2021, all mainstem stations showed DO concentrations below 5.0 mg/L at depths greater than 5-6.0 m in most months monitored with the exception of May and June (Figures 10-15). Anoxic conditions existed at all stations, usually at depths greater than 5.0 m, mostly July-September. Based on temperature profiles, all mainstem stations were thermally stratified, April-October. The highest water temperatures were observed July-October.

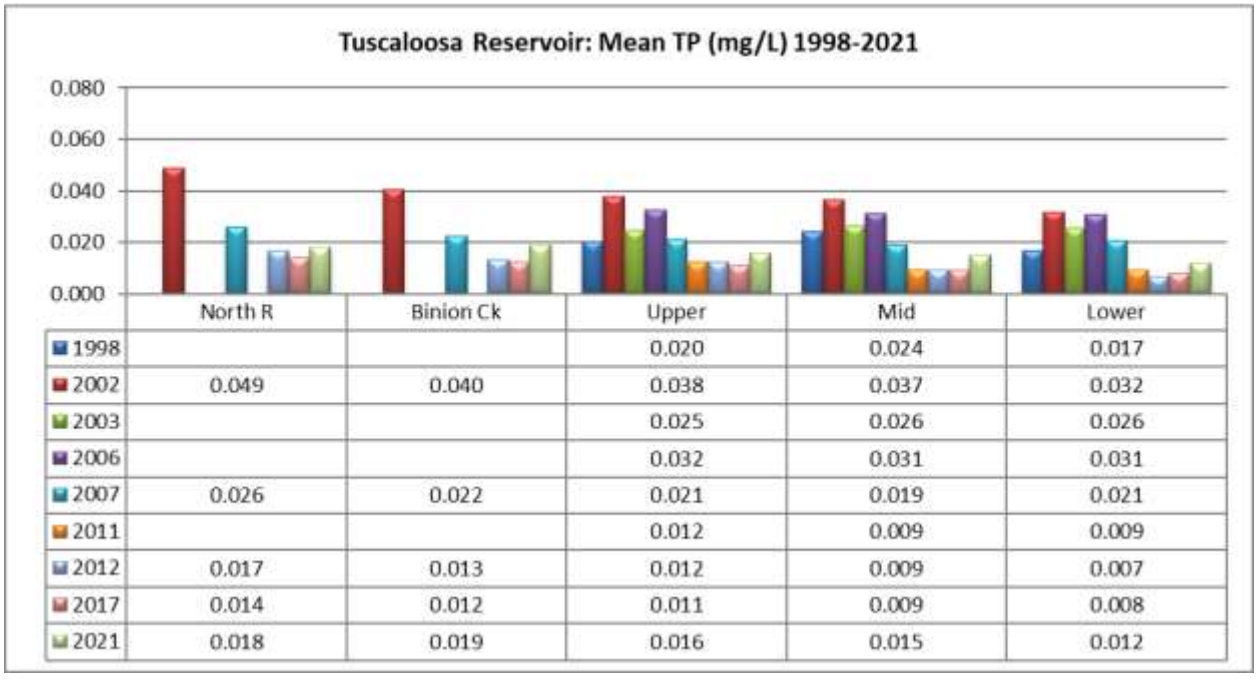
TSI values were calculated using monthly chl *a* concentrations and Carlson's Trophic State Index. Among the mainstem stations, the upper station fluctuated from eutrophic to mesotrophic throughout both sampling seasons during 2017 and 2021 (Figures 16-17). The mid station varied from mesotrophic to eutrophic in both 2017 and 2021 but reached oligotrophic conditions in October 2017. The lower station remained mostly mesotrophic throughout 2017 and 2021,

dropping occasionally to oligotrophic for short periods. In 2017, the North River station was eutrophic most of the year, dropping to mesotrophic during June and July. However, in 2021 the North River station fluctuated from oligotrophic to eutrophic to mesotrophic throughout the year. The Binion Creek station started out 2017 with eutrophic TSI values dropping to mesotrophic in July and then to oligotrophic in October. In 2021, the Binion Creek station was mesotrophic until July and then remained eutrophic the rest of the growing season.

Figure 2. Mean growing season TN and TP measured in Tuscaloosa Reservoir, April-October 1998-2021. Bar graphs show multiple stations, illustrated from upstream to downstream as the graph is read from left to right.

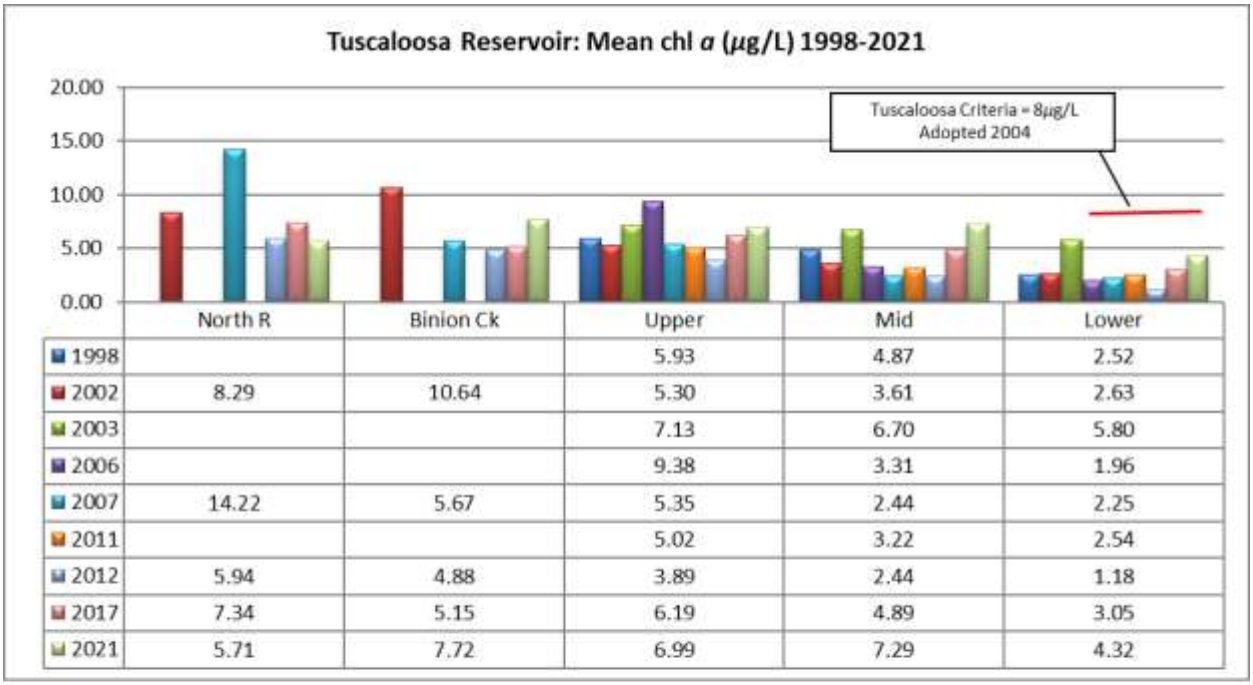


	North R	Binion Ck	Upper	Mid	Lower
1998			0.153	0.146	0.201
2002	0.225	0.309	0.211	0.217	0.218
2003			0.113	0.130	0.286
2006			0.358	0.278	0.252
2007	0.329	0.252	0.183	0.170	0.171
2011			0.227	0.219	0.315
2012	0.246	0.168	0.251	0.143	0.150
2017	0.471	0.289	0.340	0.378	0.220
2021	0.214	0.276	0.229	0.240	0.180

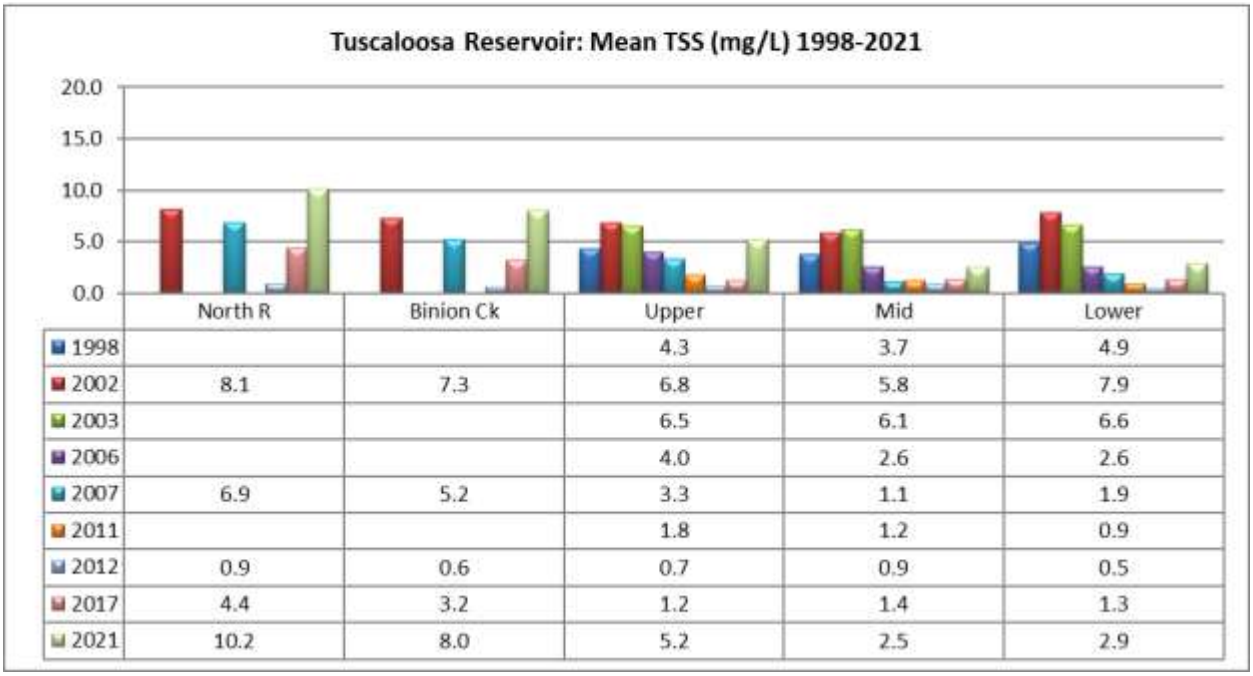


	North R	Binion Ck	Upper	Mid	Lower
1998			0.020	0.024	0.017
2002	0.049	0.040	0.038	0.037	0.032
2003			0.025	0.026	0.026
2006			0.032	0.031	0.031
2007	0.026	0.022	0.021	0.019	0.021
2011			0.012	0.009	0.009
2012	0.017	0.013	0.012	0.009	0.007
2017	0.014	0.012	0.011	0.009	0.008
2021	0.018	0.019	0.016	0.015	0.012

Figure 3. Mean growing season chl *a* and TSS measured in Tuscaloosa Reservoir, April-October 1998-2021. Bar graphs show multiple stations, illustrated from upstream to downstream as the graph is read from left to right.



	North R	Binion Ck	Upper	Mid	Lower
1998			5.93	4.87	2.52
2002	8.29	10.64	5.30	3.61	2.63
2003			7.13	6.70	5.80
2006			9.38	3.31	1.96
2007	14.22	5.67	5.35	2.44	2.25
2011			5.02	3.22	2.54
2012	5.94	4.88	3.89	2.44	1.18
2017	7.34	5.15	6.19	4.89	3.05
2021	5.71	7.72	6.99	7.29	4.32



	North R	Binion Ck	Upper	Mid	Lower
1998			4.3	3.7	4.9
2002	8.1	7.3	6.8	5.8	7.9
2003			6.5	6.1	6.6
2006			4.0	2.6	2.6
2007	6.9	5.2	3.3	1.1	1.9
2011			1.8	1.2	0.9
2012	0.9	0.6	0.7	0.9	0.5
2017	4.4	3.2	1.2	1.4	1.3
2021	10.2	8.0	5.2	2.5	2.9

Figure 4. Monthly TN concentrations measured in Tuscaloosa Reservoir, 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. Discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.

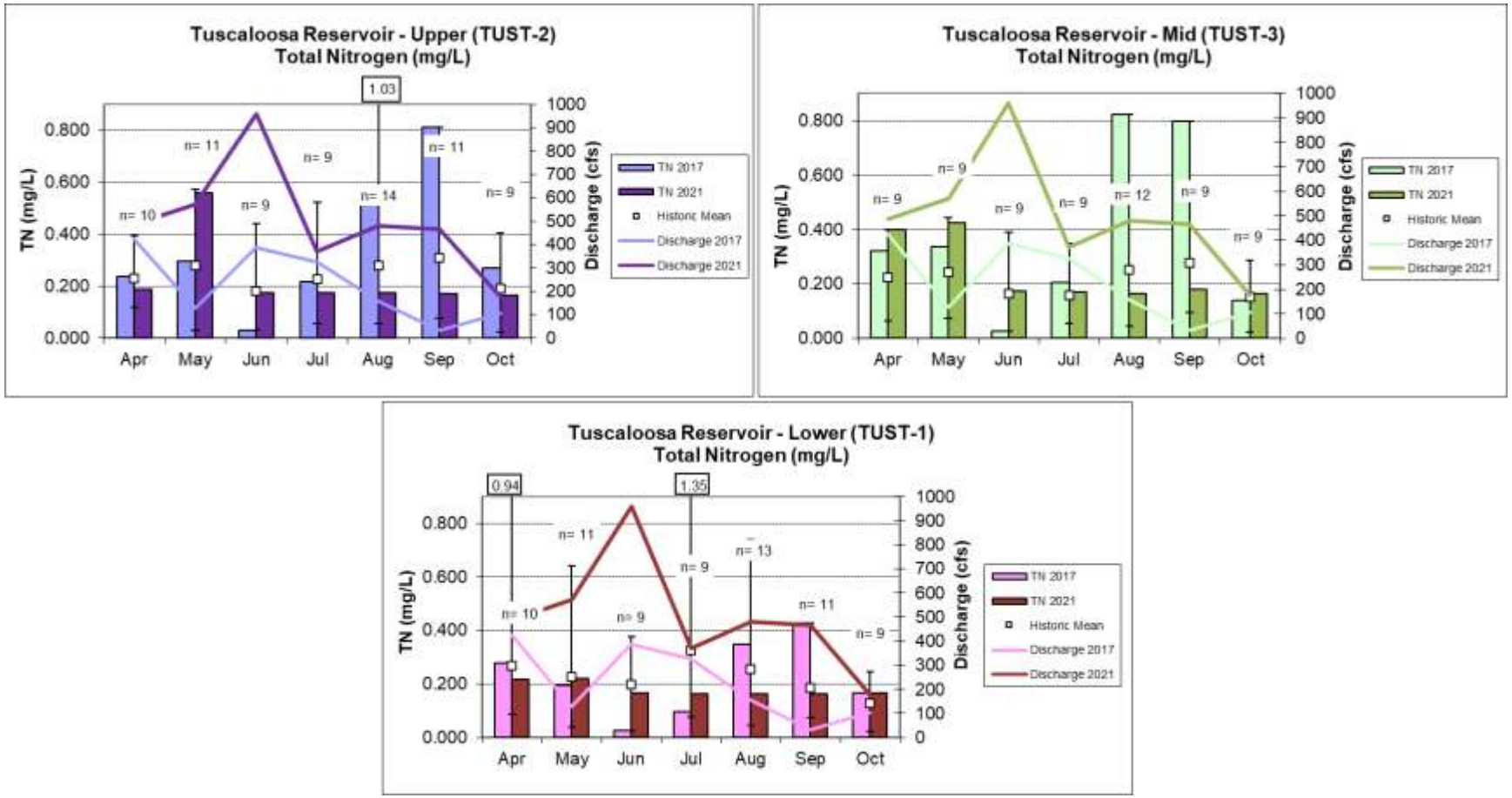


Figure 5. Monthly TP concentrations measured in Tuscaloosa Reservoir, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. Discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.

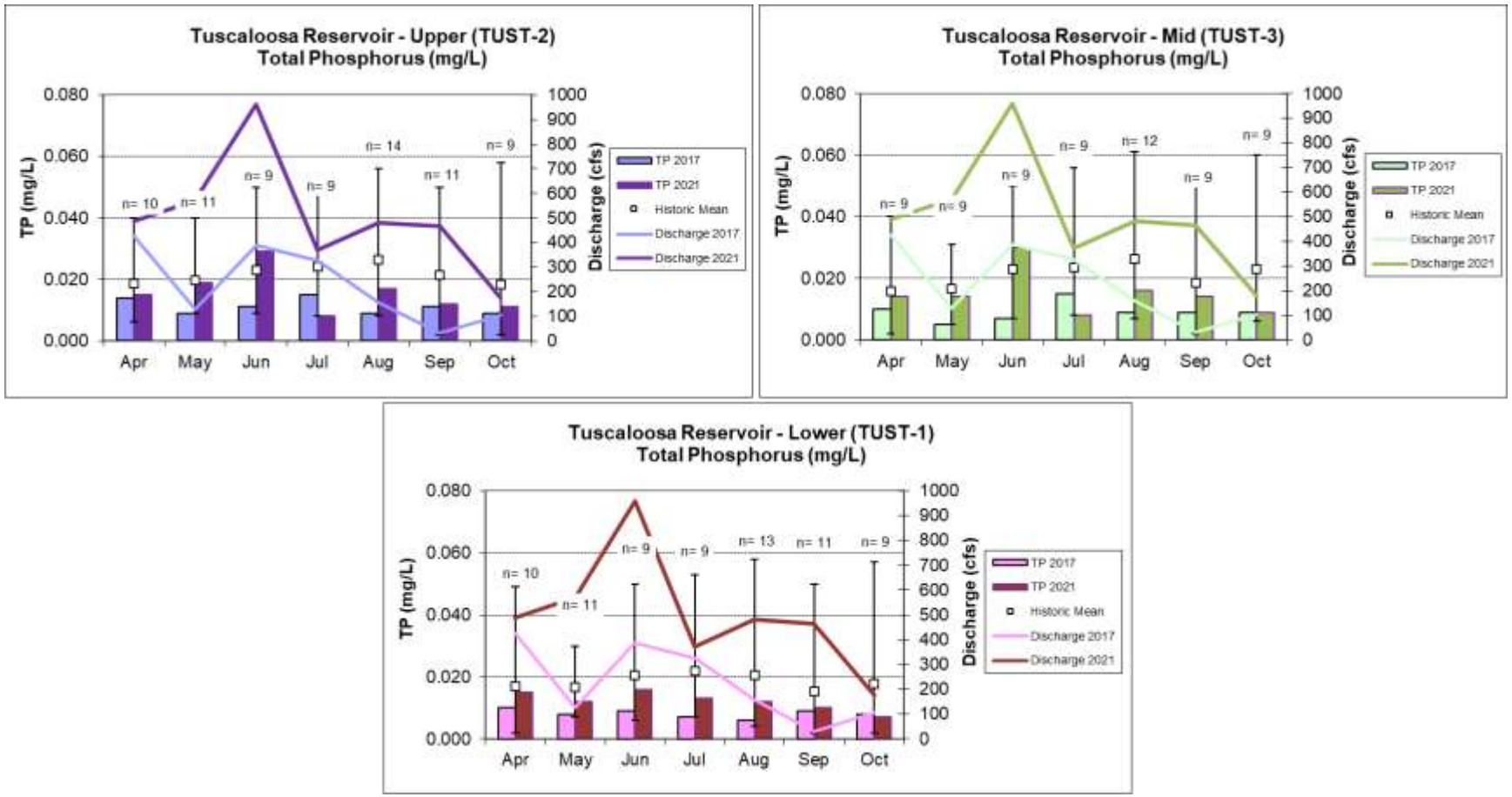


Figure 6. Monthly chl *a* concentrations measured in Tuscaloosa Reservoir, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. Discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.

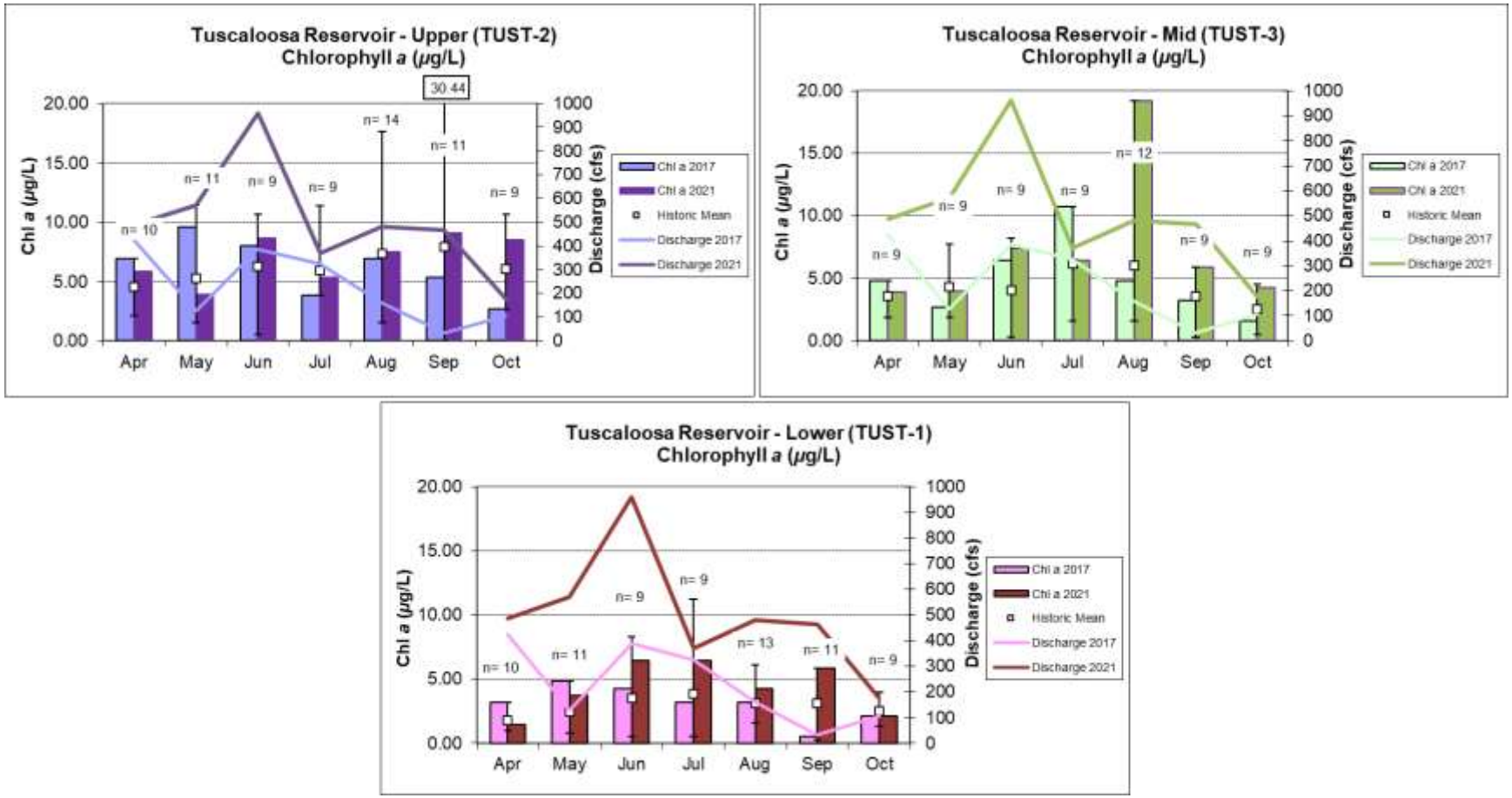


Figure 7. Monthly TSS concentrations measured in Tuscaloosa Reservoir, April-October 2017 and 2021. Each bar graph depicts monthly changes in each station. The historic mean (1990-2021) and min/max ranges are also displayed for comparison. The "n" value equals the number of datapoints included in the monthly historic calculations. Discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.

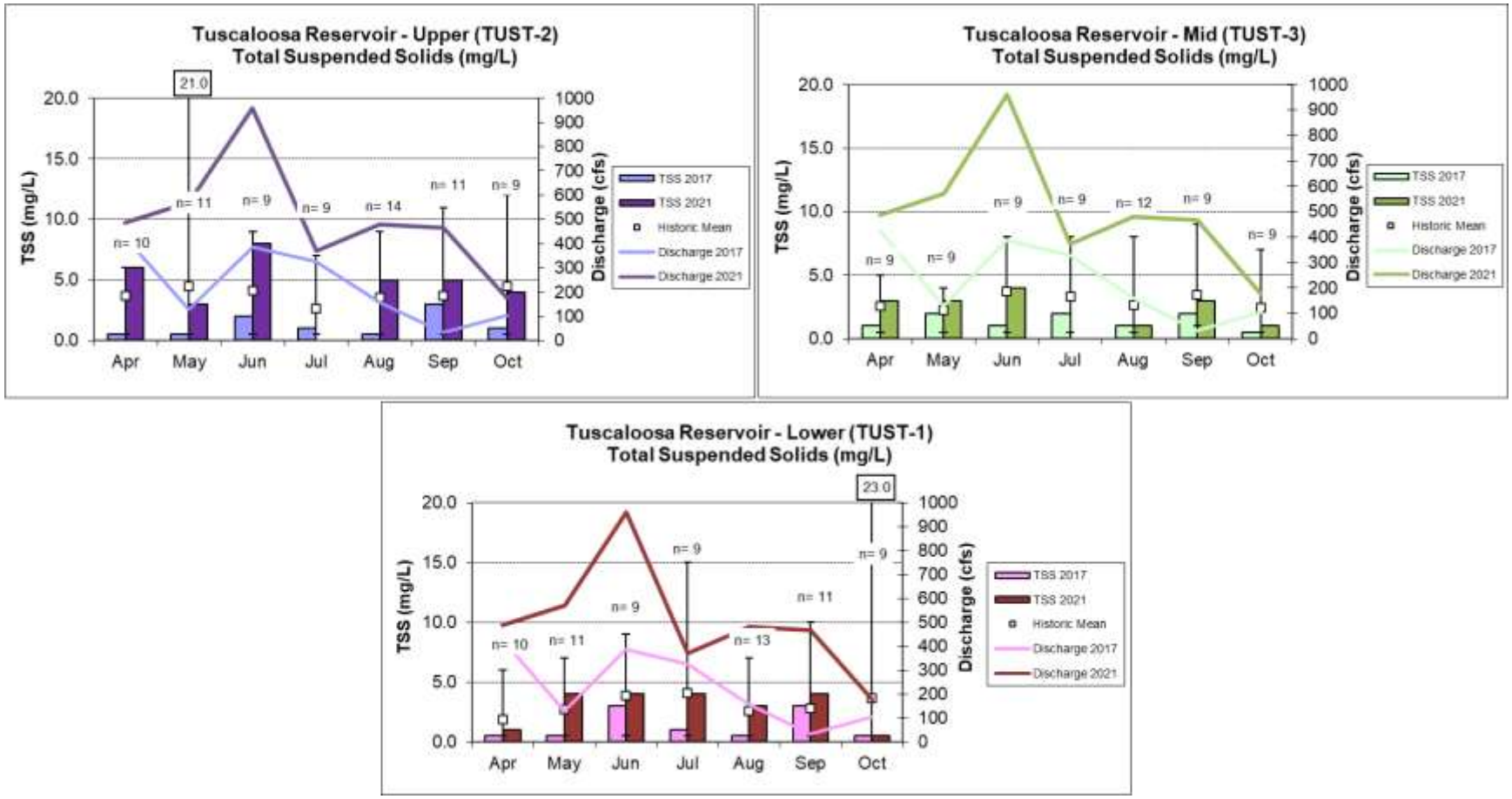
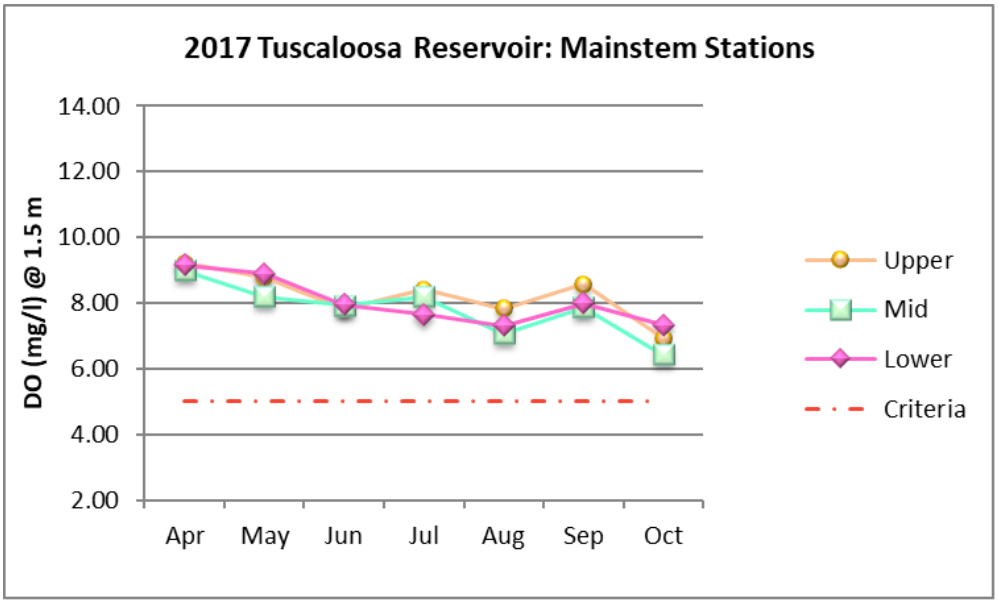


Table 2. Algal growth potential test results, Tuscaloosa Reservoir, 1998-2017 (expressed as mean Maximum Standing Crop (MSC) or dry weights of Selenastrum capricornutum in mg/L) and limiting nutrient status. MSC values below 5 mg/L are considered to be protective in reservoirs and lakes; MSC values below 20 mg/L MSC are considered protective of flowing streams and rivers. (Raschke and Schultz 1987).

Station	Upper (TUST-2)		Mid (TUST-3)		Lower (TUST-1)	
	MSC	Limiting Nutrient	MSC	Limiting Nutrient	MSC	Limiting Nutrient
August 1998	2.49	Phosphorus	2.18	Phosphorus	2.31	Co-limiting
August 2002	1.80	Co-limiting	1.89	Nitrogen	1.82	Phosphorus
June 2007	2.05	Co-limiting	1.79	Phosphorus	2.13	Phosphorus
July 2007	1.80	Phosphorus	1.05	Co-limiting	1.28	Phosphorus
August 2007	2.21	Co-limiting	2.26	Phosphorus	2.32	Phosphorus
August 2012	1.93	Co-limiting	2.12	Co-limiting	1.51	Phosphorus
August 2017	---	---	1.33	Co-limiting	---	---

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



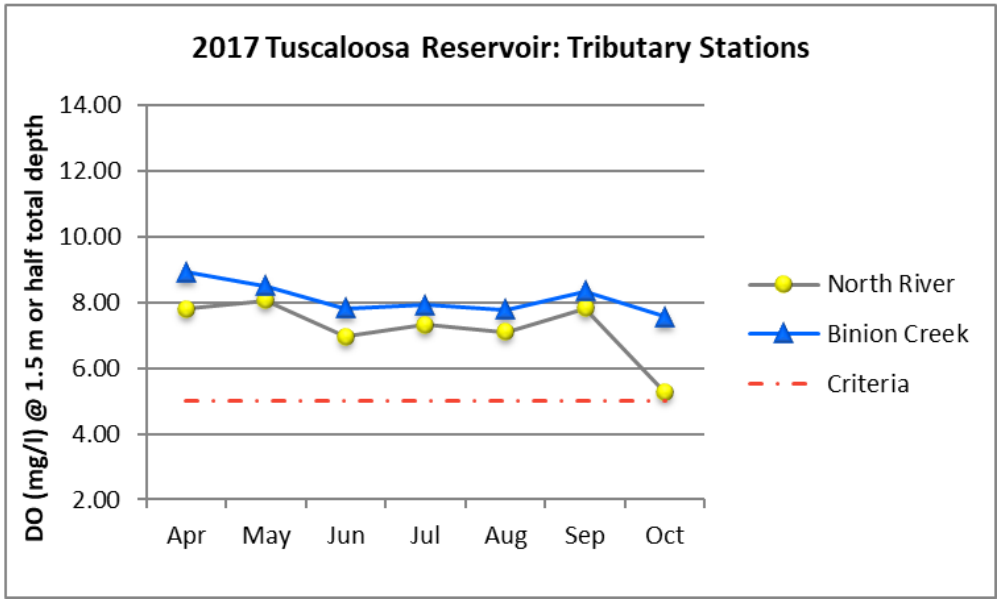
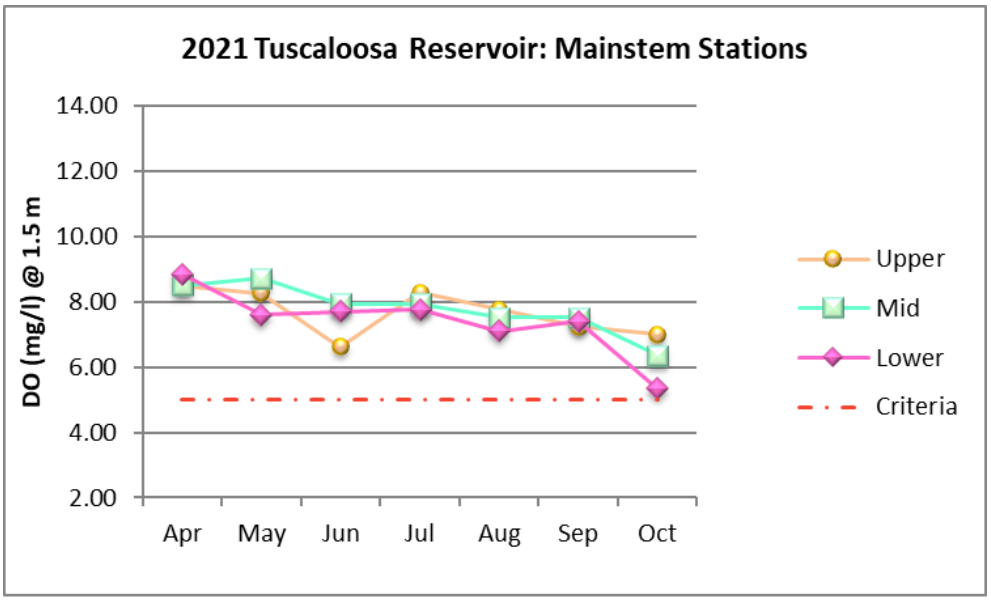


Figure 9. Monthly DO concentrations at 1.5 m (5 ft) for Tuscaloosa Reservoir stations collected April-October 2021. ADEM Water Quality Criteria pertaining to reservoir waters require a minimum DO concentration of 5.0 mg/L at this depth (ADEM Admin. Code R. 335-6-10-.09).



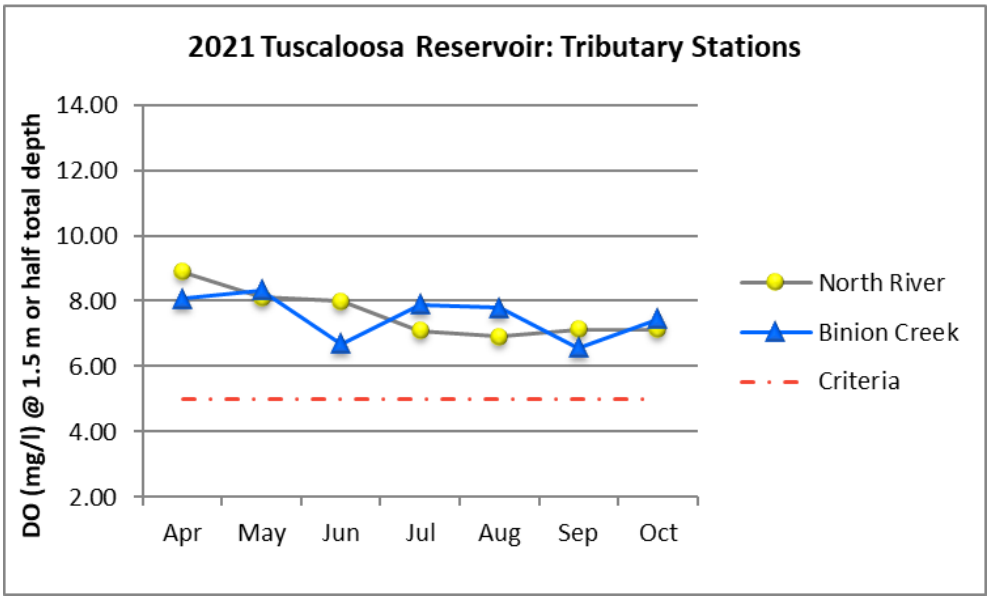


Figure 10. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the lower Tuscaloosa Reservoir station, April-October 2017.

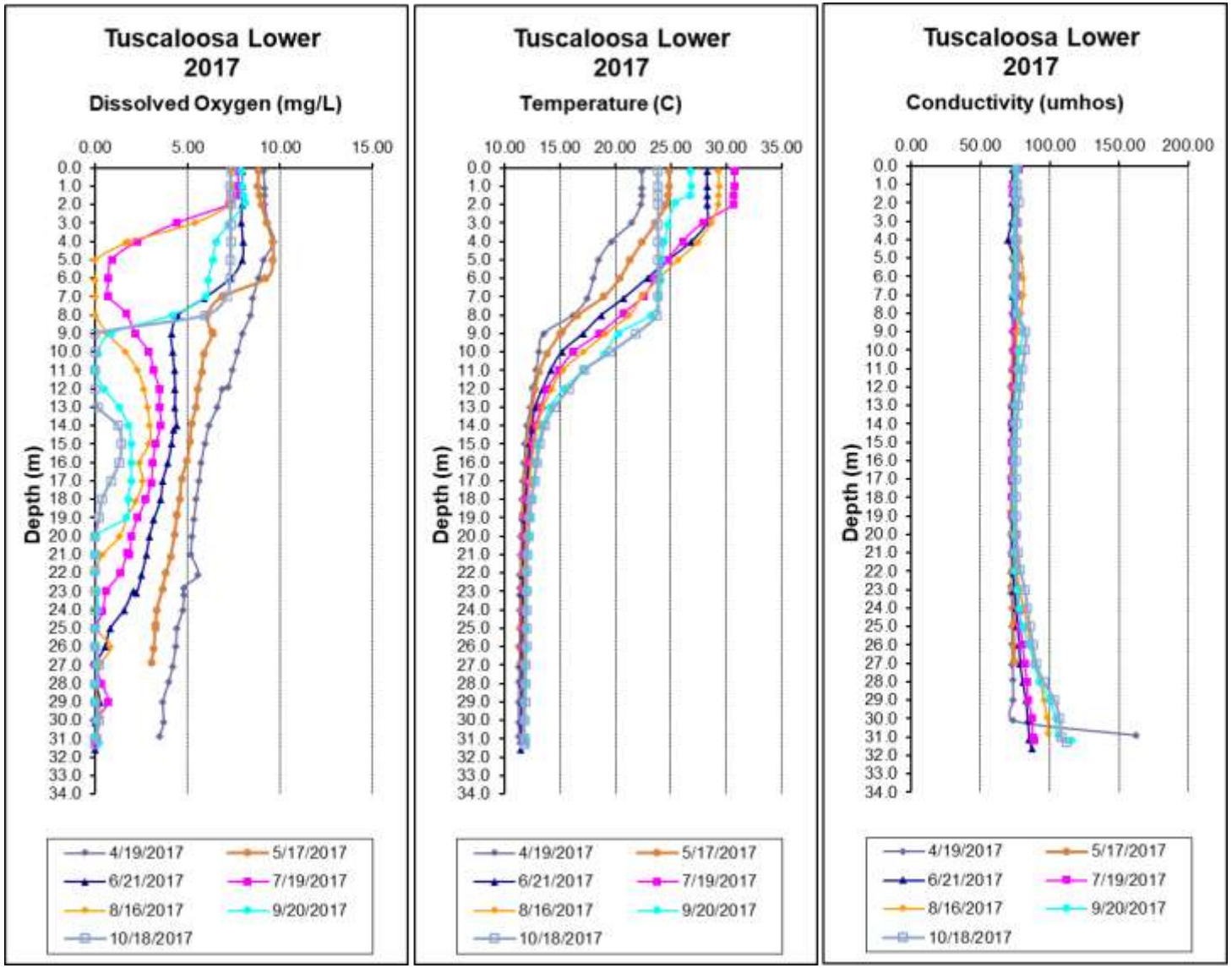


Figure 11. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the mid Tuscaloosa Reservoir station, April-October 2017.

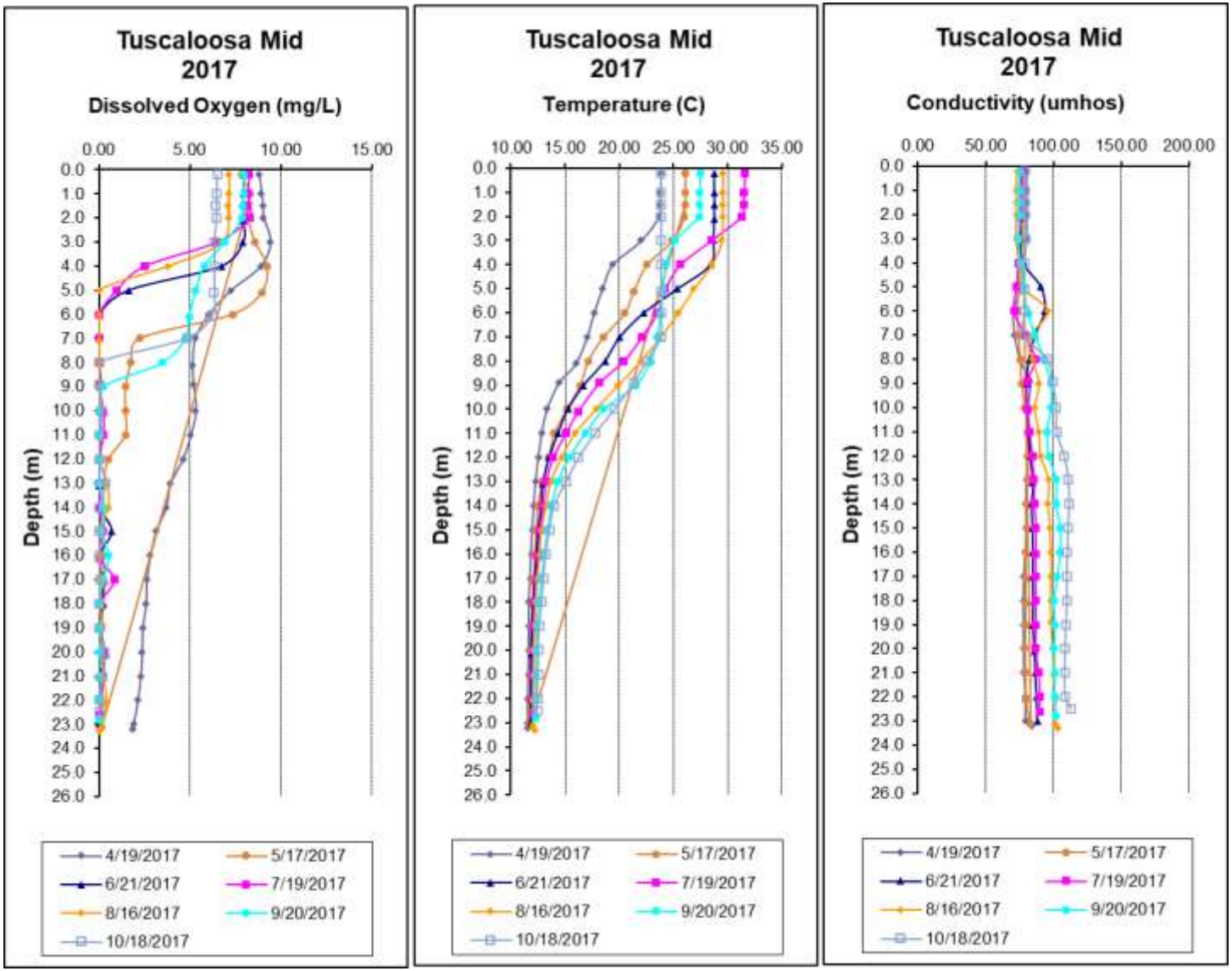


Figure 12. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the upper Tuscaloosa Reservoir station, April-October 2017.

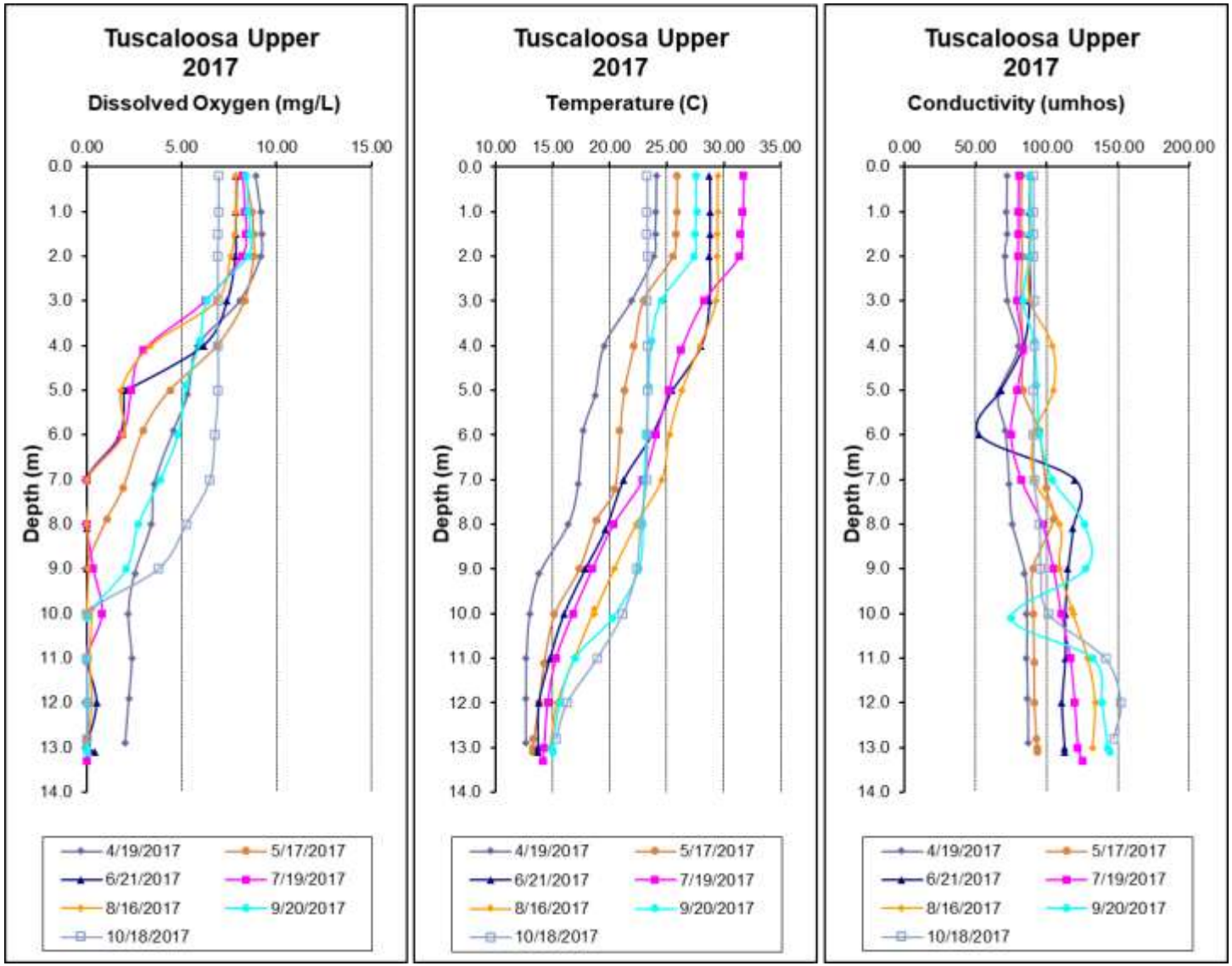


Figure 13. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the lower Tuscaloosa Reservoir station, April-October 2021.

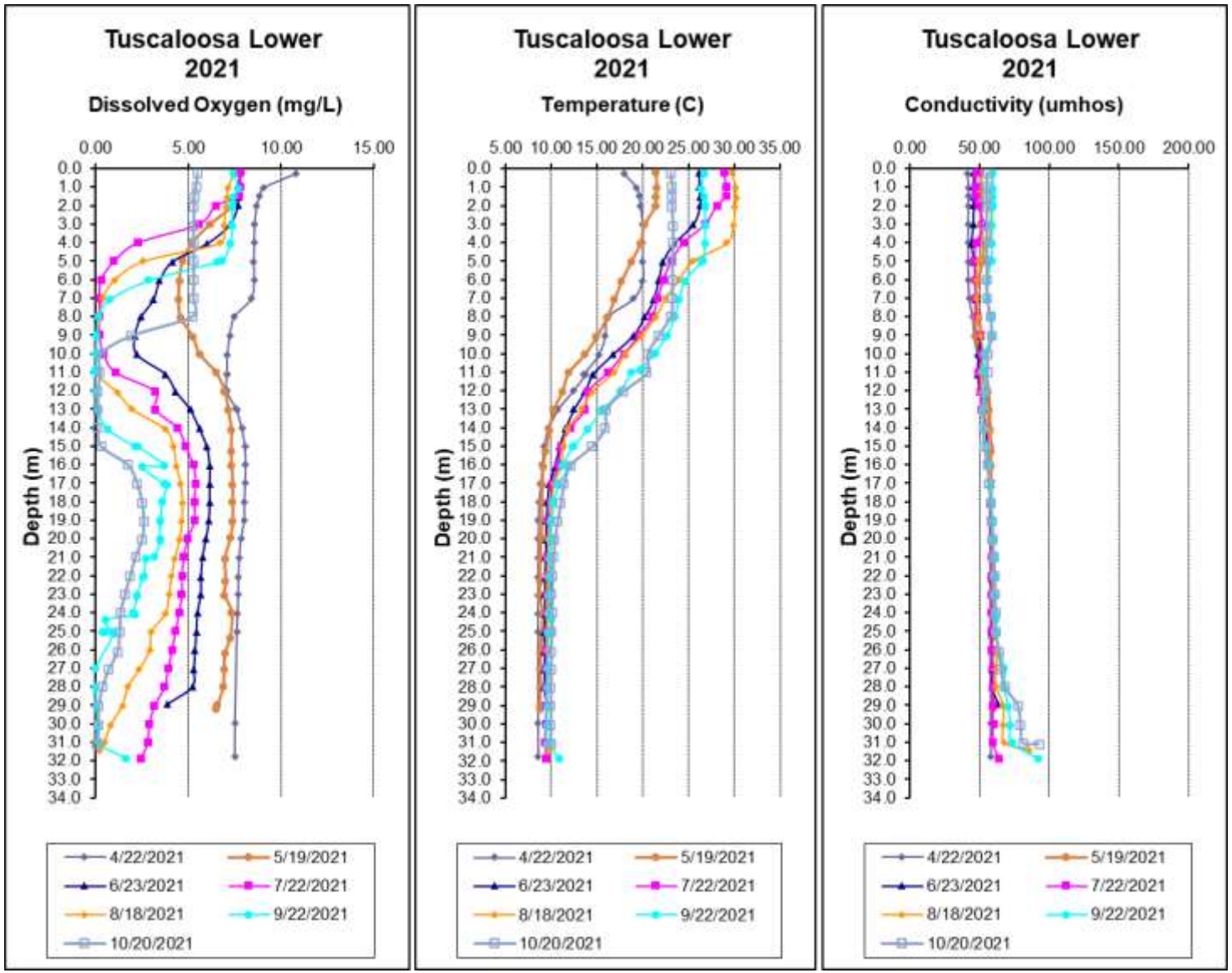


Figure 14. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the mid Tuscaloosa Reservoir station, April-October 2021.

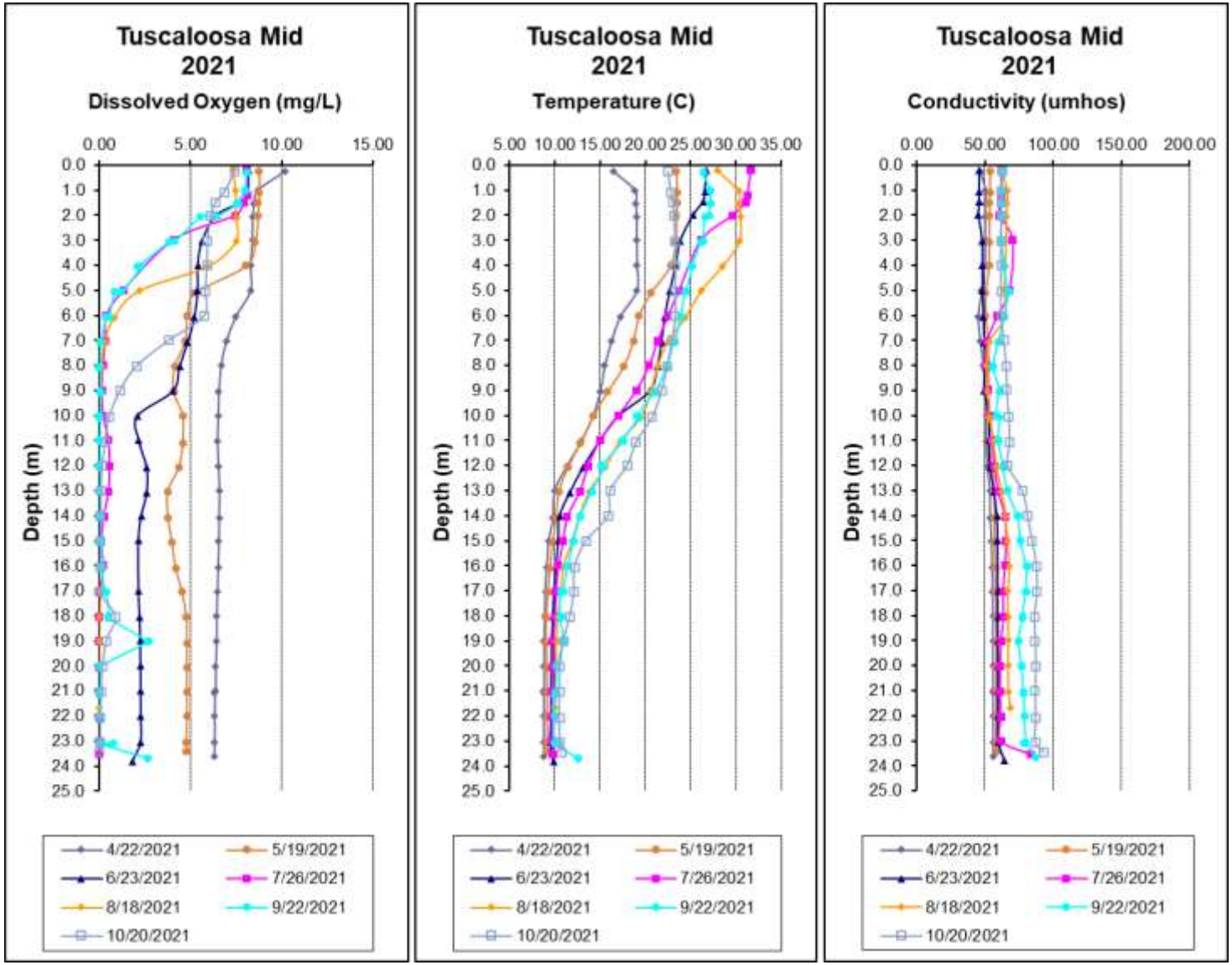


Figure 15. Monthly depth profiles of dissolved oxygen, temperature, and conductivity in the upper Tuscaloosa Reservoir station, April-October 2021.

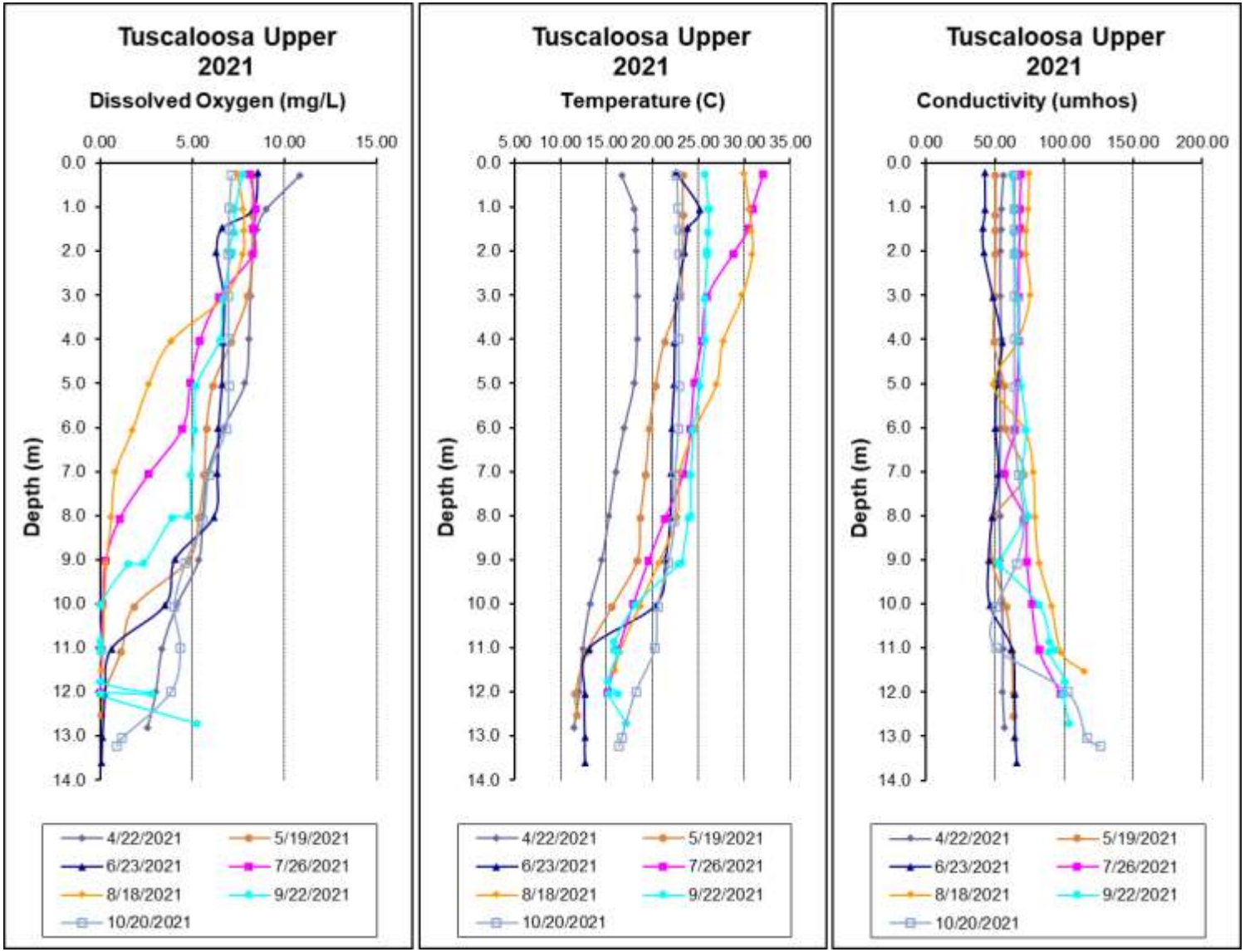
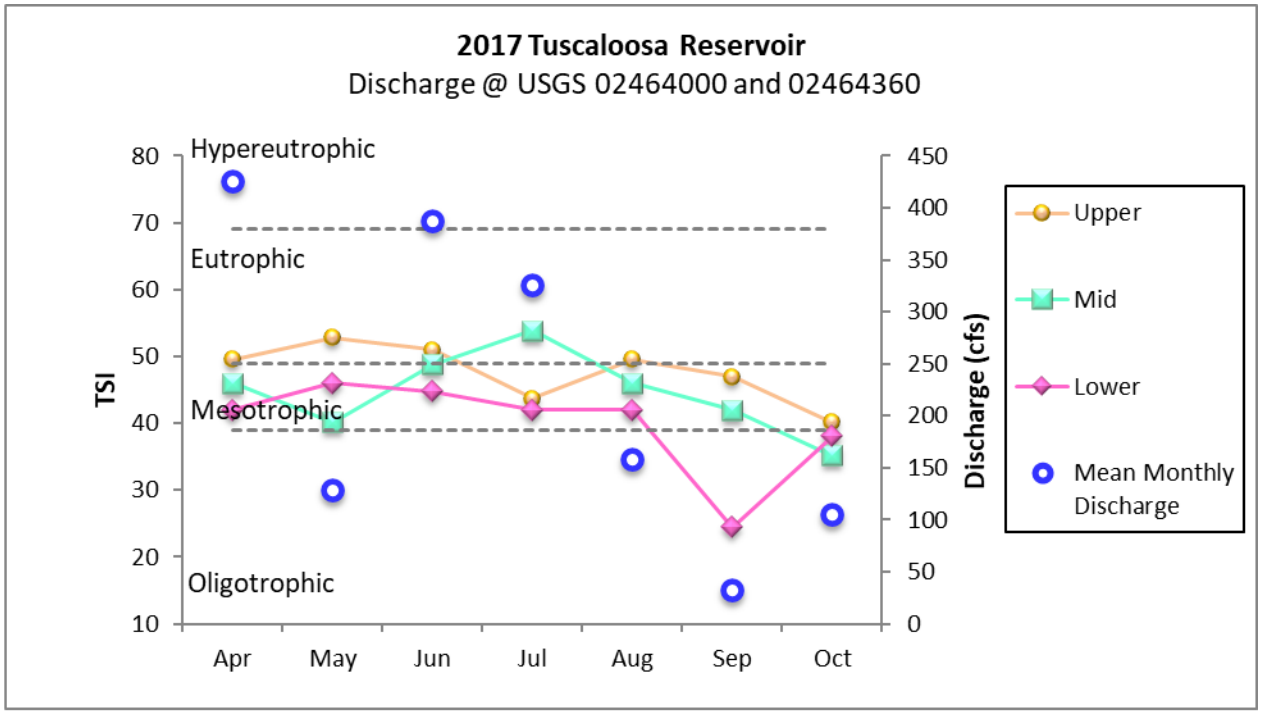


Figure 16. Monthly TSI values calculated for mainstem and tributary Tuscaloosa Reservoir stations in 2017 using chl *a* concentrations and Carlson's Trophic State Index calculation. Mean monthly discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.



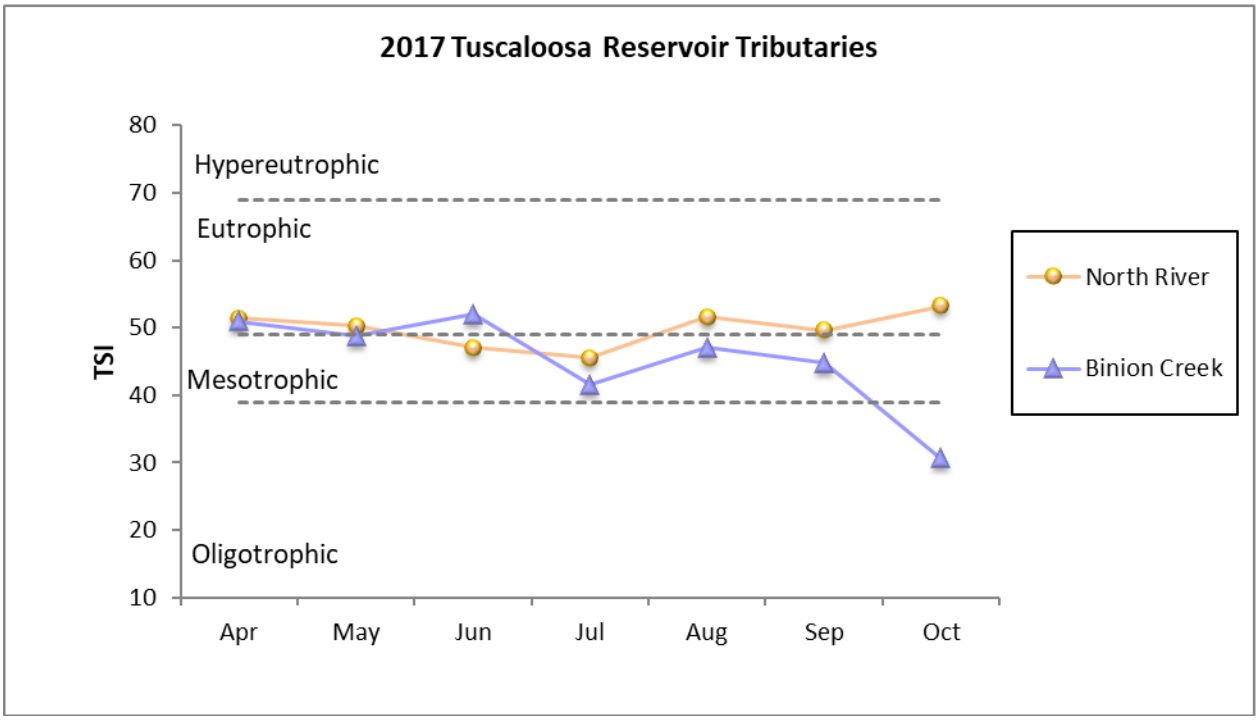
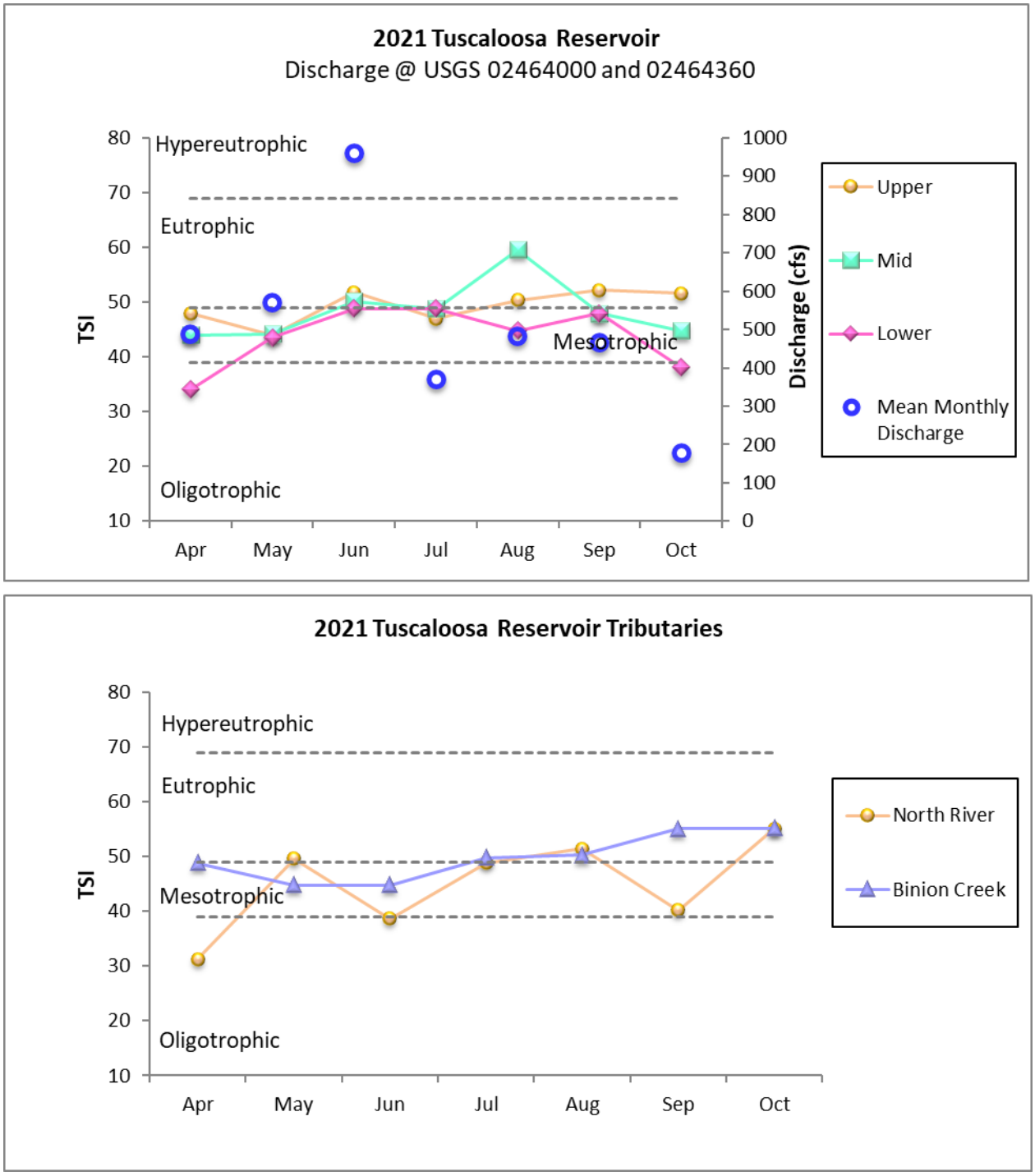


Figure 17. Monthly TSI values calculated for mainstem and tributary Tuscaloosa Reservoir stations in 2021 using chl *a* concentrations and Carlson's Trophic State Index calculation. Mean monthly discharge calculated as the sum of USGS 02464000 North River near Samantha, AL, and 02464360 Binion Creek below Gin Creek near Samantha, AL.



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APPENDIX

Appendix Table 1. Summary of Tuscaloosa Reservoir 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
TUST-1	**Physical**						
	Turbidity (NTU)	7	1.4	6.3	1.6	2.3	1.8
	Total Dissolved Solids (mg/L)	7	39.0	68.0	49.0	52.0	9.4
	Total Suspended Solids (mg/L)	7	< 1.0	3.0	0.5	1.3	1.2
	Hardness (mg/L)	4	22.0	27.0	22.7	23.6	2.3
	Alkalinity (mg/L)	7	11.0	17.4	14.1	13.6	2.3
	Photic Zone (m)	7	6.19	7.04	6.29	6.47	0.37
	Secchi (m)	7	2.93	4.69	4.09	3.81	0.63
	Bottom Depth (m)	7	26.9	31.6	31.2	30.6	1.6
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.004	0.007	0.002	0.003	0.001
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.002	0.060	0.002	0.010	0.022
	Total Kjeldahl Nitrogen (mg/L)[J]	7	< 0.049	0.427	0.195	0.210	0.139
	Total Nitrogen (mg/L)[J]	7	< 0.076	1.287	0.196	0.220	0.142
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.002	0.003	0.002	0.002	0.001
	Total Phosphorus (mg/L)[J]	7	0.006	0.010	0.008	0.008	0.001
	CBOD-5 (mg/L)[J]	6	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	3.8	4.8	4.4	4.3	0.3
	Biological						
	Chlorophyll a (mg/m³)	7	0.53	4.81	3.20	3.05	1.40
	E. coli (MPN/DL)	4	1	104	6	29	50
TUST-2	**Physical**						
	Turbidity (NTU)	7	2.7	5.3	3.5	3.7	1.0
	Total Dissolved Solids (mg/L)	7	< 1.0	63.0	55.0	44.1	23.5
	Total Suspended Solids (mg/L)	7	< 1.0	3.0	1.0	1.2	1.0
	Hardness (mg/L)	4	25.2	30.2	26.4	27.0	2.2
	Alkalinity (mg/L)	7	11.4	16.5	14.3	14.4	1.8
	Photic Zone (m)	7	3.49	6.17	5.03	4.79	0.89
	Secchi (m)	7	1.35	2.46	2.30	2.10	0.40
	Bottom Depth (m)	7	12.8	13.3	13.1	13.0	0.2
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.004	0.007	0.002	0.003	0.001
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.002	0.028	0.002	0.006	0.010
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.049	0.810	0.268	0.334	0.255
	Total Nitrogen (mg/L)[J]	7	< 0.086	2.436	0.270	0.340	0.253
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.002	0.003	0.002	0.002	0.001
	Total Phosphorus (mg/L)[J]	7	0.009	0.015	0.011	0.011	0.002
	CBOD-5 (mg/L)[J]	6	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.2	4.8	4.7	4.6	0.2
	Biological						
	Chlorophyll a (mg/m³)	7	2.67	9.61	6.94	6.19	2.41
	E. coli (MPN/DL)	4	3	9	5	5	3

Station	Parameter	N	Min	Max	Med	Avg	SD
TUST-3	**Physical**						
	Turbidity (NTU)	7	1.7	2.9	2.0	2.1	0.4
	Total Dissolved Solids (mg/L)	7	42.0	54.0	49.0	47.4	4.7
	Total Suspended Solids (mg/L)	7	< 1.0	2.0	1.0	1.4	0.6
	Hardness (mg/L)	4	23.0	24.0	23.6	23.5	0.5
	Alkalinity (mg/L)	7	11.0	14.9	13.0	12.8	1.4
	Photic Zone (m)	7	4.94	6.46	5.85	5.91	0.52
	Secchi (m)	7	2.54	3.89	3.13	3.23	0.43
	Bottom Depth (m)	7	22.5	23.3	23.0	22.9	0.3
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.004	0.007	0.002	0.003	0.001
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.002	0.031	0.002	0.006	0.011
	Total Kjeldahl Nitrogen (mg/L)[J]	7	< 0.049	0.819	0.289	0.372	0.314
	Total Nitrogen (mg/L)[J]	7	< 0.076	2.463	0.320	0.378	0.313
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.002	< 0.002	0.002	0.002	0.000
	Total Phosphorus (mg/L)[J]	7	0.005	0.015	0.009	0.009	0.003
	CBOD-5 (mg/L)[J]	6	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	3.7	5.0	4.3	4.4	0.4
	Biological						
	Chlorophyll a (mg/m³)	7	1.60	10.70	4.81	4.89	3.02
	E. coli (MPN/DL)[J]	4	< 1	7	2	3	3
TUST-4	**Physical**						
	Turbidity (NTU)	7	5.2	10.2	7.0	7.0	1.6
	Total Dissolved Solids (mg/L)[J]	7	22.0	92.0	63.0	61.7	21.4
	Total Suspended Solids (mg/L)[J]	7	3.0	7.0	4.0	4.4	1.5
	Hardness (mg/L)	4	22.4	37.7	31.0	30.5	6.8
	Alkalinity (mg/L)	7	11.9	27.2	17.3	18.6	5.3
	Photic Zone (m)	7	2.16	3.55	3.31	3.09	0.54
	Secchi (m)	7	0.89	1.60	1.21	1.31	0.26
	Bottom Depth (m)	7	4.3	6.0	5.6	5.4	0.6
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.004	0.007	0.002	0.003	0.001
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.002	0.018	0.005	0.008	0.007
	Total Kjeldahl Nitrogen (mg/L)	7	0.175	0.822	0.452	0.463	0.247
	Total Nitrogen (mg/L)[J]	7	< 0.540	2.472	0.466	0.471	0.243
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.002	0.004	0.001	0.002	0.001
	Total Phosphorus (mg/L)	7	0.011	0.018	0.013	0.014	0.002
	CBOD-5 (mg/L)[J]	6	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	4.0	10.9	5.7	6.0	2.3
	Biological						
	Chlorophyll a (mg/m³)	7	4.58	10.10	7.48	7.34	1.91
	E. coli (MPN/DL)	4	5	23	10	12	8

Station	Parameter	N	Min	Max	Med	Avg	SD
TUST-5	**Physical**						
	Turbidity (NTU)	7	2.9	9.3	4.8	5.2	1.1
	Total Dissolved Solids (mg/L)[J]	7	16.0	71.0	49.0	49.6	18.2
	Total Suspended Solids (mg/L)[J]	7	< 1.0	5.0	4.0	3.2	1.7
	Hardness (mg/L)	4	21.9	28.4	25.8	25.5	3.0
	Alkalinity (mg/L)	7	9.6	22.1	13.6	14.7	4.0
	Photic Zone (m)	7	3.29	5.45	3.71	4.01	0.77
	Secchi (m)	7	1.33	2.53	2.03	1.95	0.48
	Bottom Depth (m)	7	7.0	7.6	7.2	7.2	0.2
	Chemical						
	Ammonia Nitrogen (mg/L)[J]	7	< 0.004	0.063	0.004	0.013	0.022
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.002	0.015	0.002	0.005	0.005
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.049	0.570	0.287	0.283	0.162
	Total Nitrogen (mg/L)[J]	7	< 0.118	1.716	0.289	0.289	0.159
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.002	0.004	0.002	0.002	0.001
	Total Phosphorus (mg/L)[J]	7	0.008	0.018	0.011	0.012	0.004
	CBOD-5 (mg/L)[J]	6	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	3.2	4.8	4.3	4.1	0.5
	Biological						
	Chlorophyll a (mg/m³)	7	< 0.10	8.90	5.34	5.15	3.03
	E. coli (MPN/DL)	4	1	9	5	4	3

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

Appendix Table 2. Summary of Tuscaloosa Reservoir 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
TUST-1	**Physical**						
	Turbidity (NTU)	7	2.8	6.6	4.0	4.5	1.6
	Total Dissolved Solids (mg/L)[J]	7	2.0	52.0	34.0	33.6	16.4
	Total Suspended Solids (mg/L)[J]	7	< 1.0	4.0	4.0	2.9	1.5
	Hardness (mg/L)	4	16.1	20.6	18.6	18.5	2.1
	Alkalinity (mg/L)	7	7.4	12.3	10.2	9.9	1.8
	Photic Zone (m)	7	3.40	11.92	5.98	6.70	3.21
	Secchi (m)	7	0.70	2.98	2.20	2.08	0.77
	Bottom Depth (m)	7	28.9	31.9	31.4	30.9	1.3
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.016	0.046	0.023	0.021	0.006
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.003	0.058	0.003	0.018	0.026
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.324	< 0.324	0.162	0.162	0.000
	Total Nitrogen (mg/L)[J]	7	< 0.490	0.660	0.165	0.180	0.026
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.004	0.004	0.002	0.003	0.001
	Total Phosphorus (mg/L)[J]	7	0.007	0.016	0.012	0.012	0.003
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	2.2	2.8	2.4	2.4	0.2
	Biological						
	Chlorophyll a (mg/m³)	7	1.42	6.41	4.27	4.32	2.03
	E. coli (MPN/DL)	4	7	15	12	11	3
TUST-2	**Physical**						
	Turbidity (NTU)	7	5.1	19.4	7.6	9.2	5.0
	Total Dissolved Solids (mg/L)[J]	6	25.0	50.0	40.0	39.0	10.9
	Total Suspended Solids (mg/L)[J]	6	3.0	8.0	5.0	5.2	1.7
	Hardness (mg/L)	4	16.0	24.0	22.4	21.2	3.6
	Alkalinity (mg/L)	7	8.1	13.4	11.2	10.6	2.1
	Photic Zone (m)	7	1.96	7.28	3.39	4.37	2.08
	Secchi (m)	7	0.60	1.82	1.36	1.35	0.42
	Bottom Depth (m)	7	11.5	13.6	12.7	12.6	0.7
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.016	0.079	0.023	0.029	0.023
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.003	0.026	0.012	0.012	0.007
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.324	0.544	0.162	0.217	0.144
	Total Nitrogen (mg/L)[J]	7	< 0.490	1.674	0.174	0.229	0.145
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.004	0.005	0.002	0.002	0.001
	Total Phosphorus (mg/L)[J]	7	0.008	0.029	0.015	0.016	0.007
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	2.0	3.5	3.1	2.9	0.6
	Biological						
	Chlorophyll a (mg/m³)	7	3.92	9.08	7.48	6.99	1.97
	E. coli (MPN/DL)	4	1	41	19	21	21

Station	Parameter	N	Min	Max	Med	Avg	SD
TUST-3	**Physical**						
	Turbidity (NTU)	7	2.9	8.3	5.1	5.1	1.8
	Total Dissolved Solids (mg/L)[J]	6	27.0	72.0	38.5	43.0	16.2
	Total Suspended Solids (mg/L)[J]	6	1.0	4.0	3.0	2.5	1.2
	Hardness (mg/L)	4	16.5	23.1	21.7	20.8	2.9
	Alkalinity (mg/L)	7	8.4	12.6	11.6	10.7	1.9
	Photic Zone (m)	7	2.99	10.64	5.07	6.32	3.09
	Secchi (m)	7	1.18	2.66	2.10	1.96	0.49
	Bottom Depth (m)	7	21.7	23.8	23.6	23.3	0.7
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.016	0.066	0.023	0.027	0.018
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.003	0.027	0.013	0.012	0.009
	Total Kjeldahl Nitrogen (mg/L)[J]	7	< 0.324	0.411	0.162	0.227	0.112
	Total Nitrogen (mg/L)[J]	7	< 0.490	1.272	0.175	0.240	0.117
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.004	0.004	0.002	0.003	0.001
	Total Phosphorus (mg/L)[J]	7	0.008	0.030	0.014	0.015	0.007
	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	2.2	3.2	3.0	2.8	0.4
	Biological						
	Chlorophyll a (mg/m³)	7	3.92	19.20	5.87	7.29	5.42
	E. coli (MPN/DL)	4	2	6	5	5	2
TUST-4	**Physical**						
	Turbidity (NTU)	7	7.6	41.5	10.6	18.0	12.4
	Total Dissolved Solids (mg/L)[J]	6	37.0	71.0	55.5	55.2	12.1
	Total Suspended Solids (mg/L)[J]	6	4.0	26.0	7.0	10.2	8.2
	Hardness (mg/L)	4	20.0	35.9	22.6	25.2	7.4
	Alkalinity (mg/L)	7	10.9	17.5	11.1	12.9	2.6
	Photic Zone (m)	7	1.56	4.12	2.94	2.68	0.92
	Secchi (m)	7	0.36	1.05	0.76	0.74	0.28
	Bottom Depth (m)	7	4.0	5.8	4.8	4.8	0.7
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.016	0.096	0.023	0.031	0.029
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	0.013	0.107	0.046	0.052	0.035
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.324	0.324	0.162	0.162	0.000
	Total Nitrogen (mg/L)[J]	7	< 0.525	0.807	0.208	0.214	0.035
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.004	0.009	0.002	0.004	0.003
	Total Phosphorus (mg/L)	7	0.011	0.038	0.015	0.018	0.009
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	2.9	6.7	4.1	4.2	1.3
	Biological						
	Chlorophyll a (mg/m³)	7	1.07	12.20	6.41	5.71	3.95
	E. coli (MPN/DL)	4	3	2,420	81	646	1,184

Station	Parameter	N	Min	Max	Med	Avg	SD
TUST-5	**Physical**						
	Turbidity (NTU)	7	6.3	32.4	10.9	13.1	8.8
	Total Dissolved Solids (mg/L)[J]	6	24.0	48.0	34.0	34.5	9.7
	Total Suspended Solids (mg/L)[J]	6	4.0	16.0	7.0	8.0	4.2
	Hardness (mg/L)	4	9.9	18.2	16.5	15.3	3.7
	Alkalinity (mg/L)[J]	7	4.9	11.5	9.4	8.6	2.2
	Photic Zone (m)	7	1.46	7.04	3.25	3.86	1.89
	Secchi (m)	7	0.38	1.76	1.17	1.11	0.42
	Bottom Depth (m)	7	6.6	7.6	7.5	7.3	0.3
	Chemical						
	Ammonia Nitrogen (mg/L)	7	< 0.016	0.046	0.023	0.021	0.006
	Nitrate+Nitrite Nitrogen (mg/L)[J]	7	< 0.003	0.056	0.011	0.023	0.024
	Total Kjeldahl Nitrogen (mg/L)[J]	7	< 0.324	0.395	0.162	0.253	0.115
	Total Nitrogen (mg/L)[J]	7	< 0.490	1.194	0.217	0.276	0.113
	Dis Reactive Phosphorus (mg/L)[J]	7	< 0.004	0.004	0.002	0.003	0.001
	Total Phosphorus (mg/L)	7	0.011	0.031	0.018	0.019	0.007
	CBOD-5 (mg/L)	7	< 2.0	2.0	1.0	1.0	0.0
	Chlorides (mg/L)	7	1.4	3.1	2.3	2.3	0.6
	Biological						
	Chlorophyll a (mg/m³)	7	4.27	12.30	7.12	7.72	3.34
	E. coli (MPN/DL)	4	5	613	188	248	295

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