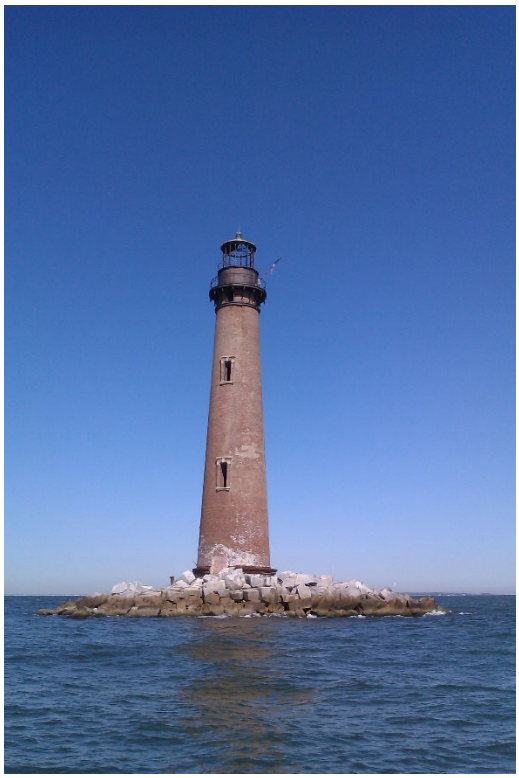
2017 Mobile Bay Sub-Estuary Report



Alabama Department of Environmental Management

Field Operations Division
Mobile Office
Environmental Assessment Section
Water Unit
July 2021

Coastal Waters Monitoring Program

2017

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Water Unit

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LIST OF ACRONYMS

A&I	Agricultural and Industrial Water Supply
ADEM	Alabama Department of Environmental Management
CHL *a*	Chlorophyll *a*
CWA	Clean Water Act
CWMP	Coastal Waters Monitoring Program
DO	Dissolved Oxygen
F&W	Fish and Wildlife
LWF	Limited Warmwater Fishery
MAX	Maximum
MDL	Method Detection Limit
MIN	Minimum
NTU	Nephelometric Turbidity Units
OAW	Outstanding Alabama Water
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
S	Swimming and Other Whole Body Water-Contact Sports
SD	Standard Deviation
SH	Shellfish Harvesting
SOP	Standard Operating Procedures
TEMP	Temperature
TN	Total Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency

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INTRODUCTION

The Mobile Bay watershed is the sixth largest in the U.S. with a drainage area of over 44,000 square miles, which is spread across four states. It has an average discharge of 65,000 cubic feet per second, the fourth largest in the nation. Mobile Bay has an average depth of 10 feet. North to south, the bay is approximately 32 miles long, and east to west, it is 23 miles wide at its widest point. It is bordered to the north by the Mobile River delta area, which is the second largest delta in the contiguous United States, encompassing approximately 260,000 acres. The northern end of the delta is the confluence of the Tombigbee and Alabama rivers. The rivers within the delta include the Mobile, Tensaw, Apalachee, Middle, Blakeley, Raft, and Spanish Rivers. This watershed provides valuable resources to the area, including agriculture, spawning habitats for commercial fish, and recreational activities such as birdwatching, hunting, boating, fishing, and swimming.

The Alabama Department of Environmental Management (ADEM) monitored stations within the Mobile Bay watershed as part of the 2017 assessment under the Coastal Waters Monitoring Program (CWMP). Implemented in 2011, the CWMP is designed to provide data to assess current water quality conditions, to identify long-term trends in water quality conditions and to develop Total Maximum Daily Loads (TMDLs) and nutrient criteria. The program is also being used to update protocols and methodologies to more accurately assess water quality conditions for estuaries and coastal rivers and streams. Although the CWMP is relatively new, most sites within it have been sampled in other programs throughout ADEM's history, with many having been sampled since the 1970s. Descriptions of all CWMP monitoring activities are available in ADEM's 2017 Monitoring Strategy (ADEM 2017).

Surface waters within Alabama are categorized according to their designated use classification and the degree to which the water quality supports its use classification. As required by Section 303(d) of the 1972 Clean Water Act (CWA), surface waters that do not meet their use classification are placed on Alabama's 303(d) List of Impaired Waters. Once a waterbody is listed as impaired, a TMDL is implemented to take measures needed for the waterbody to meet or exceed its water quality standards. Table 1 shows a tabular listing of waterbodies that remain on the 303(d) list as impaired. Figure 1 shows a map of waterbodies within the Mobile Bay watershed that are on the 2016 CWA 303(d) list.

The purpose of this report is to summarize data collected at 21 stations within the Mobile Bay watershed during the 2017 growing season and to evaluate trends in nutrient concentrations using ADEM's historic dataset. Monthly and/or mean concentrations of nutrients [total nitrogen (TN); total phosphorus (TP)], algal biomass/productivity [chlorophyll *a* (chl *a*)], and sediment [total suspended solids (TSS)], were compared to ADEM's historical data.

Table 1. 303(d) listed water bodies in the Mobile Bay Sub-Estuary.

Assessment Unit ID	Waterbody Name	County	Uses	Causes	Sources	Size	Unit Type	Year Listed
AL03160204-0403-112	Mobile River	Baldwin Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	20.90	miles	2000
AL03160204-0106-112	Mobile River	Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2.37	miles	2014
AL03160204-0103-100	Mobile River	Baldwin Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	5.72	miles	2014
AL03160204-0105-111	Cold Creek	Mobile	Fish & Wildlife	Metals (Mercury)	Contaminated sediments	4.21	miles	1996
AL03160204-0305-101	Chickasaw Creek	Mobile	Limited Warmwater Fishery	Metals (Mercury)	Atmospheric deposition	4.43	miles	2000
AL03160204-0305-102	Chickasaw Creek	Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	6.64	miles	2000
AL03160204-0303-100	Chickasaw Creek	Mobile	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	26.82	miles	2000
AL03160204-0503-102	Bay Minette Creek	Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	18.15	miles	2014
AL03160204-0504-300	Toulmins Spring Branch	Mobile	Fish & Wildlife	Nutrients	Urban runoff/storm sewers	3.22	miles	2008
AL03160204-0504-500	UT to Threemile Creek	Mobile	Fish & Wildlife	Nutrients	Urban runoff/storm sewers	1.04	miles	2008

Table 1. (continued)

Assessment Unit ID	Waterbody Name	County	Uses	Causes	Sources	Size	Unit Type	Year Listed
AL03160204-0505-202	Tensaw River	Baldwin	Outstanding Alabama Water Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	21.73	miles	2002
AL03160204-0505-500	D'Olive Creek	Baldwin	Fish & Wildlife	Siltation (habitat alteration)	Land development	4.89	miles	2008
AL03160204-0505-800	Joes Branch	Baldwin	Fish & Wildlife	Siltation (habitat alteration)	Land development	1.57	miles	2008
AL03160204-0505-900	Tiawasee Creek	Baldwin	Fish & Wildlife	Siltation (habitat alteration)	Land development	3.54	miles	2008
AL03160204-0505-905	UT to Tiawasee Creek	Baldwin	Fish & Wildlife	Siltation (habitat alteration)	Land development	1.87	miles	2008
AL03160204-0505-505	UT to D'Olive Creek	Baldwin	Fish & Wildlife	Siltation (habitat alteration)	Land development	1.22	miles	2008
AL03160204-0202-200	Middle River	Baldwin Mobile	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	9.72	miles	2014
AL03160204-0202-300	Mifflin Lake	Baldwin	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	0.73	square miles	2014

Table 1. (continued)

Assessment Unit ID	Waterbody Name	County	Uses	Causes	Sources	Size	Unit Type	Year Listed
AL03160205-0203-110	Magnolia River	Baldwin	Outstanding Alabama Water Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	12.41	miles	2014
AL03160205-0300-102	Mobile Bay	Mobile	Shellfish Harvesting Fish & Wildlife	Pathogens (Enterococcus)	Urban runoff/storm sewers	168.29	square miles	1998
AL03160205-0300-202	Bon Secour Bay	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens (Enterococcus)	On-site wastewater systems Urban runoff/storm sewers	102.96	square miles	1998
AL03160205-0102-110	Halls Mill Creek	Mobile	Fish & Wildlife	Siltation (habitat alteration)	Land development	11.30	miles	2012
AL03160205-0105-100	Deer River	Mobile	Fish & Wildlife	Organic enrichment (CBOD, NBOD)	Collection system failure Urban runoff/storm sewers	1.02	miles	2006
AL03160205-0105-300	Middle Fork Deer River	Mobile	Fish & Wildlife	Organic enrichment (CBOD, NBOD)	Collection system failure Urban runoff/storm sewers	2.47	miles	2006

Table 1. (continued)

Assessment Unit ID	Waterbody Name	County	Uses	Causes	Sources	Size	Unit Type	Year Listed
AL03160205-0104-110	Fowl River	Mobile	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	20.56	miles	2000
AL03160205-0202-210	Polecat Creek	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	7.89	miles	2006
AL03160205-0202-510	Baker Branch	Baldwin	Fish & Wildlife	Organic enrichment (CBOD, NBOD)	Pasture grazing	6.15	miles	2006
AL03160205-0204-112	Fish River	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	30.01	miles	1998
AL03160205-0204-700	Cowpen Creek	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	7.12	miles	2008
AL03160205-0206-101	Bon Secour River	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	9.12	miles	2006
AL03160205-0206-102	Bon Secour River	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	4.38	miles	2006
AL03160205-0208-100	Oyster Bay	Baldwin	Shellfish Harvesting Fish & Wildlife	Pathogens (Enterococcus)	Unknown source	0.95	square miles	2006
AL-Gulf-of-Mexico	Gulf of Mexico	Baldwin Mobile	Shellfish Harvesting Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	201.02	square miles	1998

METHODS

Sampling stations were selected using historical data and previous assessments (Fig. 1). Specific location information can be found in Table 2. Mobile Bay, Mobile River, Tensaw River, Bay Minette Basin, Chickasaw Creek, Threemile Creek, Dog River, Theodore Canal, Weeks Bay, and Magnolia River were sampled within the Mobile Bay watershed.

Water quality assessments were conducted monthly, bi-monthly, or quarterly January-December. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operation Procedures (ADEM 2017), Surface Water Quality Assurance Project Plan (2017), and Quality Management Plan (ADEM 2012).

Mean growing season, March-October, TN, TP, chl *a*, and TSS were calculated to evaluate water quality conditions at each site. Monthly concentrations of these parameters were graphed with ADEM's previously collected data for all stations within the focus watershed. Monthly growing season readings of dissolved oxygen (DO), salinity, and temperature were graphed at 1.5m (5ft), or mid-depth if less than 10ft deep, for comparison with ADEM's water quality criteria level of 5.0 mg/L DO. Growing season profiles of DO, salinity, and temperature were also graphed to show stratification of each parameter. Chemical analysis also includes select total and dissolved metals. While summary statistics of metals analysis are presented in Appendix Table 1, all metals analyses are available through the National Water Quality Monitoring Council Water Quality Data Portal at https://www.waterqualitydata.us/. As Alabama's state environmental regulatory agency, the ADEM submits all possible surface water quality monitoring data to the EPA.

Figure 1. 2017 Mobile Bay stations & impaired waterbodies.

Table 2. Descriptions for the monitoring stations in 2017 for the Mobile Bay Sub-Watershed.

HUC8	County	Station Number	Use Classification	Waterbody Name	Station Description	Latitude	Longitude
3160204	Baldwin	BMBB-1	F&W	Bay Minette	Middle of Bay Minette Basin (widened portion of Bay Minette Creek just upstream of Blakely River).	30.6978	-87.9206
3160205	Mobile	CHANNEL-1A	F&W	Mobile Ship Chn	Mobile ship channel just south of Arlington ship channel at channel marker 76	30.62973	-88.03263
3160205	Mobile	CHANNEL-2	S/F&W	Mobile Ship Chn	Mobile ship channel south of Galliard Island at channel marker 51	30.46437	-88.01577
3160205	Mobile	CHANNEL-3	SH/F&W	Mobile Ship Chn	Intersection of the Intracoastal Waterway and the Mobile Ship Channel	30.273	-88.036
3160204	Mobile	CS-1	LWF	Chickasaw Ck	Chickasaw Ck @ US Hwy 43 crossing	30.78224	-88.072481
3160204	Mobile	CS-2	LWF	Chickasaw Ck	Chickasaw Ck @ CSX Railroad crossing bridge at confluence with Mobile River	30.73925	-88.04571
3160205	Mobile	DGRM-1A	S/F&W	Dog R	Dog R @ 0.19 miles from Riverforest Drive	30.5868	-88.1098

Table 2. (continued)

HUC8	County	Station Number	Use Classification	Waterbody Name	Station Description	Latitude	Longitude
3160205	Mobile	DR-1	S/F&W	Dog R	Dog River @ Luscher (Creek) Park Boat Launch near I-10	30.62845	-88.10166
	Mobile	MB-2A	SH/S/F&W	Gulf Of Mexico	Mobile ship channel just south of Sand Island Light in the Gulf of Mexico at buoy 10	30.1718	-88.04895
3160205	Mobile	MB-3A	SH/S/F&W	Bon Secour Bay	Intracoastal Waterway in Bon Secour Bay at channel marker 127	30.28407	-87.85137
3160205	Mobile	MB-9	SH/F&W	Mobile Ship Chn	Southwest Mobile Bay South of Denton Reef	30.273	-88.036
3160205	Baldwin	MGRB-9	S/F&W	Magnolia R	Magnolia River downstream of Noltie Creek.	30.3902	-87.8082
3160204	Baldwin	MO-1A	F&W	Mobile R	Mobile River at L&N Railroad crossing.	30.8364	-87.94406
3160204	Mobile	MO-2	LWF	Mobile R	Mobile River @ Government Street (Bankhead Tunnel) in Mobile at Alabama State Docks	30.69137	-88.03646

Table 2. (continued)

HUC8	County	Station Number	Use Classification	Waterbody Name	Station Description	Latitude	Longitude
3160205	Mobile	MOBB-1	S/F&W	Mobile Bay	Northeast Mobile Bay.	30.6276	-87.9548
3160205	Mobile	TC-1	F&W	M Fk Deer R	Theodore Industrial Canal at AL Hwy 193 at Rangeline Rd.	30.533333	-88.123889
3160204	Baldwin	TE-1	OAW/S/F&W	Tensaw R	Tensaw River at the L&N Railroad crossing, Baldwin County.	30.84277725	-87.910833
3160204	Baldwin	TENB-2	OAW/S/F&W	Tensaw R	Tensaw River approx. 0.3 miles ds of power line (near Blakely Park and Steam Mill Landing)	30.75291	-87.91987
3160204	Mobile	TM-1	A&I	Three Mile Ck	Three Mile Creek upstream of US Hwy 43 & railroad crossing	30.723983	-88.059119
3160205	Baldwin	WB-1	S/F&W	Fish R	Weeks Bay @ US Hwy 98 (Marina)	30.41469	-87.82583
3160205	Baldwin	WKBB-1	S/F&W	Weeks Bay	Central Weeks Bay about 1.4 miles north of the mouth.	30.3975	-87.833611

RESULTS

Growing season mean graphs of TN, TP, chl *a*, and TSS are provided in this section (Figs. 2-5). Monthly graphs for TN, TP, chl *a*, TSS, DO, temperature, and salinity are also provided (Figs. 6-10). Depth profile graphs of DO, temperature, and salinity appear in Figure 11. Summary statistics of all data collected during 2017 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 the 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, mean TN values in and near Weeks Bay (WB-1, MGRB-9, WKBB-1) were higher than any other station in the Mobile Bay watershed (Fig. 2). Mean TN values for Threemile Creek (TM-1) were much lower than in previous years. Monthly TN concentrations in Threemile Creek were notably lower than historical means reaching historic lows most months (Fig. 6). Other monthly TN concentrations were similar to historical means.

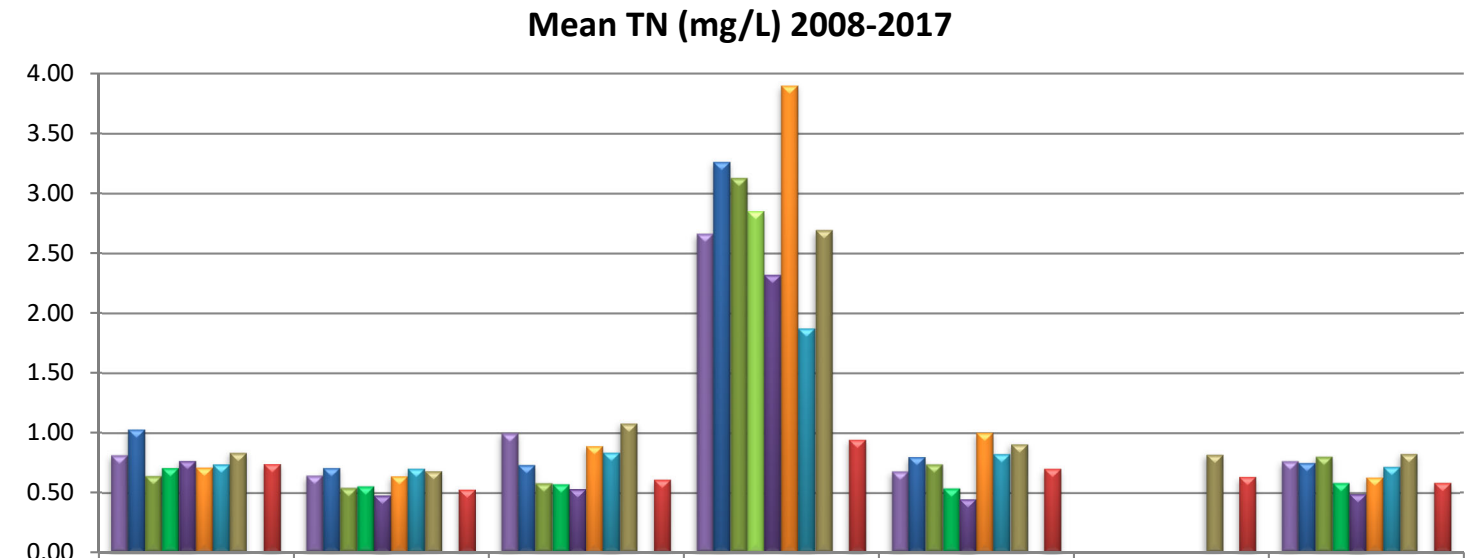
In 2017, the highest growing season mean TP value was in Theodore Canal at TC-1 (Fig. 3). While the mean TP value in Threemile Creek (TM-1) was significantly lower than the prior years sampled, concentrations in most other monitoring locations have changed little. While most monthly TP concentrations in 2017 varied little from historic means, concentrations in Threemile Creek at TM-1 were notably lower than historical means reaching historic lows most months (Fig. 7).

In 2017 the highest mean growing season chl *a* values were in and near Weeks Bay at MGRB-9, WB-1 and WKBB-1 (Fig. 4). Mean growing season chl *a* concentrations in all locations have been declining since monitoring began. Monthly chl *a* concentrations for most stations have decreased or remained at the historic means (Fig. 8). Chl *a* criteria have not been established in the coastal area.

In 2017, the highest mean growing season TSS value was in the Mobile River at MO-1A (Fig. 5). Mean values have changed little since monitoring began. Monthly concentrations were the highest in 2017 during April at Mobile River (MO-1A) and the lowest overall concentrations were at Chickasaw Creek (CS-1), for all months sampled (Fig. 9). Most 2017 monthly TSS concentrations were close to historic means.

Dissolved oxygen concentrations in the Dog River location at DR-1 were below the ADEM criteria limit of 5.0 mg/L April through July and October 2017 (ADEM Admin. Code R. 335-6-10-09) (Fig. 10). DO concentrations in Bay Minette Basin (BMBB-1), Bon Secour Bay (MB-3A), Mobile Bay (Channel-1A and MOBB-1), Chickasaw Creek (CS-1), Magnolia River (MGRB-9), Mobile River (MO-1A and MO-2), Tensaw River (TE-1 and TENB-2), and Threemile Creek (TM-1) were near or below the criteria limit at least one month during the growing season. All measurements of DO concentrations at other sites were above the ADEM criteria. Monthly depth profiles of dissolved oxygen, temperature, and salinity for Mobile Bay Sub-Watershed stations are provided in Figure 11.

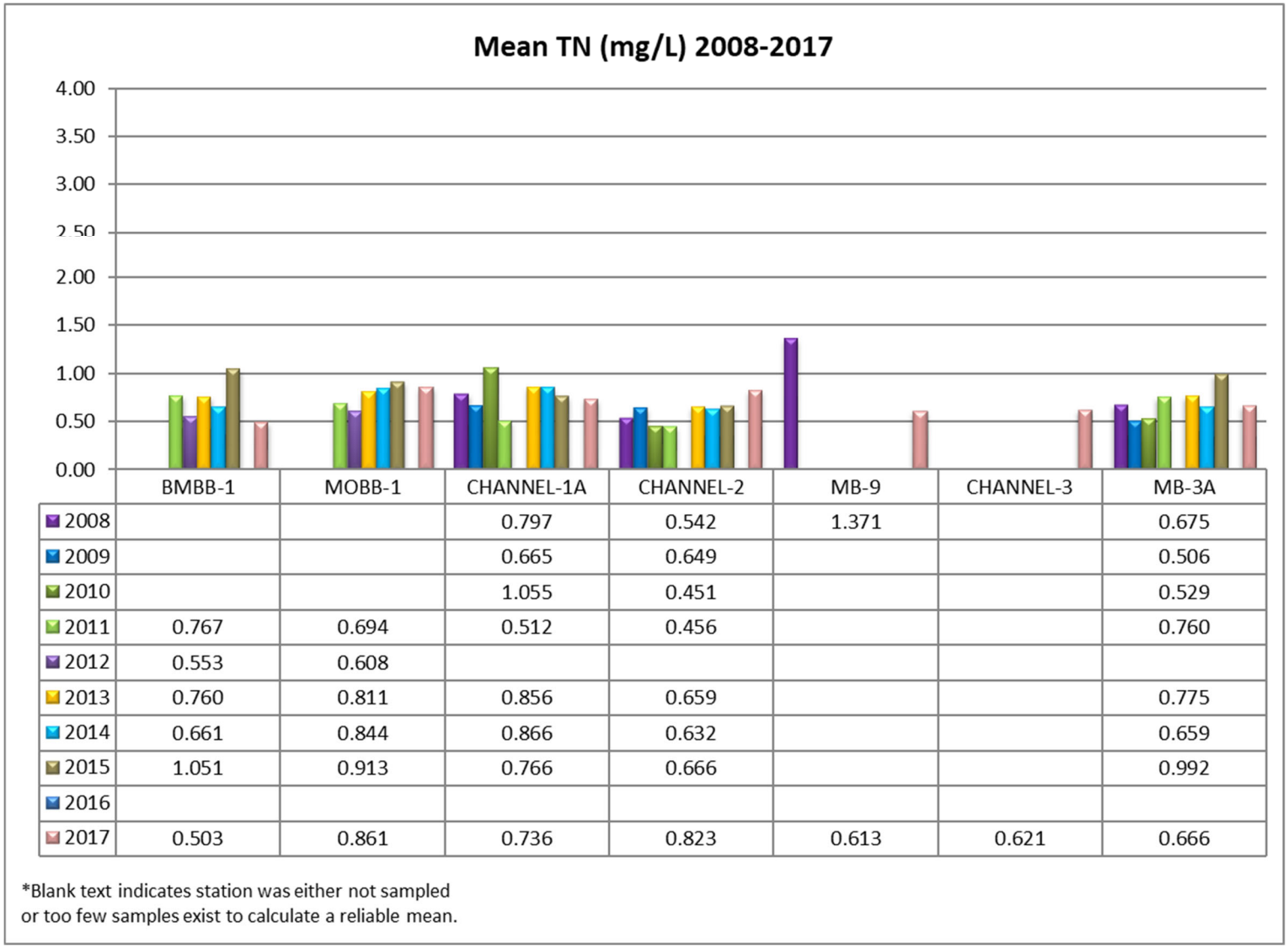
Figure 2. Mean growing season TN measured in Mobile Bay Sub-Watershed stations, 2008-2017.



	MO-1A	CS-1	CS-2	TM-1	MO-2	TE-1	TENB-2
2008	0.814	0.645	0.999	2.664	0.680		0.765
2009	1.029	0.707	0.731	3.262	0.799		0.748
2010	0.640	0.540	0.578	3.130	0.738		0.803
2011	0.708	0.554	0.571	2.852	0.536		0.582
2012	0.765	0.477	0.531	2.319	0.447		0.490
2013	0.709	0.639	0.890	3.900	1.002		0.628
2014	0.736	0.702	0.835	1.872	0.823		0.716
2015	0.838	0.685	1.083	2.694	0.911	0.822	0.830
2016							
2017	0.740	0.528	0.609	0.943	0.700	0.633	0.582

*Blank cell indicates station was not sampled in that particular year.

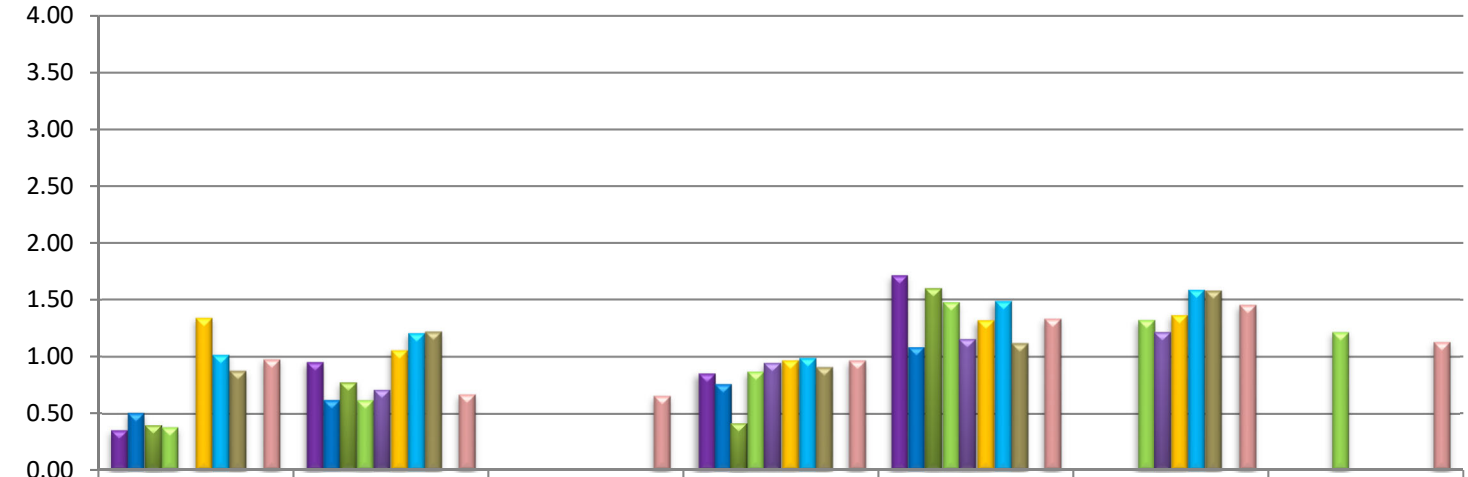
Figure 2. (continued)



	BMBB-1	MOBB-1	CHANNEL-1A	CHANNEL-2	MB-9	CHANNEL-3	MB-3A
2008			0.797	0.542	1.371		0.675
2009			0.665	0.649			0.506
2010			1.055	0.451			0.529
2011	0.767	0.694	0.512	0.456			0.760
2012	0.553	0.608					
2013	0.760	0.811	0.856	0.659			0.775
2014	0.661	0.844	0.866	0.632			0.659
2015	1.051	0.913	0.766	0.666			0.992
2016							
2017	0.503	0.861	0.736	0.823	0.613	0.621	0.666

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

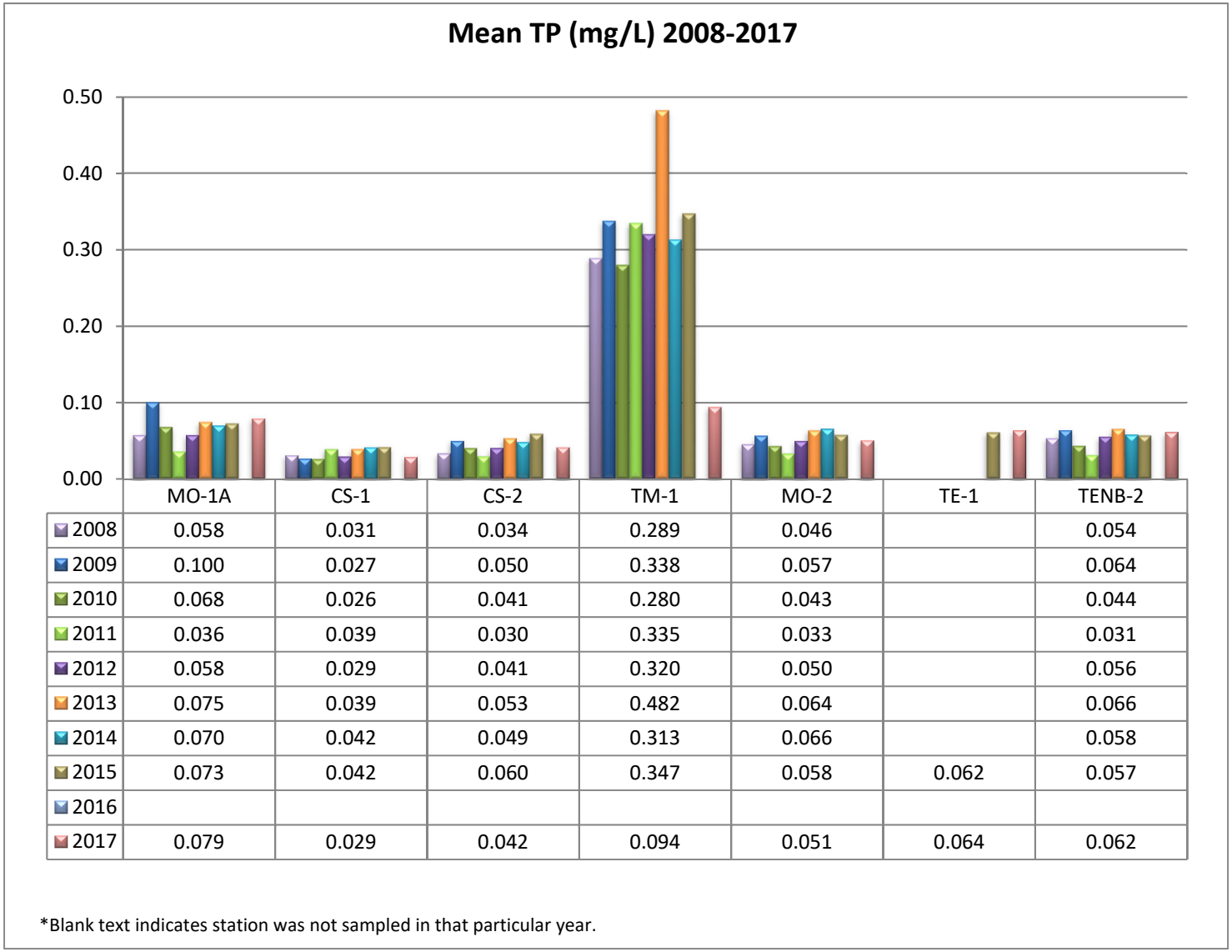
Figure 2. (continued)



	MB-2A	DR-1	DGRM-1A	TC-1	WB-1	MGRB-9	WKBB-1
2008	0.356	0.952		0.851	1.709		
2009	0.506	0.620		0.757	1.081		
2010	0.400	0.772		0.418	1.595		
2011	0.380	0.616		0.865	1.473	1.319	1.211
2012		0.709		0.943	1.151	1.212	
2013	1.336	1.053		0.964	1.316	1.361	
2014	1.015	1.204		0.989	1.484	1.583	
2015	0.875	1.216		0.907	1.115	1.576	
2016							
2017	0.973	0.668	0.654	0.964	1.329	1.450	1.125

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

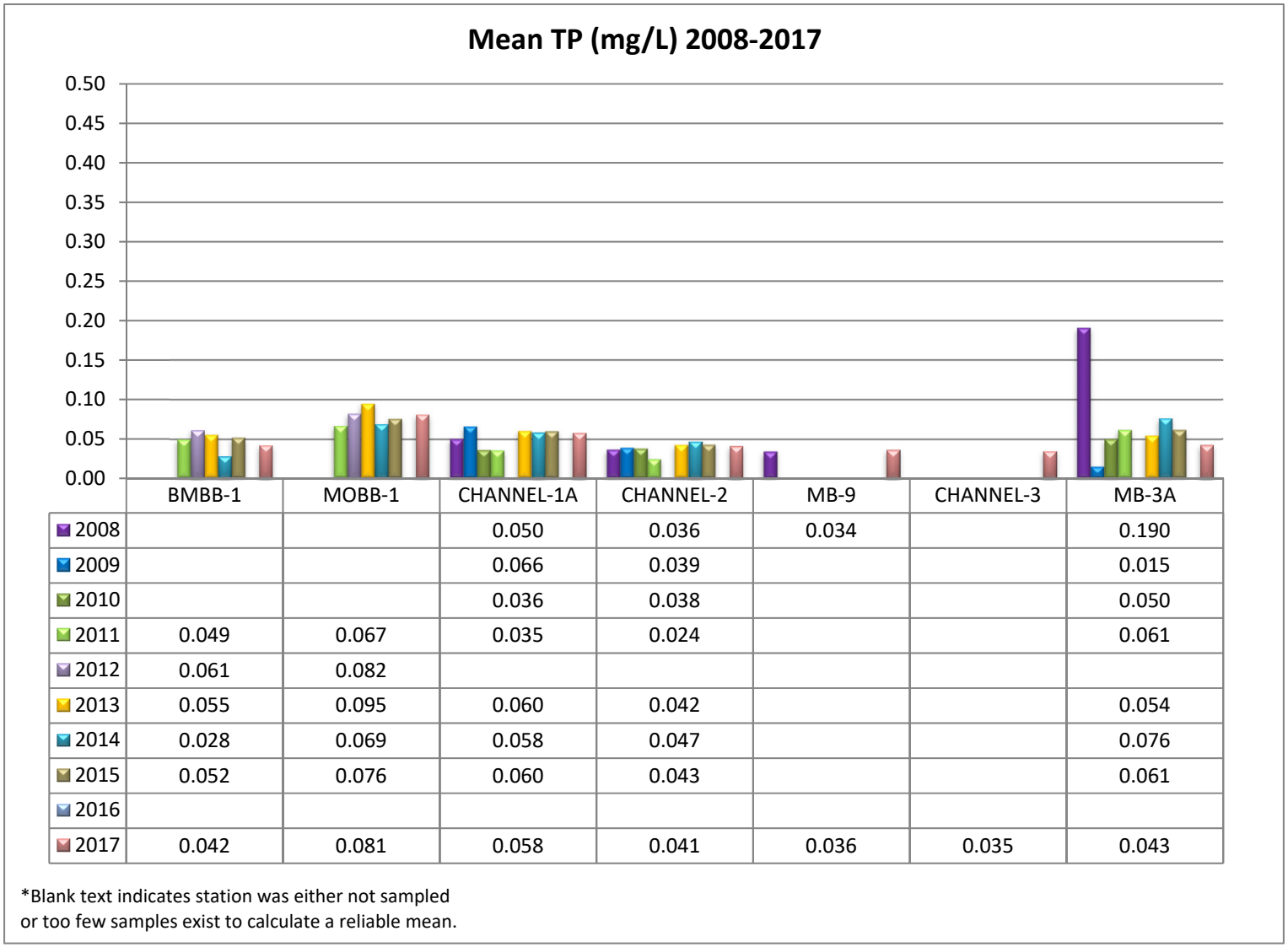
Figure 3. Mean growing season TP measured in Mobile Bay Sub-Watershed stations, 2008-2017.



	MO-1A	CS-1	CS-2	TM-1	MO-2	TE-1	TENB-2
2008	0.058	0.031	0.034	0.289	0.046		0.054
2009	0.100	0.027	0.050	0.338	0.057		0.064
2010	0.068	0.026	0.041	0.280	0.043		0.044
2011	0.036	0.039	0.030	0.335	0.033		0.031
2012	0.058	0.029	0.041	0.320	0.050		0.056
2013	0.075	0.039	0.053	0.482	0.064		0.066
2014	0.070	0.042	0.049	0.313	0.066		0.058
2015	0.073	0.042	0.060	0.347	0.058	0.062	0.057
2016							
2017	0.079	0.029	0.042	0.094	0.051	0.064	0.062

*Blank text indicates station was not sampled in that particular year.

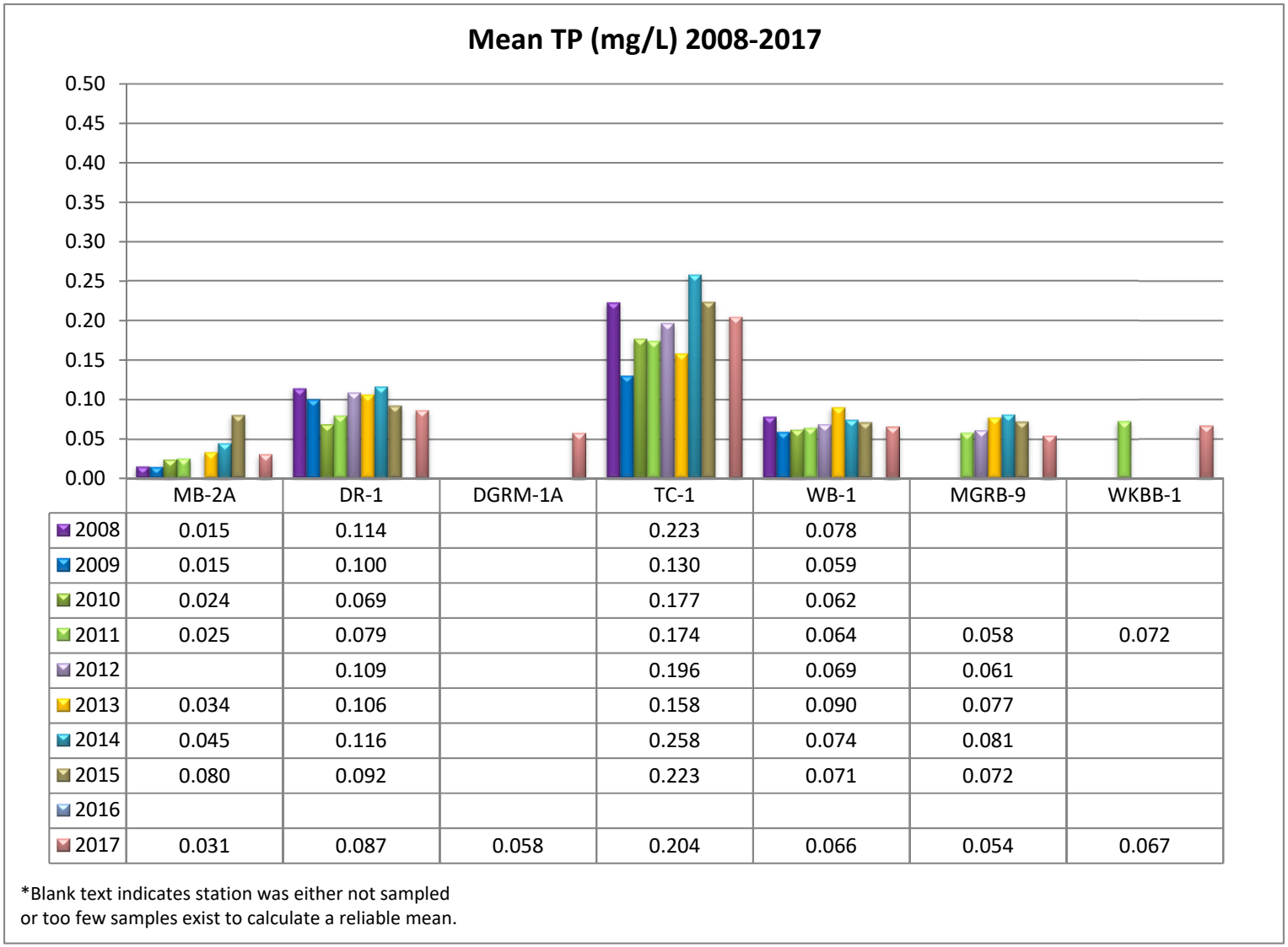
Figure 3. (continued)



	BMBB-1	MOBB-1	CHANNEL-1A	CHANNEL-2	MB-9	CHANNEL-3	MB-3A
2008			0.050	0.036	0.034		0.190
2009			0.066	0.039			0.015
2010			0.036	0.038			0.050
2011	0.049	0.067	0.035	0.024			0.061
2012	0.061	0.082					
2013	0.055	0.095	0.060	0.042			0.054
2014	0.028	0.069	0.058	0.047			0.076
2015	0.052	0.076	0.060	0.043			0.061
2016							
2017	0.042	0.081	0.058	0.041	0.036	0.035	0.043

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

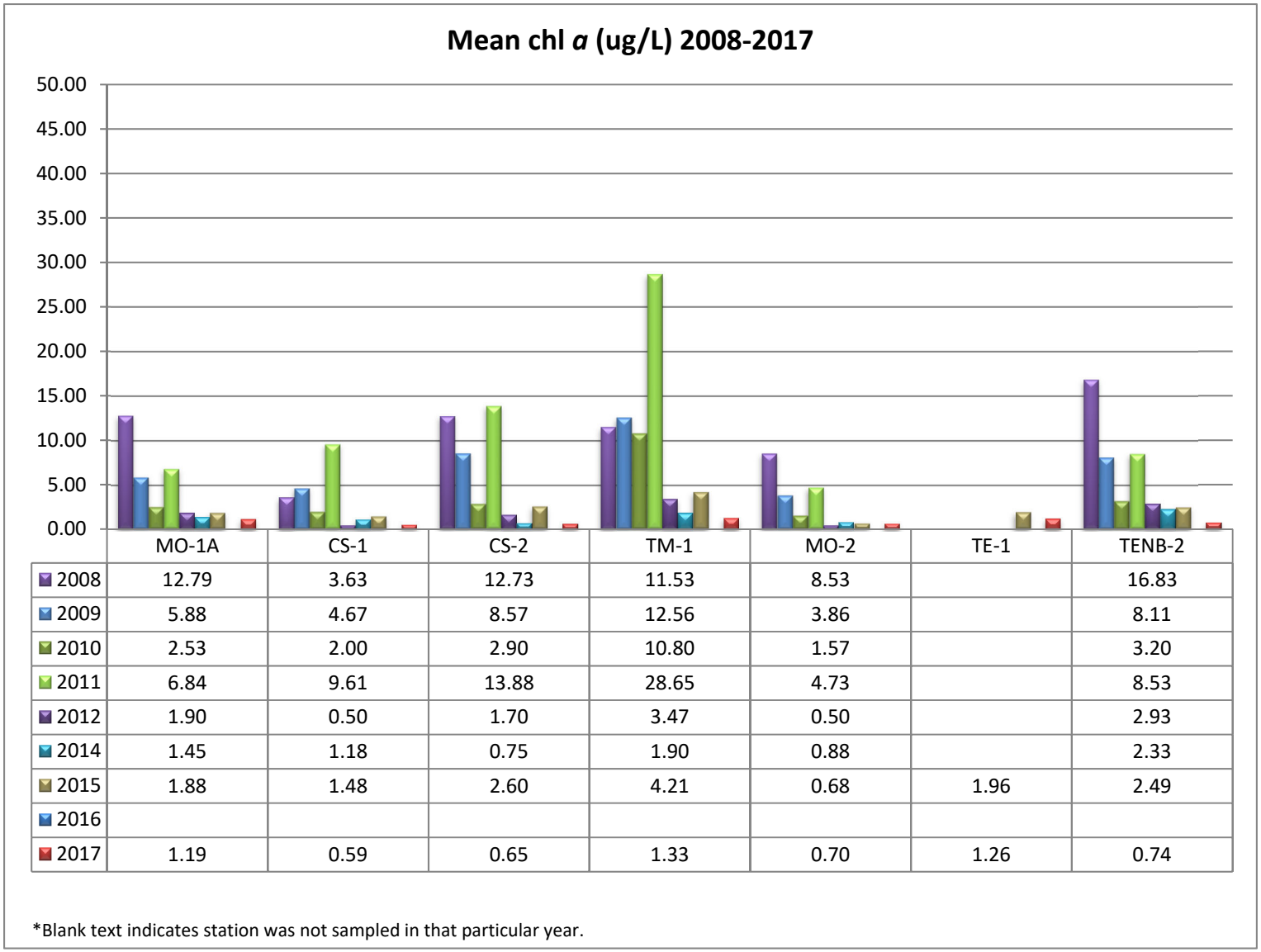
Figure 3. (continued)



	MB-2A	DR-1	DGRM-1A	TC-1	WB-1	MGRB-9	WKBB-1
2008	0.015	0.114		0.223	0.078		
2009	0.015	0.100		0.130	0.059		
2010	0.024	0.069		0.177	0.062		
2011	0.025	0.079		0.174	0.064	0.058	0.072
2012		0.109		0.196	0.069	0.061	
2013	0.034	0.106		0.158	0.090	0.077	
2014	0.045	0.116		0.258	0.074	0.081	
2015	0.080	0.092		0.223	0.071	0.072	
2016							
2017	0.031	0.087	0.058	0.204	0.066	0.054	0.067

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

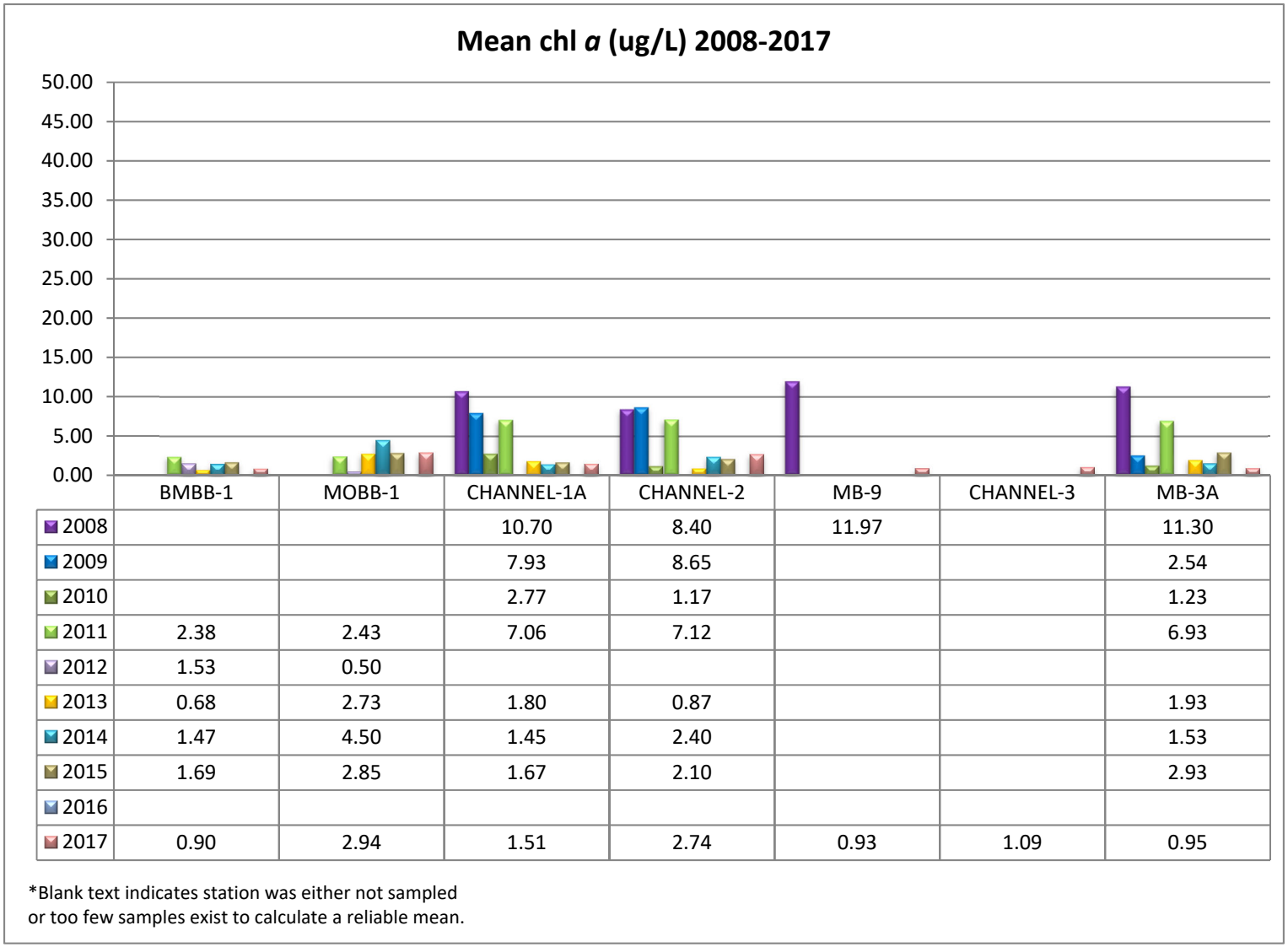
Figure 4. Mean growing season chl *a* measured in Mobile Bay Sub-Watershed stations, 2008-2017.



	MO-1A	CS-1	CS-2	TM-1	MO-2	TE-1	TENB-2
2008	12.79	3.63	12.73	11.53	8.53		16.83
2009	5.88	4.67	8.57	12.56	3.86		8.11
2010	2.53	2.00	2.90	10.80	1.57		3.20
2011	6.84	9.61	13.88	28.65	4.73		8.53
2012	1.90	0.50	1.70	3.47	0.50		2.93
2014	1.45	1.18	0.75	1.90	0.88		2.33
2015	1.88	1.48	2.60	4.21	0.68	1.96	2.49
2016							
2017	1.19	0.59	0.65	1.33	0.70	1.26	0.74

*Blank text indicates station was not sampled in that particular year.

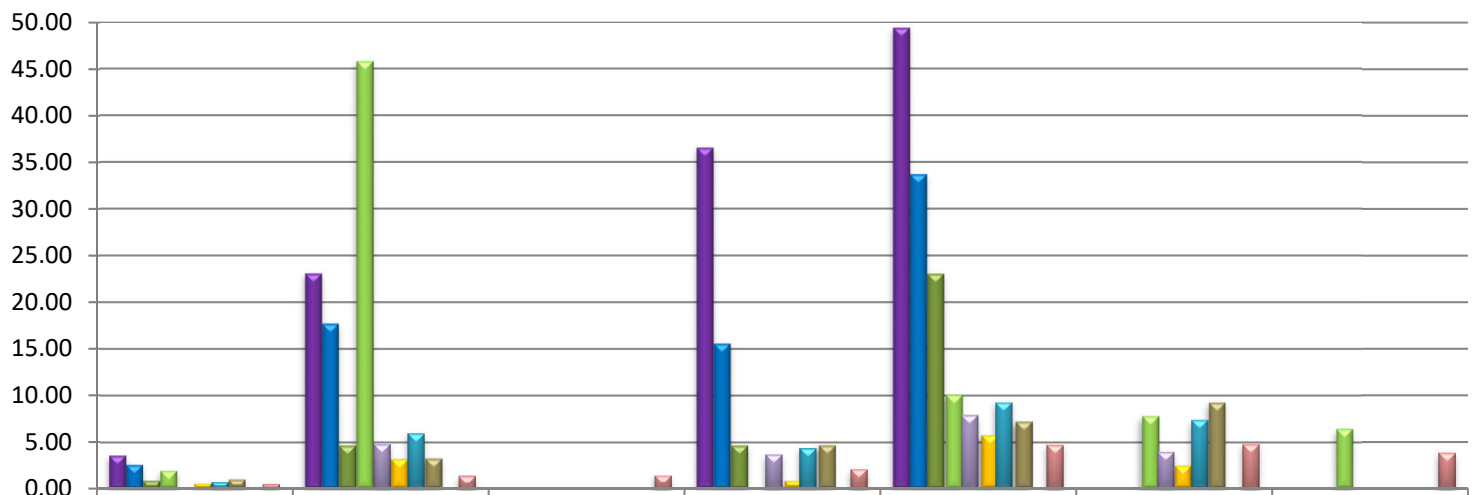
Figure 4. (continued)



	BMBB-1	MOBB-1	CHANNEL-1A	CHANNEL-2	MB-9	CHANNEL-3	MB-3A
2008			10.70	8.40	11.97		11.30
2009			7.93	8.65			2.54
2010			2.77	1.17			1.23
2011	2.38	2.43	7.06	7.12			6.93
2012	1.53	0.50					
2013	0.68	2.73	1.80	0.87			1.93
2014	1.47	4.50	1.45	2.40			1.53
2015	1.69	2.85	1.67	2.10			2.93
2016							
2017	0.90	2.94	1.51	2.74	0.93	1.09	0.95

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

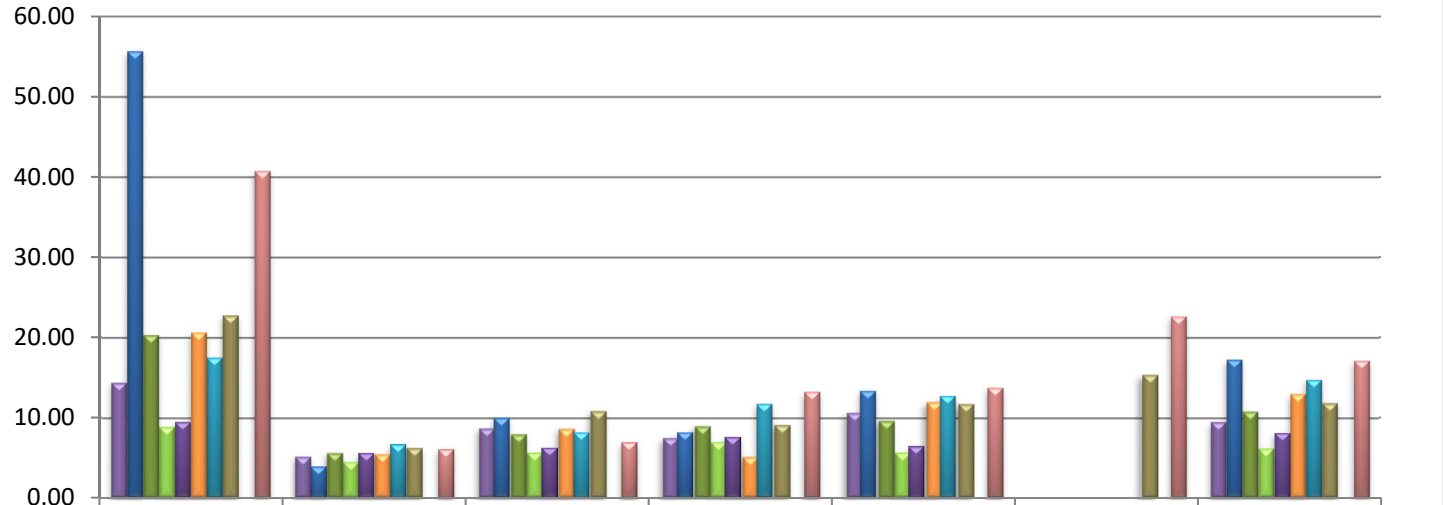
Figure 4. (continued)



	MB-2A	DR-1	DGRM-1A	TC-1	WB-1	MGRB-9	WKBB-1
2008	3.51	23.00		36.48	49.33		
2009	2.54	17.67		15.53	33.67		
2010	0.83	4.63		4.63	23.02		
2011	1.90	45.75			10.00	7.73	6.36
2012		4.80		3.70	7.89	3.98	
2013	0.50	3.13		0.80	5.71	2.45	
2014	0.75	5.95		4.38	9.24	7.38	
2015	0.97	3.20		4.63	7.17	9.23	
2016							
2017	0.50	1.40	1.45	2.13	4.71	4.80	3.83

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

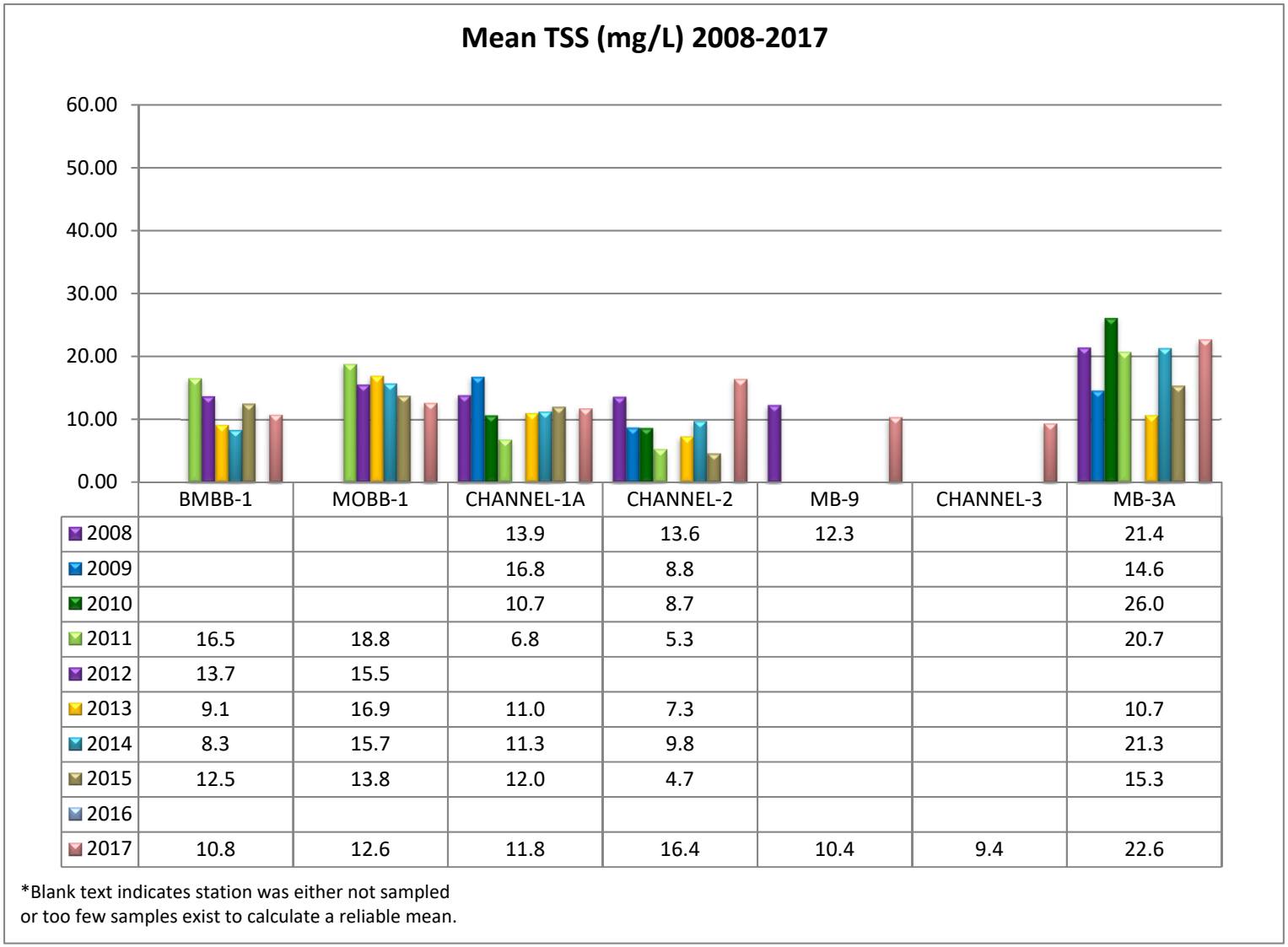
Figure 5. Mean growing season TSS measured in Mobile Bay Sub-Watershed stations, 2008-2017.



	MO-1A	CS-1	CS-2	TM-1	MO-2	TE-1	TENB-2
2008	14.4	5.2	8.7	7.5	10.6		9.5
2009	55.6	4.0	10.0	8.3	13.4		17.3
2010	20.3	5.7	8.0	9.0	9.7		10.8
2011	8.9	4.5	5.7	7.0	5.7		6.2
2012	9.5	5.7	6.3	7.7	6.5		8.2
2013	20.7	5.5	8.7	5.2	12.0		13.0
2014	17.5	6.8	8.3	11.8	12.8		14.8
2015	22.8	6.3	10.9	9.1	11.8	15.4	11.9
2016							
2017	40.8	6.1	7.0	13.3	13.8	22.6	17.1

*Blank text indicates station was not sampled in that particular year.

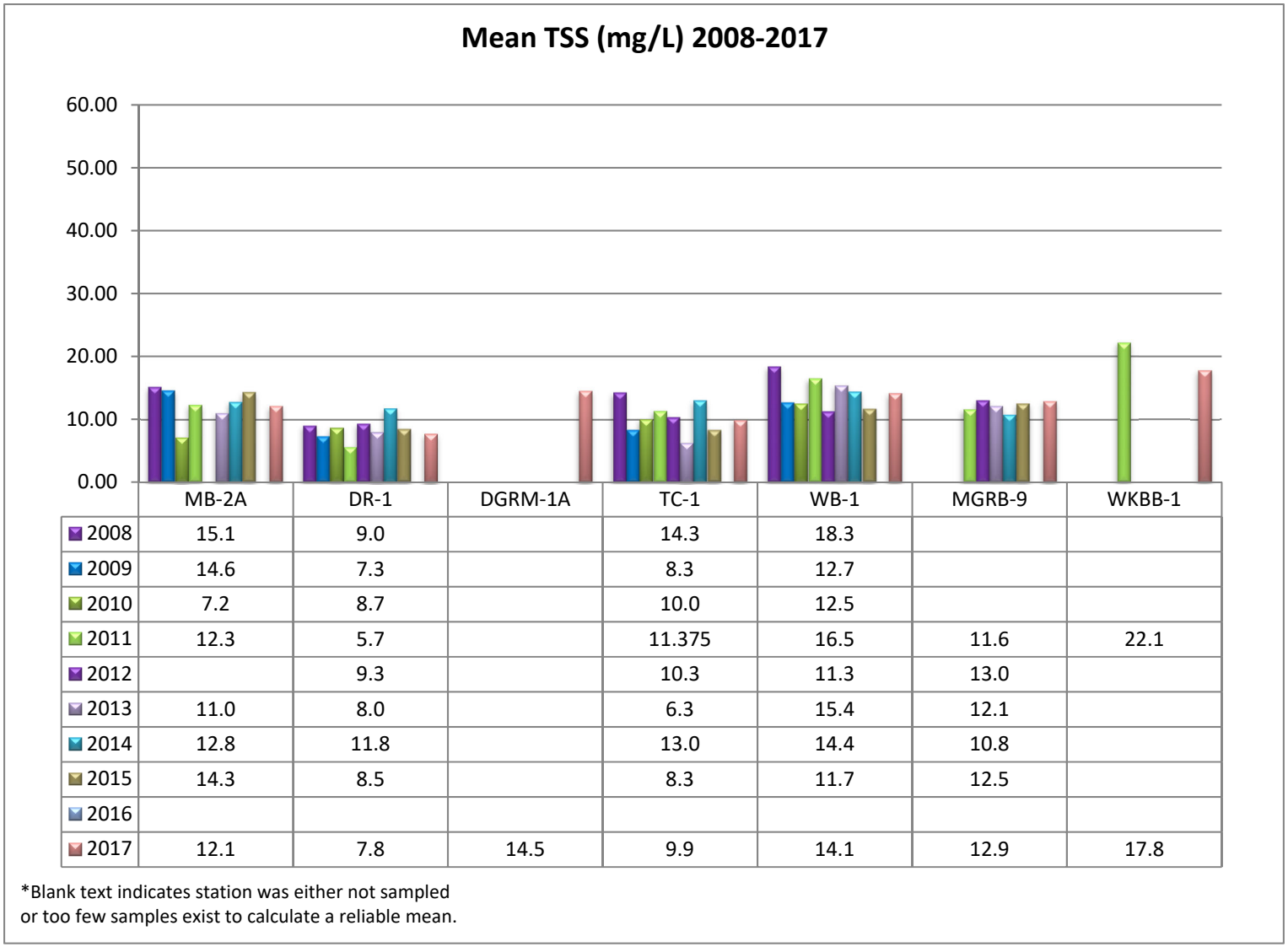
Figure 5. (continued)



	BMBB-1	MOBB-1	CHANNEL-1A	CHANNEL-2	MB-9	CHANNEL-3	MB-3A
2008			13.9	13.6	12.3		21.4
2009			16.8	8.8			14.6
2010			10.7	8.7			26.0
2011	16.5	18.8	6.8	5.3			20.7
2012	13.7	15.5					
2013	9.1	16.9	11.0	7.3			10.7
2014	8.3	15.7	11.3	9.8			21.3
2015	12.5	13.8	12.0	4.7			15.3
2016							
2017	10.8	12.6	11.8	16.4	10.4	9.4	22.6

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

Figure 5. (continued)



	MB-2A	DR-1	DGRM-1A	TC-1	WB-1	MGRB-9	WKBB-1
2008	15.1	9.0		14.3	18.3		
2009	14.6	7.3		8.3	12.7		
2010	7.2	8.7		10.0	12.5		
2011	12.3	5.7		11.375	16.5	11.6	22.1
2012		9.3		10.3	11.3	13.0	
2013	11.0	8.0		6.3	15.4	12.1	
2014	12.8	11.8		13.0	14.4	10.8	
2015	14.3	8.5		8.3	11.7	12.5	
2016							
2017	12.1	7.8	14.5	9.9	14.1	12.9	17.8

*Blank text indicates station was either not sampled
or too few samples exist to calculate a reliable mean.

Figure 6. Monthly TN concentrations measured in the Mobile Bay Sub-Watershed, March-October 2017. Each bar graph depicts changes in each station. The historic mean (1990-2017) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Flow is included for comparison, if conducted.

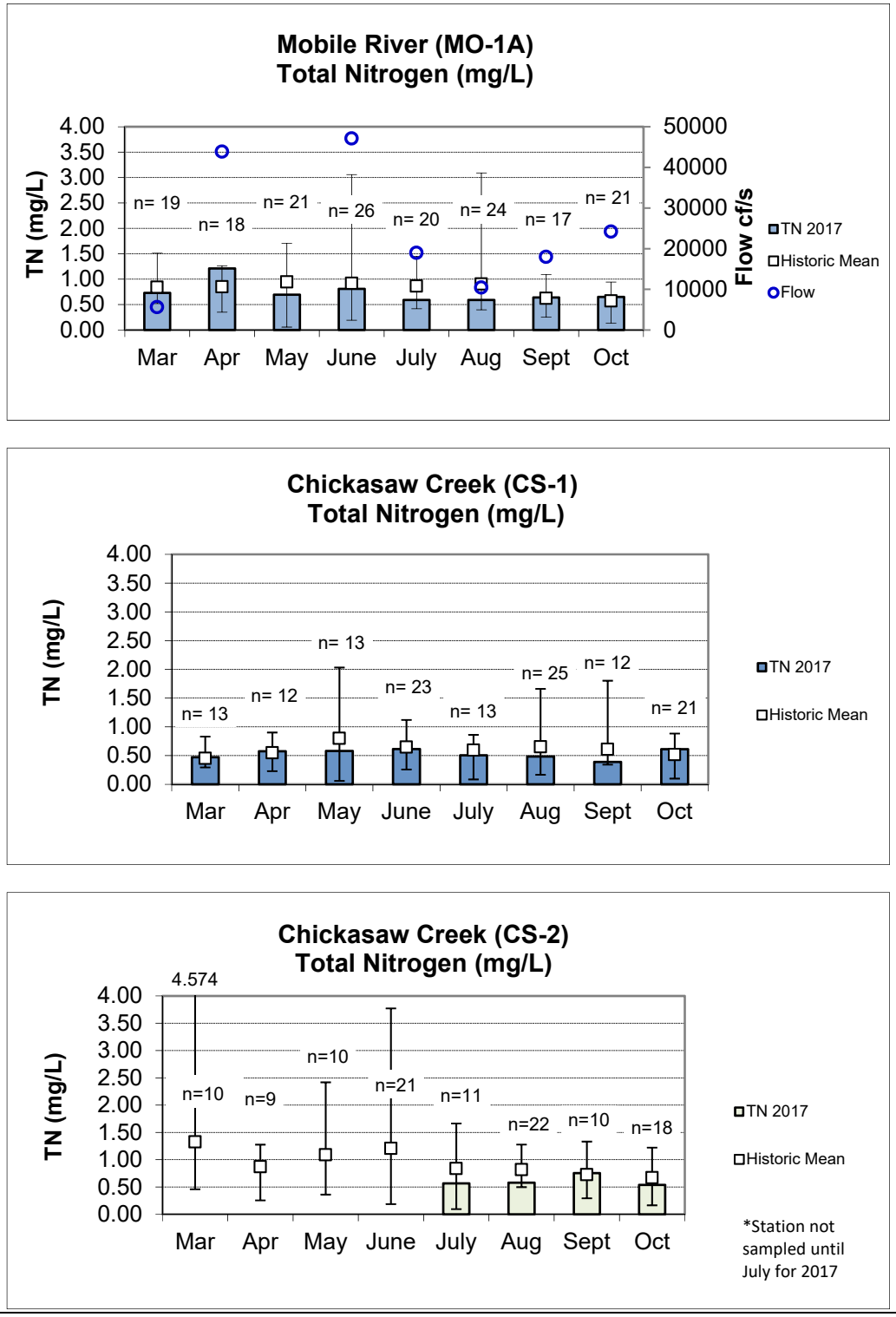
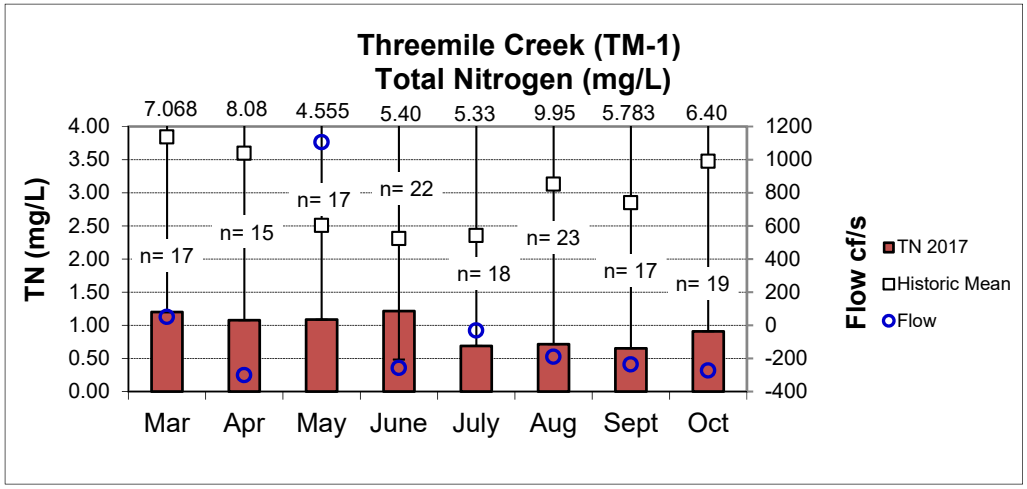
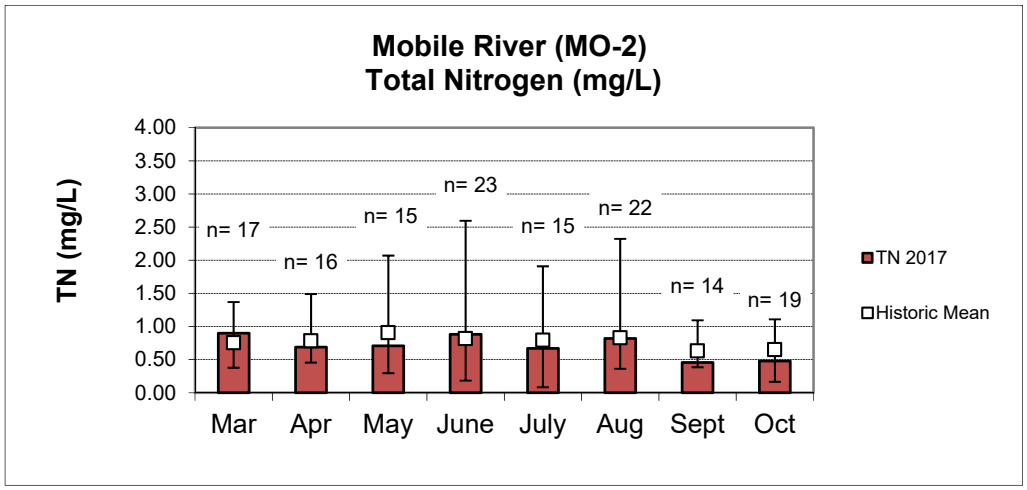


Figure 6. (continued)





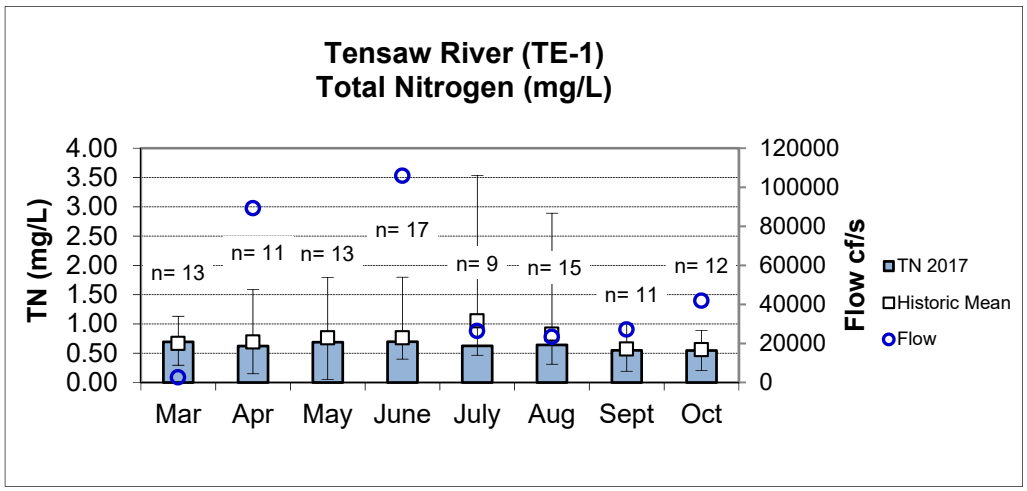
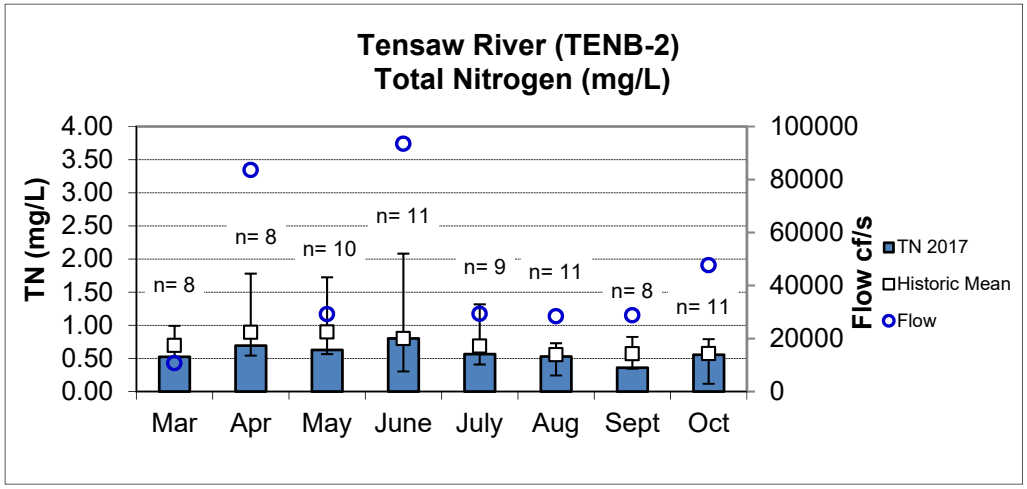
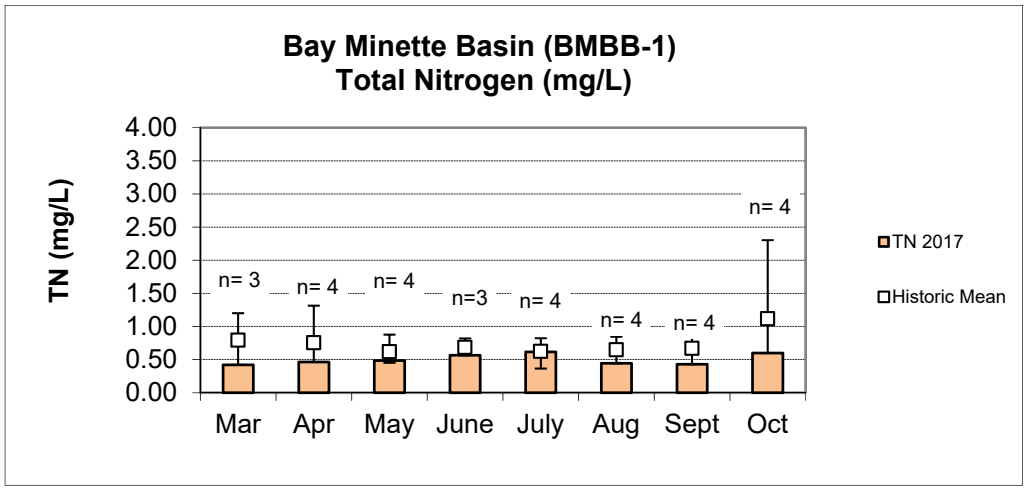
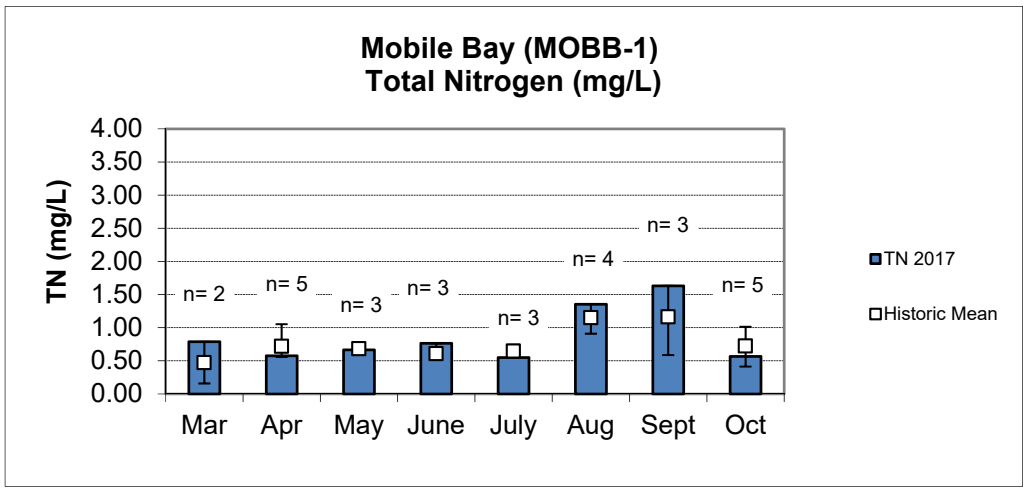


Figure 6. (continued)







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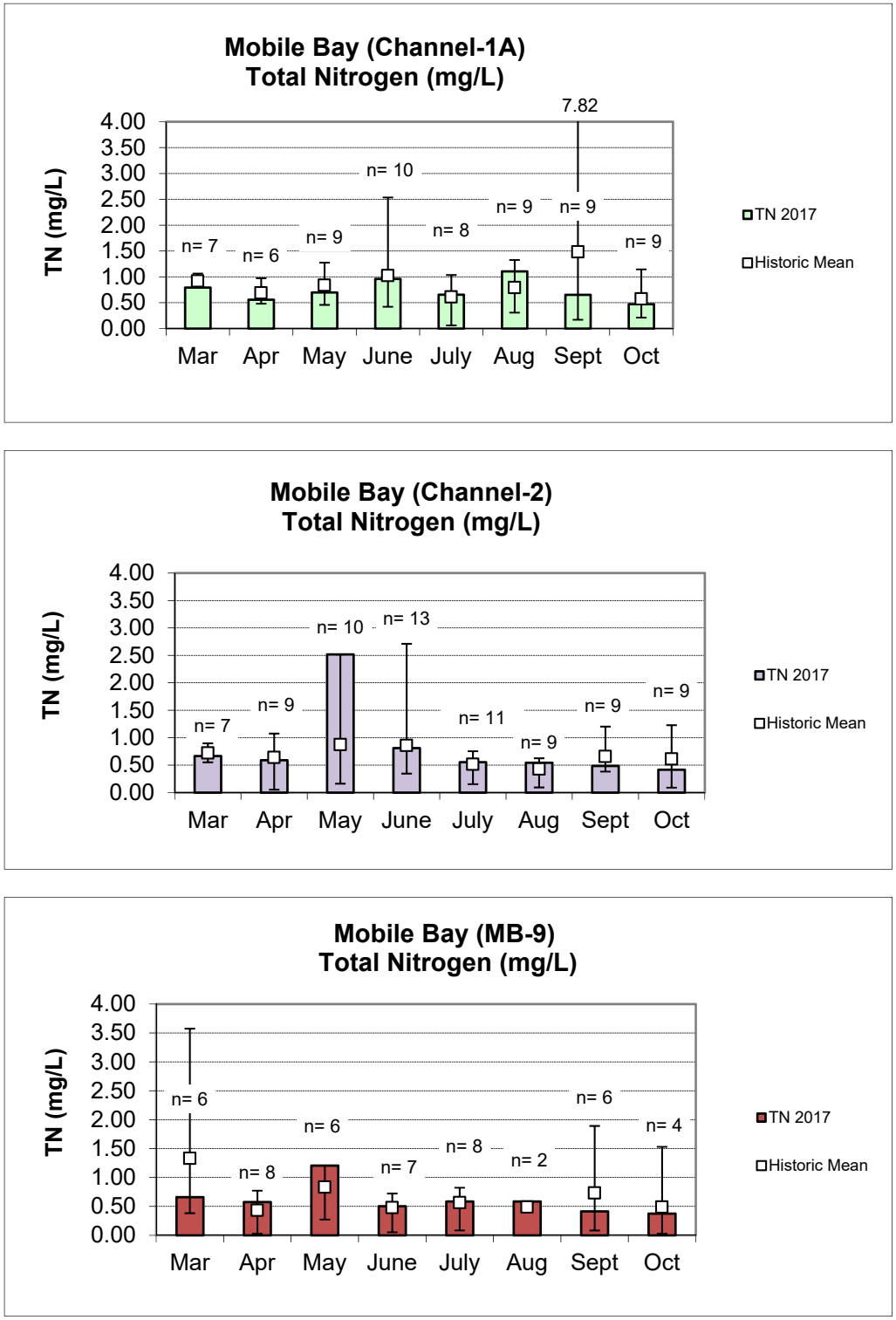

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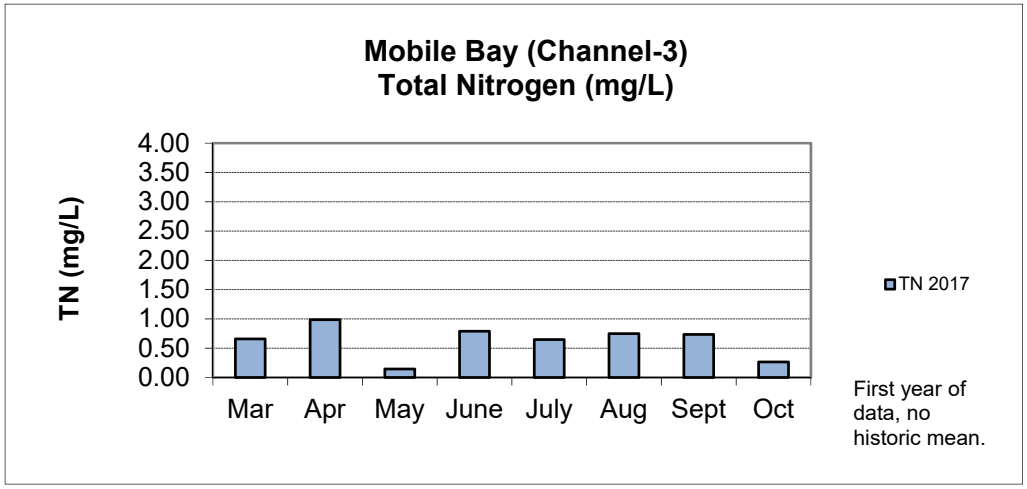

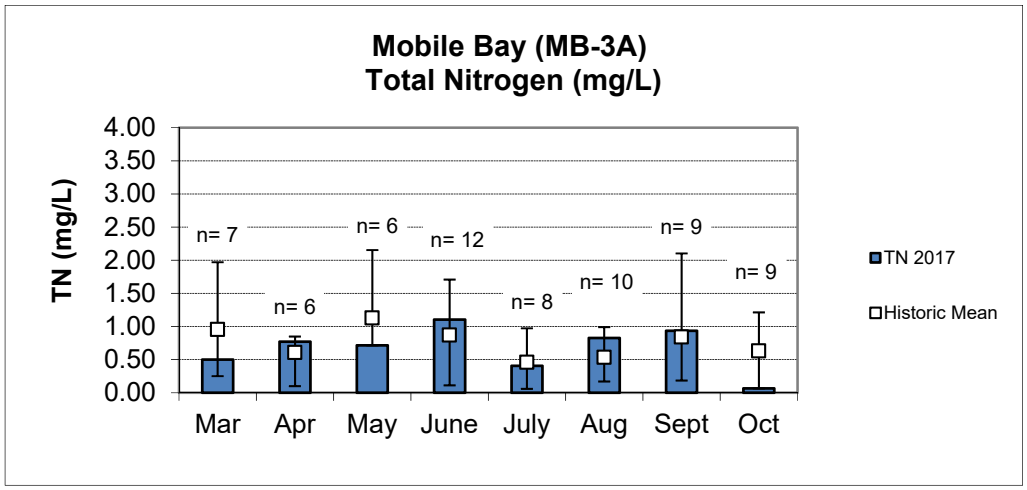

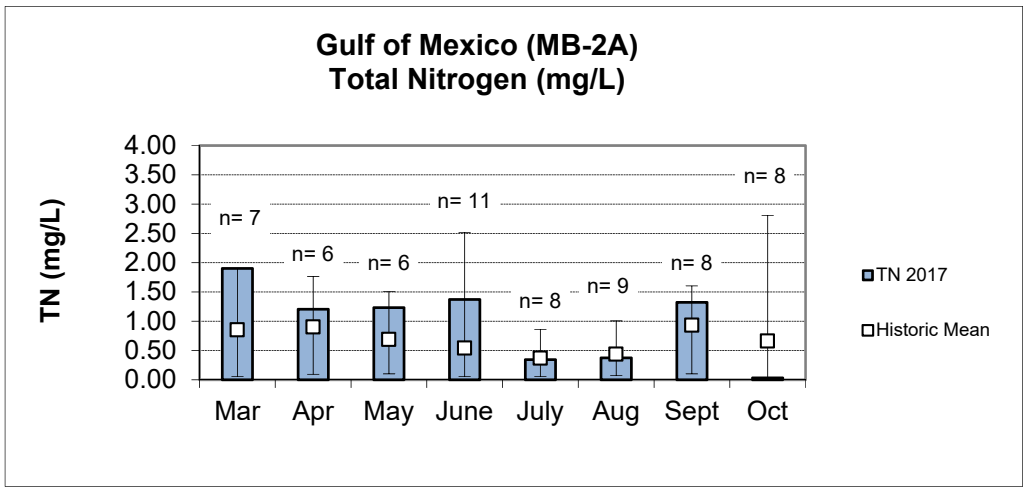

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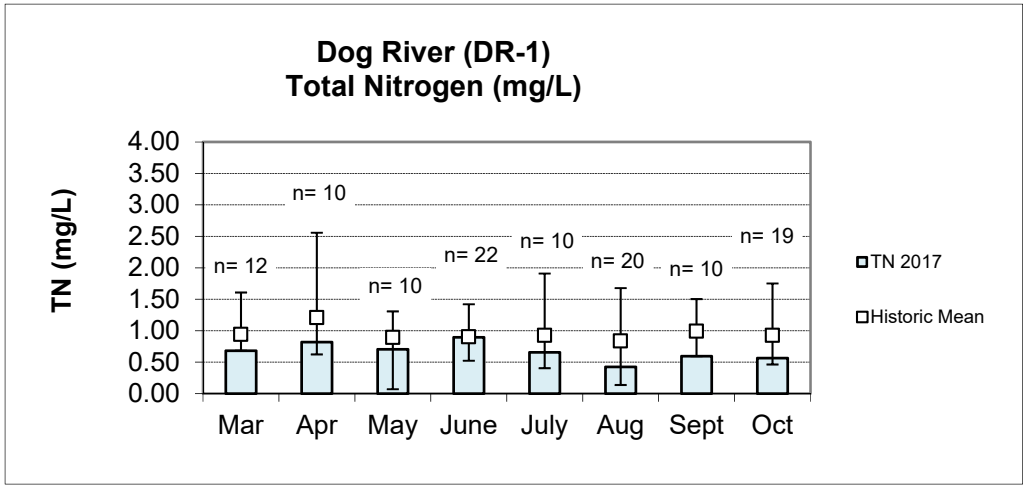

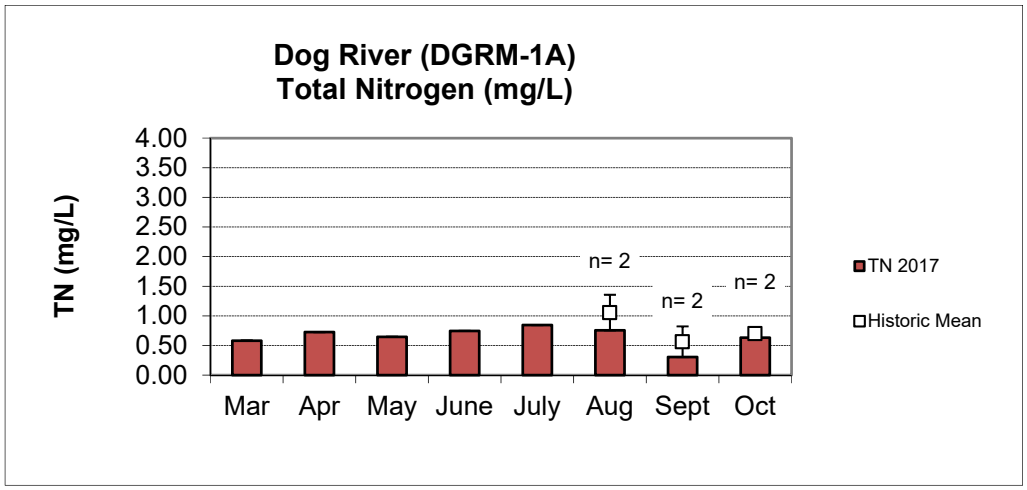

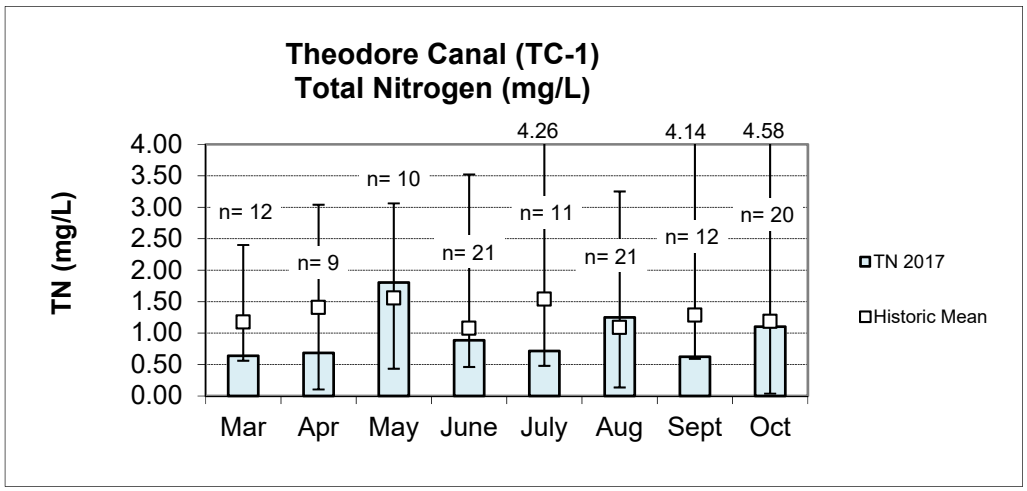

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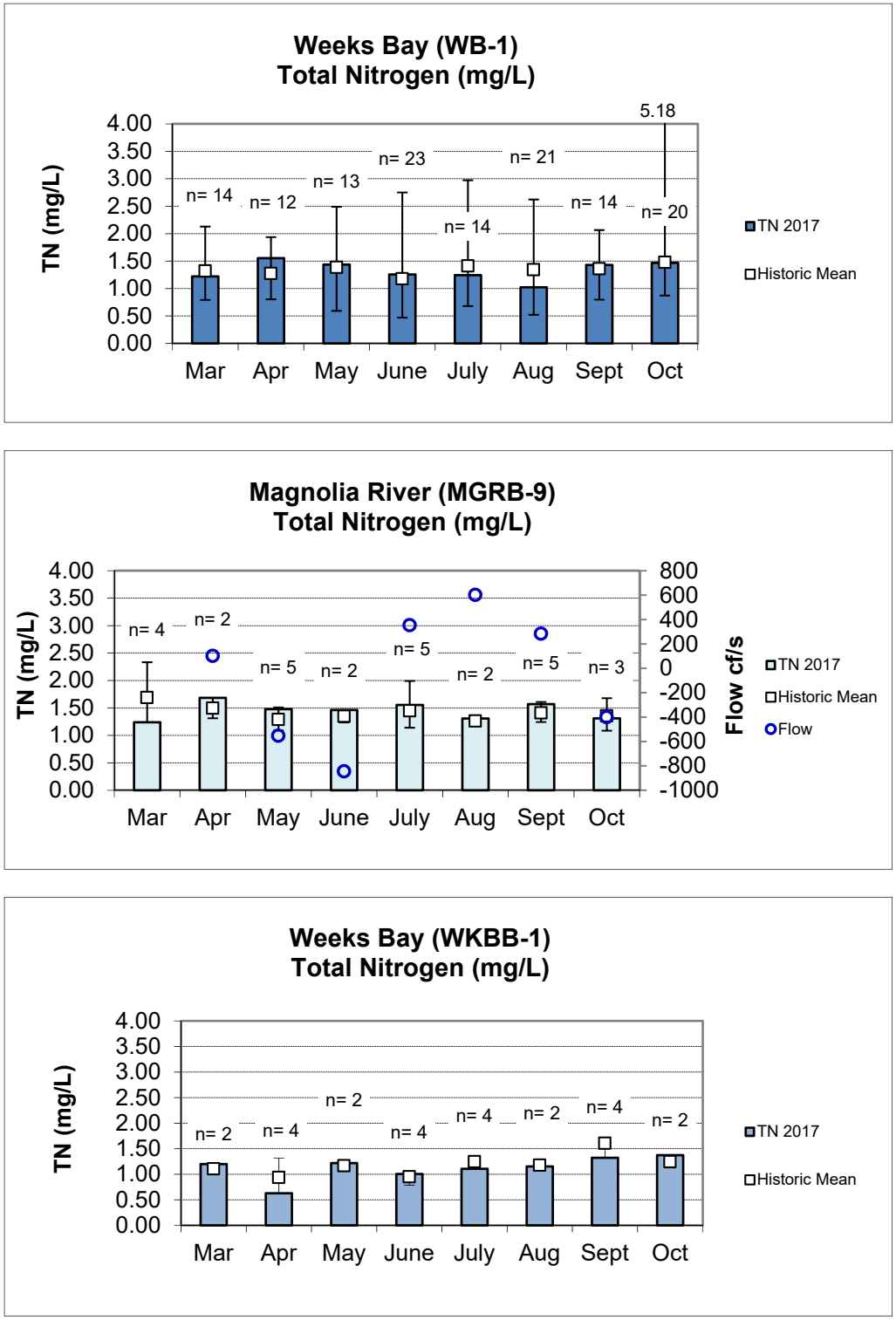


Figure 7. Monthly TP concentrations measured in the Mobile Bay Sub-Watershed, March-October 2017. Each bar graph depicts changes in each station. The historic mean (1990-2017) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Flow is included for comparison, if conducted.

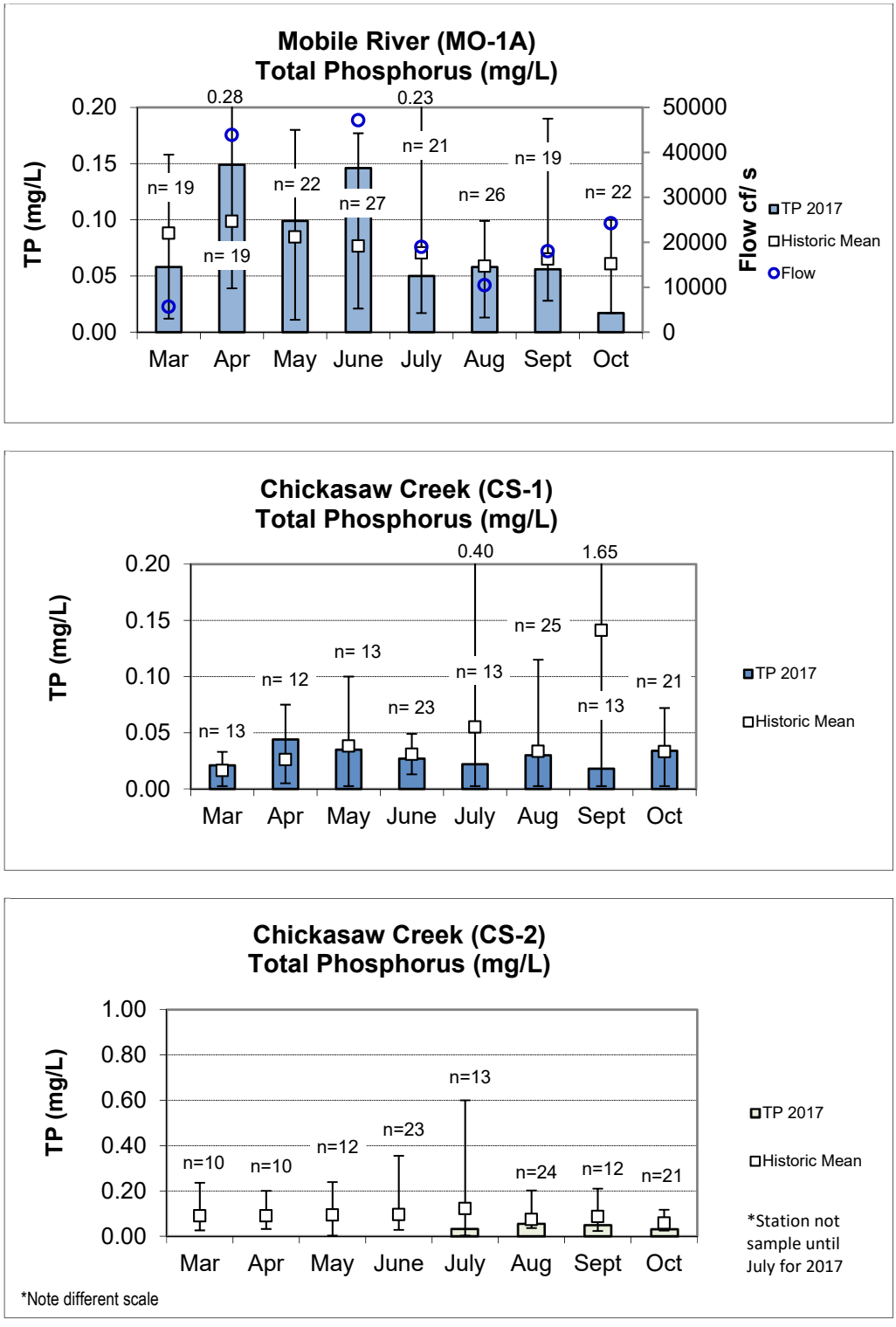
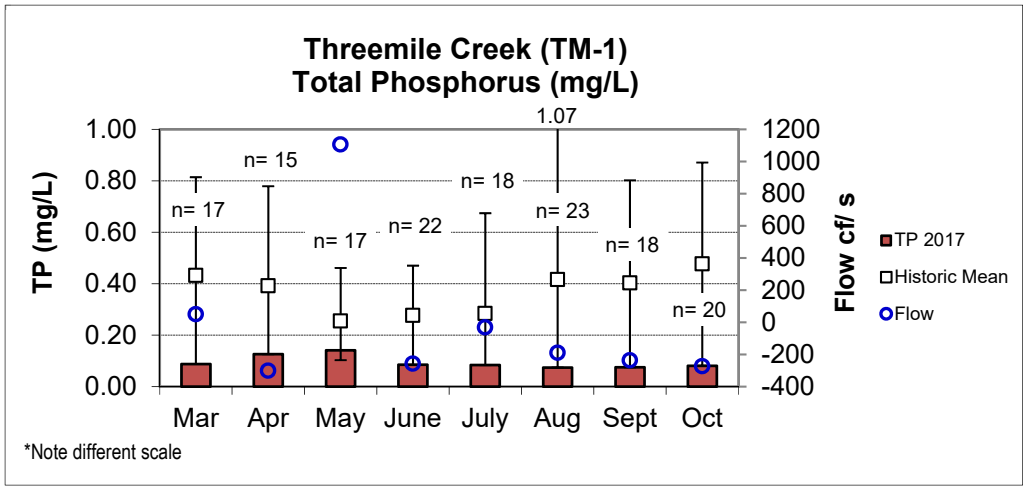
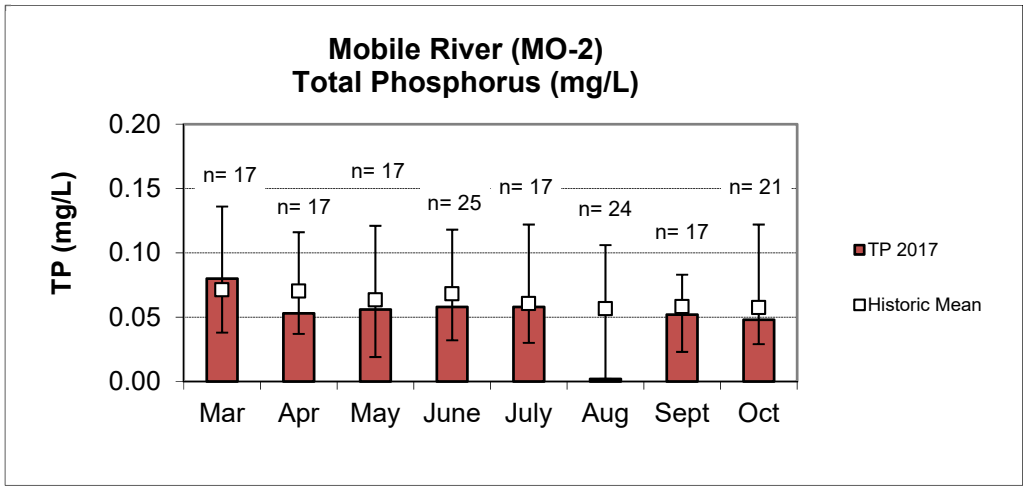


Figure 7. (continued)





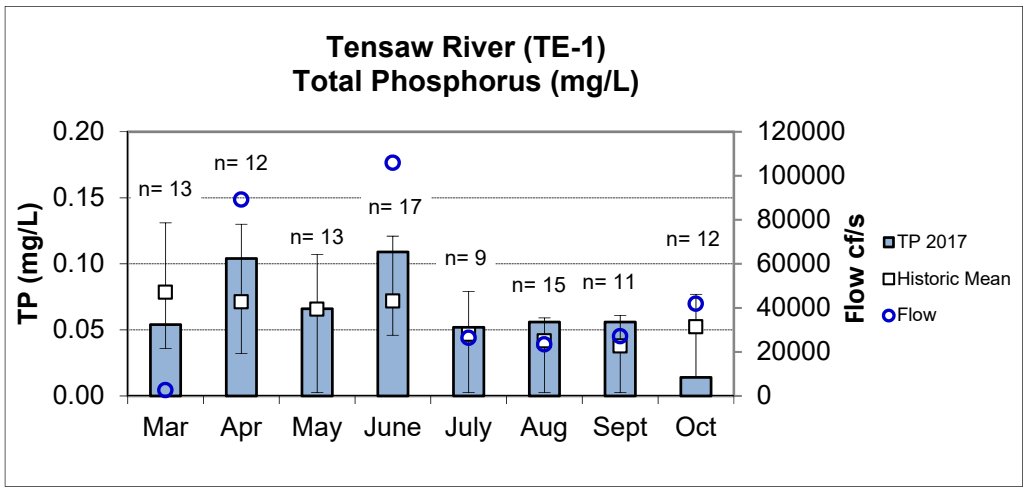


Figure 7. (continued)

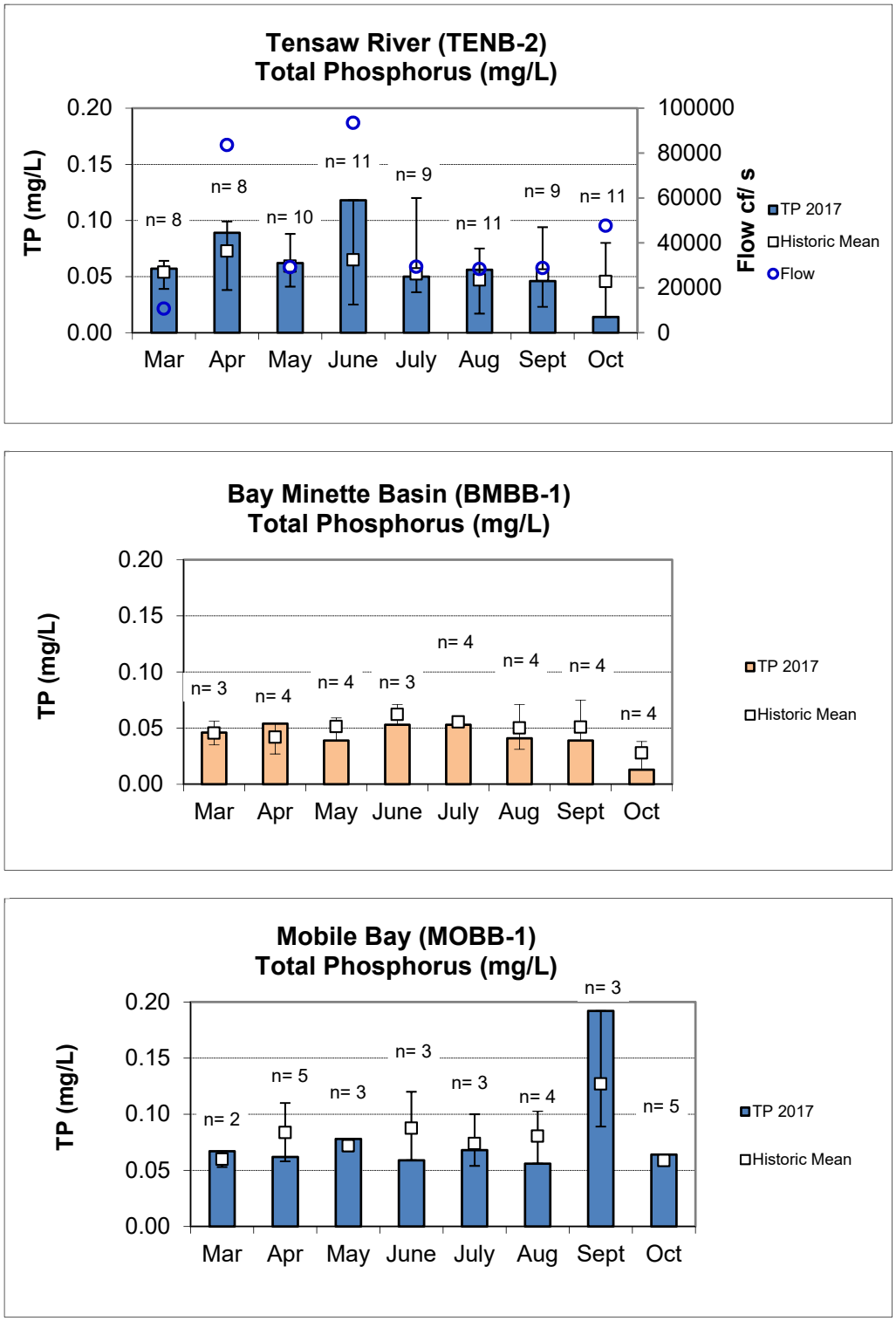
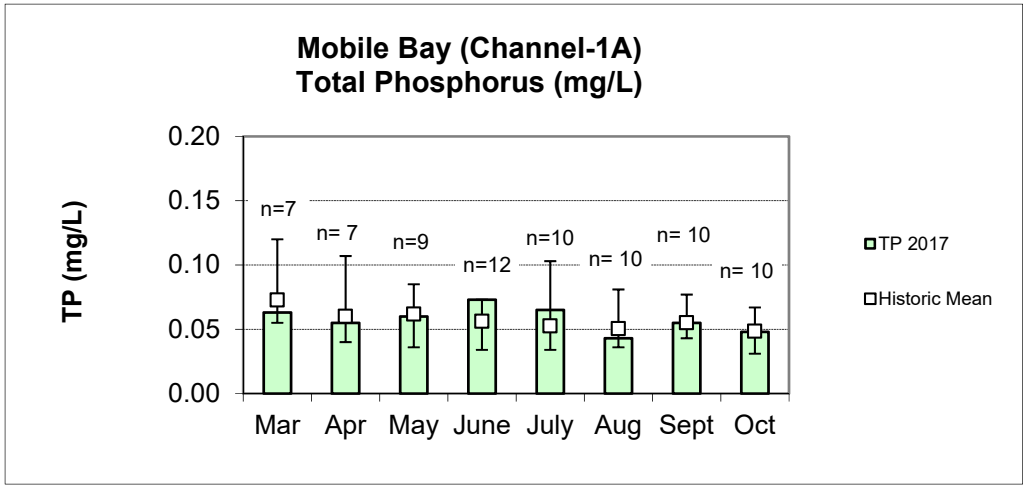
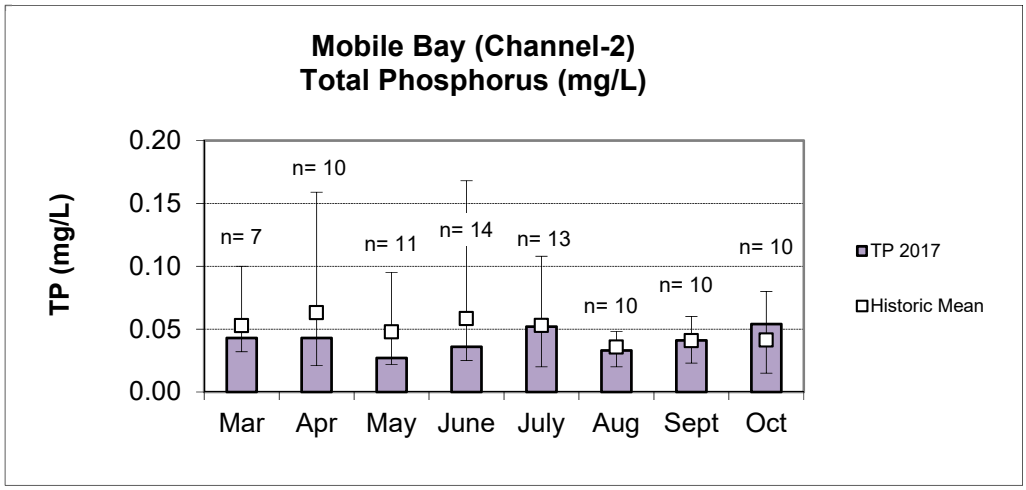
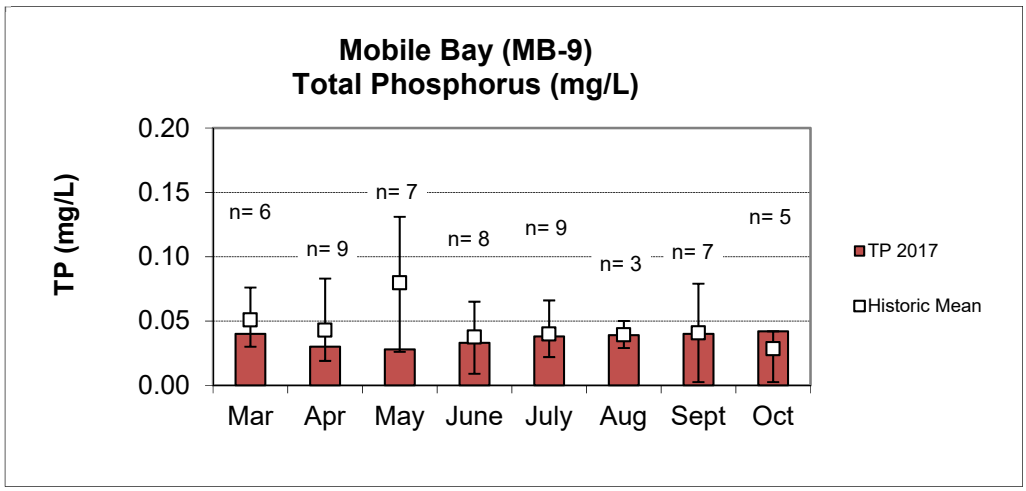


Figure 7. (continued)







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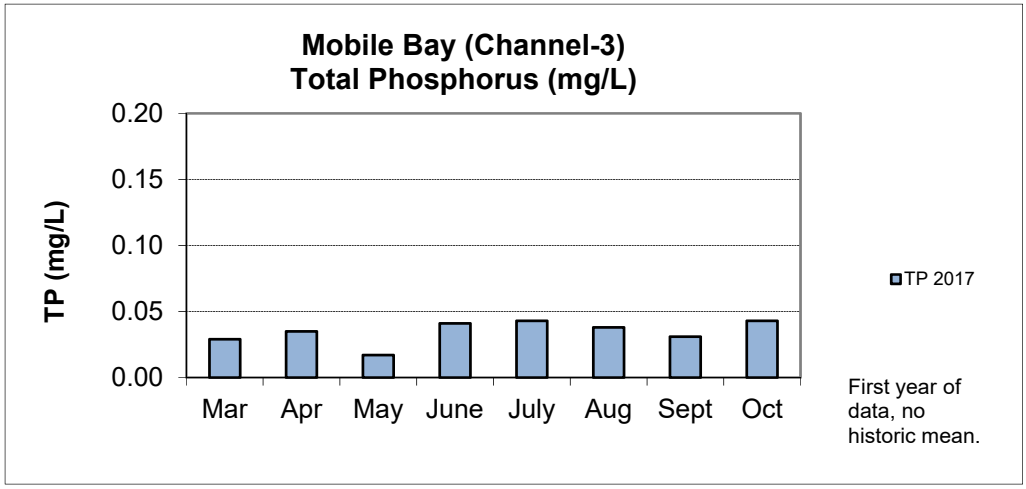

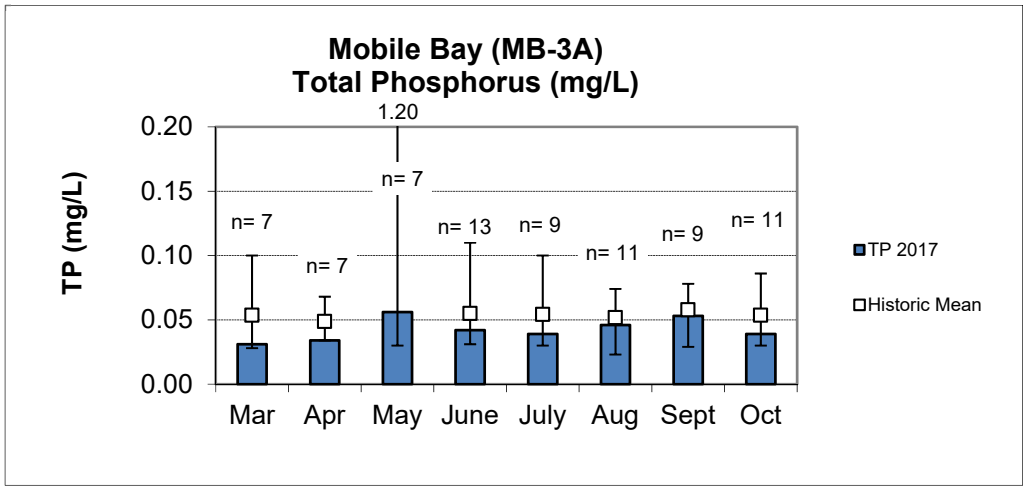

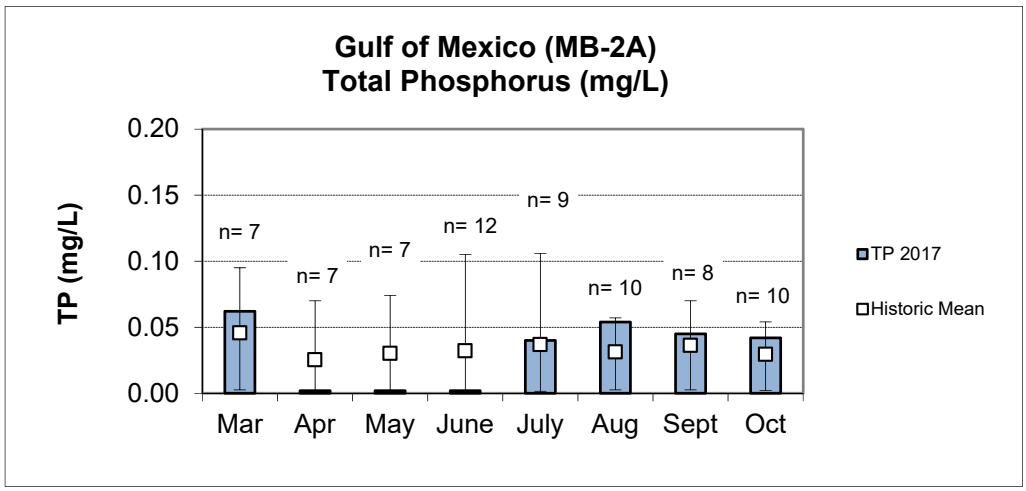

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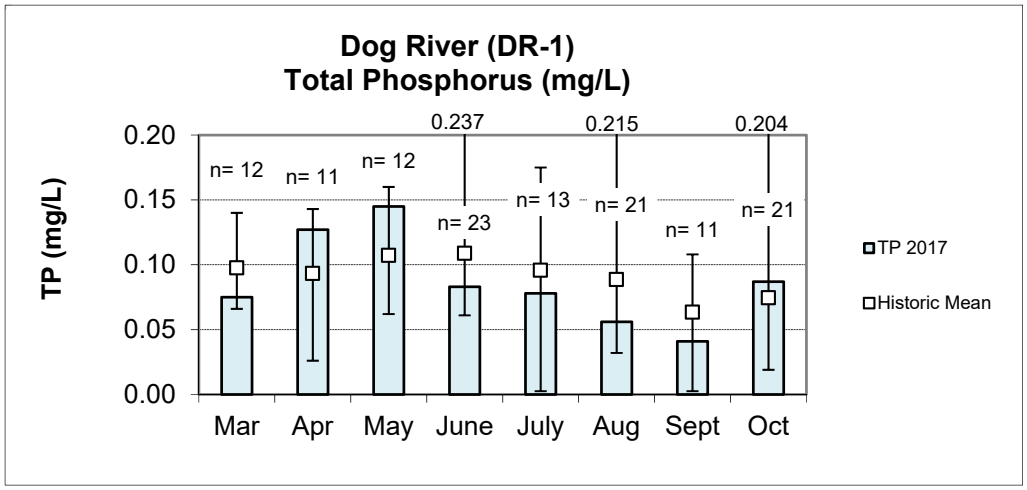

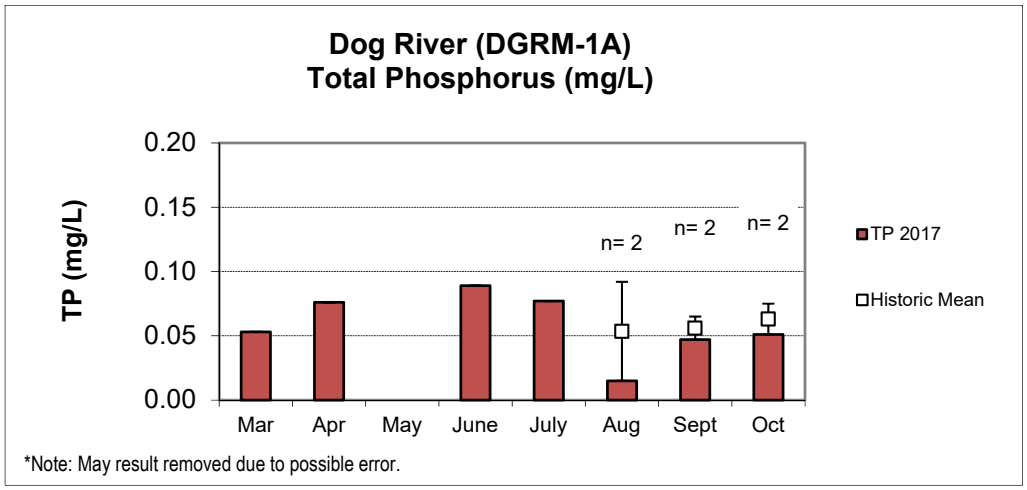

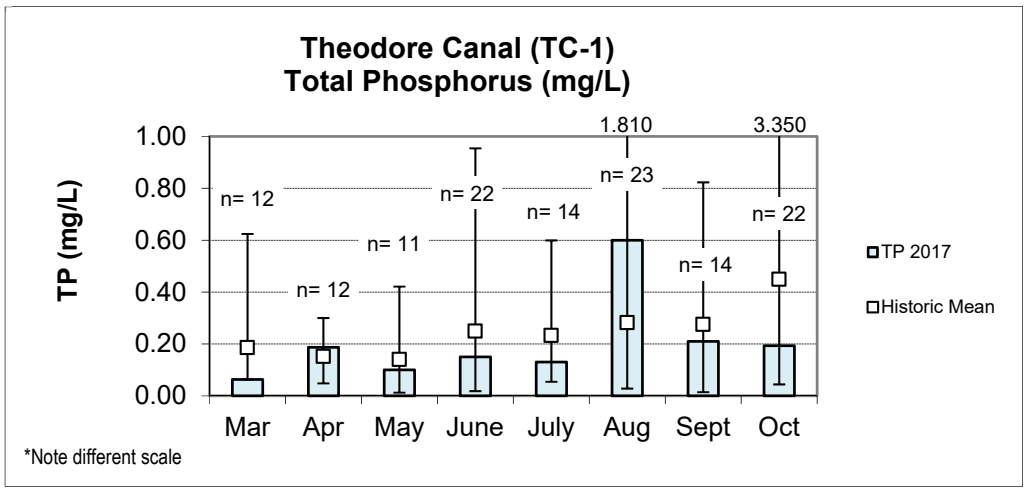

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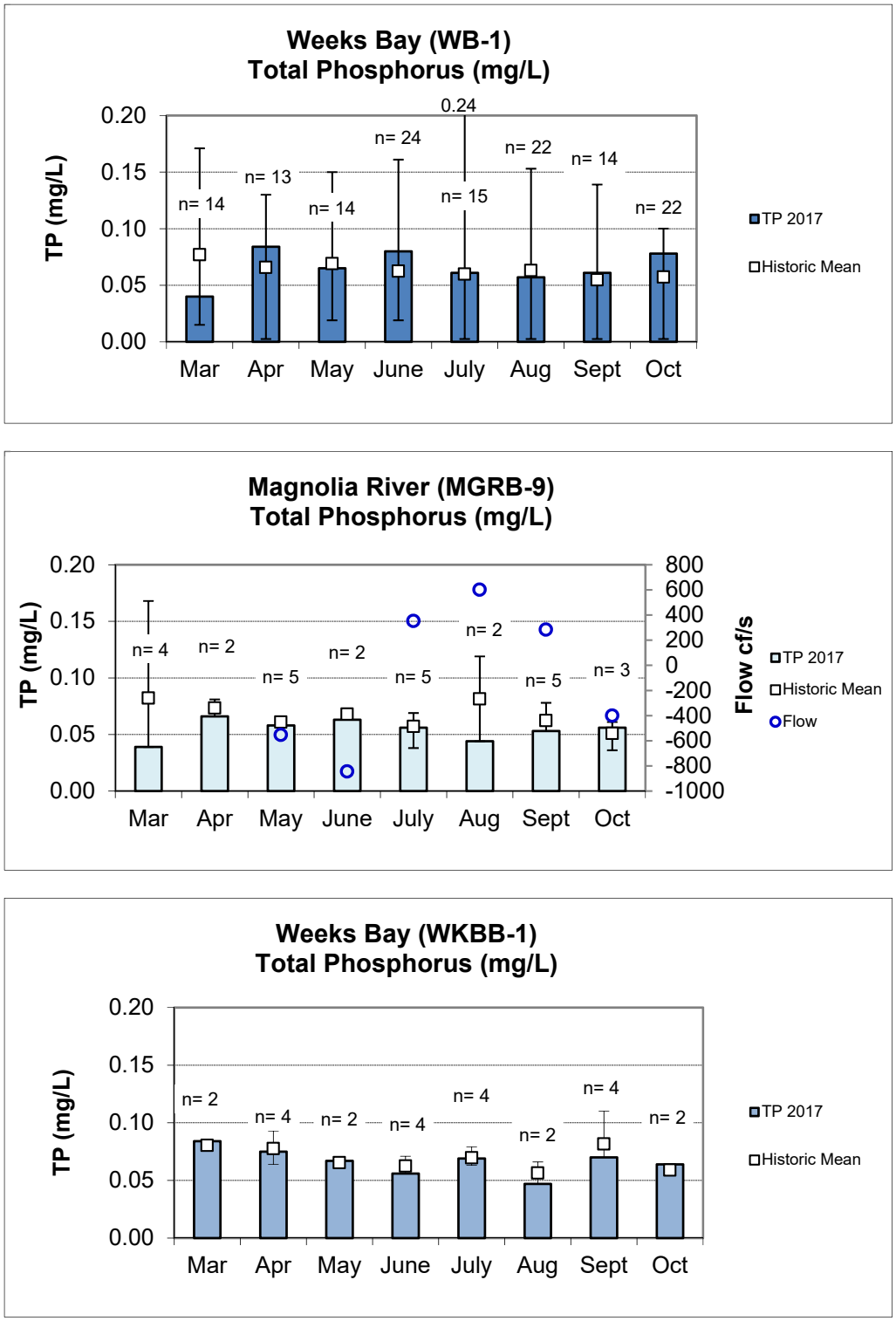
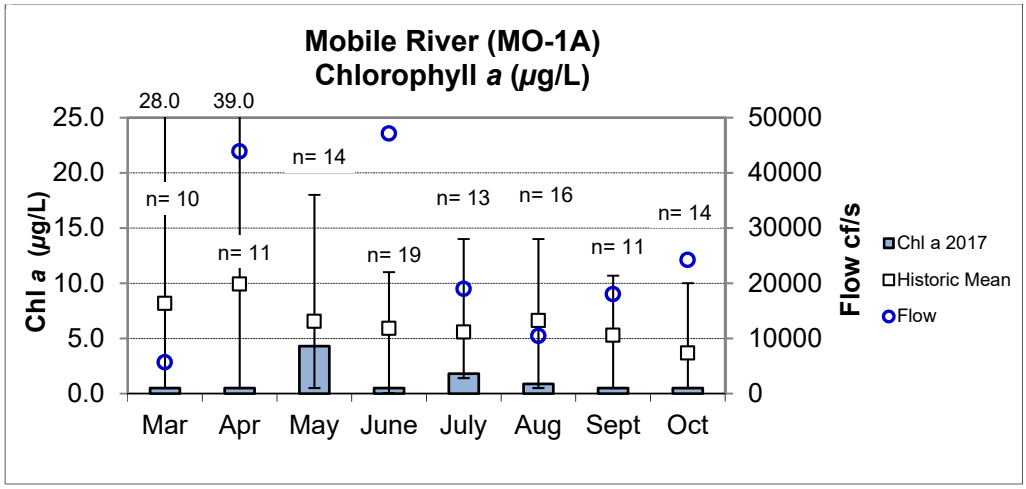
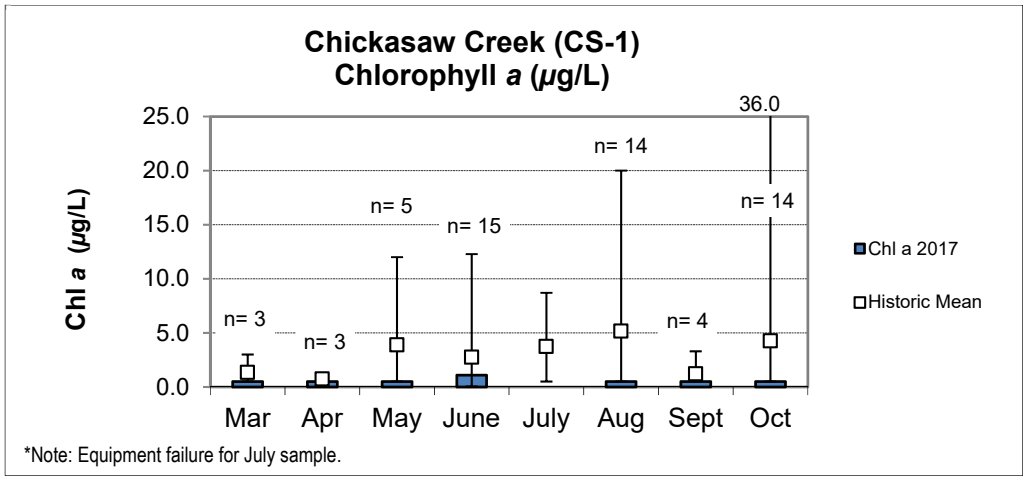
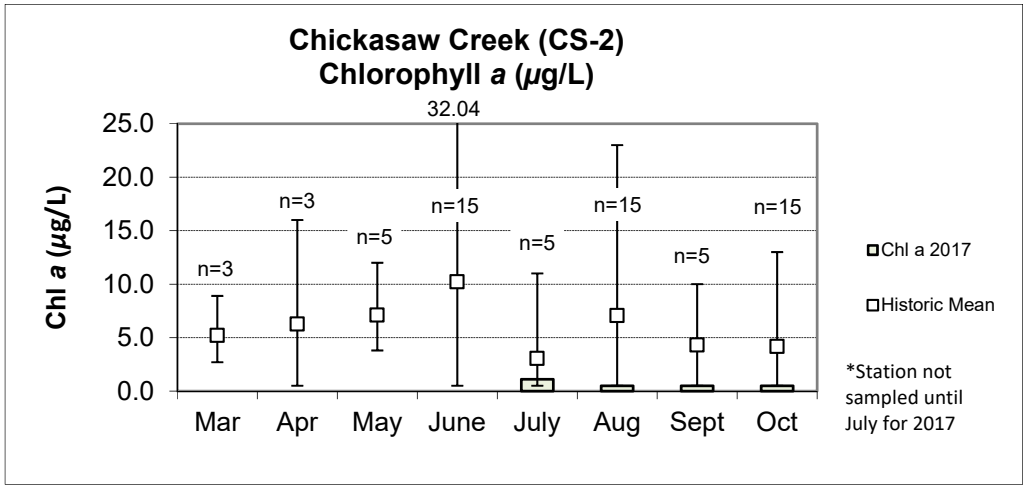


Figure 8. Monthly chl *a* concentrations measured in the Mobile Bay Sub-Watershed, March-October 2017. Each graph depicts changes in each station. The historic mean (1990-2017) and min/max ranges are also displayed. The "n" value equals the number of data points included in the monthly historic calculations. Flow is included for comparison, if conducted.







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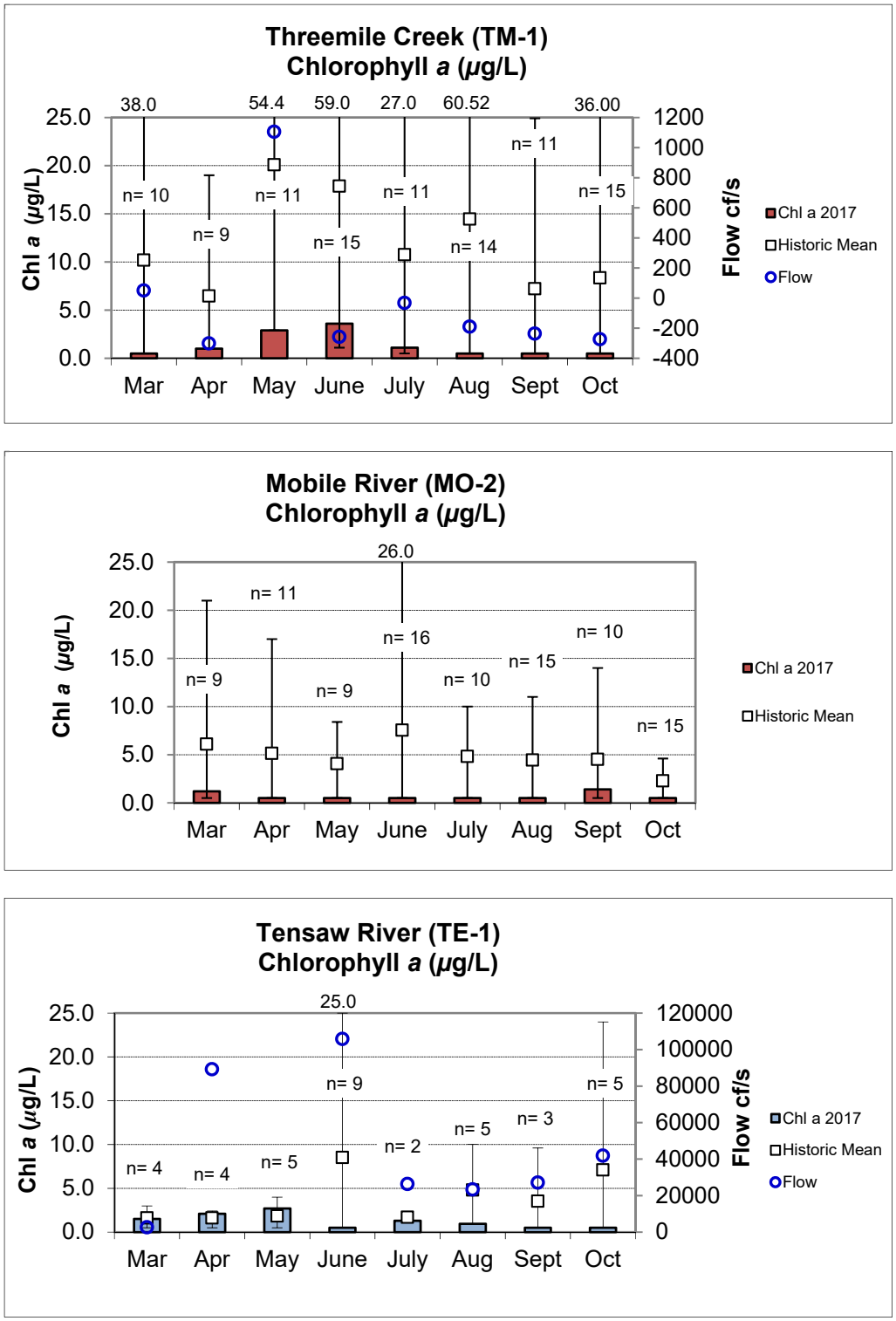

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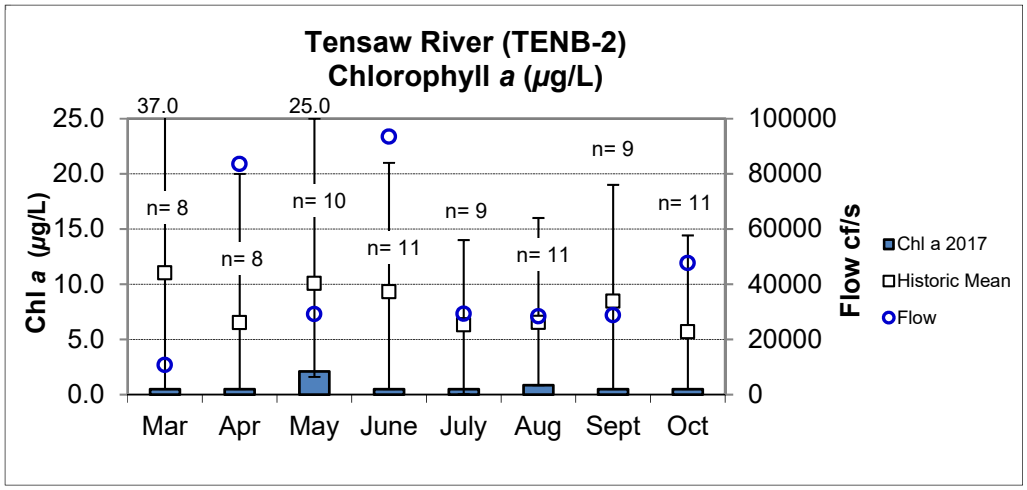

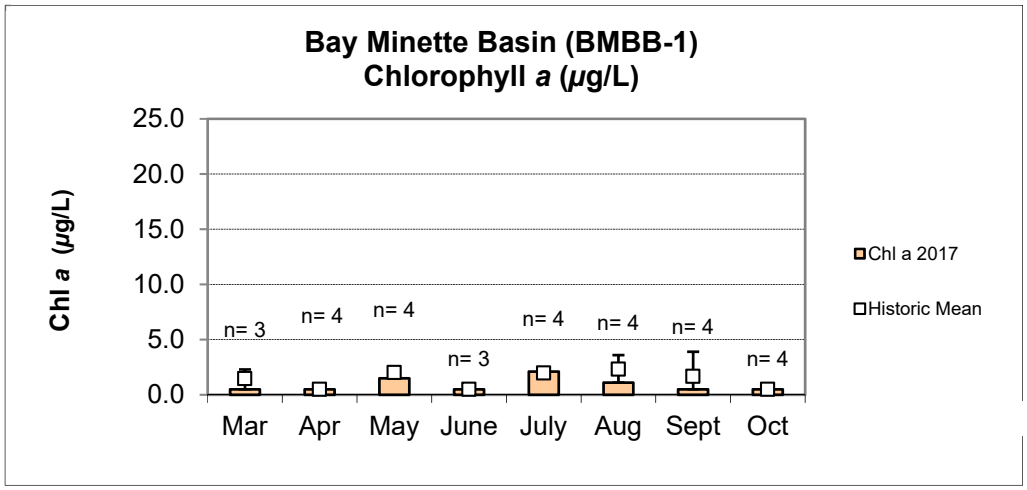

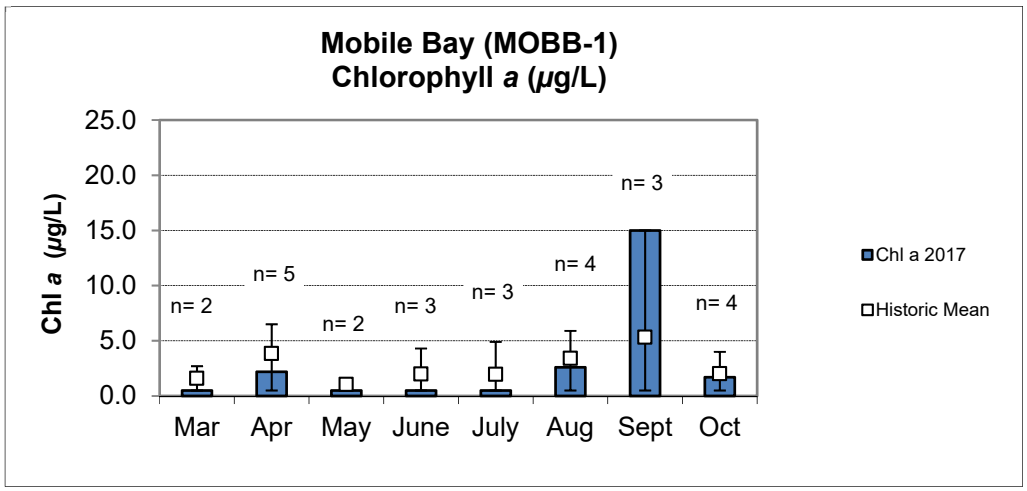

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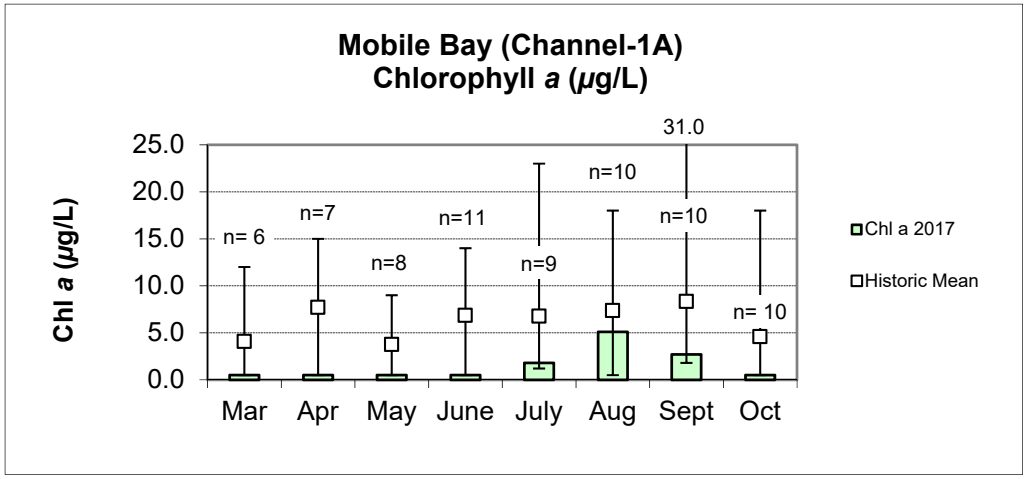
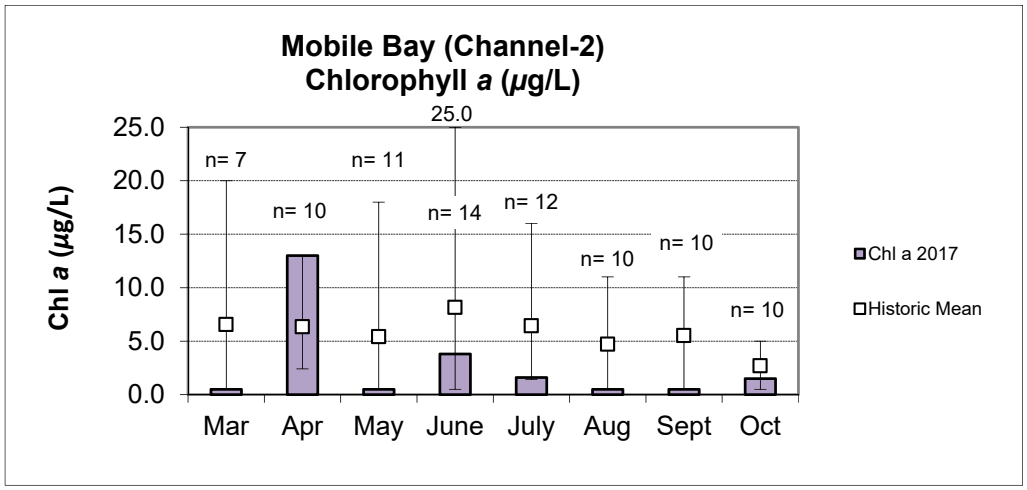




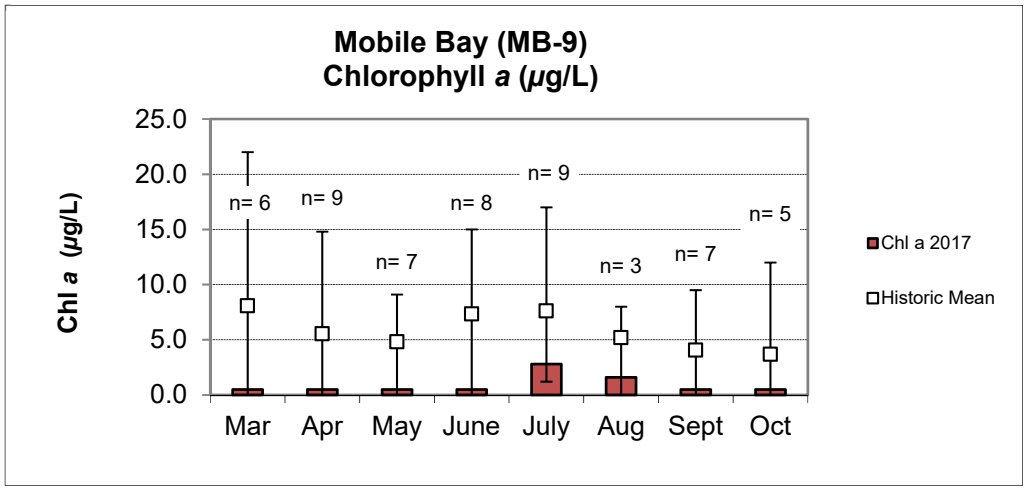
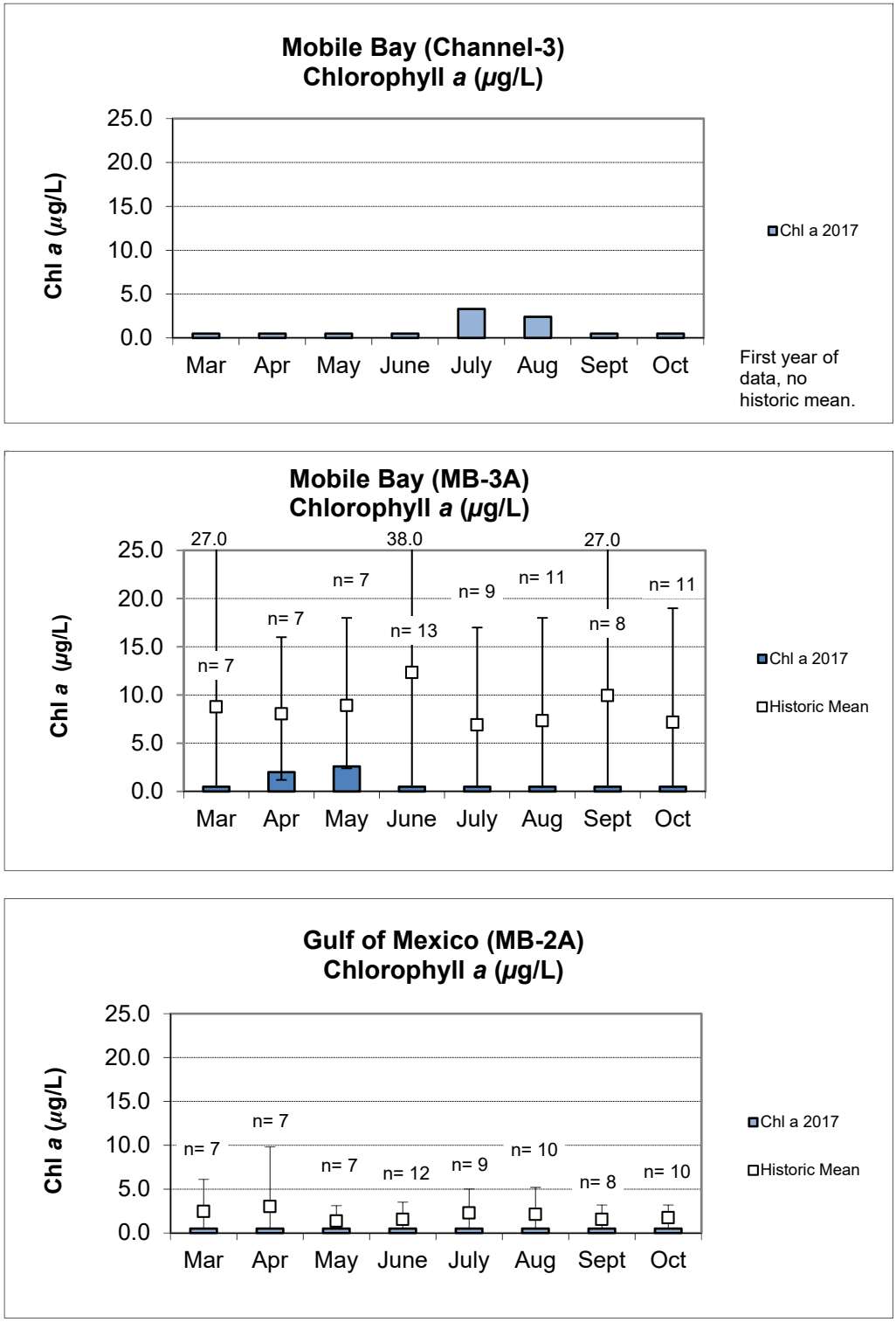


Figure 8. (continued)



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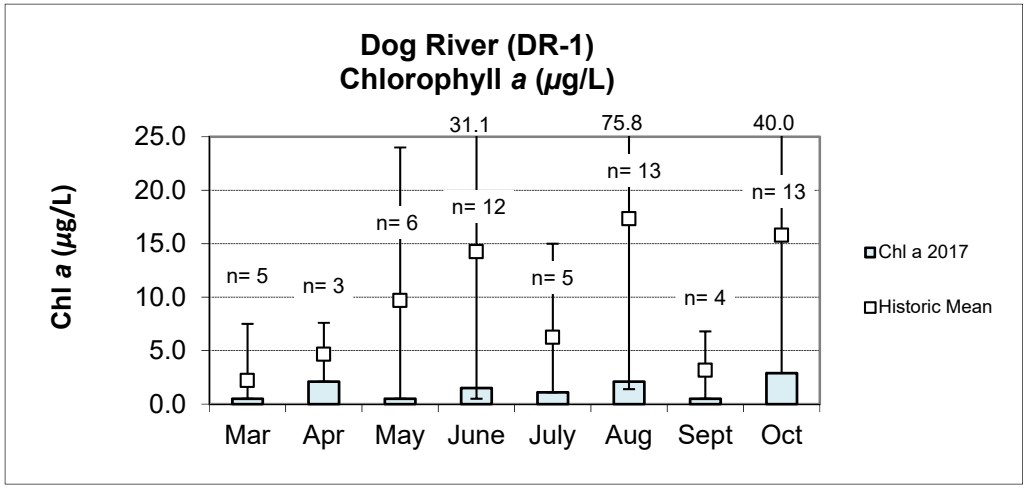

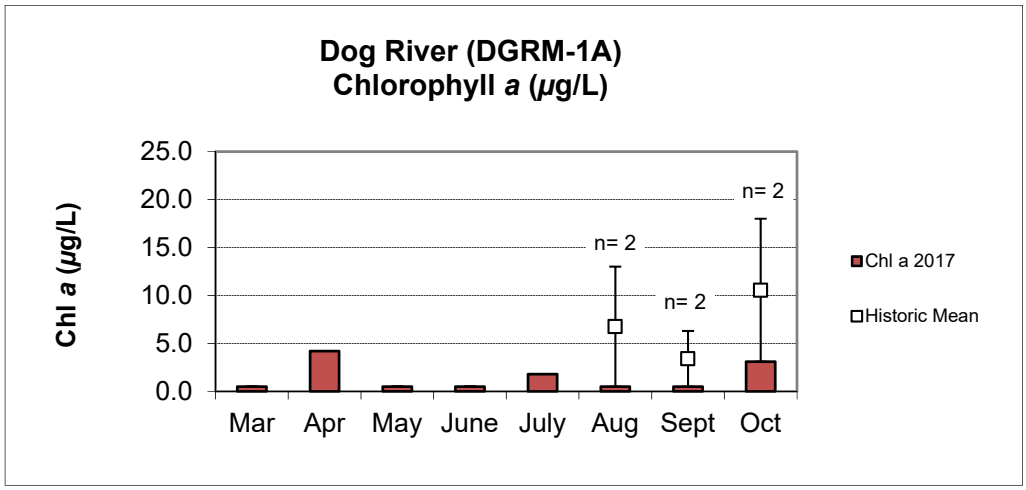

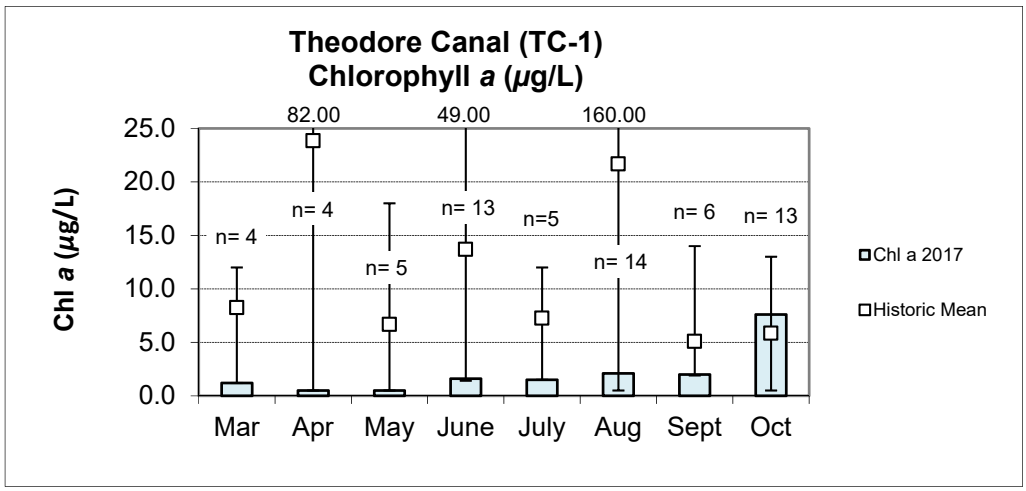

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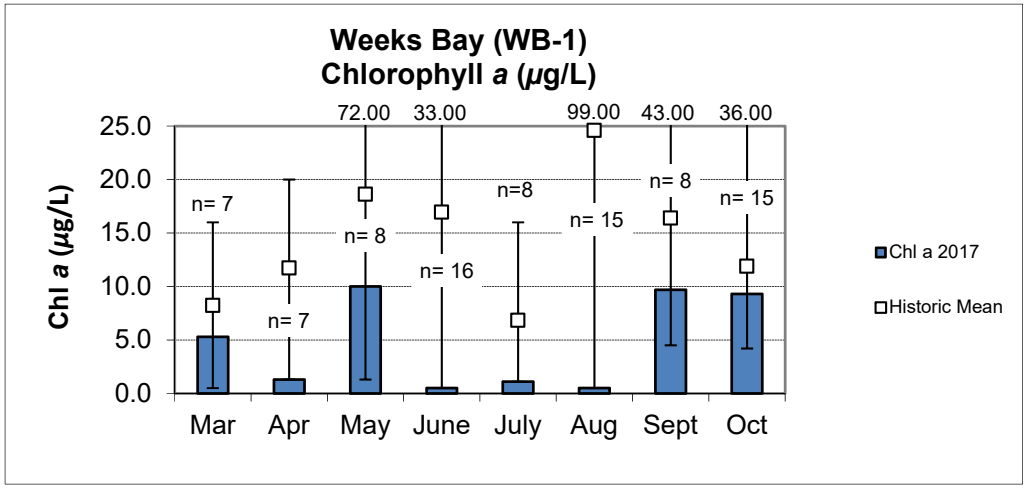
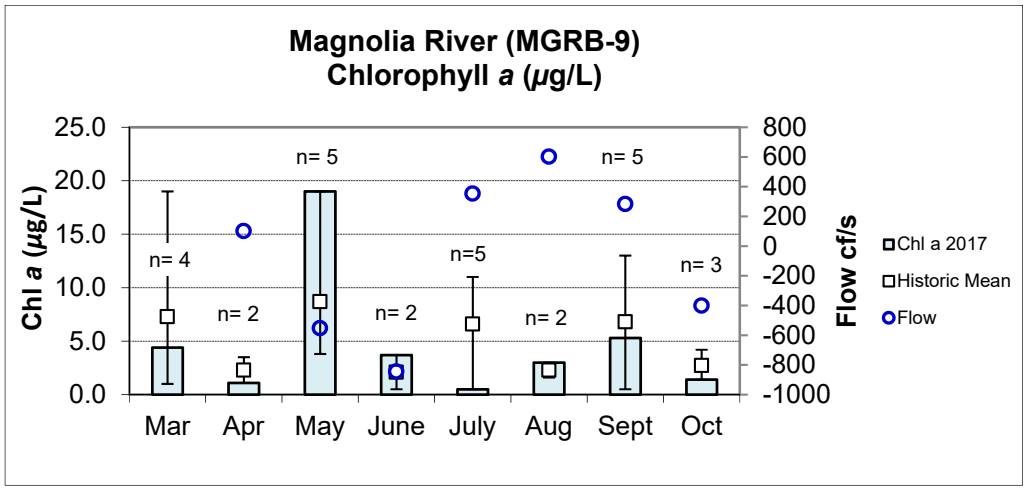




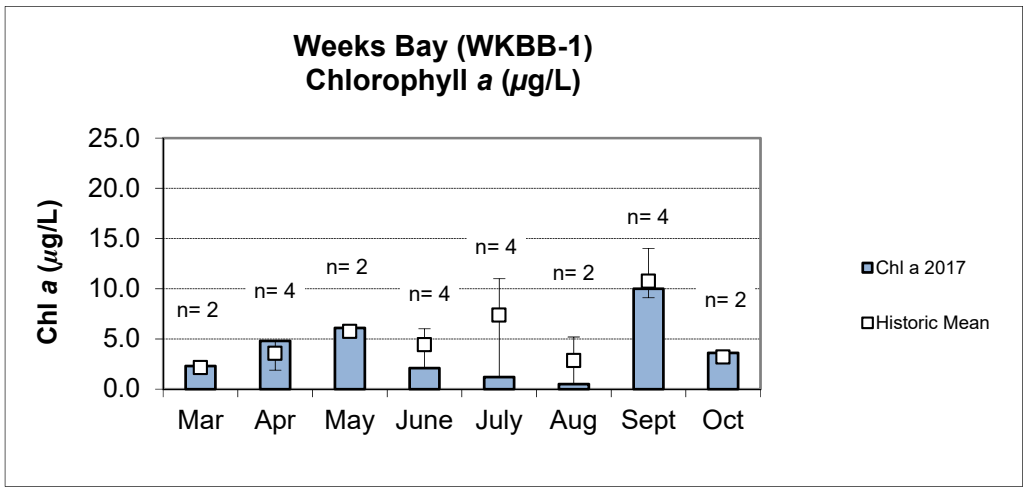
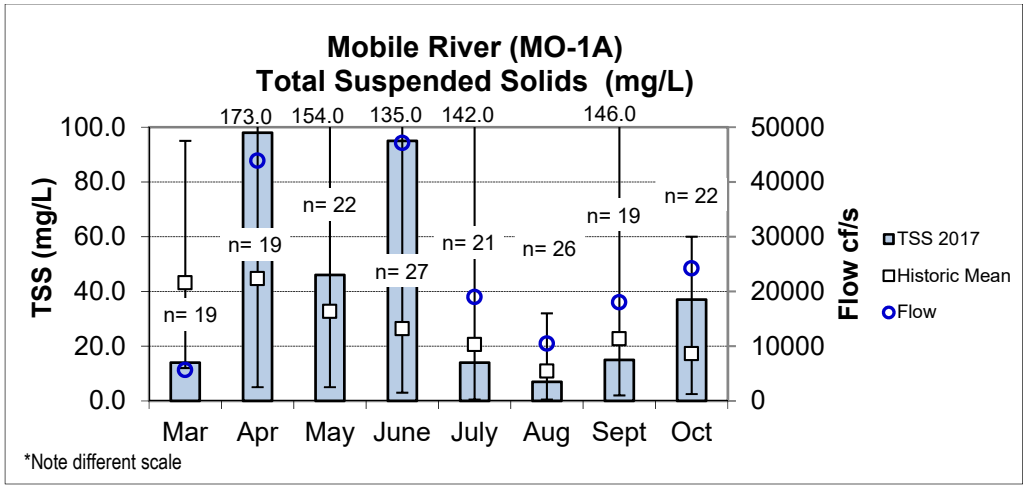
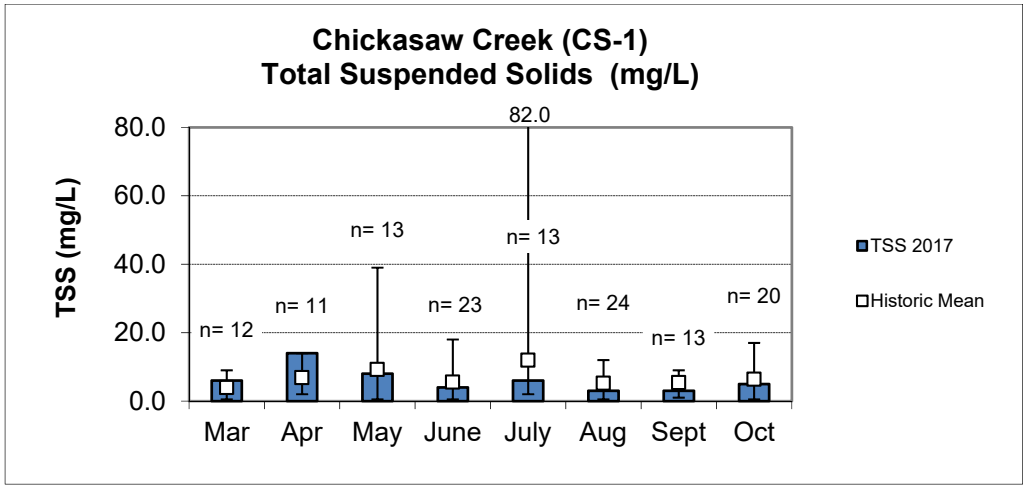
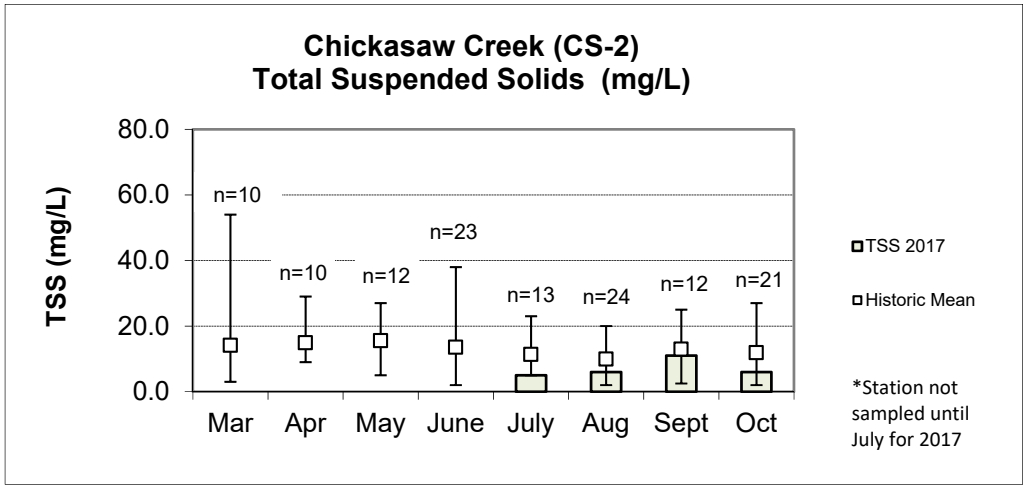


Figure 9. Monthly TSS concentrations measured in the Mobile Bay Sub-Watershed, March-October 2017. Each bar graph depicts changes in each station. The historic mean (1990-2017) and min/max ranges are also displayed. The "n" value equals the number of data points included in the monthly historic calculations. Flow is included for comparison, if conducted.







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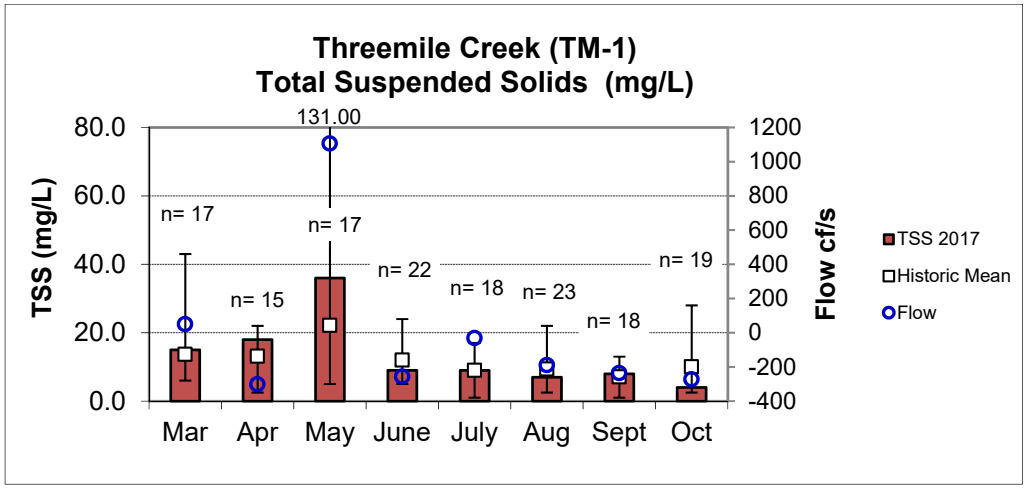

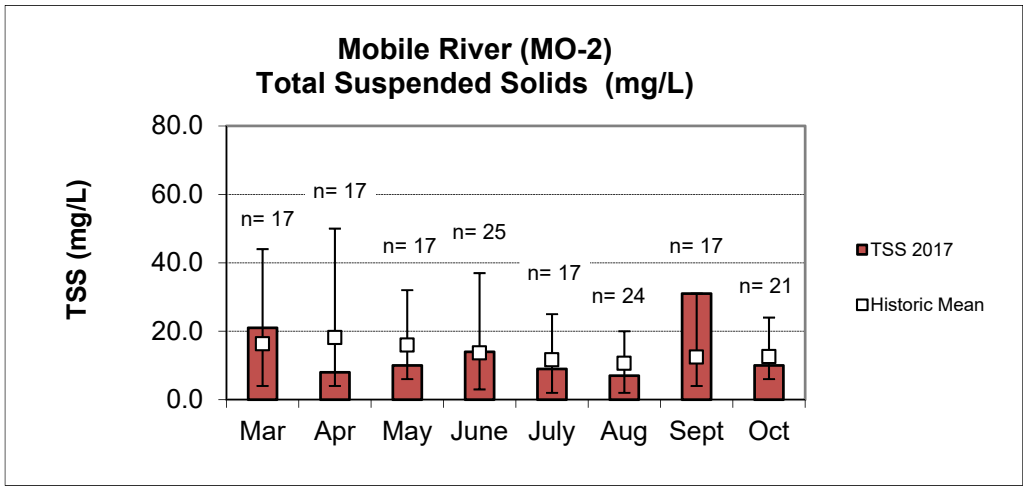

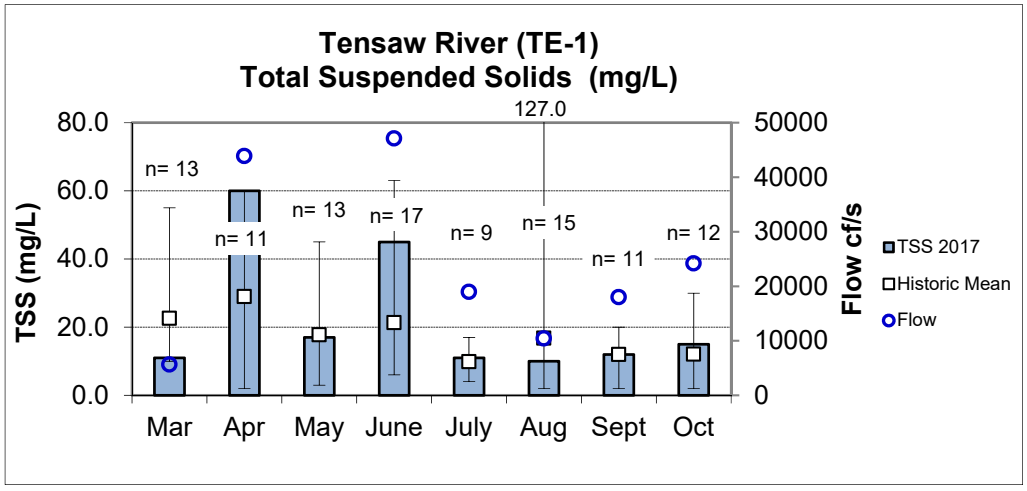

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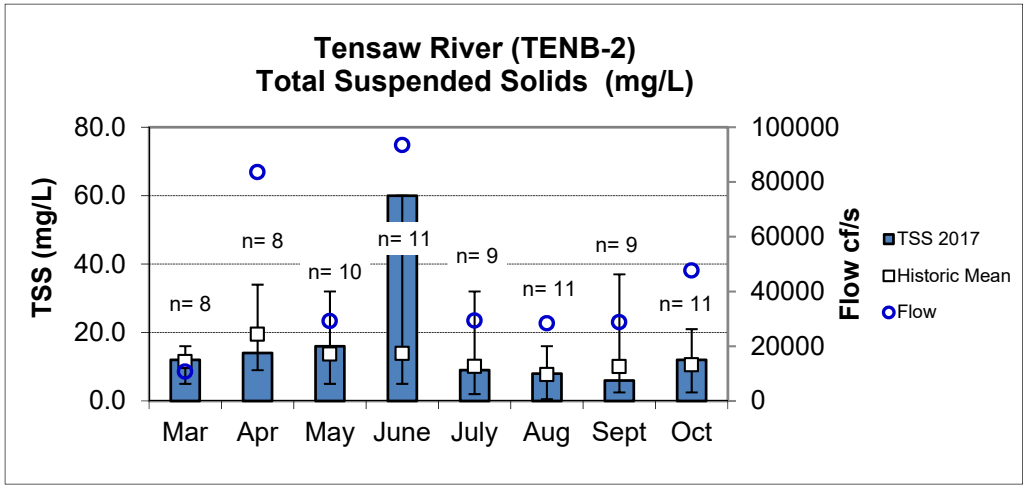

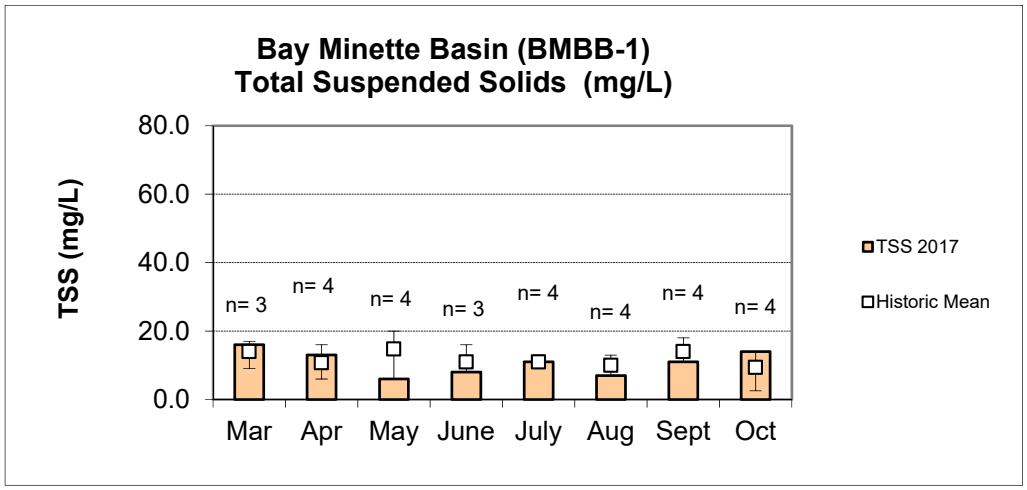

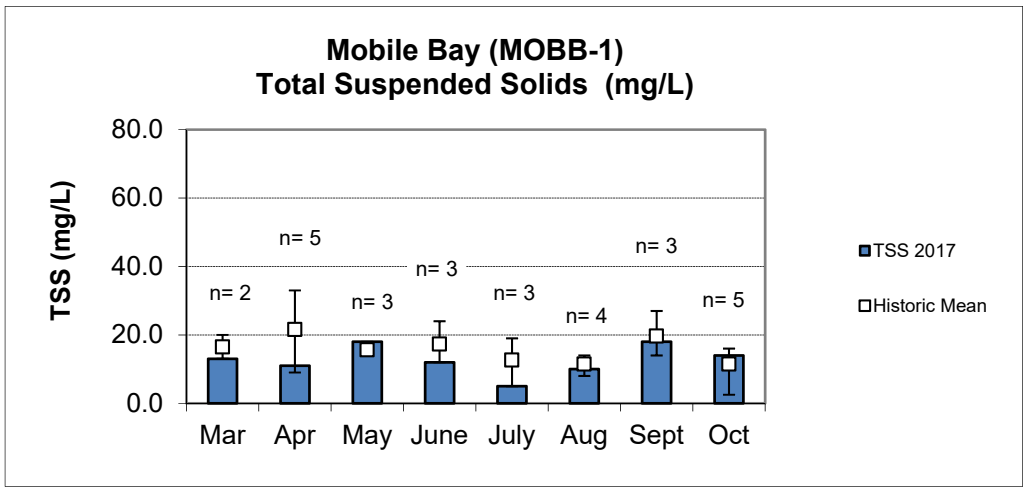

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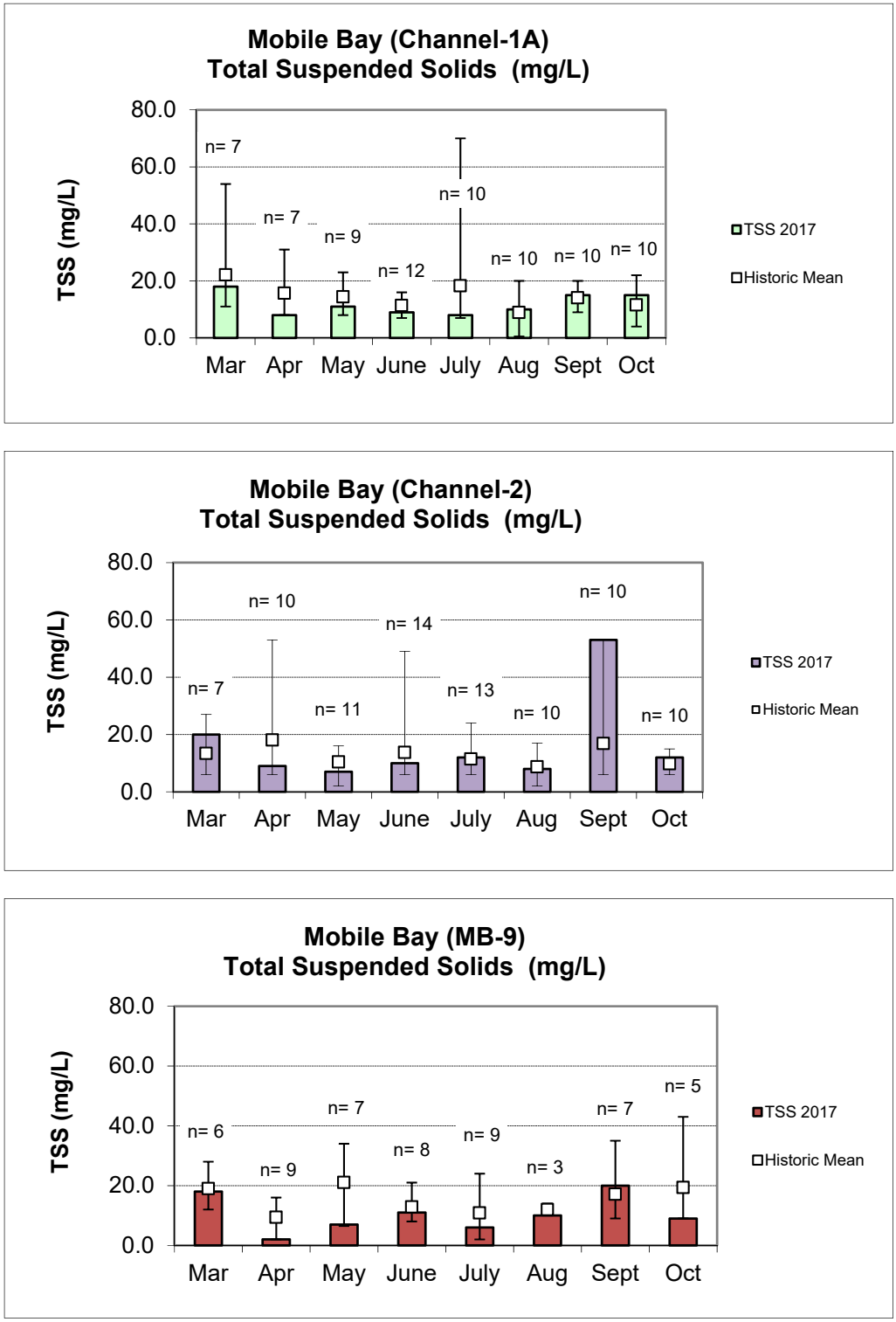

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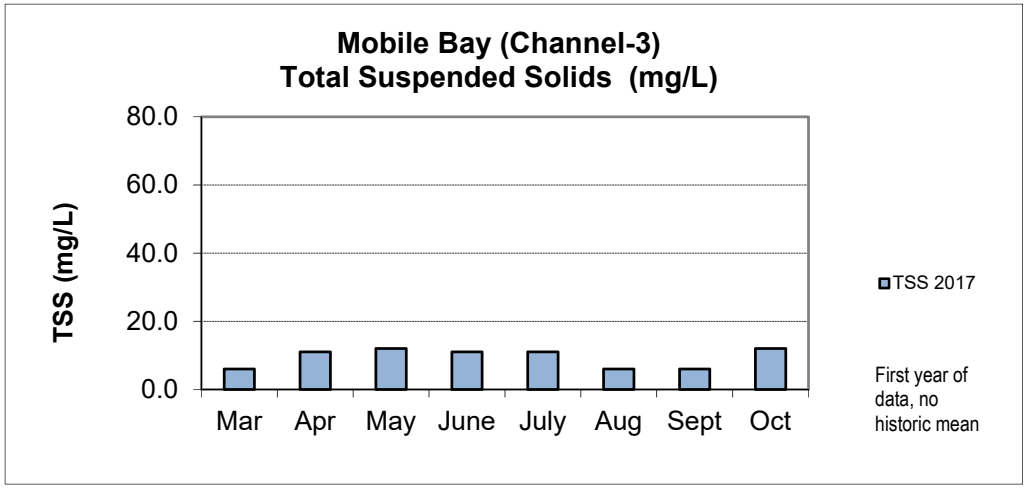

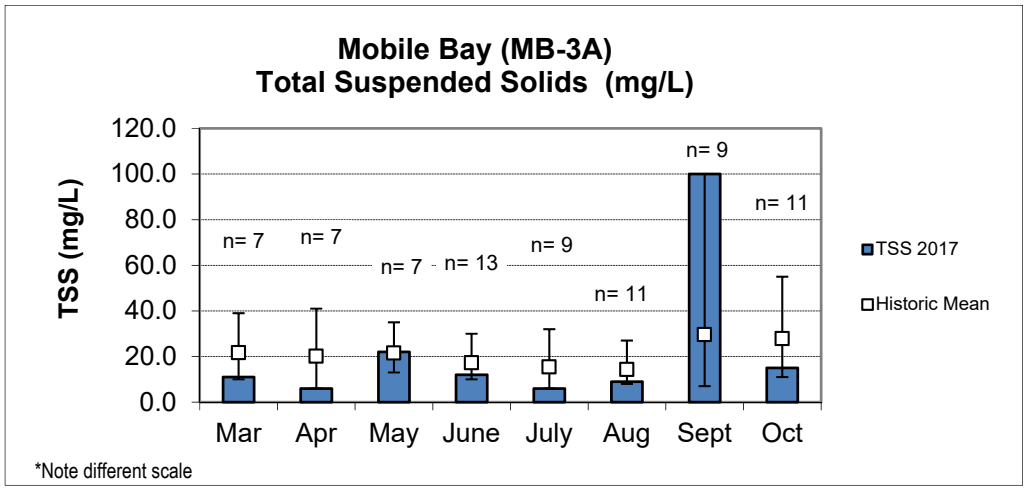

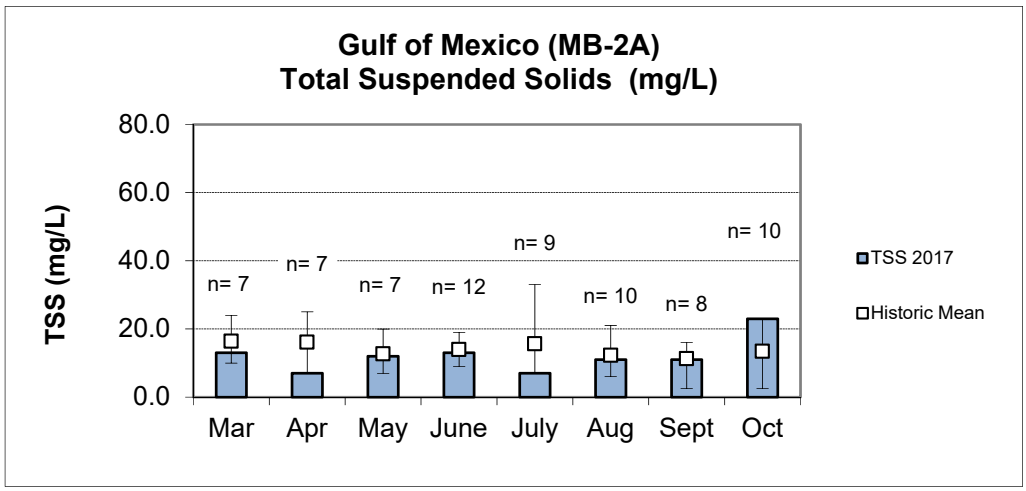

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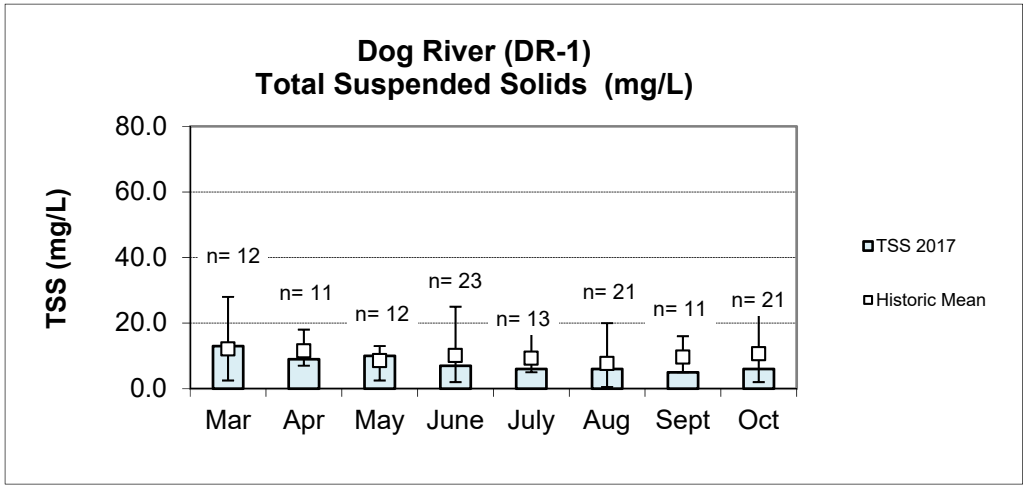

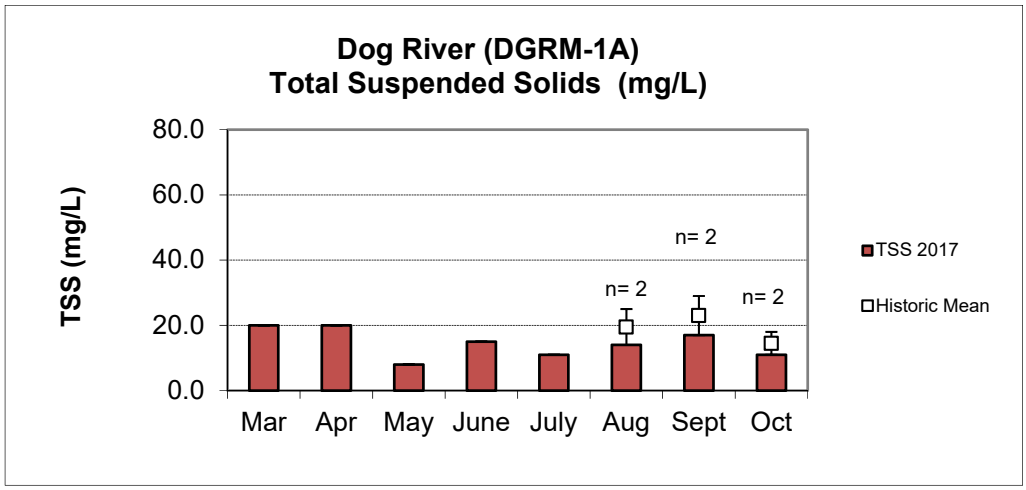

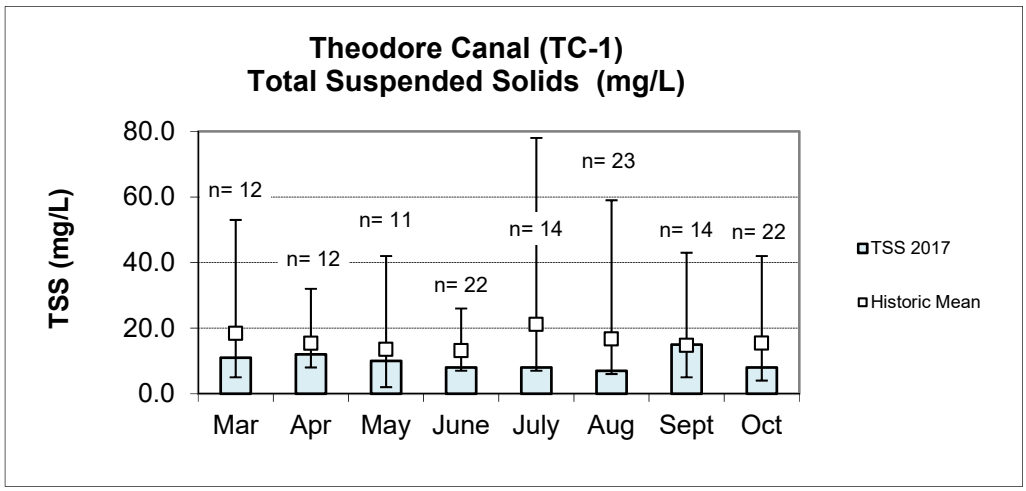

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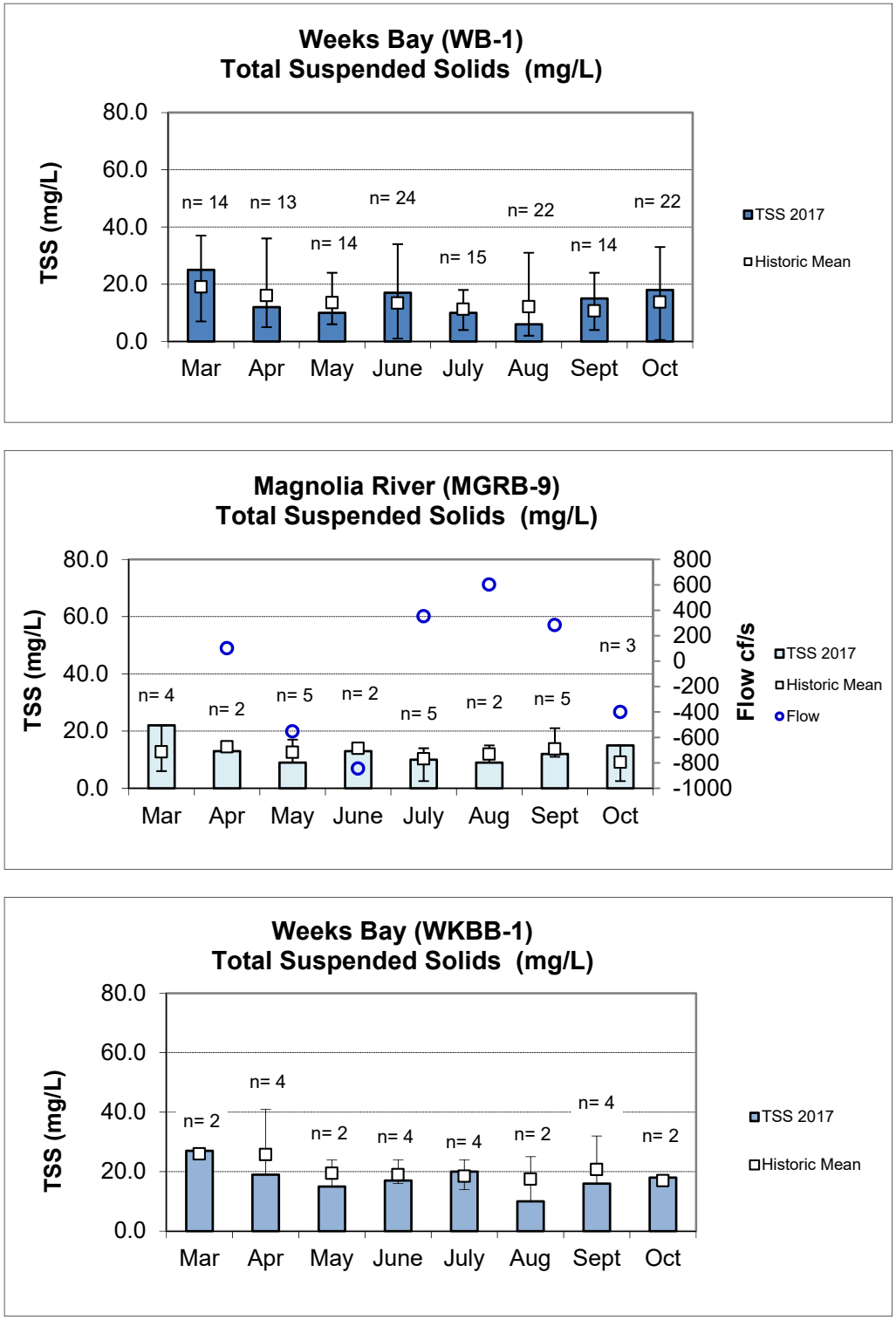
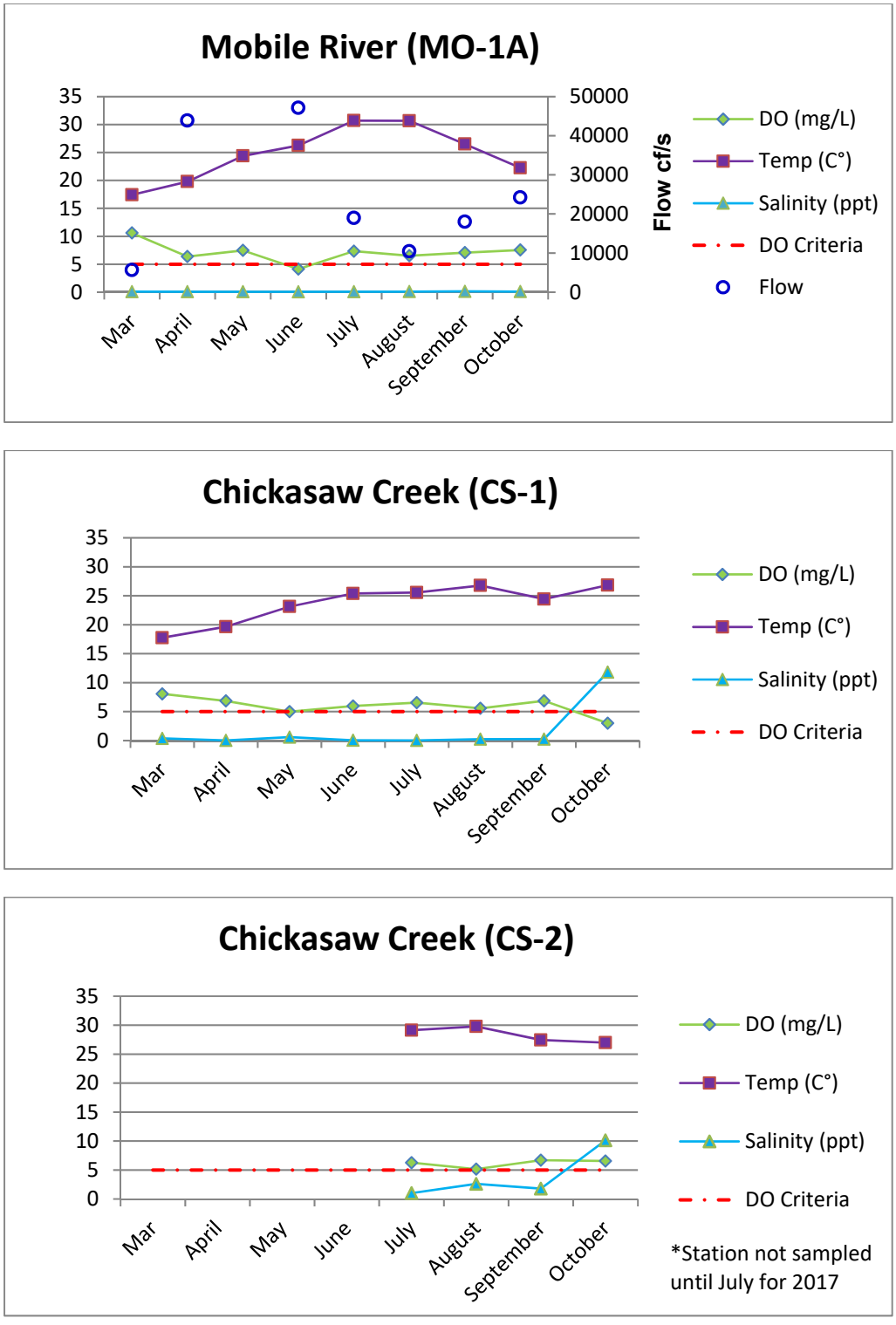


Figure 10. Monthly DO, Temperature, and Salinity concentrations at 1.5 m (5 ft), or mid-depth, for the Mobile Bay Sub-Watershed stations collected March-October 2017. ADEM Water Quality Criteria requires a DO concentration of 5.0 mg/L at this depth (ADEM 2012). Flow is included for comparison, if conducted.



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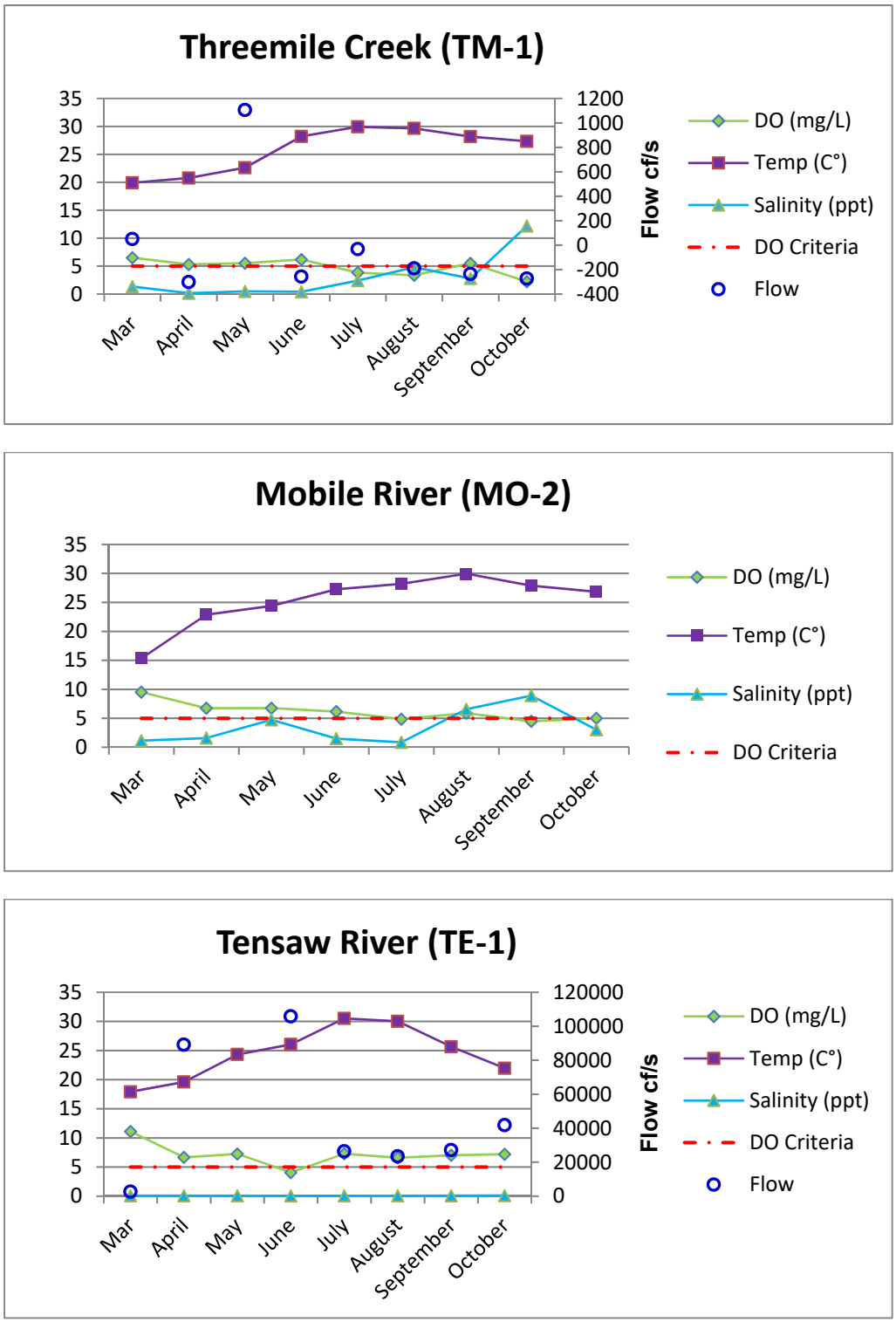

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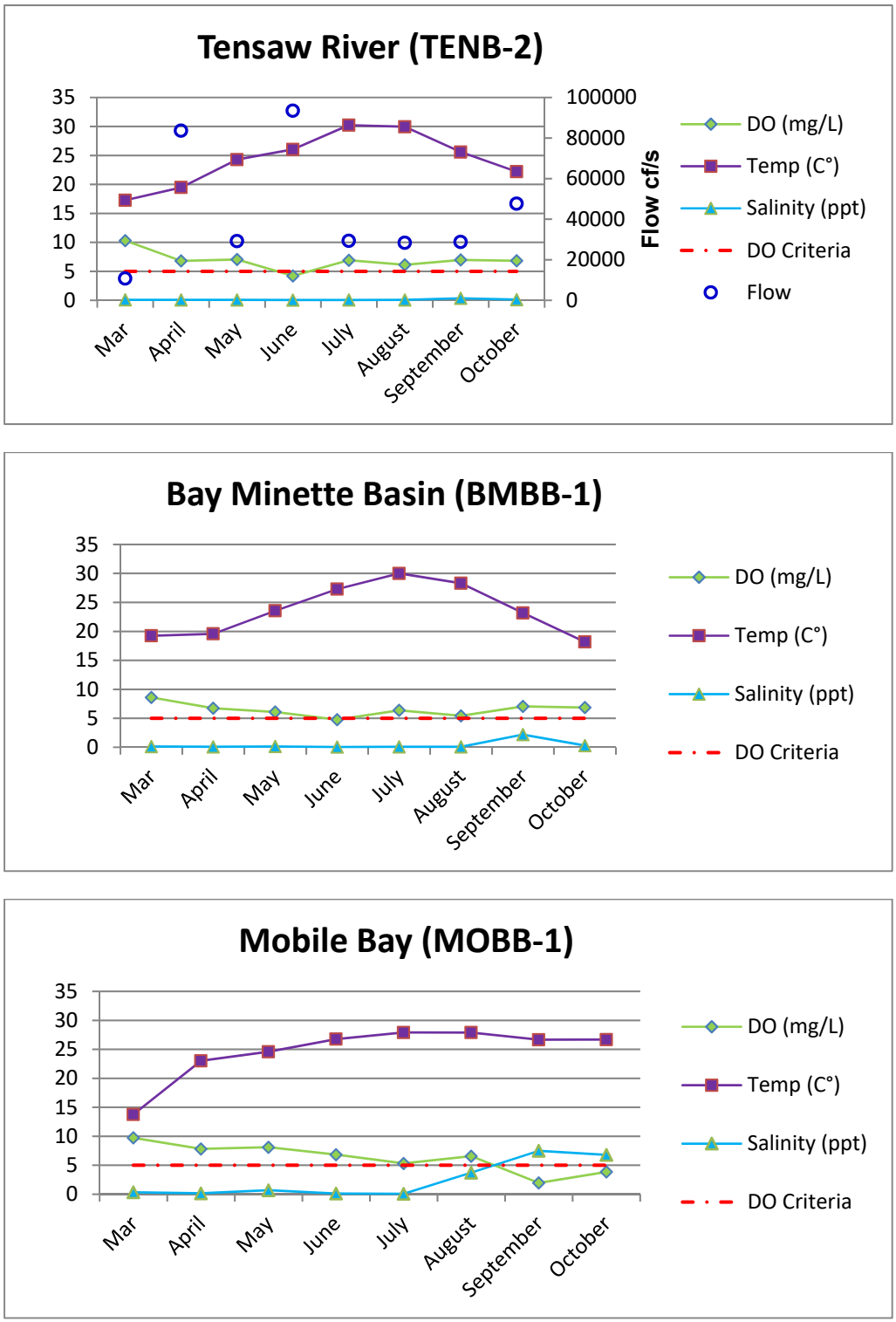

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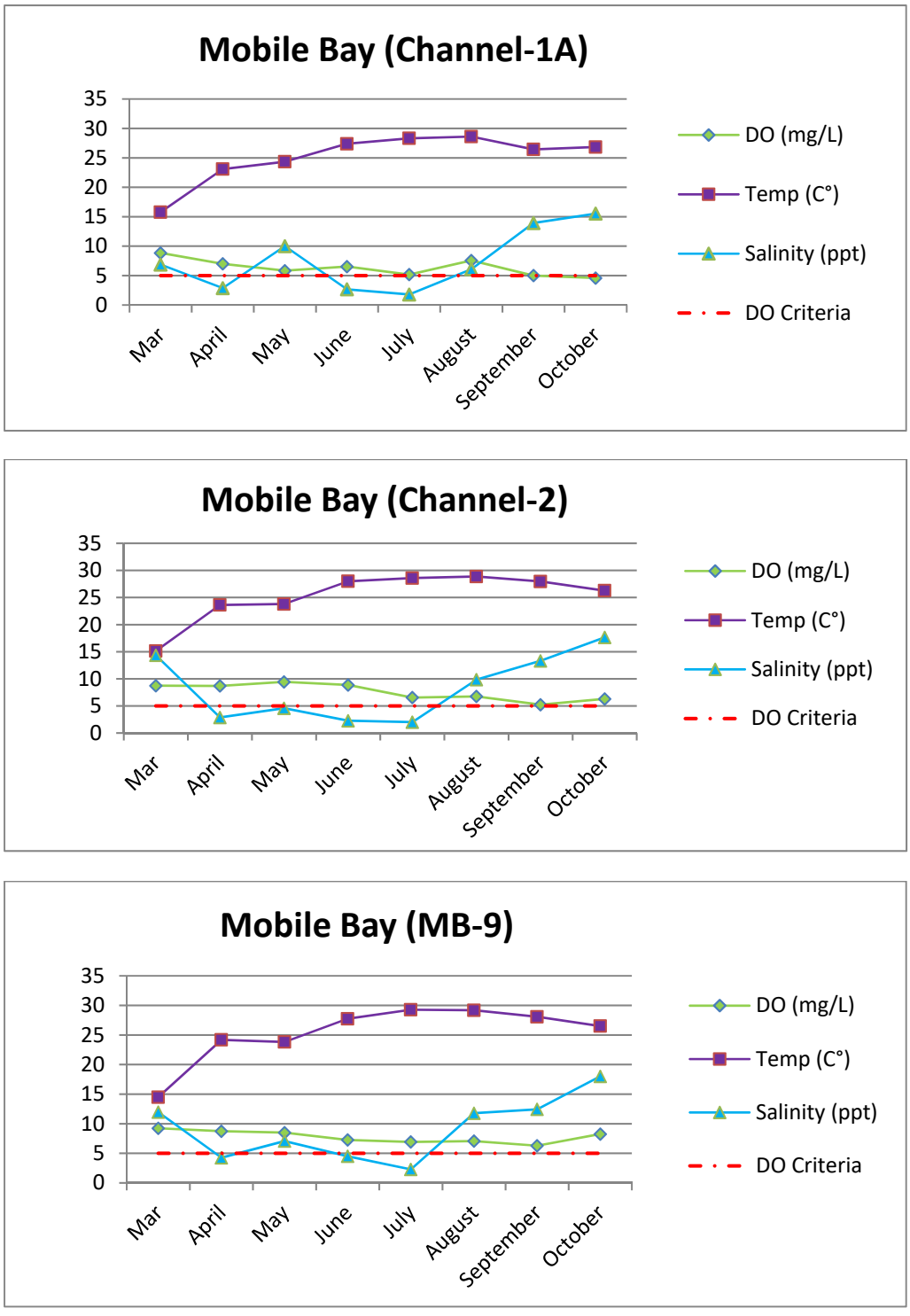

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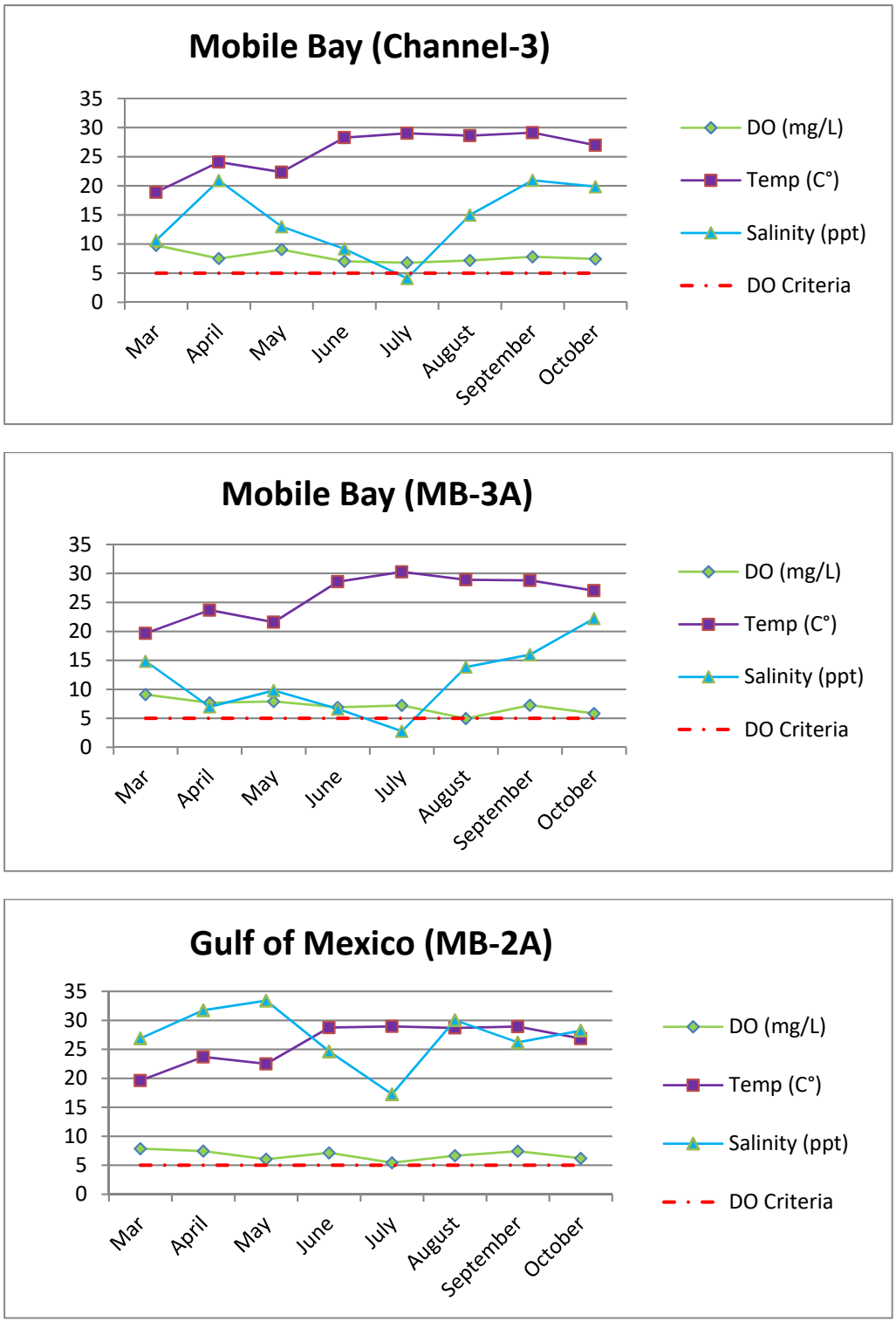

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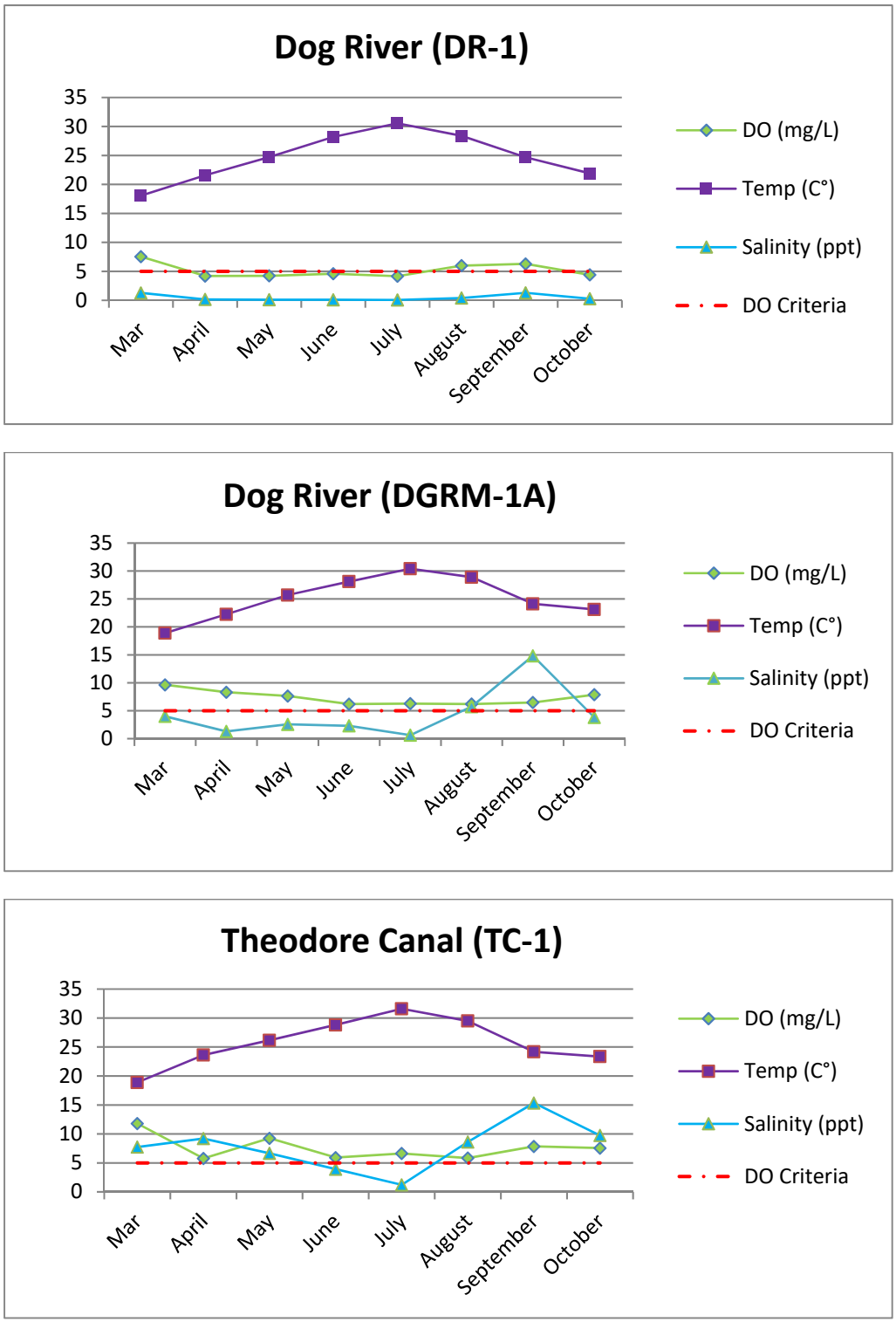

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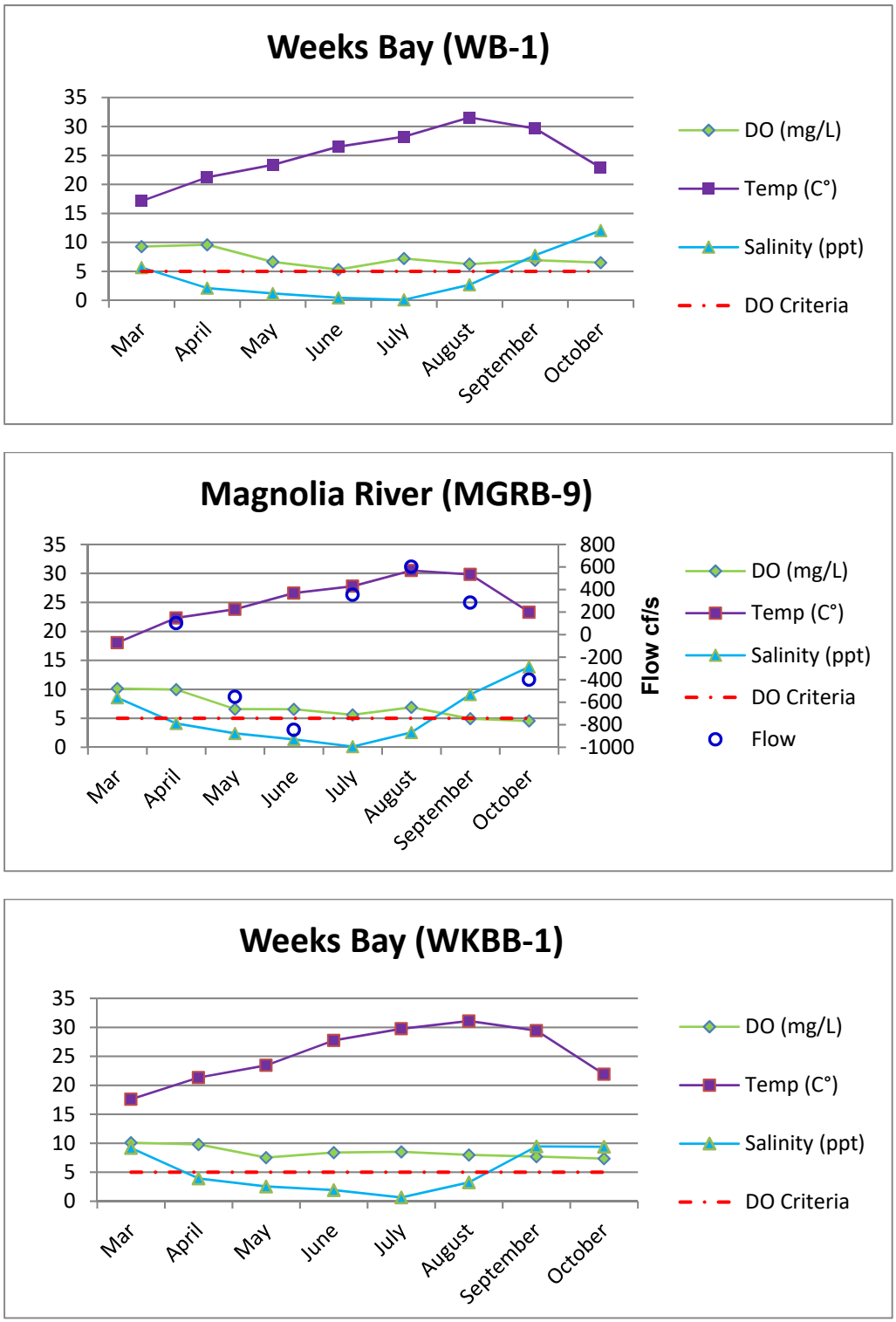
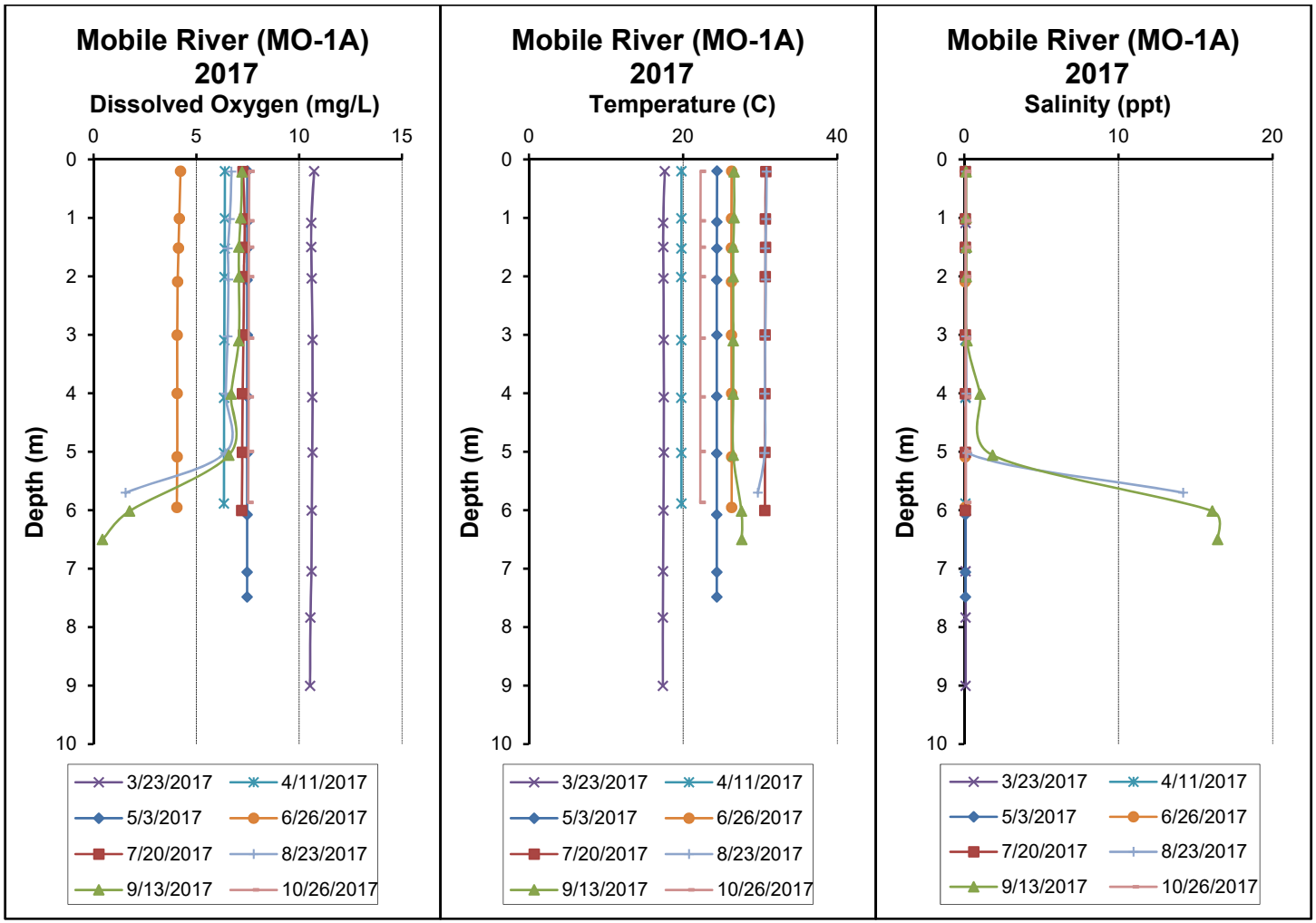


Figure 11. Monthly depth profiles of Dissolved Oxygen, Temperature, and Salinity for Mobile Bay Sub-Watershed, March-October 2017.



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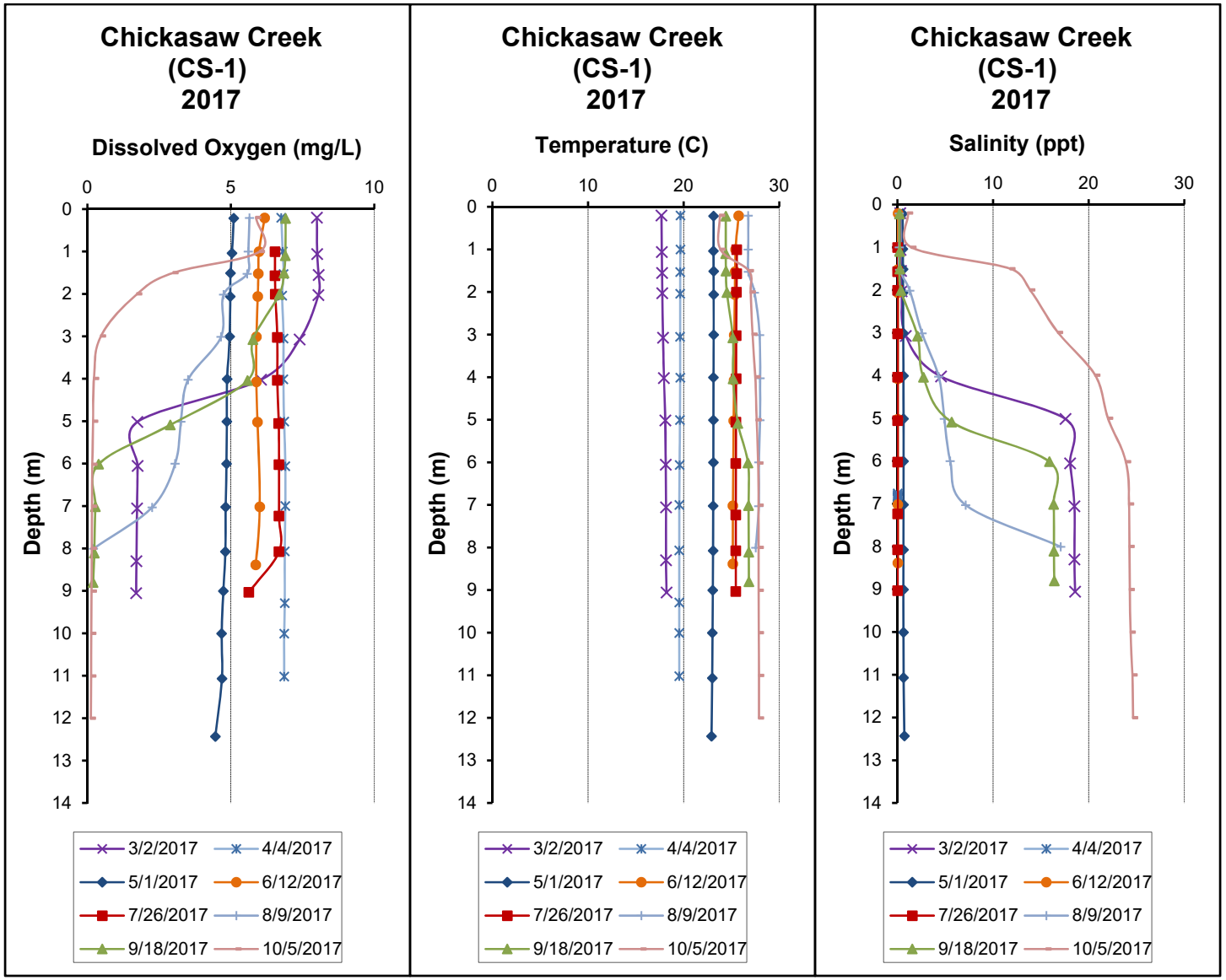

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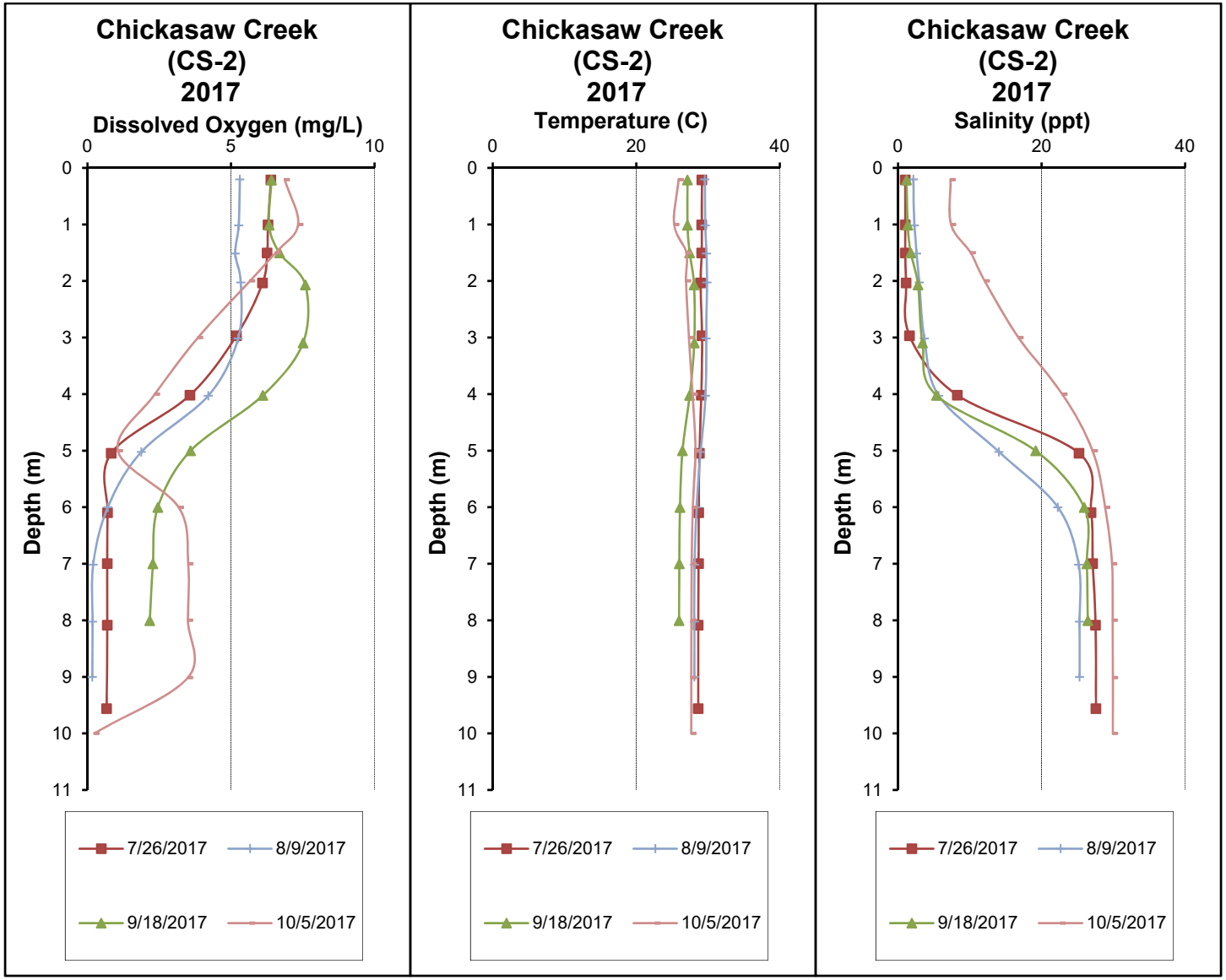

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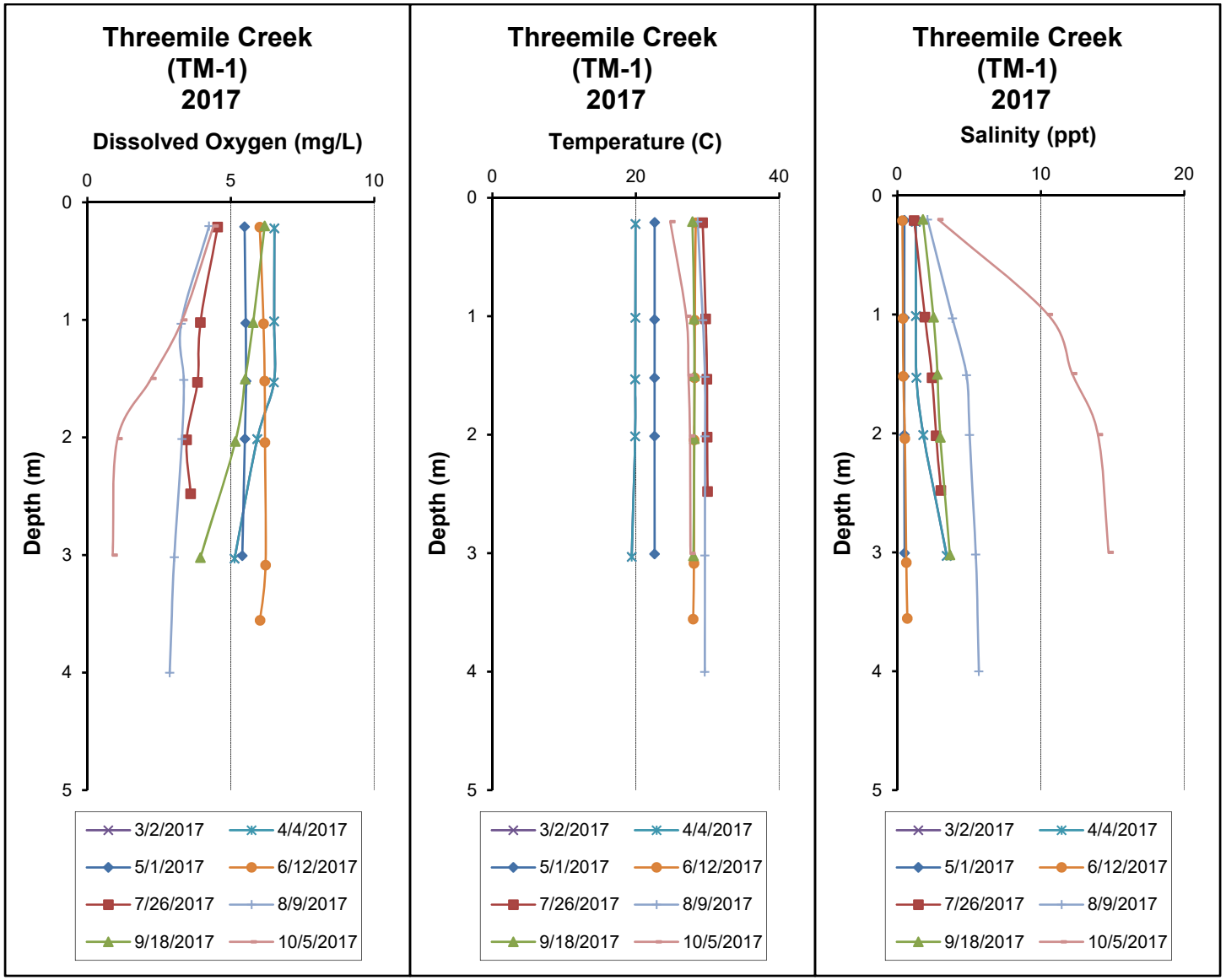

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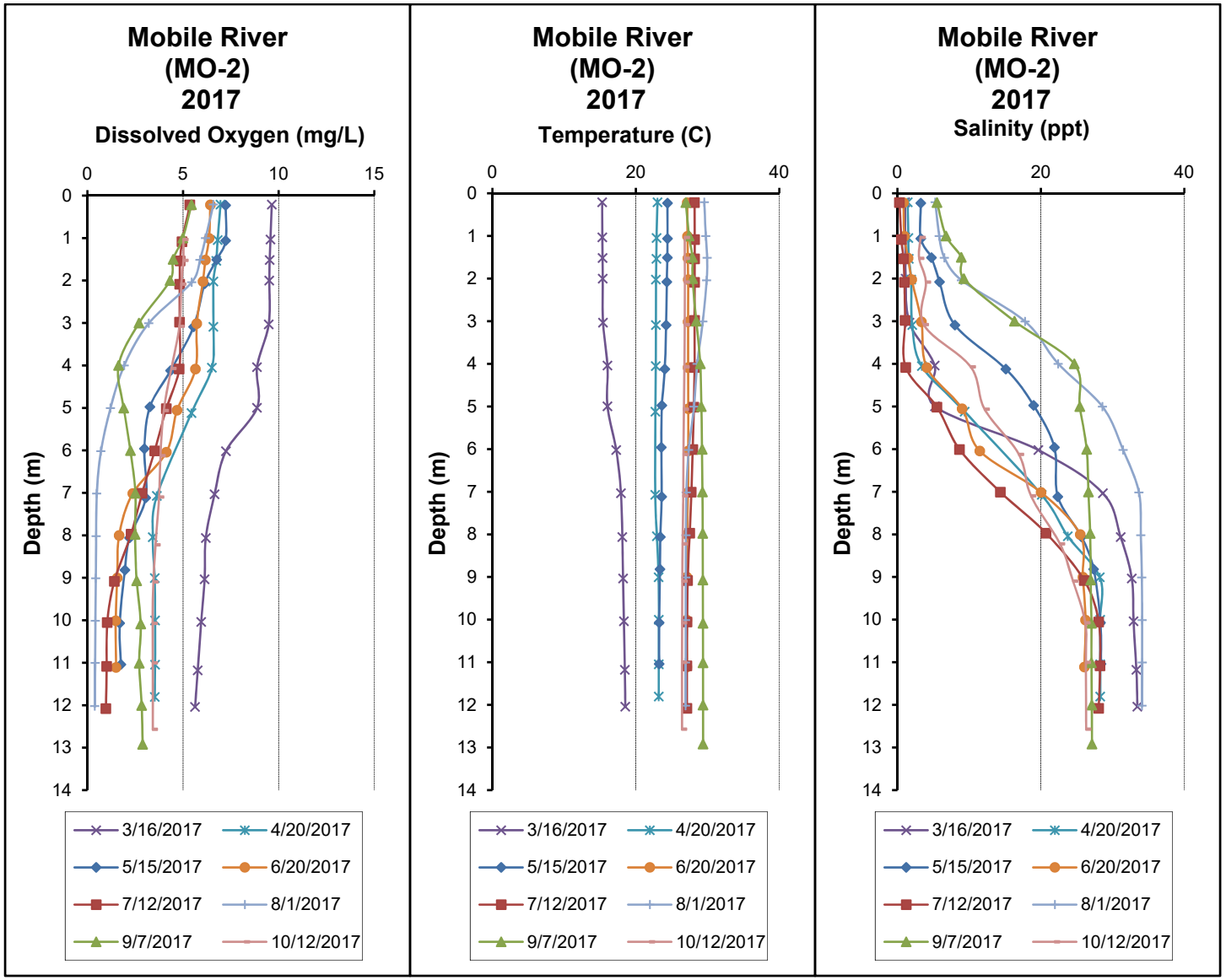

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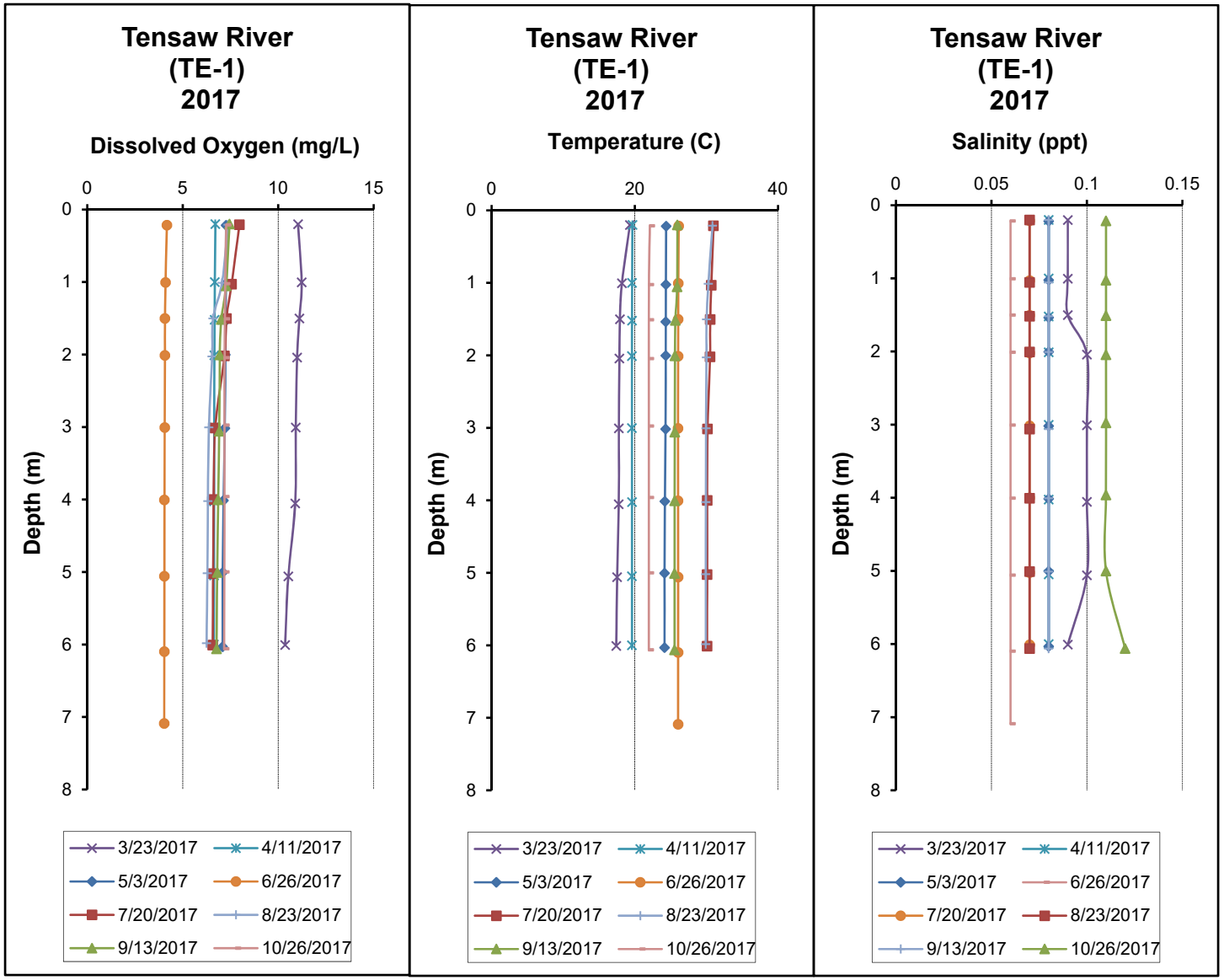

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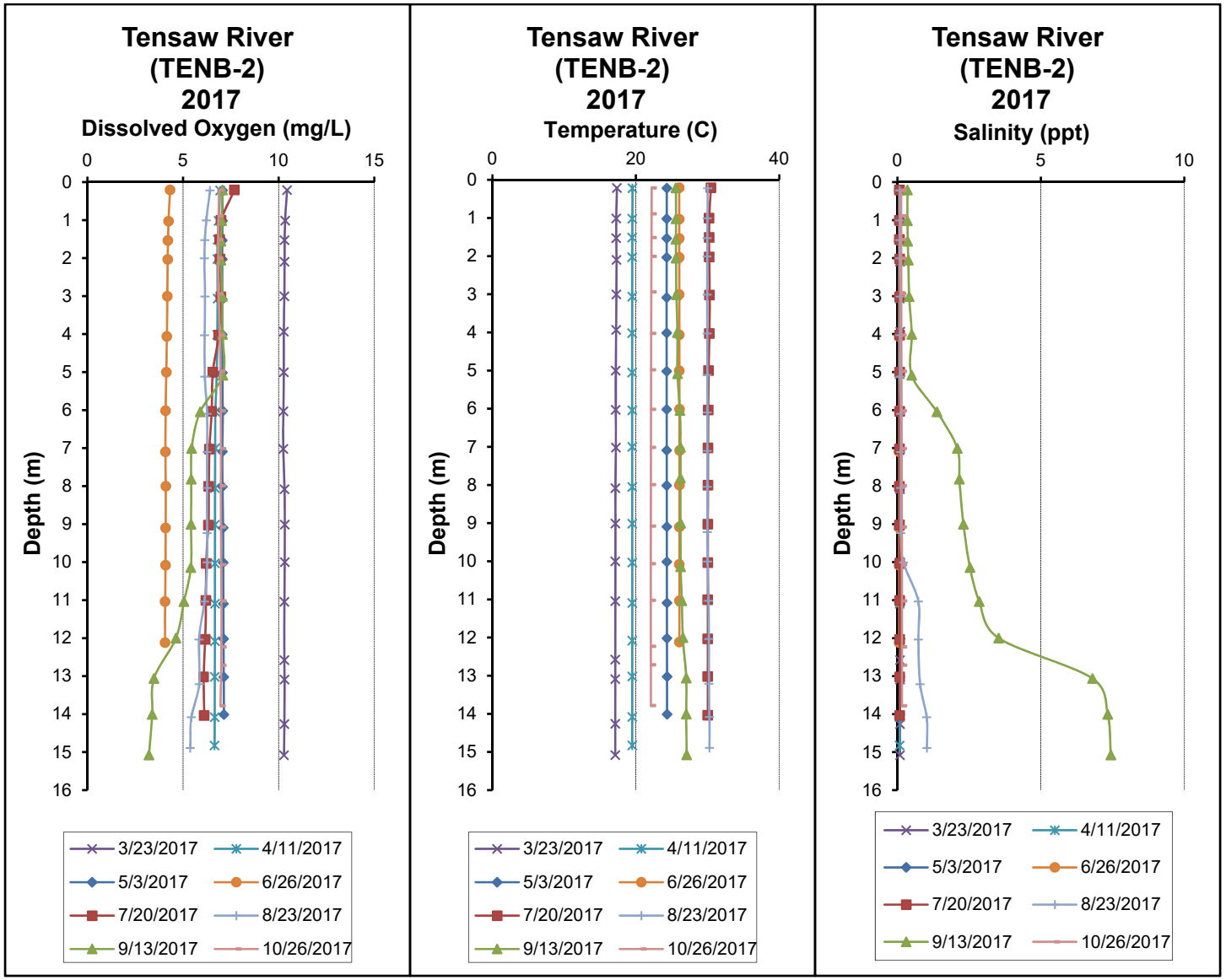

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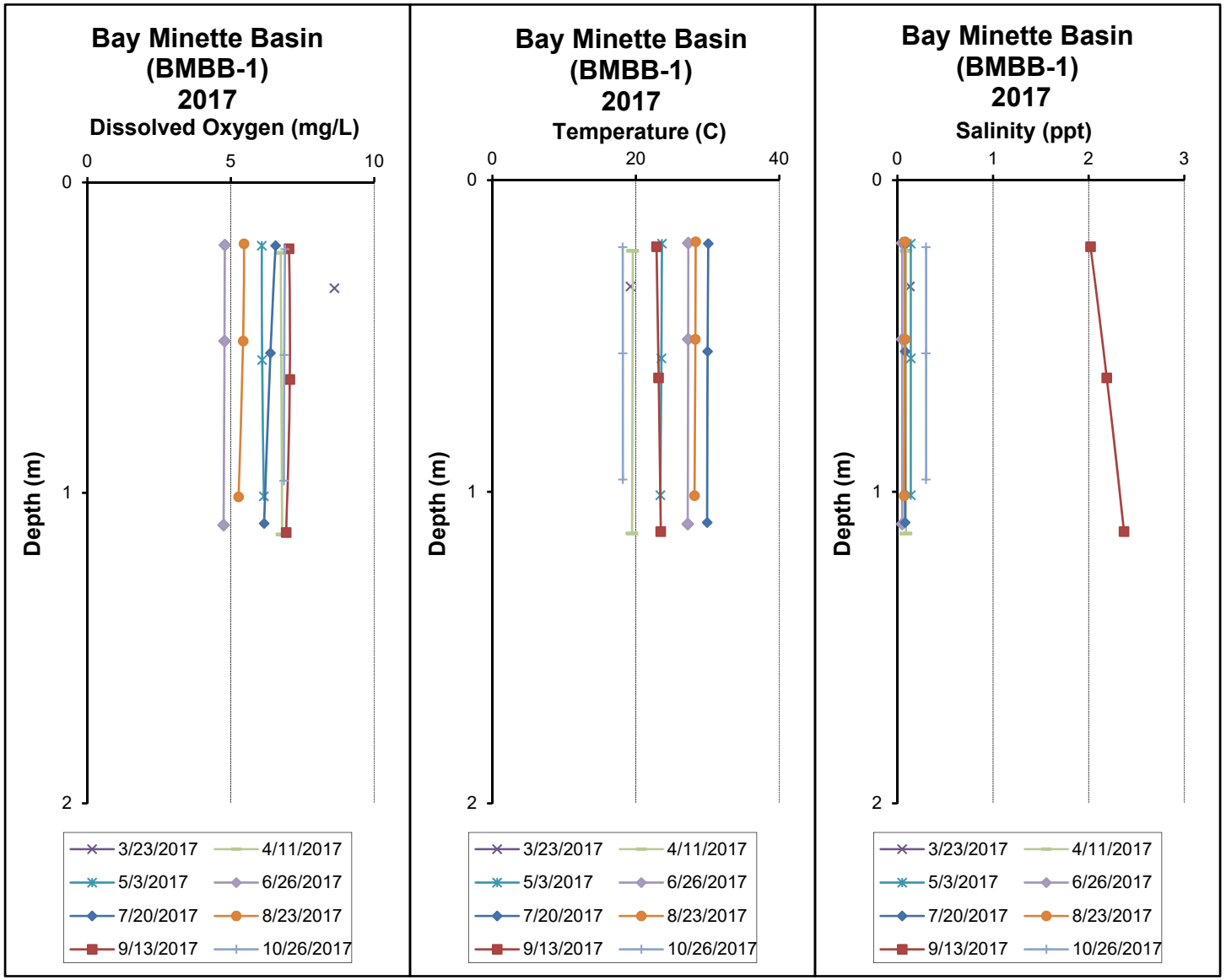

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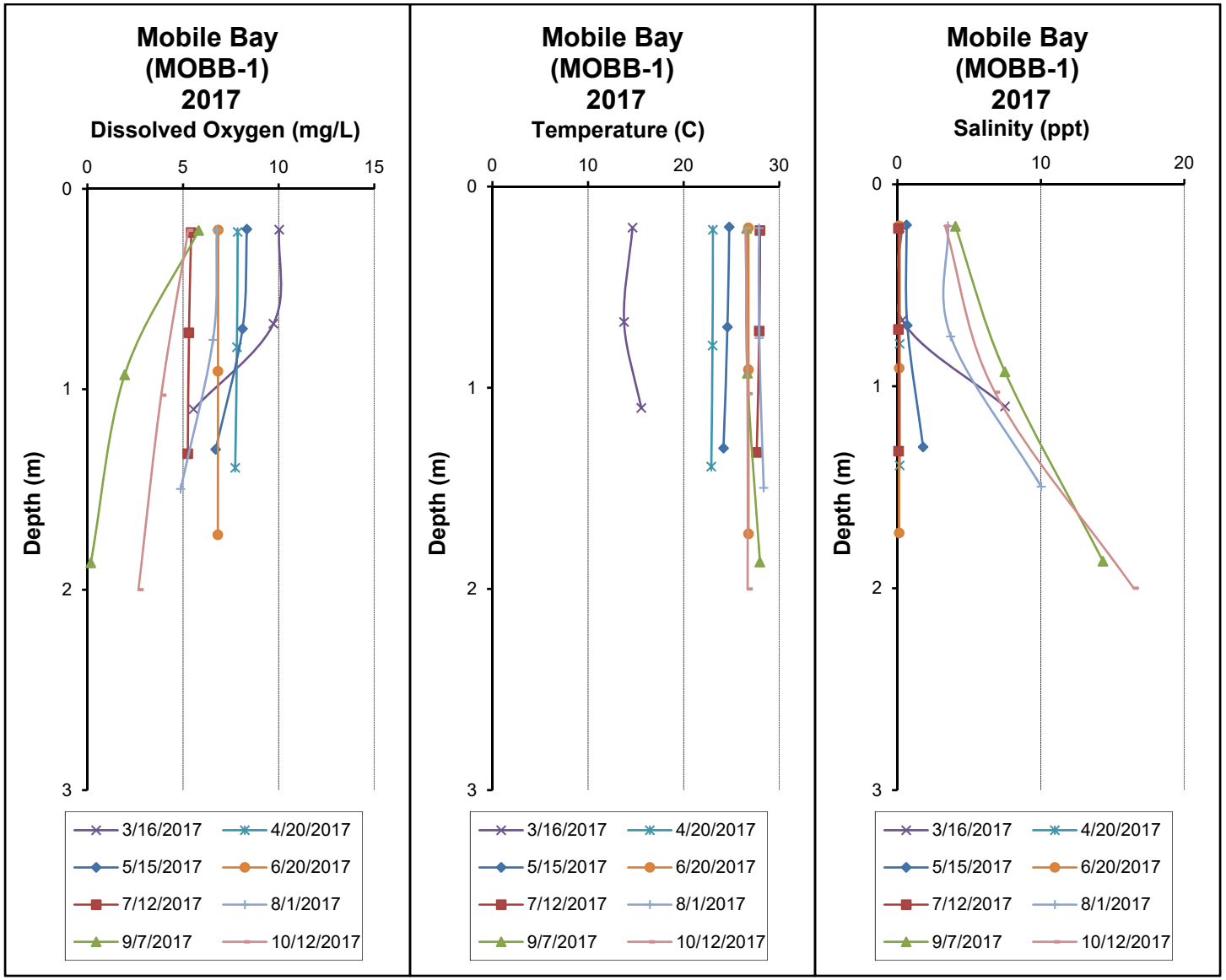

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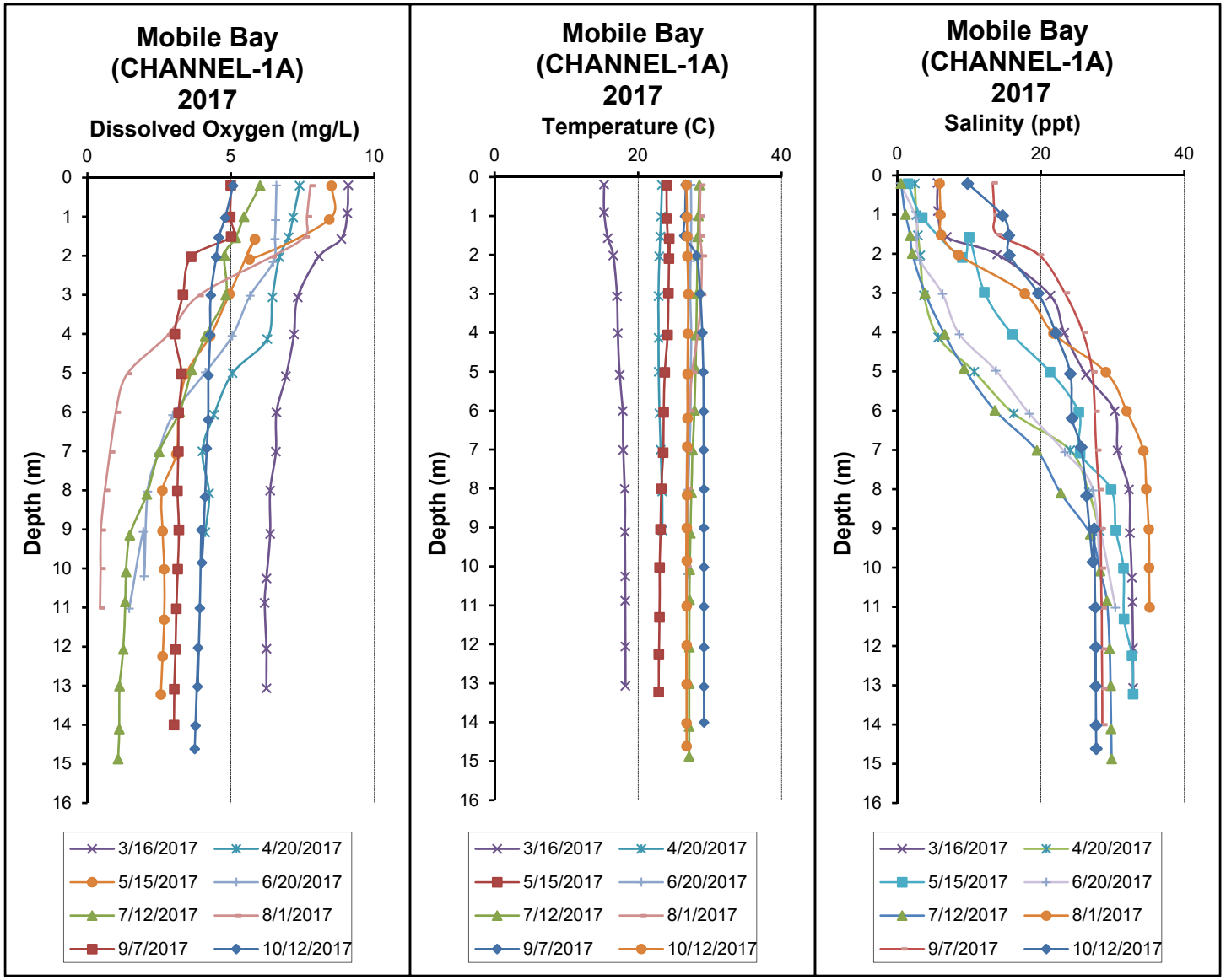

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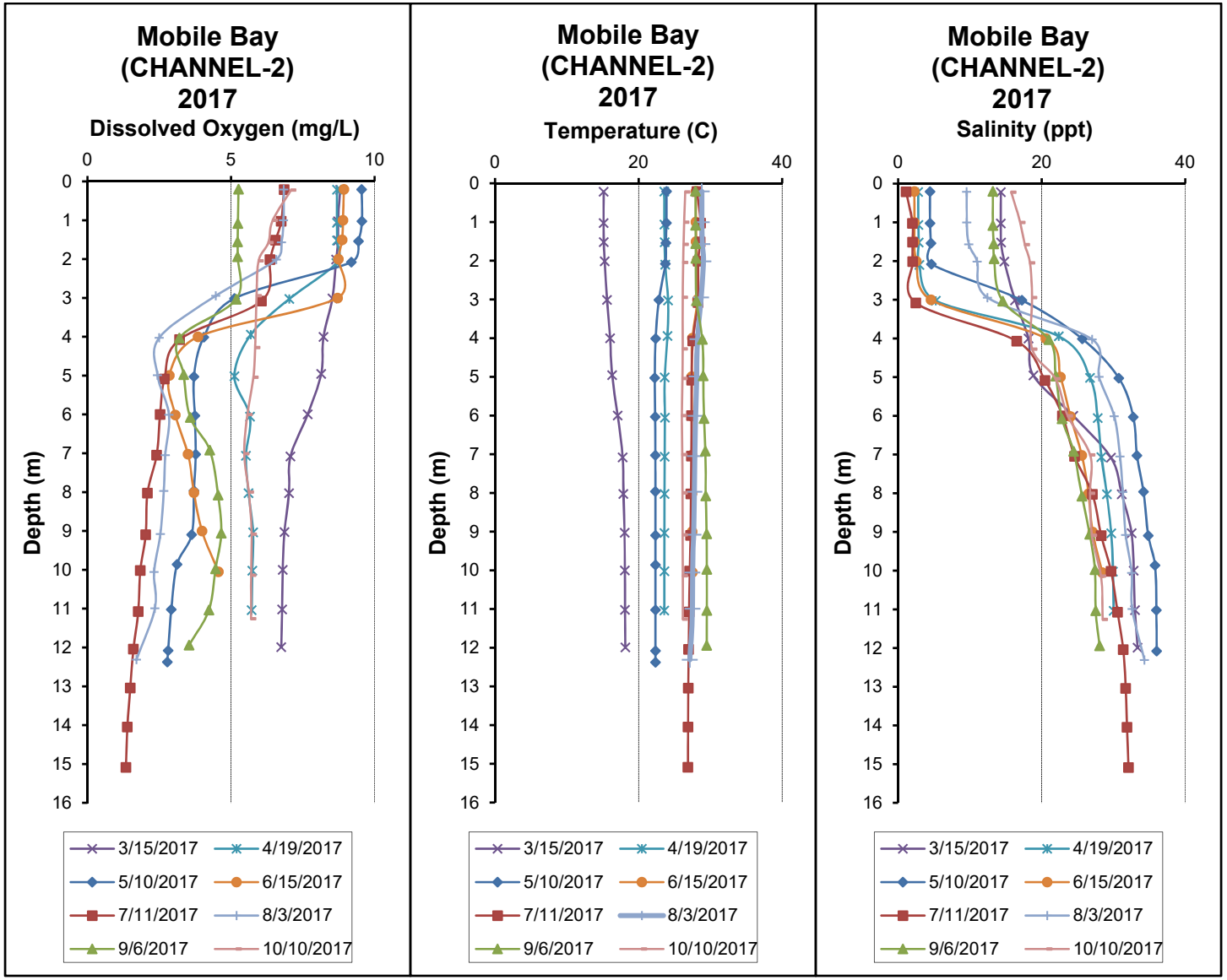

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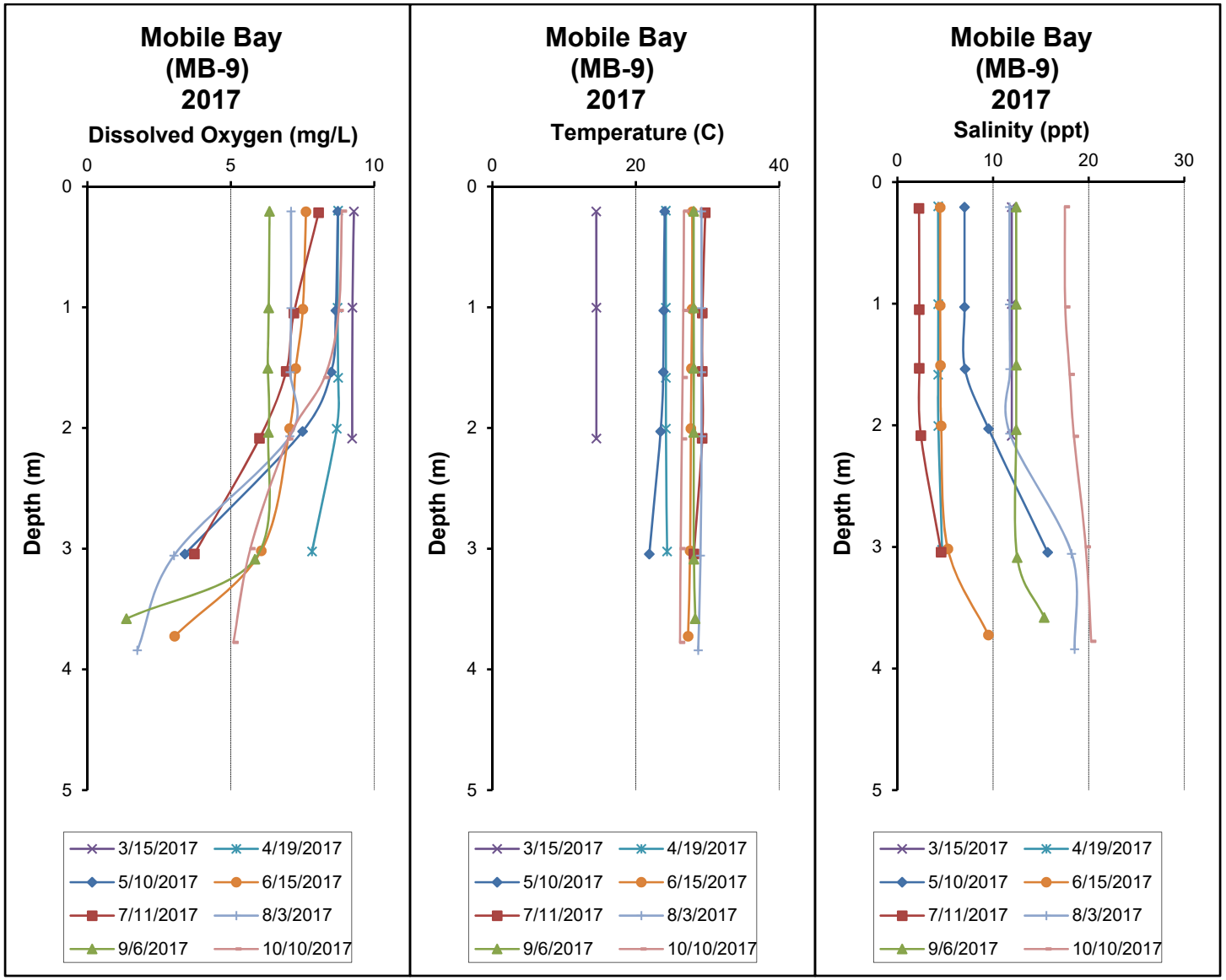

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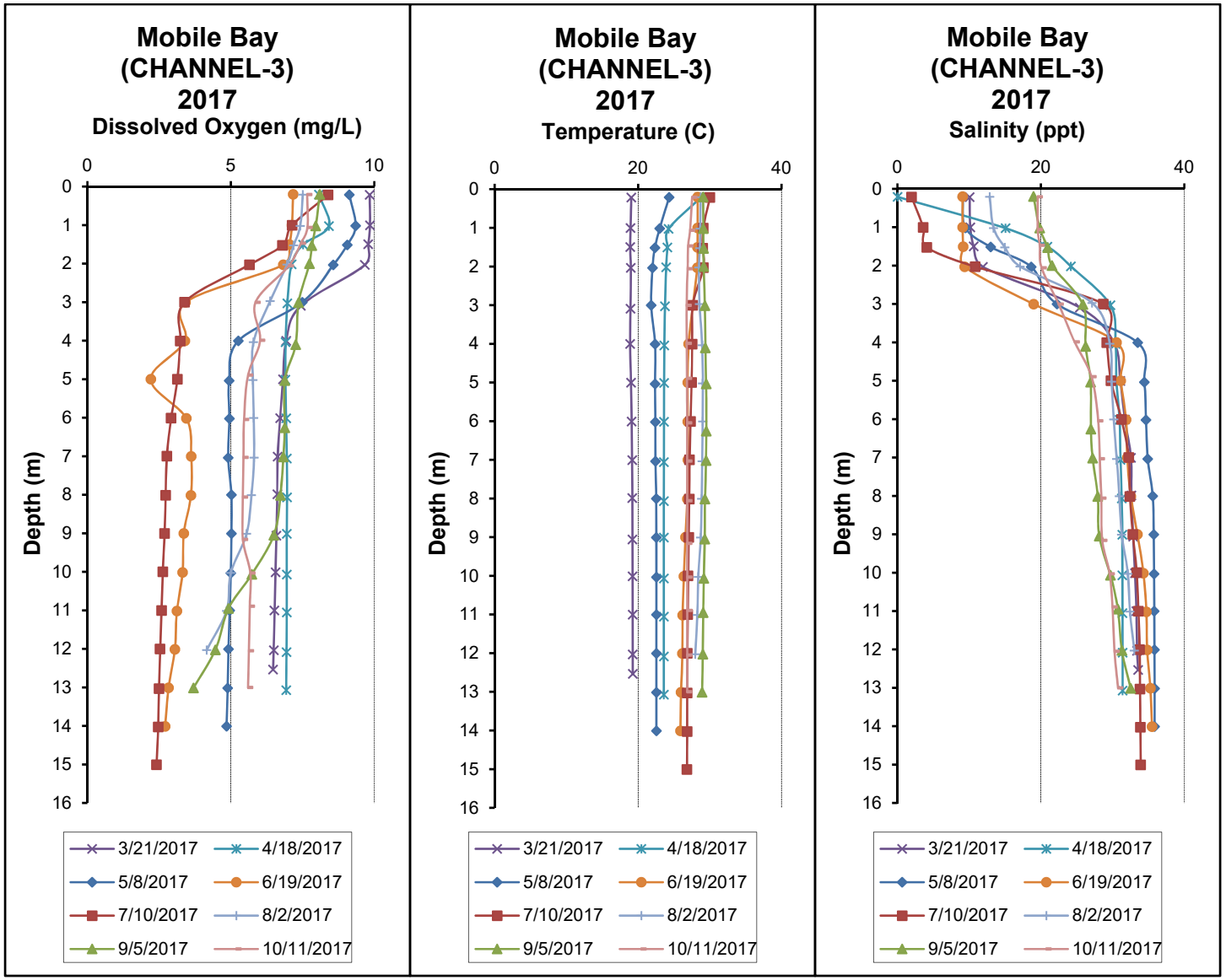

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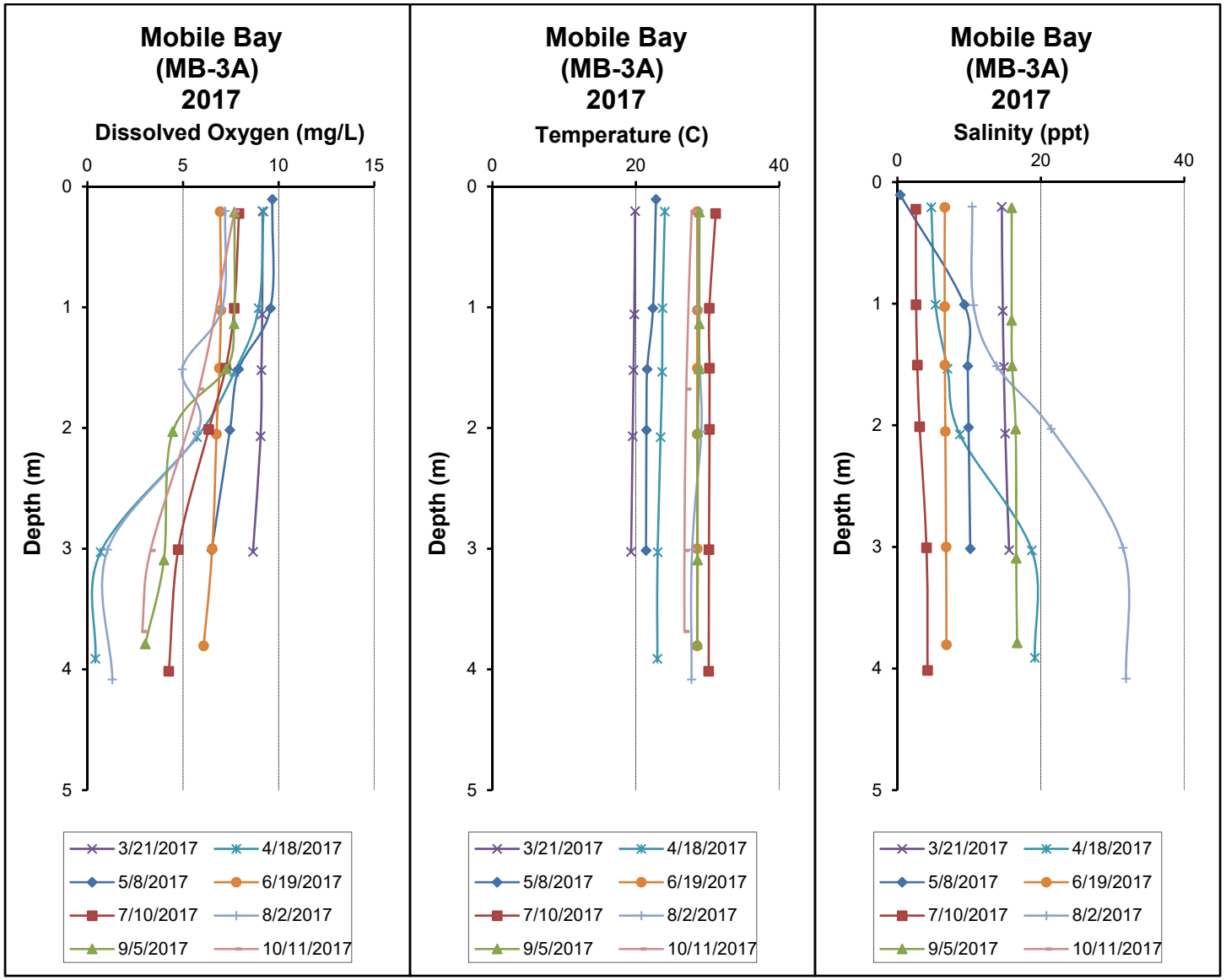

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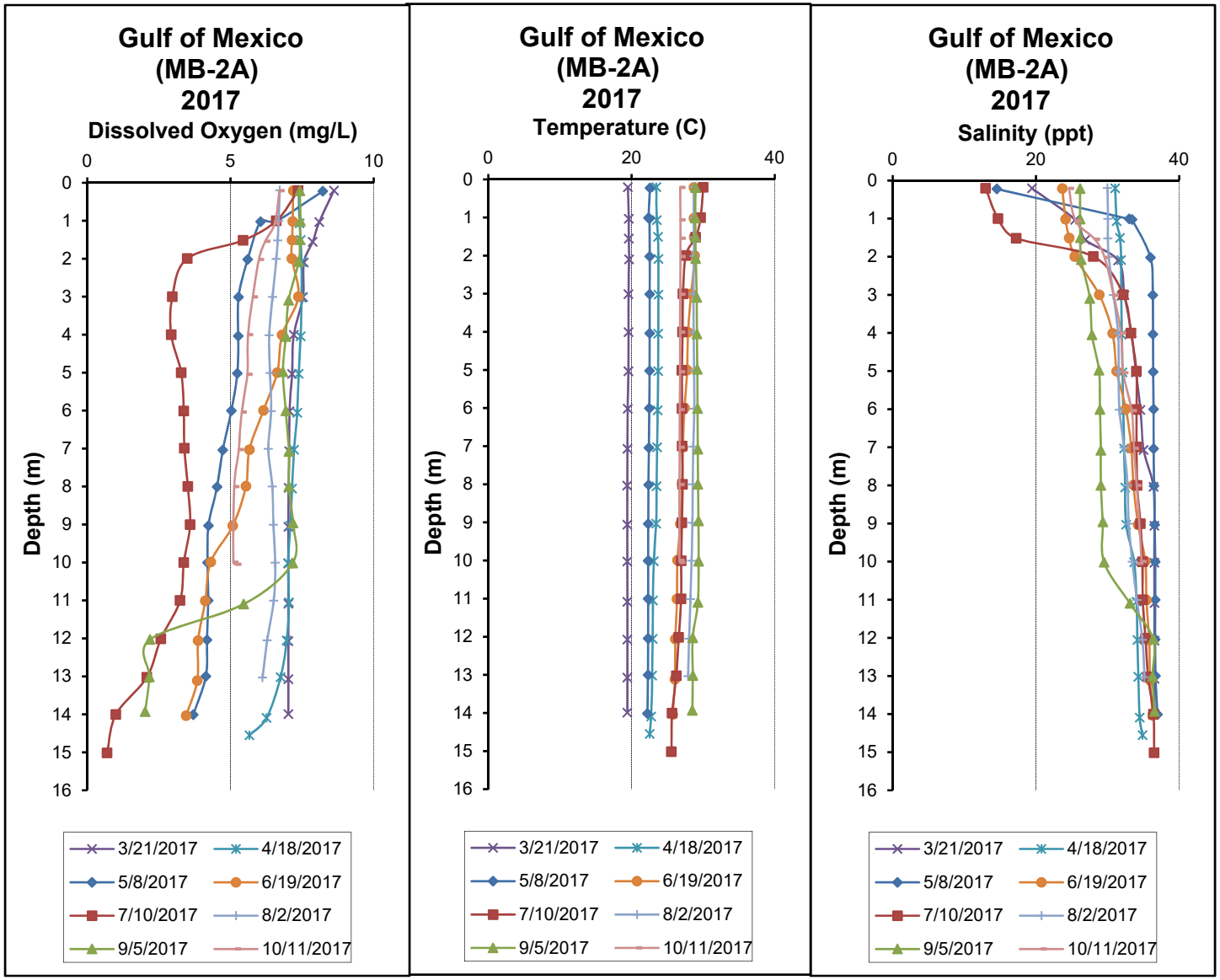

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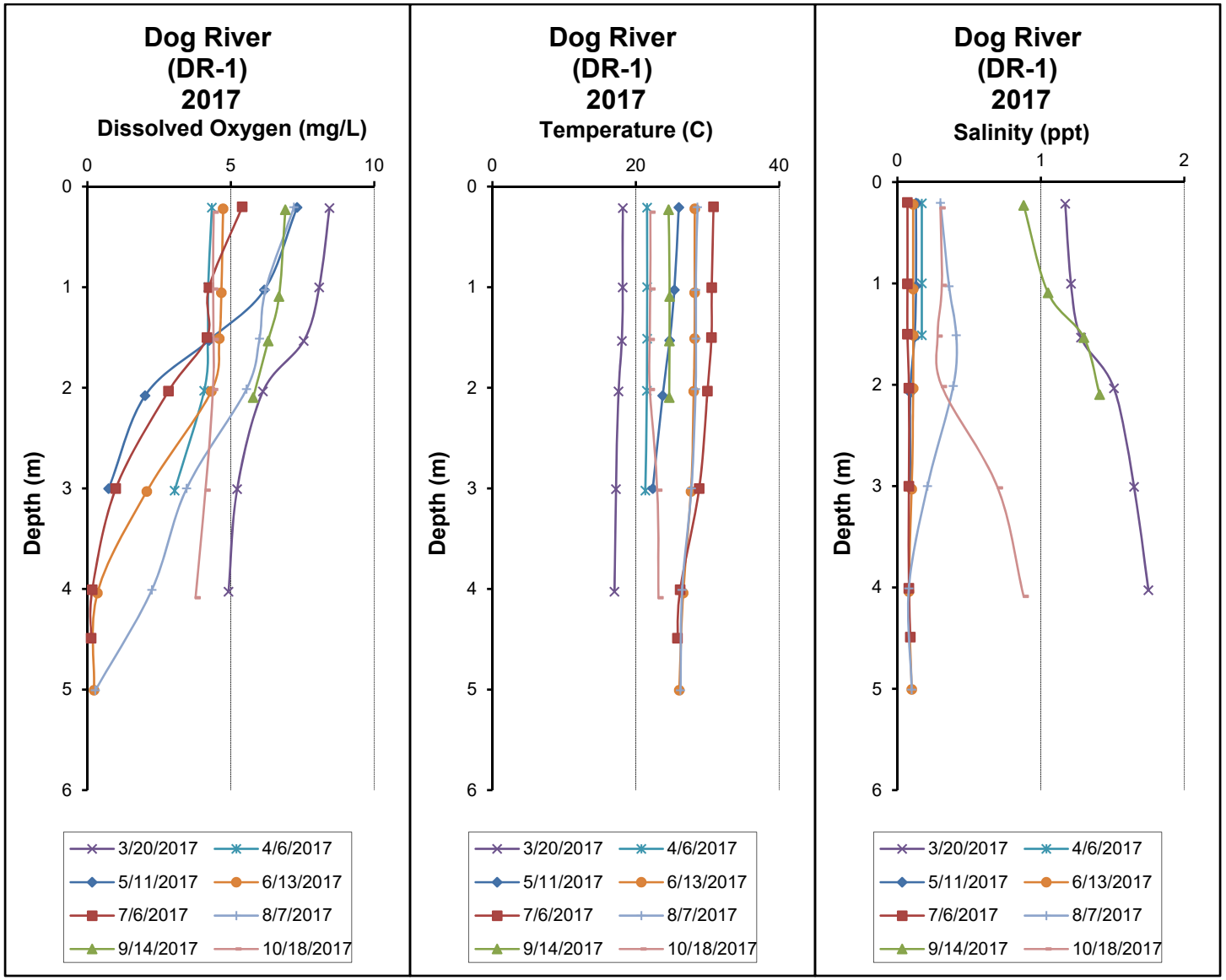

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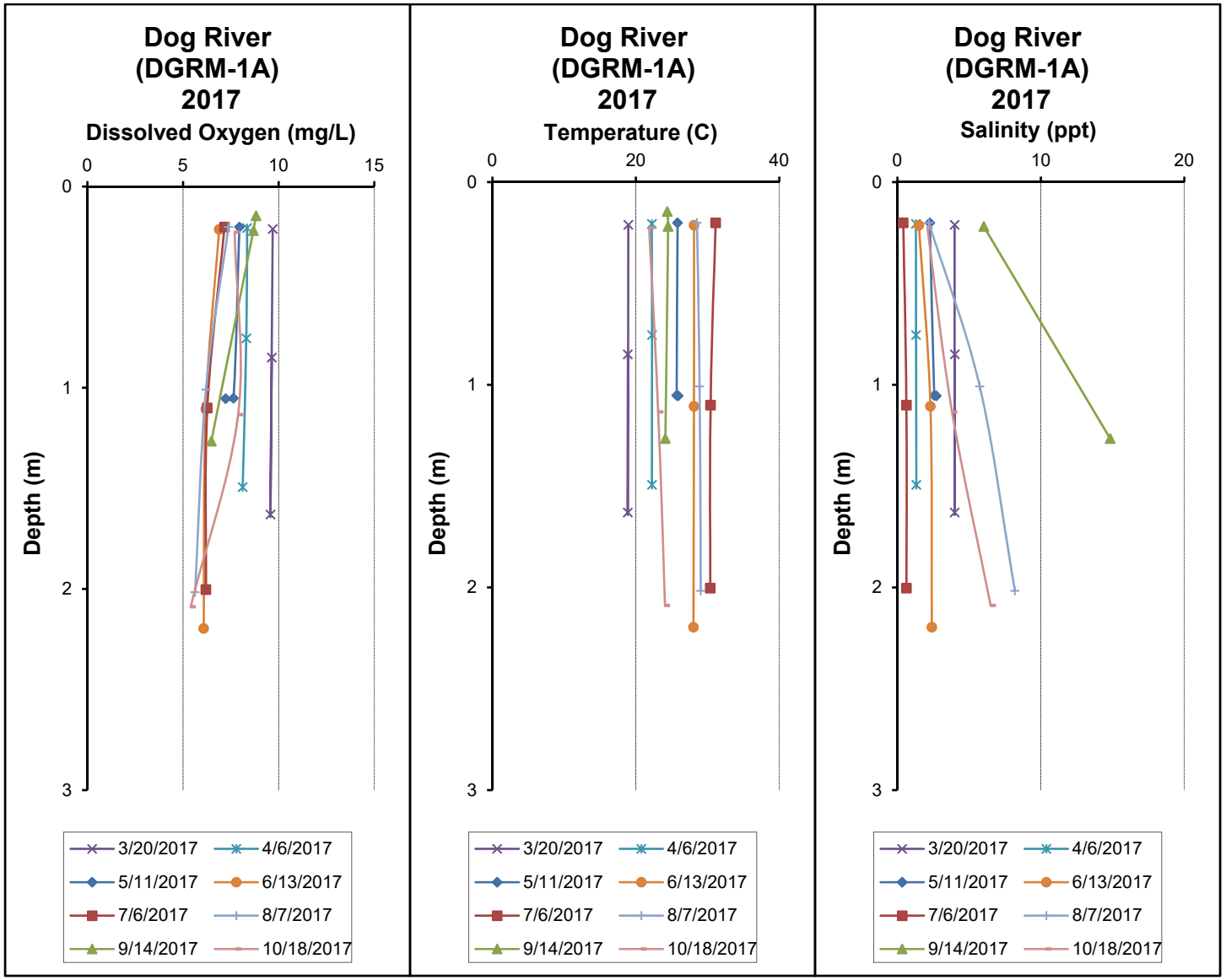

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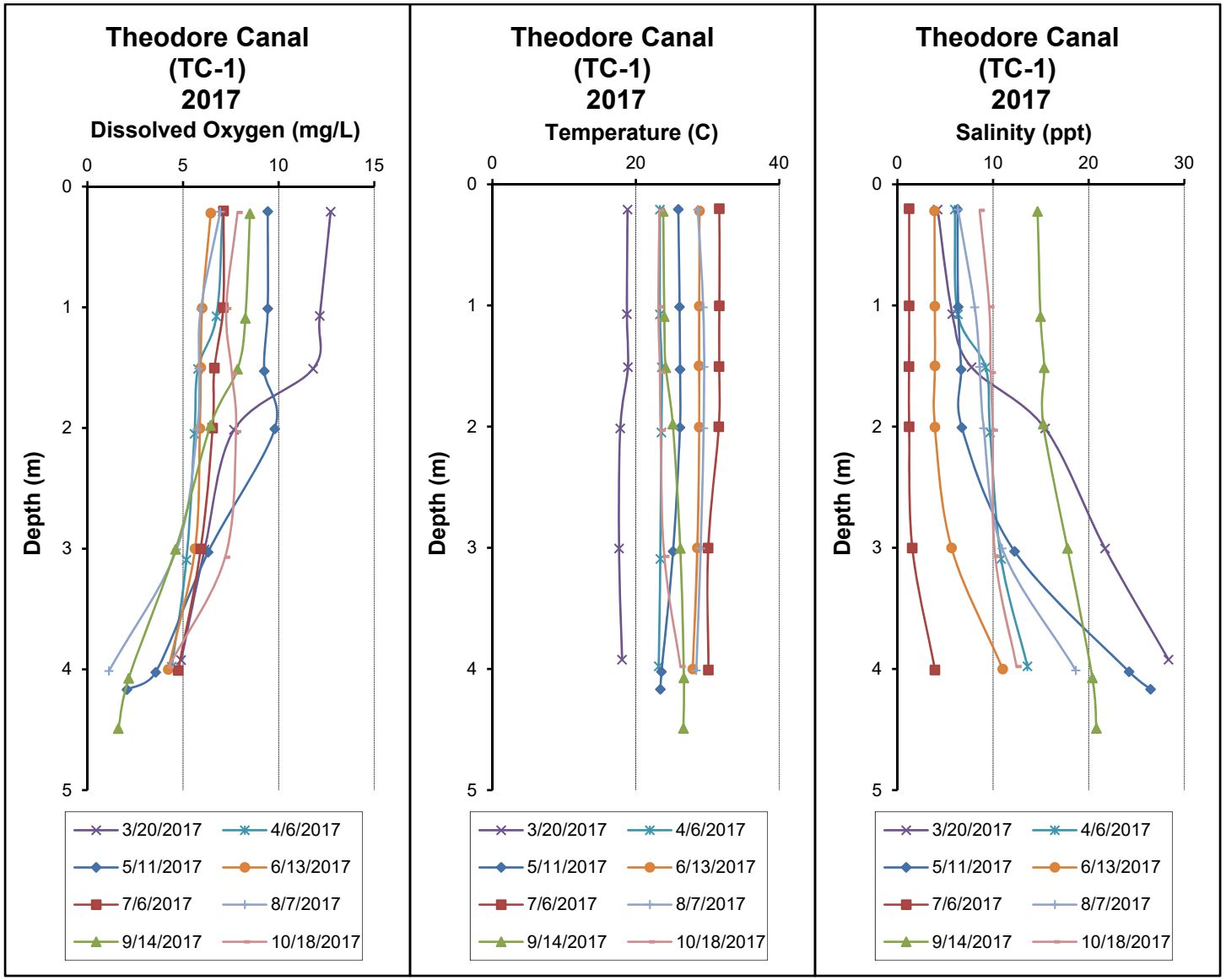

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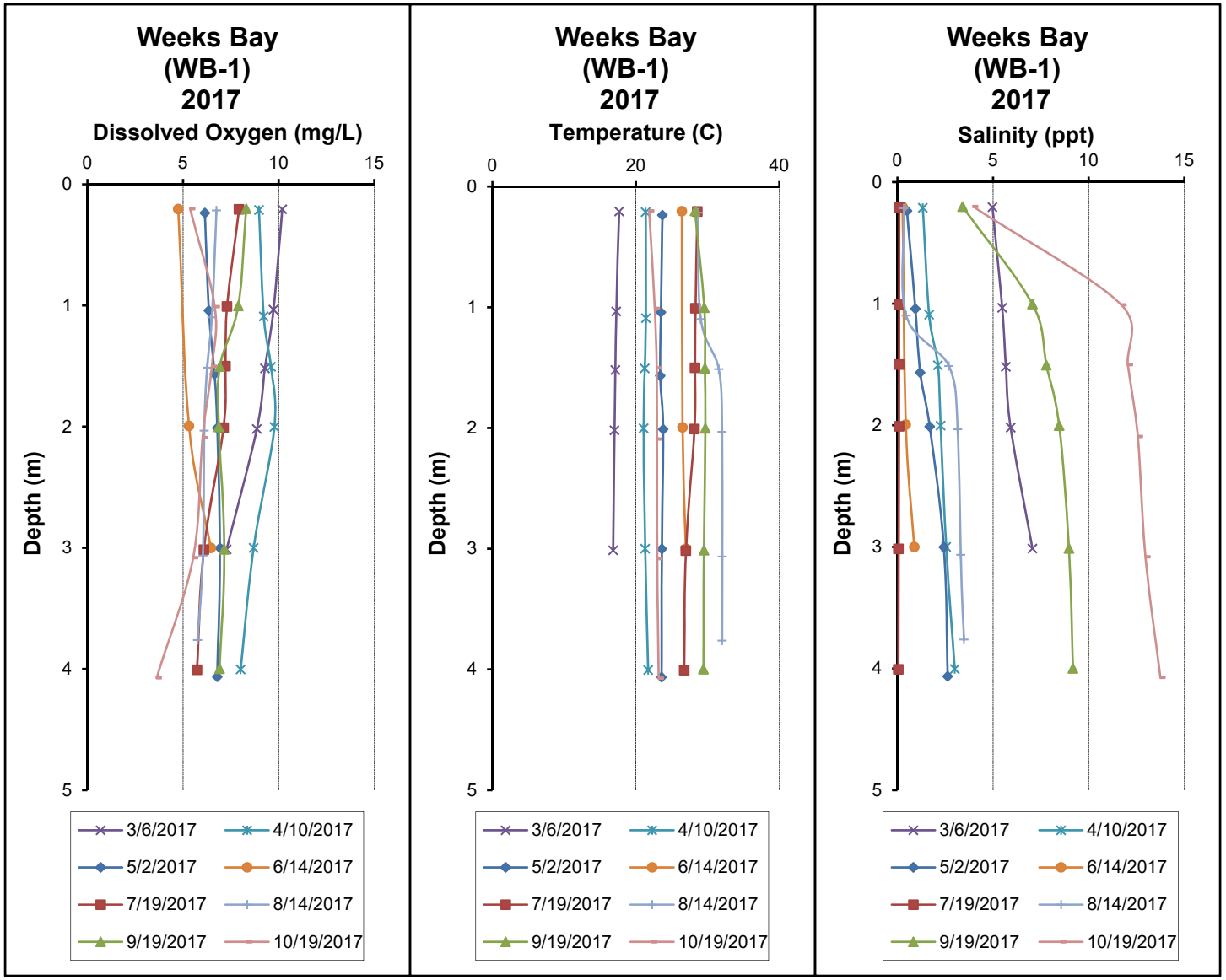

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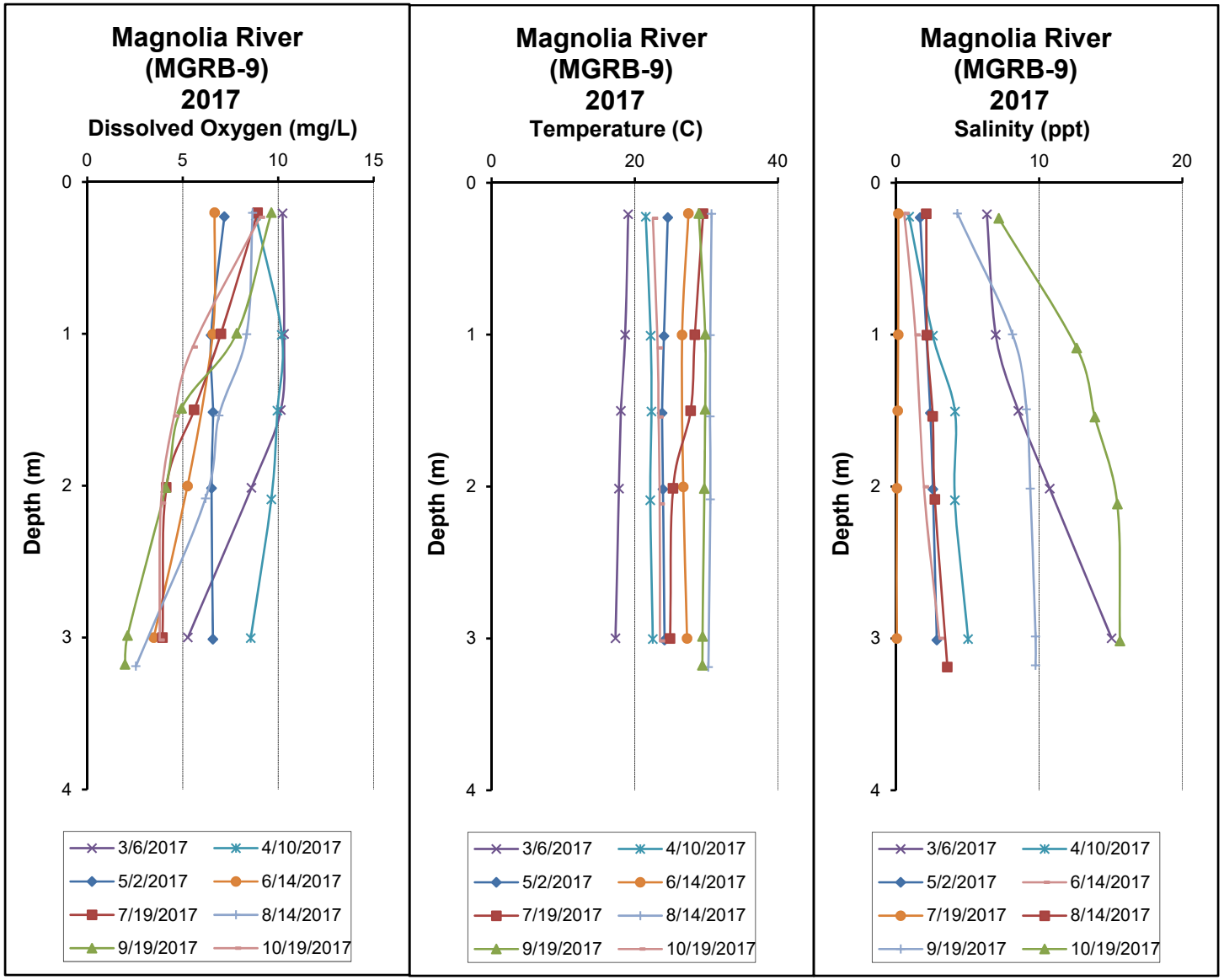

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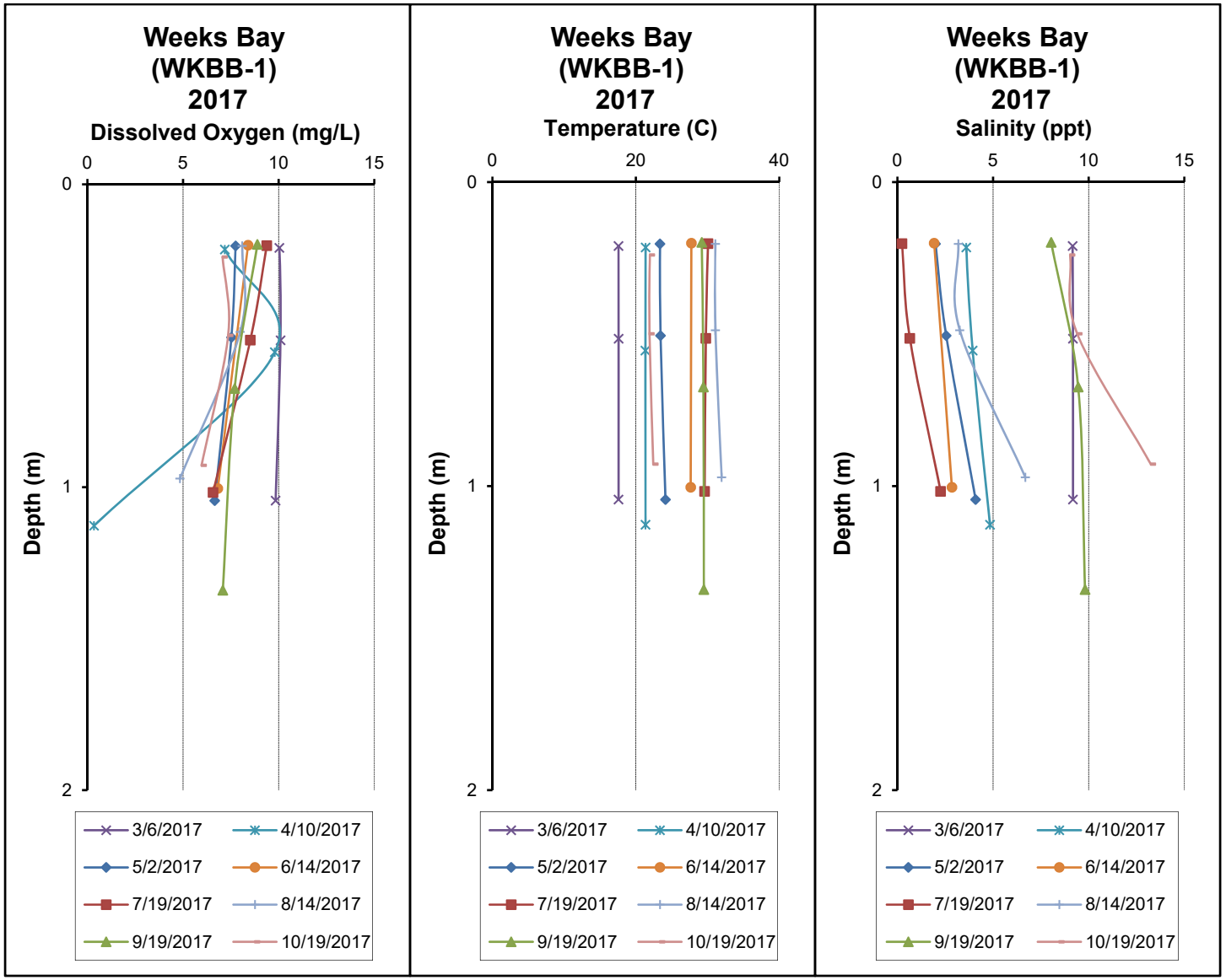

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APPENDIX

Appendix Table 1. Summary of Mobile Bay Sub-Watershed water quality data collected during the 2017 sampling season. 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	E	Q
BMBB-1	**Physical**								
	Temperature (°C)	8	18.2	30.0	23.4	23.7	4.5		
	Turbidity (NTU)	11	9.6	37.6	12.2	17.8	9.2		
	Total Dissolved Solids (mg/L)	8	90.0	2120.0	137.0	398.9	699.6		
	Total Suspended Solids (mg/L)	8	6.0	16.0	11.0	10.8	3.5		
	Specific Conductance (µmhos/cm)	8	101.4	4126.9	235.0	744.3	1376.2		
	Hardness (mg/L)	1				46.8			
	Alkalinity (mg/L)	8	< 0.6	44.0	18.7	20.8	13.6		
	Chemical								
	Dissolved Oxygen (mg/L)	8	4.8 C	8.6	6.6	6.5	1.1	1	
	pH (SU)	8	6.2	7.2	7.0	6.9	0.3		
J	Ammonia Nitrogen (mg/L)	8	< 0.013	0.068	0.010	0.020	0.021		
J	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.070	0.005	0.021	0.026		
	Total Kjeldahl Nitrogen (mg/L)	8	0.360	0.590	0.470	0.482	0.079		
J	Dis Reactive Phosphorus (mg/L)	8	0.004	0.016	0.009	0.009	0.004		
J	Total Phosphorus (mg/L)	8	0.013	0.054	0.044	0.042	0.013		
J	CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
J	Chlorides (mg/L)	8	13.0	1100.0	44.5	180.2	374.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.335			
	Iron (T) (mg/L)	1				0.798			
J	Manganese (T) (mg/L)	1				0.043			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
	Antimony (µg/L)	1				< 0.441			
J	Arsenic (µg/L)	1				0.598			
	Cadmium (µg/L)	1				< 0.116			
J	Chromium (µg/L)	1				0.418			
J	Copper (µg/L)	1				1.722			
	Iron (mg/L)	1				0.370			
	Lead (µg/L)	1				< 0.156			
	Manganese (mg/L)	1				< 0.004			
J	Nickel (µg/L)	1				0.805			
	Selenium (µg/L)	1				< 0.217			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
J	Zinc (µg/L)	1				2.338			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	2.10	0.50	0.90	0.61		
J	Enterococci (MPN/DL)	4	10	20	8	10	7		

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
CHANNEL-1A	**Physical**								
	Temperature (°C)	12	12.0	28.6	23.7	22.1	5.9		
	Turbidity (NTU)	16	7.0	40.0	13.6	18.6	11.5		
	Total Dissolved Solids (mg/L)	12	548.0	17700.0	5000.0	6626.5	6164.0		
	Total Suspended Solids (mg/L)	12	6.0	18.0	11.5	12.2	4.1		
	Specific Conductance (µmhos/cm)	12	3437.1	26599.1	11383.1	12784.3	8406.7		
	Hardness (mg/L)	3	129.0	398.0	202.0	243.0	139.1		
	J Alkalinity (mg/L)	12	10.0	86.0	50.5	50.2	22.0		
	Chemical								
	Dissolved Oxygen (mg/L)	12	4.6 C	8.9	7.0	6.8	1.4	1	
	pH (SU)	12	5.9 C	7.9	7.3	7.2	0.6	1	
	J Ammonia Nitrogen (mg/L)	12	< 0.013	0.160	0.040	0.055	0.044		
	J Nitrate+Nitrite Nitrogen (mg/L)	12	< 0.010	0.212	0.128	0.130	0.063		
	Total Kjeldahl Nitrogen (mg/L)	12	0.340	1.100	0.590	0.608	0.202		
	J Dis Reactive Phosphorus (mg/L)	12	< 0.003	0.031	0.017	0.016	0.008		
	J Total Phosphorus (mg/L)	12	0.006	0.079	0.058	0.052	0.022		
	J CBOD-5 (mg/L)	12	< 2.0	2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	12	140.0	9700.0	2800.0	3305.0	3155.6		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.453			
	Iron (T) (mg/L)	1				0.855			
	J Manganese (T) (mg/L)	1				0.011			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				1.500			
	Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.517			
	J Copper (µg/L)	1				2.594			
	Iron (mg/L)	1				0.348			
	J Lead (µg/L)	1				0.199			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				1.197			
	J Selenium (µg/L)	1				2.474			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				2.207			
	Biological								
	Chlorophyll a (mg/m³)	12	< 1.00	5.10	0.50	1.26	1.41		
	Fecal Coliform (MPN/DL)	1				75.0			
	J,L Enterococci (MPN/DL)	8	10	30	8	14	11		

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
CHANNEL-2	**Physical**								
	Temperature (°C)	8	15.1	28.9	27.1	25.3	4.6		
	Turbidity (NTU)	12	5.1	18.9	8.9	10.1	4.2		
	Total Dissolved Solids (mg/L)	8	1630.0	16600.0	8195.0	8535.0	5696.2		
	Total Suspended Solids (mg/L)	8	7.0	53.0	11.0	16.4	15.3		
	Specific Conductance (µmhos/cm)	8	3837.0	28656.2	12542.8	14126.9	9915.0		
	Hardness (mg/L)	1				297.0			
	Alkalinity (mg/L)	8	< 0.6	75.0	51.5	40.3	34.5		
	Chemical								
	Dissolved Oxygen (mg/L)	8	5.2	9.4	7.7	7.6	1.5		
	pH (SU)	8	7.2	8.3	7.9	7.8	0.4		
J	Ammonia Nitrogen (mg/L)	8	< 0.013	0.040	0.006	0.016	0.015		
J	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.010	0.180	0.046	0.056	0.056		
J	Total Kjeldahl Nitrogen (mg/L)	8	0.400	2.500	0.520	0.766	0.704		
J	Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.027	0.010	0.012	0.010		
	Total Phosphorus (mg/L)	8	0.027	0.054	0.042	0.041	0.009		
J	CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	870.0	8600.0	4850.0	4583.8	3096.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.557			
	Iron (T) (mg/L)	1				0.793			
J	Manganese (T) (mg/L)	1				0.029			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	Antimony (µg/L)	1			<	0.441			
J	Arsenic (µg/L)	1				1.666			
	Cadmium (µg/L)	1			<	0.116			
J	Chromium (µg/L)	1				0.461			
J	Copper (µg/L)	1				2.211			
	Iron (mg/L)	1				0.229			
J	Lead (µg/L)	1				0.182			
	Manganese (mg/L)	1			<	0.004			
J	Nickel (µg/L)	1				1.096			
J	Selenium (µg/L)	1				3.800			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
J	Zinc (µg/L)	1				1.892			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	13.00	1.00	2.74	4.30		
J	Fecal Coliform (MPN/DL)	8	1.0	12.0	2.0	3.9	4.3		
J	Enterococci (MPN/DL)	8	10	10	5	6	2		

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Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
CHANNEL-3	**Physical**								
	Temperature (°C)	8	18.9	29.1	27.6	25.9	3.8		
	Turbidity (NTU)	11	3.1	11.9	4.7	5.6	2.6		
	Total Dissolved Solids (mg/L)	8	5820.0	23600.0	20150.0	17727.5	6418.0		
	Total Suspended Solids (mg/L)	8	6.0	12.0	11.0	9.4	2.8		
	Specific Conductance (µmhos/cm)	8	7500.2	33587.9	23190.6	23313.4	9428.5		
	Hardness (mg/L)	1				2120.0			
	J Alkalinity (mg/L)	8	3.0	107.0	53.5	53.9	37.6		
	Chemical								
	Dissolved Oxygen (mg/L)	8	6.8	9.8	7.5	7.8	1.0		
	pH (SU)	8	7.8	8.3	8.2	8.1	0.2		
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.028	0.006	0.008	0.003		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.010	0.068	0.018	0.020	0.021		
	J Total Kjeldahl Nitrogen (mg/L)	8	0.140	0.980	0.675	0.601	0.276		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.029	0.002	0.005	0.010		
	Total Phosphorus (mg/L)	8	0.017	0.043	0.036	0.035	0.009		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	3500.0	12000.0	10500.0	9437.5	3045.8		
	Total Metals								
	J Aluminum (T) (mg/L)	1				0.121			
	Iron (T) (mg/L)	1				< 0.063			
	J Manganese (T) (mg/L)	1				0.010			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
	J Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				14.500			
	J Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.836			
	J Copper (µg/L)	1				127.000 S			1
	Iron (mg/L)	1				< 0.063			
	J Lead (µg/L)	1				< 0.156			
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				2.430			
	J Selenium (µg/L)	1				54.400 A			1
	J Silver (µg/L)	1				< 0.328			
	J Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				1.020			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	3.30	0.50	1.09	1.11		
	J,L Fecal Coliform (MPN/DL)	8	1.0	1.0	0.5	0.6	0.2		
	L Enterococci (MPN/DL)	8	10	10	5	5	0		

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Station	Parameters	N	Min	Max	Med	Avg	SD	E	Q
CS-1	**Physical**								
	Temperature (°C)	9	17.7	26.8	25.4	23.9	3.2		
	Turbidity (NTU)	12	3.5	42.0	6.6	11.0	11.6		
	J Total Dissolved Solids (mg/L)	8	46.0	7900.0	309.0	1206.9	2711.0		
	J Total Suspended Solids (mg/L)	8	3.0	14.0	5.5	6.1	3.6		
	Specific Conductance (µmhos/cm)	9	61.7	19865.7	528.8	2747.7	6441.7		
	Hardness (mg/L)	1				11.9			
	J Alkalinity (mg/L)	8	< 0.6	42.4	7.5	11.3	12.9		
	Monthly Stream Flow (cfs)	1				258.2			
	Measured Stream Flow (cfs)	1				258.2			
	Chemical								
	Dissolved Oxygen (mg/L)	9	3.0 C	8.1	6.0	5.9	1.4	1	
	pH (SU)	9	5.7 C	6.5	6.2	6.2	0.2	1	
	J Ammonia Nitrogen (mg/L)	8	< 0.013	1.700	0.022	0.244	0.590		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.010	0.182	0.066	0.074	0.056		
	Total Kjeldahl Nitrogen (mg/L)	8	0.340	0.540	0.475	0.454	0.075		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.014	0.004	0.005	0.004		
	Total Phosphorus (mg/L)	8	0.018	0.044	0.028	0.029	0.009		
	J CBOD-5 (mg/L)	8	< 2.0	2.0	1.0	1.0	0.0		
	J COD (mg/L)	1				16.0			
	J Chlorides (mg/L)	7	9.4	5000.0	120.0	803.6	1853.5		
	J Sulfate (mg/L)	1				27.00			
	Total Metals								
	Aluminum (T) (mg/L)	1				0.278			
	Iron (T) (mg/L)	1				1.620			
	Manganese (T) (mg/L)	1				< 0.004			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.126			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				0.523			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.526			
	Copper (µg/L)	1				< 0.902			
	Iron (mg/L)	1				0.639			
	J Lead (µg/L)	1				0.240 S			1
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				0.653			
	Selenium (µg/L)	1				< 0.217			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				3.149			
	Biological								
	Chlorophyll a (mg/m³)	7	< 1.00	1.10	0.50	0.58	0.23		
	J Enterococci (MPN/DL)	5	20	150	20	48	57		

A=LWF aquatic life use criterion exceeded; C=LWF criterion violated; E=# samples that exceeded criteria; H=LWF human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=LWF aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
CS-2	**Physical**								
	Temperature (°C)	4	27.0	29.8	28.3	28.3	1.3		
	Turbidity (NTU)	5	3.8	18.8	7.2	8.8	6.2		
	Total Dissolved Solids (mg/L)	4	978.0	11400.0	2050.0	4119.5	4891.9		
	Total Suspended Solids (mg/L)	4	5.0	11.0	6.0	7.0	2.7		
	Specific Conductance	4	1994.7	17247.9	4151.4	6886.4	7008.0		
	Hardness (mg/L)	1				177.0			
	Alkalinity (mg/L)	4	21.0	60.6	50.5	45.6	17.3		
	Chemical								
	Dissolved Oxygen (mg/L)	4	5.2	6.7	6.4	6.2	0.7		
	pH (SU)	4	6.7	7.3	7.1	7.0	0.3		
	J Ammonia Nitrogen (mg/L)	4	< 0.013	0.033	0.010	0.015	0.012		
	Nitrate+Nitrite Nitrogen (mg/L)	4	< 0.010	0.273	0.054	0.096	0.120		
	Total Kjeldahl Nitrogen (mg/L)	4	0.480	0.560	0.505	0.512	0.036		
	Total Nitrogen (mg/L)	4	< 0.539	0.753	0.572	0.609	0.097		
	J Dis Reactive Phosphorus (mg/L)	4	< 0.003	0.013	0.005	0.006	0.006		
	Total Phosphorus (mg/L)	4	0.031	0.055	0.040	0.042	0.012		
	J CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	4	520.0	6600.0	1080.0	2320.0	2871.1		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.266			
	Iron (T) (mg/L)	1				1.110			
	J Manganese (T) (mg/L)	1				0.029			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.116			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				1.150			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.617			
	J Copper (µg/L)	1				2.149			
	Iron (mg/L)	1				0.643			
	J Lead (µg/L)	1				0.372			
	J Manganese (mg/L)	1				0.020			
	J Nickel (µg/L)	1				0.789			
	J Selenium (µg/L)	1				2.353			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				3.306			
	Biological								
	Chlorophyll a (mg/m³)	4	< 1.00	1.10	0.50	0.65	0.30		
	J,L Enterococci (MPN/DL)	4	10	20	5	9	8		

A=LWF aquatic life use criterion exceeded; C=LWF criterion violated; E=# samples that exceeded criteria; H=LWF human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=LWF aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
DGRM-1A	**Physical**								
	Temperature (°C)	7	18.9	30.4 C	25.9	25.4	4.1	1	
	Turbidity (NTU)	12	13.1	24.6	16.1	17.4	3.6		
	Total Dissolved Solids (mg/L)	8	534.0	5180.0	1940.0	2463.0	1632.1		
	Total Suspended Solids (mg/L)	8	8.0	20.0	14.5	14.5	4.4		
	Specific Conductance (µmhos/cm)	7	1283.7	10239.9	5055.2	5375.7	3043.2		
	Hardness (mg/L)	1				859.0			
J	Alkalinity (mg/L)	8	< 0.6	70.0	20.0	25.9	27.7		
	Chemical								
	Dissolved Oxygen (mg/L)	7	6.2	9.6	7.2	7.4	1.3		
	pH (SU)	7	7.2	7.8	7.4	7.4	0.2		
J	Ammonia Nitrogen (mg/L)	8	< 0.013	0.083	0.006	0.017	0.027		
J	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.052	0.005	0.010	0.017		
	Total Kjeldahl Nitrogen (mg/L)	8	0.300	0.840	0.680	0.644	0.165		
J	Dis Reactive Phosphorus (mg/L)	8	< 0.001	0.041	0.002	0.009	0.014		
	Total Phosphorus (mg/L)	7	0.015	0.089	0.053	0.058	0.033		
J	CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	240.0	7100.0	1650.0	2176.2	2183.6		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.448			
	Iron (T) (mg/L)	1				0.397			
J	Manganese (T) (mg/L)	1				0.055			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
J	Antimony (µg/L)	1				< 0.441			
J	Arsenic (µg/L)	1				4.840			
J	Cadmium (µg/L)	1				< 0.116			
J	Chromium (µg/L)	1				0.730			
J	Copper (µg/L)	1				18.100			
	Iron (mg/L)	1				< 0.063			
J	Lead (µg/L)	1				< 0.156			
	Manganese (mg/L)	1				< 0.004			
J	Nickel (µg/L)	1				0.958			
J	Selenium (µg/L)	1				15.700 A			1
J	Silver (µg/L)	1				< 0.328			
J	Thallium (µg/L)	1				< 0.153			
J	Zinc (µg/L)	1				< 0.705			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	4.20	0.50	1.45	1.46		
J,L	Enterococci (MPN/DL)	4	10	40	8	15	17		

A=S,*F&W* aquatic life use criterion exceeded; C=S,*F&W* criterion violated; E=# samples that exceeded criteria; H=S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=S,F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
DR-1	**Physical**								
	Temperature (°C)	7	18.1	30.5 C	24.7	24.8	4.5	1	
	Turbidity (NTU)	11	4.9	14.6	9.5	9.8	3.2		
	Total Dissolved Solids (mg/L)	8	85.0	1240.0	168.5	327.8	384.2		
	Total Suspended Solids (mg/L)	8	5.0	13.0	6.5	7.8	2.7		
	Specific Conductance (µmhos/cm)	7	148.9	2475.7	350.4	696.1	819.1		
	Hardness (mg/L)	1				90.1			
J	Alkalinity (mg/L)	8	< 0.6	48.0	30.3	24.9	20.9		
	Chemical								
	Dissolved Oxygen (mg/L)	7	4.2 C	7.5	4.4	5.0	1.3	5	
	pH (SU)	7	6.3	7.2	6.7	6.8	0.3		
J	Ammonia Nitrogen (mg/L)	8	< 0.013	0.140	0.010	0.038	0.048		
J	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.159	0.005	0.024	0.055		
	Total Kjeldahl Nitrogen (mg/L)	8	0.420	0.890	0.655	0.644	0.134		
J	Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.054	0.014	0.019	0.020		
	Total Phosphorus (mg/L)	8	0.041	0.145	0.080	0.086	0.034		
J	CBOD-5 (mg/L)	7	< 2.0	2.2	1.0	1.2	0.4		
	Chlorides (mg/L)	8	15.0	700.0	113.5	222.1	265.4		
	Total Metals								
J	Aluminum (T) (mg/L)	1				0.122			
	Iron (T) (mg/L)	1				0.276			
J	Manganese (T) (mg/L)	1				0.014			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
J	Antimony (µg/L)	1				< 0.441			
J	Arsenic (µg/L)	1				1.510			
J	Cadmium (µg/L)	1				< 0.116			
J	Chromium (µg/L)	1				0.453			
J	Copper (µg/L)	1				3.000			
J	Iron (mg/L)	1				0.090			
J	Lead (µg/L)	1				0.201			
	Manganese (mg/L)	1				< 0.004			
J	Nickel (µg/L)	1				0.479			
J	Selenium (µg/L)	1				2.350			
J	Silver (µg/L)	1				< 0.328			
J	Thallium (µg/L)	1				< 0.153			
J	Zinc (µg/L)	1				0.760			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	2.90	1.30	1.40	0.91		
J,L	Enterococci (MPN/DL)	4	10	60	15	24	25		

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MB-2A	**Physical**								
	Temperature (°C)	12	16.0	29.0	23.1	23.7	4.6		
	Turbidity (NTU)	15	0.7	11.2	3.0	3.6	3.0		
	Total Dissolved Solids (mg/L)	12	25400.0	37400.0	32700.0	32108.3	3340.2		
	Total Suspended Solids (mg/L)	12	6.0	23.0	11.5	12.3	5.6		
	Specific Conductance (µmhos/cm)	12	28156.2	55873.8	45989.9	45760.4	7810.6		
	Hardness (mg/L)	2	1890.0	2670.0	2280.0	2280.0	551.5		
	Alkalinity (mg/L)	12	42.0	131.0	109.0	96.3	29.0		
	Chemical								
	Dissolved Oxygen (mg/L)	12	5.4	8.3	7.0	7.0	0.8		
	pH (SU)	12	7.9	8.2	8.0	8.0	0.1		
J	Ammonia Nitrogen (mg/L)	12	< 0.013	0.060	0.010	0.017	0.018		
	Nitrate+Nitrite Nitrogen (mg/L)	12	< 0.003	0.144	0.014	0.030	0.042		
	Total Kjeldahl Nitrogen (mg/L)	12	< 0.058	1.900	0.785	0.783	0.643		
J	Dis Reactive Phosphorus (mg/L)	12	< 0.001	0.047	0.002	0.005	0.013		
J	Total Phosphorus (mg/L)	12	< 0.004	0.064	0.041	0.032	0.026		
J	CBOD-5 (mg/L)	12	< 2.0	< 2.0	1.0	1.0	0.0		
J	Chlorides (mg/L)	12	1600.0	19000.0	16500.0	15050.0	4705.2		
	Total Metals								
	Aluminum (T) (mg/L)	1				< 0.056			
	Iron (T) (mg/L)	1				< 0.063			
	Manganese (T) (mg/L)	1				< 0.004			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
J	Antimony (µg/L)	1				< 0.441			
J	Arsenic (µg/L)	1				24.700			
J	Cadmium (µg/L)	1				< 0.116			
J	Chromium (µg/L)	1				0.800			
J	Copper (µg/L)	1				307.000 S			1
	Iron (mg/L)	1				< 0.063			
J	Lead (µg/L)	1				< 0.156			
	Manganese (mg/L)	1				< 0.004			
J	Nickel (µg/L)	1				4.159			
J	Selenium (µg/L)	1				96.000 A			1
J	Silver (µg/L)	1				< 0.328			
J	Thallium (µg/L)	1				< 0.153			
J	Zinc (µg/L)	1				3.321			
	Biological								
	Chlorophyll a (mg/m³)	12	< 1.00	1.50	0.50	0.58	0.29		
J,L	Fecal Coliform (MPN/DL)	10	1.0	60.0	0.5	6.4	18.8		
L	Enterococci (MPN/DL)	12	10	10	5	5	0		

A=SH,S,F*&W* aquatic life use criterion exceeded; C=SH,S,*F&W* criterion violated; E=# samples that exceeded criteria; H=SH,S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have Uncertain exceedances; S=SH,S,F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MB-3A	**Physical**								
	Temperature (°C)	12	10.8	30.3 C	22.6	22.6	6.2	1	
	Turbidity (NTU)	17	4.2	37.3	9.3	14.1	9.9		
	Total Dissolved Solids (mg/L)	12	1300.0	23400.0	15200.0	13401.7	7919.3		
	Total Suspended Solids (mg/L)	12	6.0	100.0	14.0	22.2	25.6		
	Specific Conductance (µmhos/cm)	12	5204.3	38525.9	23714.2	23350.7	10582.0		
	Hardness (mg/L)	3	1200.0	2040.0	1600.0	1613.3	420.2		
	J Alkalinity (mg/L)	12	< 0.6	101.0	69.4	60.7	31.8		
	Chemical								
	Dissolved Oxygen (mg/L)	12	5.0	10.1	7.8	7.9	1.6		
	pH (SU)	12	7.8	8.3	8.1	8.0	0.2		
	J Ammonia Nitrogen (mg/L)	12	< 0.013	0.080	0.010	0.016	0.020		
	J Nitrate+Nitrite Nitrogen (mg/L)	12	< 0.003	0.062	0.005	0.012	0.020		
	J Total Kjeldahl Nitrogen (mg/L)	12	0.060	1.100	0.745	0.714	0.289		
	J Dis Reactive Phosphorus (mg/L)	12	< 0.001	0.034	0.002	0.005	0.010		
	J Total Phosphorus (mg/L)	12	0.011	0.066	0.040	0.042	0.014		
	J CBOD-5 (mg/L)	12	< 2.0	3.8	1.0	1.4	0.9		
	Chlorides (mg/L)	12	1500.0	14000.0	8200.0	7558.3	3526.9		
	Total Metals								
	J Aluminum (T) (mg/L)	1				0.189			
	J Iron (T) (mg/L)	1				0.106			
	J Manganese (T) (mg/L)	1				0.062			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
	J Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				14.900			
	J Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.699			
	J Copper (µg/L)	1				89.500			
	Iron (mg/L)	1				< 0.063			
	J Lead (µg/L)	1				< 0.156			
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				2.500			
	J Selenium (µg/L)	1				55.500 A		1	
	J Silver (µg/L)	1				< 0.328			
	J Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				1.230			
	Biological								
	Chlorophyll a (mg/m³)	12	< 1.00	6.40	0.50	1.58	1.76		
	J,L Fecal Coliform (MPN/DL)	10	1.0	1.0	0.5	0.6	0.2		
	J,L Enterococci (MPN/DL)	12	10	10	5	6	2		

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Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MB-9	**Physical**								
	Temperature (°C)	12	10.8	29.3	24.0	22.1	6.5		
	Turbidity (NTU)	17	3.6	37.3	8.3	10.9	8.2		
	Total Dissolved Solids (mg/L)	12	2270.0	20400.0	11150.0	10129.2	5830.2		
	J Total Suspended Solids (mg/L)	12	2.0	20.0	9.5	10.5	5.6		
	Specific Conductance (µmhos/cm)	12	4346.5	38525.9	19933.6	18891.2	11156.8		
	Hardness (mg/L)	3	394.0	1080.0	595.0	689.7	352.7		
	J Alkalinity (mg/L)	12	< 0.6	100.0	65.8	53.6	31.9		
	Chemical								
	Dissolved Oxygen (mg/L)	12	6.3	10.2	8.4	8.4	1.3		
	pH (SU)	12	7.6	8.4	8.0	8.0	0.3		
	J Ammonia Nitrogen (mg/L)	12	< 0.013	0.060	0.010	0.014	0.015		
	J Nitrate+Nitrite Nitrogen (mg/L)	12	< 0.009	0.200	0.005	0.031	0.057		
	Total Kjeldahl Nitrogen (mg/L)	12	0.370	1.200	0.580	0.604	0.216		
	J Dis Reactive Phosphorus (mg/L)	12	< 0.001	0.026	0.002	0.006	0.009		
	J Total Phosphorus (mg/L)	12	0.009	0.042	0.038	0.034	0.009		
	J CBOD-5 (mg/L)	12	< 2.0	2.8	1.0	1.3	0.6		
	Chlorides (mg/L)	12	1200.0	11000.0	6250.0	5608.3	3112.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.382			
	Iron (T) (mg/L)	1				0.394			
	Manganese (T) (mg/L)	1			<	0.004			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				1.671			
	Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.411			
	J Copper (µg/L)	1				3.121			
	Iron (mg/L)	1			<	0.063			
	Lead (µg/L)	1			<	0.156			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				1.013			
	Selenium (µg/L)	1				5.290			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				1.477			
	Biological								
	Chlorophyll a (mg/m³)	11	< 1.00	5.90	0.50	1.30	1.69		
	J Fecal Coliform (MPN/DL)	10	1.0	10.0	0.8	2.2	3.1		
	J Enterococci (MPN/DL)	12	10	10	5	6	2		

A=SH,F*&W* aquatic life use criterion exceeded; C=SH,*F&W* criterion violated; E=# samples that exceeded criteria; H=SH,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=SH,F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MGRB-9	**Physical**								
	Temperature (°C)	9	18.0	30.5 C	26.6	25.7	4.1	1	
	Turbidity (NTU)	11	5.7	16.5	12.7	12.6	3.1		
	Total Dissolved Solids (mg/L)	8	169.0	10300.0	2195.0	4208.4	3923.3		
	J Total Suspended Solids (mg/L)	8	9.0	22.0	12.5	12.9	4.2		
	Specific Conductance (µmhos/cm)	9	255.0	22980.9	7460.4	10124.7	7900.7		
	Hardness (mg/L)	1				35.7			
	J Alkalinity (mg/L)	8	5.0	51.8	22.5	27.6	18.1		
	Monthly Stream Flow (cfs)	7	-845.7	602.3	101.8	-66.8	536.5		
	Measured Stream Flow (cfs)	7	-845.7	602.3	101.8	-66.8	536.5		
	Chemical								
	Dissolved Oxygen (mg/L)	9	4.6 C	10.1	6.6	6.7	2.1	3	
	pH (SU)	9	6.4	8.2	7.0	7.1	0.5		
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.060	0.014	0.022	0.020		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.269	0.743	0.588	0.534	0.194		
	J Total Kjeldahl Nitrogen (mg/L)	8	0.570	1.300	0.910	0.916	0.228		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.001	0.013	0.003	0.004	0.004		
	Total Phosphorus (mg/L)	8	0.039	0.066	0.056	0.054	0.009		
	J CBOD-5 (mg/L)	7	< 2.0	3.8	2.2	2.4	1.1		
	Chlorides (mg/L)	8	74.0	6000.0	1250.0	2455.5	2335.0		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.579			
	Iron (T) (mg/L)	1				0.381			
	Manganese (T) (mg/L)	1				< 0.004			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.092			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				1.343			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.368			
	J Copper (µg/L)	1				1.091			
	J Iron (mg/L)	1				0.068			
	J Lead (µg/L)	1				0.218			
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				0.428			
	J Selenium (µg/L)	1				0.391			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				2.648			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	19.00	3.35	4.80	5.98		
	J,L Enterococci (MPN/DL)	4	10	10	5	6	3		

A=OAW,S,*F&W* aquatic life use criterion exceeded; C=OAW,S,*F&W* criterion violated; E=# samples that exceeded criteria; H=OAW,S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=OAW,S,F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MO-1A	**Physical**								
	Temperature (°C)	8	17.4	30.7 [c]	25.3	24.7	4.8	2	
	Turbidity (NTU)	11	18.3	99.6	51.1	51.8	30.5		
	Total Dissolved Solids (mg/L)	8	105.0	188.0	124.0	133.4	29.1		
	Total Suspended Solids (mg/L)	8	7.0	98.0	26.0	40.8	36.8		
	Specific Conductance (µmhos/cm)	8	122.6	290.9	180.4	193.1	50.1		
	Hardness (mg/L)	1				49.3			
	[J] Alkalinity (mg/L)	8	2.0	51.6	31.5	30.0	18.0		
	Monthly Stream Flow (cfs)	7	5639.7	47119.8	18966.4	24035.5	15872.7		
	Measured Stream Flow (cfs)	7	5639.7	47119.8	18966.4	24035.5	15872.7		
	Chemical								
	Dissolved Oxygen (mg/L)	8	4.1 [C]	10.6	7.2	7.1	1.8	1	
	pH (SU)	8	6.8	7.8	7.3	7.2	0.3		
	[J] Ammonia Nitrogen (mg/L)	8	< 0.013	0.050	0.025	0.028	0.015		
	[J] Nitrate+Nitrite Nitrogen (mg/L)	8	0.070	0.290	0.172	0.174	0.068		
	Total Kjeldahl Nitrogen (mg/L)	8	0.430	0.920	0.505	0.566	0.172		
	[J] Dis Reactive Phosphorus (mg/L)	8	0.008	0.018	0.013	0.013	0.003		
	[J] Total Phosphorus (mg/L)	8	0.017	0.149	0.058	0.079	0.048		
	[J] CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	6.9	59.0	11.4	17.7	17.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.596			
	Iron (T) (mg/L)	1				0.912			
	[J] Manganese (T) (mg/L)	1				0.011			
	Dissolved Metals								
	Aluminum (mg/L)	1	<		<	0.056			
	Antimony (µg/L)	1	<		<	0.441			
	[J] Arsenic (µg/L)	1				0.490			
	Cadmium (µg/L)	1	<		<	0.116			
	[J] Chromium (µg/L)	1				0.402			
	[J] Copper (µg/L)	1				0.999			
	Iron (mg/L)	1				0.236			
	Lead (µg/L)	1	<		<	0.156			
	Manganese (mg/L)	1	<		<	0.004			
	[J] Nickel (µg/L)	1				0.745			
	Selenium (µg/L)	1	<		<	0.217			
	Silver (µg/L)	1	<		<	0.328			
	Thallium (µg/L)	1	<		<	0.153			
	[J] Zinc (µg/L)	1				1.981			
	Biological								
	Chlorophyll a (mg/m³)	8	< 0.88	4.30	0.50	1.18	1.34		
	[L] Enterococci (MPN/DL)	4	10	10	5	5	0		

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MO-2	**Physical**								
	Temperature (°C)	8	15.4	29.9	27.0	25.3	4.6		
	Turbidity (NTU)	12	8.6	30.4	11.6	14.6	7.4		
	Total Dissolved Solids (mg/L)	8	604.0	9790.0	3070.0	3515.4	3089.6		
	Total Suspended Solids (mg/L)	8	7.0	31.0	10.0	13.8	8.3		
	Specific Conductance (µmhos/cm)	8	1711.7	15355.4	4332.6	6368.0	5008.7		
	Hardness (mg/L)	1				136.0			
	J Alkalinity (mg/L)	8	16.0	67.0	48.5	43.8	16.6		
	Chemical								
	Dissolved Oxygen (mg/L)	8	4.5 C	9.5	6.0	6.2	1.6	2	
	pH (SU)	8	5.9 C	7.3	7.1	7.0	0.4	1	
	J Ammonia Nitrogen (mg/L)	8	< 0.013	1.600	0.027	0.227	0.556		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.106	0.313	0.180	0.205	0.071		
	Total Kjeldahl Nitrogen (mg/L)	8	0.300	0.640	0.510	0.495	0.117		
	J Dis Reactive Phosphorus (mg/L)	7	0.003	0.022	0.015	0.015	0.007		
	Total Phosphorus (mg/L)	8	< 0.004	0.080	0.054	0.051	0.022		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	300.0	6100.0	1190.0	1903.8	2001.1		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.410			
	Iron (T) (mg/L)	1				0.893			
	Manganese (T) (mg/L)	1			<	0.004			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.061			
	Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				1.189			
	Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.500			
	J Copper (µg/L)	1				2.260			
	Iron (mg/L)	1				0.377			
	J Lead (µg/L)	1				0.212			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				1.332			
	J Selenium (µg/L)	1				1.207			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				2.463			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	1.40	0.50	0.70	0.37		
	J,L Enterococci (MPN/DL)	4	10	40	10	16	16		

A=LWF aquatic life use criterion exceeded; C=LWF criterion violated; E=# samples that exceeded criteria; H=LWF human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=LWF aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
MOBB-1	**Physical**								
	Temperature (°C)	11	13.2	28.4	24.6	22.6	5.6		
	Turbidity (NTU)	16	9.1	48.3	19.0	22.8	11.0		
	Total Dissolved Solids (mg/L)	12	119.0	9520.0	369.5	2576.6	3605.6		
J	Total Suspended Solids (mg/L)	12	4.0	22.0	13.5	13.1	5.2		
	Specific Conductance (µmhos/cm)	11	171.7	18869.5	699.2	5869.6	7657.3		
	Hardness (mg/L)	3	45.9	65.2	54.1	55.1	9.7		
J	Alkalinity (mg/L)	12	< 0.6	68.1	46.5	39.2	21.7		
	Chemical								
	Dissolved Oxygen (mg/L)	11	2.0 C	9.7	7.7	6.5	2.3	3	
	pH (SU)	11	7.1	8.1	7.5	7.5	0.3		
J	Ammonia Nitrogen (mg/L)	12	< 0.013	0.100	0.014	0.033	0.037		
J	Nitrate+Nitrite Nitrogen (mg/L)	12	< 0.010	0.223	0.087	0.106	0.081		
	Total Kjeldahl Nitrogen (mg/L)	12	0.390	1.600	0.555	0.681	0.374		
J	Dis Reactive Phosphorus (mg/L)	12	< 0.001	0.024	0.019	0.017	0.007		
J	Total Phosphorus (mg/L)	12	0.018	0.192	0.063	0.069	0.042		
J	CBOD-5 (mg/L)	12	< 2.0	6.0	1.0	1.4	1.4		
	Chlorides (mg/L)	12	15.0	5700.0	145.0	1259.8	1866.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.498			
	Iron (T) (mg/L)	1				1.010			
J	Manganese (T) (mg/L)	1				0.009			
	Dissolved Metals								
J	Aluminum (mg/L)	1				0.100			
	Antimony (µg/L)	1				< 0.441			
J	Arsenic (µg/L)	1				0.738			
	Cadmium (µg/L)	1				< 0.116			
J	Chromium (µg/L)	1				0.432			
J	Copper (µg/L)	1				1.208			
	Iron (mg/L)	1				0.480			
J	Lead (µg/L)	1				0.201			
	Manganese (mg/L)	1				< 0.004			
J	Nickel (µg/L)	1				1.061			
	Selenium (µg/L)	1				< 0.217			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
J	Zinc (µg/L)	1				2.300			
	Biological								
	Chlorophyll a (mg/m³)	12	< 1.00	15.00	0.50	2.66	4.31		
	Fecal Coliform (MPN/DL)	1				46.0			
J,L	Enterococci (MPN/DL)	8	10	20	5	8	5		

A=S,*F&W* aquatic life use criterion exceeded; C=S,*F&W* criterion violated; E=# samples that exceeded criteria; H=S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=S,F&W aquatic life use criterion exceeded

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
TC-1	**Physical**								
	Temperature (°C)	8	18.9	31.6 C	25.2	25.8	4.1	1	
	Turbidity (NTU)	11	4.0	11.9	8.1	8.4	2.3		
	Total Dissolved Solids (mg/L)	8	1200.0	15900.0	8190.0	8458.8	4638.7		
	Total Suspended Solids (mg/L)	8	7.0	15.0	9.0	9.9	2.7		
	Specific Conductance (µmhos/cm)	8	2410.7	25197.0	14145.6	13396.4	6756.9		
	Hardness (mg/L)	1				1180.0			
	J Alkalinity (mg/L)	8	22.0	80.0	41.0	45.8	20.8		
	Chemical								
	Dissolved Oxygen (mg/L)	8	5.8	11.8	7.1	7.6	2.1		
	pH (SU)	8	7.3	8.3	7.5	7.7	0.4		
	J Ammonia Nitrogen (mg/L)	8 <	0.013	0.070	0.006	0.022	0.028		
	J Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.010	0.249	0.024	0.061	0.089		
	J Total Kjeldahl Nitrogen (mg/L)	8	0.610	1.800	0.790	0.902	0.394		
	J Dis Reactive Phosphorus (mg/L)	8	0.019	0.516	0.104	0.144	0.157		
	Total Phosphorus (mg/L)	8	0.063	0.600	0.168	0.204	0.167		
	J CBOD-5 (mg/L)	7 <	2.0	3.1	1.0	1.3	0.8		
	Chlorides (mg/L)	8	640.0	8800.0	4800.0	4742.5	2558.7		
	Total Metals								
	J Aluminum (T) (mg/L)	1				0.154			
	J Iron (T) (mg/L)	1				0.148			
	J Manganese (T) (mg/L)	1				0.038			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	J Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				6.390			
	J Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.817			
	J Copper (µg/L)	1				25.000			
	Iron (mg/L)	1			<	0.063			
	J Lead (µg/L)	1			<	0.156			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				1.540			
	J Selenium (µg/L)	1				23.200 A			1
	J Silver (µg/L)	1			<	0.328			
	J Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				1.670			
	Biological								
	Chlorophyll a (mg/m³)	8 <	1.00	7.60	1.55	2.12	2.29		
	J,L Enterococci (MPN/DL)	4	10	10	5	6	3		

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=F&W aquatic life use criterion exceeded

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
TE-1	**Physical**								
	Temperature (°C)	8	17.9	30.5 C	25.0	24.5	4.5	1	
	Turbidity (NTU)	11	15.1	64.1	23.1	34.0	19.2		
	Total Dissolved Solids (mg/L)	8	98.0	136.0	118.0	118.2	14.9		
	Total Suspended Solids (mg/L)	8	10.0	60.0	13.5	22.6	19.0		
	Specific Conductance (µmhos/cm)	8	122.3	237.4	167.6	170.3	33.7		
	Hardness (mg/L)	1				47.3			
	J Alkalinity (mg/L)	8	< 0.6	51.7	26.0	25.6	21.1		
	Monthly Stream Flow (cfs)	7	2650.3	105892.3	27165.9	45232.9	37855.8		
	Measured Stream Flow (cfs)	7	2650.3	105892.3	27165.9	45232.9	37855.8		
	Chemical								
	Dissolved Oxygen (mg/L)	8	4.1 C	11.1	7.1	7.2	1.9	1	
	pH (SU)	8	6.8	8.0	7.2	7.3	0.4		
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.040	0.017	0.020	0.012		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.066	0.242	0.165	0.149	0.058		
	Total Kjeldahl Nitrogen (mg/L)	8	0.360	0.630	0.500	0.484	0.089		
	J Dis Reactive Phosphorus (mg/L)	8	0.006	0.018	0.011	0.011	0.004		
	J Total Phosphorus (mg/L)	8	0.014	0.109	0.056	0.064	0.030		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	6.2	18.0	8.5	10.3	4.3		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.436			
	Iron (T) (mg/L)	1				0.808			
	J Manganese (T) (mg/L)	1				0.014			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				0.564			
	Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.377			
	J Copper (µg/L)	1				0.995			
	Iron (mg/L)	1				0.299			
	J Lead (µg/L)	1				0.173			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				0.729			
	Selenium (µg/L)	1			<	0.217			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				2.216			
	Biological								
	Chlorophyll a (mg/m³)	8	< 0.95	2.70	1.12	1.26	0.82		
	J,L Enterococci (MPN/DL)	4	10	10	5	6	3		

A=OAW,S,*F&W* aquatic life use criterion exceeded; C=OAW,S,*F&W* criterion violated; E=# samples that exceeded criteria; H=OAW,S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=OAW,S,F&W aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
TENB-2	**Physical**								
	Temperature (°C)	8	17.3	30.2 C	24.9	24.4	4.6	1	
	Turbidity (NTU)	11	12.6	80.0	21.9	30.9	20.3		
	Total Dissolved Solids (mg/L)	8	101.0	382.0	113.5	150.1	95.0		
	Total Suspended Solids (mg/L)	8	6.0	60.0	12.0	17.1	17.6		
	Specific Conductance (µmhos/cm)	8	121.1	735.6	175.2	250.0	200.7		
	Hardness (mg/L)	1				47.9			
	Alkalinity (mg/L)	8	13.0	51.2	36.0	32.6	14.7		
	Monthly Stream Flow (cfs)	8	10728.6	93498.8	29258.4	43896.8	29394.9		
	Measured Stream Flow (cfs)	8	10728.6	93498.8	29258.4	43896.8	29394.9		
	Chemical								
	Dissolved Oxygen (mg/L)	8	4.2 C	10.3	6.9	6.9	1.7	1	
	pH (SU)	8	6.8	7.5	7.2	7.2	0.2		
	J Ammonia Nitrogen (mg/L)	8 <	0.013	0.335	0.010	0.054	0.114		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.010	0.204	0.143	0.126	0.069		
	Total Kjeldahl Nitrogen (mg/L)	8	0.340	0.740	0.435	0.456	0.131		
	J Dis Reactive Phosphorus (mg/L)	8	0.006	0.016	0.011	0.011	0.003		
	J Total Phosphorus (mg/L)	8	0.014	0.118	0.056	0.062	0.031		
	J CBOD-5 (mg/L)	8 <	2.0	2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	6.5	150.0	11.3	30.8	48.8		
	Total Metals								
	Aluminum (T) (mg/L)	1				0.332			
	Iron (T) (mg/L)	1				0.672			
	J Manganese (T) (mg/L)	1				0.022			
	Dissolved Metals								
	Aluminum (mg/L)	1			<	0.056			
	Antimony (µg/L)	1			<	0.441			
	J Arsenic (µg/L)	1				0.606			
	Cadmium (µg/L)	1			<	0.116			
	J Chromium (µg/L)	1				0.308			
	J Copper (µg/L)	1				1.091			
	Iron (mg/L)	1				0.286			
	Lead (µg/L)	1			<	0.156			
	Manganese (mg/L)	1			<	0.004			
	J Nickel (µg/L)	1				0.741			
	Selenium (µg/L)	1			<	0.217			
	Silver (µg/L)	1			<	0.328			
	Thallium (µg/L)	1			<	0.153			
	J Zinc (µg/L)	1				1.897			
	Biological								
	Chlorophyll a (mg/m³)	8 <	0.85	2.10	0.50	0.74	0.56		
	J,L Enterococci (MPN/DL)	4	10	20	5	9	8		

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Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
TM-1	**Physical**								
	Temperature (°C)	8	19.9	29.9	27.8	25.7	4.2		
	Turbidity (NTU)	11	6.0	40.3	11.2	16.0	12.0		
	J Total Dissolved Solids (mg/L)	8	174.0	10600.0	1483.0	2722.0	3483.0		
	J Total Suspended Solids (mg/L)	8	4.0	36.0	9.0	13.2	10.2		
	Specific Conductance (µmhos/cm)	8	834.0	20454.9	3570.9	5735.6	6481.0		
	Hardness (mg/L)	1				324.0			
	J Alkalinity (mg/L)	8	9.0	74.0	58.0	47.0	22.6		
	Monthly Stream Flow (cfs)	8	-302.7	1105.6	-213.2	-17.4	470.1		
	Measured Stream Flow (cfs)	8	-302.7	1105.6	-213.2	-17.4	470.1		
	Chemical								
	Dissolved Oxygen (mg/L)	8	2.2 C	6.5	5.5	5.0	1.6	1	
	pH (SU)	8	6.2	7.0	6.8	6.7	0.3		
	J Ammonia Nitrogen (mg/L)	8	0.040	0.210	0.095	0.111	0.058		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.089	0.390	0.226	0.217	0.100		
	Total Kjeldahl Nitrogen (mg/L)	8	0.430	0.950	0.745	0.726	0.180		
	J Dis Reactive Phosphorus (mg/L)	8	0.004	0.044	0.026	0.027	0.014		
	Total Phosphorus (mg/L)	8	0.074	0.141	0.084	0.094	0.025		
	J CBOD-5 (mg/L)	8 <	2.0	2.0	1.0	1.0	0.0		
	J COD (mg/L)	1				55.0			
	Chlorides (mg/L)	7	63.0	6600.0	890.0	1676.1	2320.4		
	J Sulfate (mg/L)	1				96.00			
	Total Metals								
	Aluminum (T) (mg/L)	1				0.275			
	Iron (T) (mg/L)	1				0.746			
	J Manganese (T) (mg/L)	1				0.073			
	Dissolved Metals								
	Aluminum (mg/L)	1				< 0.056			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				1.644			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.429			
	J Copper (µg/L)	1				3.369			
	Iron (mg/L)	1				0.217			
	J Lead (µg/L)	1				0.419			
	J Manganese (mg/L)	1				0.055			
	J Nickel (µg/L)	1				0.796			
	J Selenium (µg/L)	1				3.984			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				3.394			
	Biological								
	Chlorophyll a (mg/m³)	8 <	1.00	3.60	0.75	1.32	1.23		
	J Enterococci (MPN/DL)	5	10	60	20	31	27		

A=A&I aquatic life use criterion exceeded; C=A&I criterion violated; E=# samples that exceeded criteria; H=A&I human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=A&I aquatic life use criterion exceeded.

Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
WB-1	**Physical**								
	Temperature (°C)	9	17.1	31.6 C	26.5	25.5	4.6	1	
	Turbidity (NTU)	11	11.0	31.3	15.1	17.0	6.0		
	Total Dissolved Solids (mg/L)	8	124.0	9830.0	1178.0	3234.0	3707.4		
	J Total Suspended Solids (mg/L)	8	6.0	25.0	13.5	14.1	5.9		
	Specific Conductance (µmhos/cm)	9	200.1	20166.1	5061.9	8036.2	7219.6		
	Hardness (mg/L)	1				25.5			
	J Alkalinity (mg/L)	8	< 0.6	48.3	13.0	20.7	18.5		
	Chemical								
	Dissolved Oxygen (mg/L)	9	4.2 C	9.6	6.6	6.9	1.7	1	
	pH (SU)	9	6.5	7.8	6.9	7.0	0.5		
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.060	0.022	0.025	0.021		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	0.103	0.757	0.356	0.363	0.234		
	Total Kjeldahl Nitrogen (mg/L)	8	0.680	1.300	0.960	0.966	0.255		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.017	0.008	0.009	0.005		
	Total Phosphorus (mg/L)	8	0.040	0.084	0.063	0.066	0.014		
	J CBOD-5 (mg/L)	7	< 2.0	4.1	1.0	1.6	1.2		
	Chlorides (mg/L)	8	46.0	5500.0	670.0	1827.0	2116.7		
	Total Metals								
	J Aluminum (T) (mg/L)	1				0.609			
	Iron (T) (mg/L)	1				0.624			
	Manganese (T) (mg/L)	1				< 0.004			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.129			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				1.155			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.439			
	J Copper (µg/L)	1				1.359			
	Iron (mg/L)	1				0.240			
	J Lead (µg/L)	1				0.335			
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				0.441			
	J Selenium (µg/L)	1				0.227			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				3.732			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	10.00	3.30	4.71	4.38		
	J,L Enterococci (MPN/DL)	4	10	30	5	11	13		

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Station	Parameter	N	Min	Max	Med	Avg	SD	E	Q
WKBB-1	**Physical**								
	Temperature (°C)	8	17.6	31.1 C	25.6	25.3	4.9	1	
	Turbidity (NTU)	11	13.8	294.0	20.8	46.8	82.5		
	Total Dissolved Solids (mg/L)	8	709.0	9553.0	3525.0	4955.2	3521.2		
	J Total Suspended Solids (mg/L)	8	10.0	27.0	17.5	17.8	4.8		
	Specific Conductance	8	1322.8	16239.5	6593.6	8860.3	6135.3		
	Hardness (mg/L)	1				116.0			
	J Alkalinity (mg/L)	8 <	0.6	50.0	17.0	20.0	20.1		
	Chemical								
	Dissolved Oxygen (mg/L)	8	7.4	10.1	8.2	8.4	1.0		
	pH (SU)	8	6.8	8.6 C	8.0	7.9	0.6	1	
	J Ammonia Nitrogen (mg/L)	8 <	0.013	0.030	0.010	0.013	0.008		
	J Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.010	0.611	0.130	0.186	0.215		
	Total Kjeldahl Nitrogen (mg/L)	8	0.540	1.300	1.000	0.939	0.283		
	J Dis Reactive Phosphorus	8 <	0.001	0.016	0.006	0.006	0.005		
	Total Phosphorus (mg/L)	8	0.047	0.084	0.068	0.066	0.011		
	J CBOD-5 (mg/L)	7 <	2.0	4.1	1.0	1.8	1.2		
	Chlorides (mg/L)	8	360.0	5300.0	1950.0	2782.5	1985.0		
	Total Metals								
	Aluminum (T) (mg/L)	1				1.060			
	Iron (T) (mg/L)	1				0.727			
	J Manganese (T) (mg/L)	1				0.016			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.194			
	Antimony (µg/L)	1				< 0.441			
	J Arsenic (µg/L)	1				1.658			
	Cadmium (µg/L)	1				< 0.116			
	J Chromium (µg/L)	1				0.504			
	J Copper (µg/L)	1				2.758			
	J Iron (mg/L)	1				0.118			
	J Lead (µg/L)	1				0.264			
	Manganese (mg/L)	1				< 0.004			
	J Nickel (µg/L)	1				0.443			
	J Selenium (µg/L)	1				1.772			
	Silver (µg/L)	1				< 0.328			
	Thallium (µg/L)	1				< 0.153			
	J Zinc (µg/L)	1				2.353			
	Biological								
	Chlorophyll a (mg/m³)	8 <	1.00	10.00	2.95	3.82	3.11		
	J,L Enterococci (MPN/DL)	4	10	10	5	6	3		

A=S,*F&W* aquatic life use criterion exceeded; C=S,*F&W* criterion violated; E=# samples that exceeded criteria; H=S,F&W human health criterion exceeded; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances; S=S,F&W aquatic life use criterion exceeded.