2014 Perdido Sub-Estuary Report

Alabama Department of Environmental Management

Field Operations Division
Mobile Office
Environmental Assessment Section
Water Unit
August 2020

Coastal Waters Monitoring Program

2014

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LIST OF ACRONYMS

A&I	Agriculture and Industry water supply use classification
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
MAX	Maximum
MDL	Method Detection Limit
MIN	Minimum
NTU	Nephelometric Turbidity Units
OAW	Outstanding Alabama Waters
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

Wolf Bay, an estuary classified as an Outstanding Alabama Water (OAW), has a 69.8 mi^2 watershed with tributaries such as Miflin Creek, Sandy Creek, and Wolf Creek. Wolf Bay flows into the Intracoastal Waterway and, subsequently, Perdido Bay. The Perdido Bay watershed forms the southeastern boundary of coastal Alabama, and the Perdido Bay estuary encompasses 50 mi^2 of coastal and inland portions of Alabama and Florida. The Perdido sub-watershed discharges into the Gulf of Mexico at Perdido Pass in Orange Beach, Alabama. Major tributaries to Perdido Bay include Perdido River, Styx River, Blackwater River, the Intracoastal Waterway, and Wolf Bay. Both of these watersheds provide valuable resources to the area including agriculture, spawning habitats for commercial fish and shellfish, and recreational activities such as boating, fishing, and swimming.

The Alabama Department of Environmental Management (ADEM) monitored stations within the Perdido watershed as part of the 2014 assessment under the Coastal Waters Monitoring Program (CWMP). Implemented in 2011, the CWMP is designed to provide data to assess current water quality conditions, 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 1970's. 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 Perdido watershed that are on the 2014 CWA 303(d) list.

The purpose of this report is to summarize data collected at fifteen stations within the Perdido watershed during the 2014 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 [chl *a*], and sediment [total suspended solids (TSS)], were compared to ADEM's historical data.

METHODS

Sampling stations were selected using historical data and previous assessments (Fig. 1). Specific location information can be found in Table 2. Arnica Bay, Blackwater River, Eleven Mile Creek, Gulf of Mexico, Intracoastal Waterway, Miflin Creek, Perdido Bay, Perdido River, Sandy Creek, Styx River, Wolf Bay, and Wolf Creek were sampled within the Perdido watershed.

Water quality assessments were conducted monthly, bi-monthly, or quarterly March or April-October. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operation Procedures (ADEM 2014), Surface Water Quality Assurance Project Plan (2014), 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 using data from 2004 through 2014. Monthly concentrations of these parameters were graphed with ADEM's previously collected data for all stations within the focus watersheds. 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,

https://www.waterqualitydata.us/. As Alabama's state environmental regulatory agency, the ADEM submits all possible surface water quality monitoring data to the EPA.

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

Assessment Unit ID	Waterbody Name	County	Uses	Causes	Sources	Date of Data	Downstream / Upstream Locations	Year Listed	Draft TMDL Date
AL-Gulf-of-Mexico	Gulf of Mexico	Baldwin Mobile	Shellfish Harvesting Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	1996-97	Mississippi / Florida	1998	2020
AL03140104-0104-100	Blackwater River	Escambia	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2002	AL-FL state line / its source	2004	2020
AL03140106-0504-100	Styx River	Baldwin	Swimming Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2002	Hollinger Creek / its source	2002	2020
AL03140106-0507-100	Styx River	Baldwin	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2002	Perdido River / Hollinger Creek	2002	2020
AL03140106-0603-101	Blackwater River	Baldwin	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2002	Perdido River / Narrow Gap Creek	2004	2020
AL03140106-0703-100	Perdido River	Baldwin	Fish & Wildlife	Metals (Mercury)	Atmospheric deposition	2005	Perdido Bay / Jacks Branch	2006	2020
AL03140107-0204-400	Arnica Bay	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens	On-site wastewater systems	2010	Perdido Bay / Bay la launch	2012	2016
AL03140107-0204-302	Perdido Bay	Baldwin	Shellfish Harvesting Swimming Fish & Wildlife	Pathogens	Collection system failure On-site wastewater systems	2010	Suarez Point / Lillian Bridge	2012	2016
AL03140106-0302-201	Boggy Branch	Escambia	Fish &Wildlife	Pathogens Metals	Industrial Municipal	2004	Brushy Creek / Atmore WWTP	2006	2016

Figure 1. 2014 Perdido stations & impaired waterbodies.

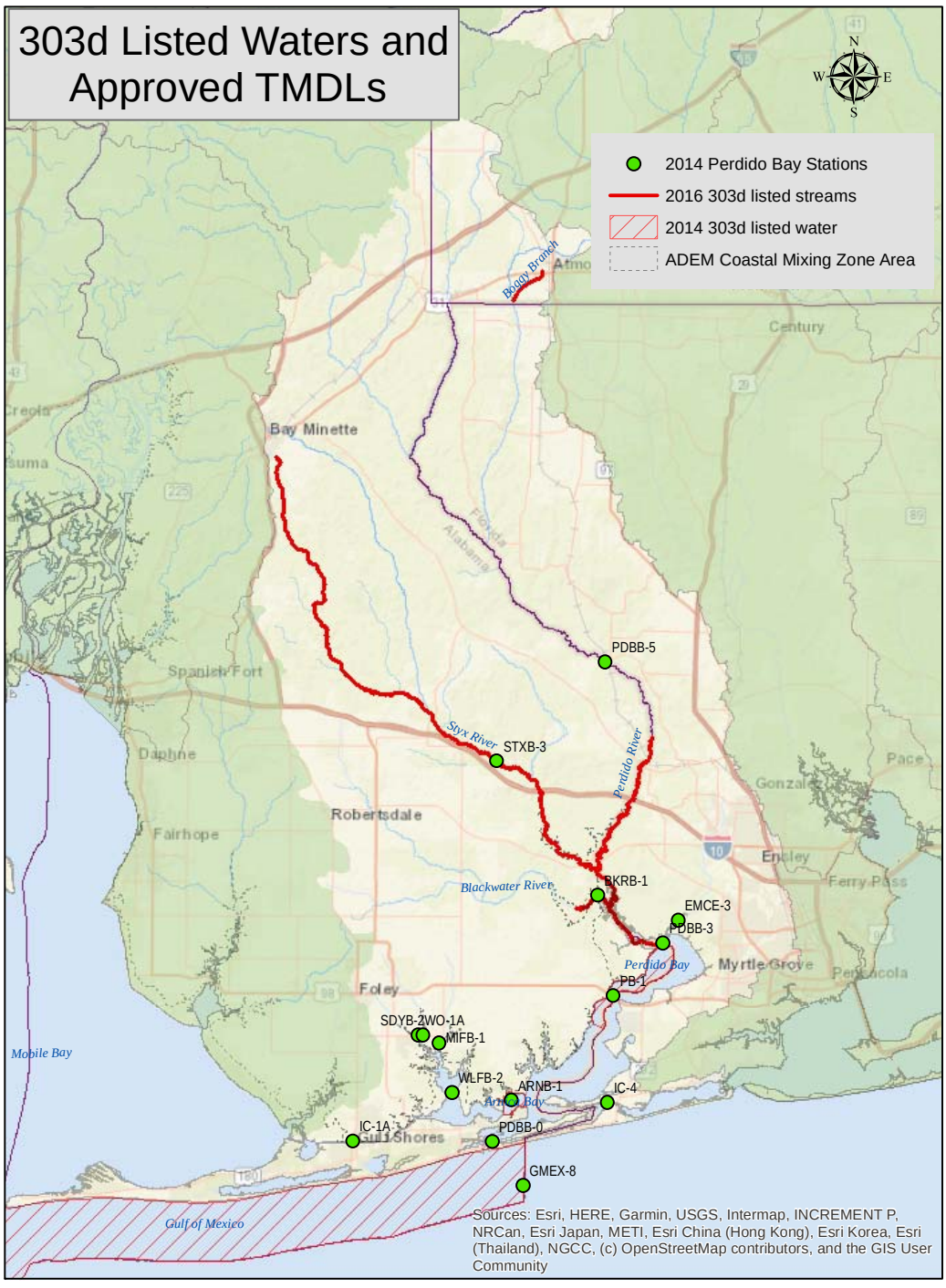


Table 2. Descriptions for the monitoring stations in 2014 for the Perdido Sub-Watershed.

HUC8	County	Station Number	Use Classification	Waterbody Name	Station Description	Latitude	Longitude
3140107	Baldwin	EMCE-3	SH/S/F&W	Eleven Mile Creek	Last two miles of Eleven Mile creek before reaching Perdido Bay.	30.469528	-87.366833
3140106	Baldwin	PDBB-5	F&W	Perdido River	Perdido River at Barrineau Park Rd.	30.69047	-87.44026
3140106	Baldwin	STXB-3	F&W	Styx River	Styx River at Baldwin County Rd. 87 (near Elsanor).	30.60532	-87.547
3140106	Baldwin	BKRB-1	F&W	Blackwater River	Area between mouth of river and powerline crossing southeast of Robertsdale, AL.	30.490806	-87.446806
3140107	Baldwin	PDBB-3	SH/S/F&W	Perdido Bay	Perdido Bay at mid-channel south of Chambers Point.	30.4501	-87.382
3140107	Baldwin	PB-1	SH/S/F&W	Perdido Bay	Perdido Bay at mid-bay at US HWY 98.	30.405	-87.4307
3140107	Baldwin	MIFB-1	S/F&W	Miflin Creek	Miflin Creek at Co Rd20.	30.3637	-87.6027
3140107	Baldwin	WO-1A	F&W	Wolf Creek	Wolf Creek at Swift Church Rd.	30.37028	-87.62341
3140107	Baldwin	SDYB-2	F&W	Sandy Creek	Sandy Creek ~50ft downstream of Co Rd 20/ Miflin Rd.	30.3704	-87.6184
3140107	Baldwin	WLFB-2	OAW/SH/S/F&W	Wolf Bay	Middle of Wolf Bay.	30.32124	-87.58962
3140107	Baldwin	IC-4	F&W	Intracoastal Waterway	Intracoastal Waterway in no wake zone between Holiday Harbor Marina and SR 292 bridge crossing.	30.313525	-87.436402

Table 3 (Continued).

HUC8	County	Station Number	Use Classification	Waterbody Name	Station Description	Latitude	Longitude
3140107	Baldwin	IC-1A	F&W	Intracoastal Waterway	Intracoastal Waterway in Gulf Shores at HWY 59.	30.2793	-87.687
3140107	Baldwin	ARNB-1	SH/S/F&W	Arnica Bay	Arnica Bay between Perdido bay and Hatchet Cr.	30.315	-87.531
3140107	Baldwin	PDBB-0	SH/S/F&W	Perdido Bay	Perdido Bay at approx. 0.25 miles upstream of State Highway 182 bridge.	30.27968	-87.54948
	Baldwin	GMEX-8	SH/S/F&W	Gulf of Mexico	1.5 miles off shore in Gulf of Mexico at AL / FL line.	30.257645	-87.518428

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 Fig. 11. Summary statistics of all data collected during 2014 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 2014 the highest mean TN value was in Wolf Creek (WO-1A) (Fig. 2). While the mean TN values in WO-1A have been the highest of all stations since monitoring began, values appear to be declining. Mean growing season TN values in most other stations appear to have changed little though higher values have been observed at PDBB-0 in recent years. Monthly TN concentrations for all stations followed the historical means for the most part. (Fig. 6).

In 2014 the highest mean growing season TP value was in Wolf Creek (WO-1A) (Fig. 3). While the mean TP values in WO-1A have been the highest of all stations since monitoring began, values appear to be declining. The highest monthly TP concentration for 2014 was in Wolf Creek (WO-1A) in March (Fig. 7). Monthly TP concentrations in 2014 varied little from historic means in the months sampled.

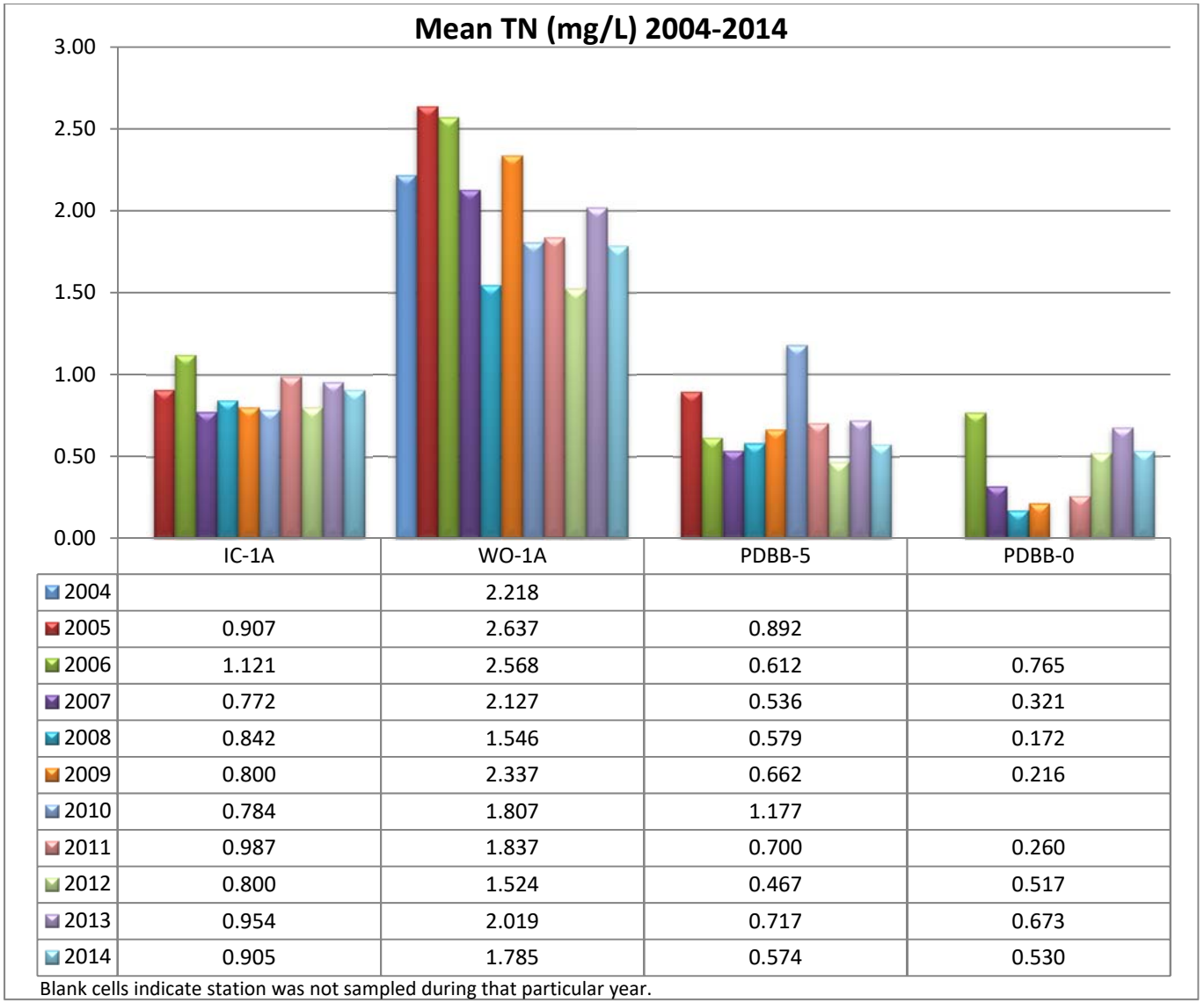
Mean growing season chl *a* concentrations have declined in most of the Perdido Bay stations since 2009 (Fig. 4). Mean values in the Intracoastal Waterway (IC-1A) were considerably

lower 2010-2014 than in previous years. The highest monthly chl *a* concentration for 2014 was in Miflin Creek (MIFB-1) in August (Fig. 8). Most stations were at or below historic means in the months sampled.

In 2014, during its first year sampled, the highest mean growing season TSS value was in the Gulf of Mexico at GMEX-8 (Fig. 5). Prior to 2014 the highest mean TSS values were in Wolf Creek (WO-1A). Monthly concentrations were highest in August 2014 at Arnica Bay (ARNB-1), Gulf of Mexico (GMEX-8), Intracoastal Waterway (IC-4 and IC-1A), Perdido Bay (PDBB-0), Sandy Creek (SDYB-2), and Wolf Bay (WLFB-2) and higher in October at Eleven Mile Creek (EMCE-3). Monthly concentrations were lowest overall at Perdido River (PDBB-5) for all months sampled (Fig. 9). Most 2014 monthly TSS concentrations were at or below historic means.

Dissolved oxygen concentrations in Sandy Creek (SDYB-2) were below the ADEM criteria limit of 5.0 mg/L in July, August, September, and October (ADEM Admin. Code R. 335-6-10-09) (Fig. 10). Dissolved oxygen concentrations were also below ADEM criteria in the Blackwater River (BKRB-1), Intracoastal Waterway (IC-1A), and Perdido Bay (PDBB-3 and PB-1) in September, as well as Miflin Creek (MIFB-1) in August, September, and October. All measurements of DO concentrations in Arnica Bay (ARNB-1), Eleven Mile Creek (EMCE-3), Gulf of Mexico (GMEX-8), Intracoastal Waterway (IC-4), Styx River (STYX-3), Wolf Bay (WLFB-2), and Wolf Creek (WO-1A) were at or above the ADEM criteria. Monthly depth profiles of dissolved oxygen, temperature and salinity can be found in Figure 11.

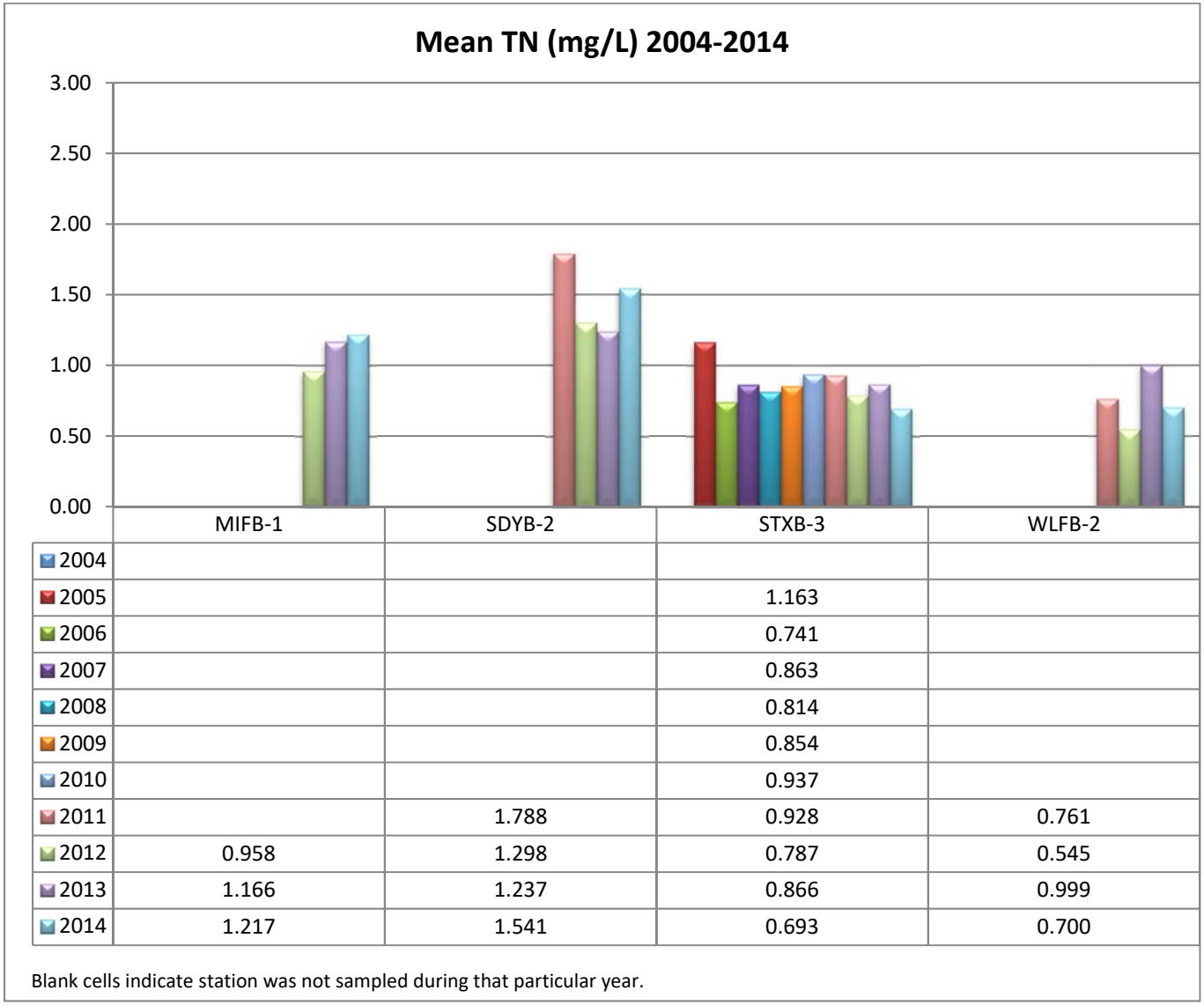
Figure 2. Mean growing season TN measured for the trend stations in the Perdido Sub-Watershed, 2004-2014.



	IC-1A	WO-1A	PDBB-5	PDBB-0
2004		2.218		
2005	0.907	2.637	0.892	
2006	1.121	2.568	0.612	0.765
2007	0.772	2.127	0.536	0.321
2008	0.842	1.546	0.579	0.172
2009	0.800	2.337	0.662	0.216
2010	0.784	1.807	1.177	
2011	0.987	1.837	0.700	0.260
2012	0.800	1.524	0.467	0.517
2013	0.954	2.019	0.717	0.673
2014	0.905	1.785	0.574	0.530

Blank cells indicate station was not sampled during that particular year.

Figure 2. (Continued)



	MIFB-1	SDYB-2	STXB-3	WLFB-2
2004				
2005			1.163	
2006			0.741	
2007			0.863	
2008			0.814	
2009			0.854	
2010			0.937	
2011		1.788	0.928	0.761
2012	0.958	1.298	0.787	0.545
2013	1.166	1.237	0.866	0.999
2014	1.217	1.541	0.693	0.700

Blank cells indicate station was not sampled during that particular year.

Figure 2. (Continued)

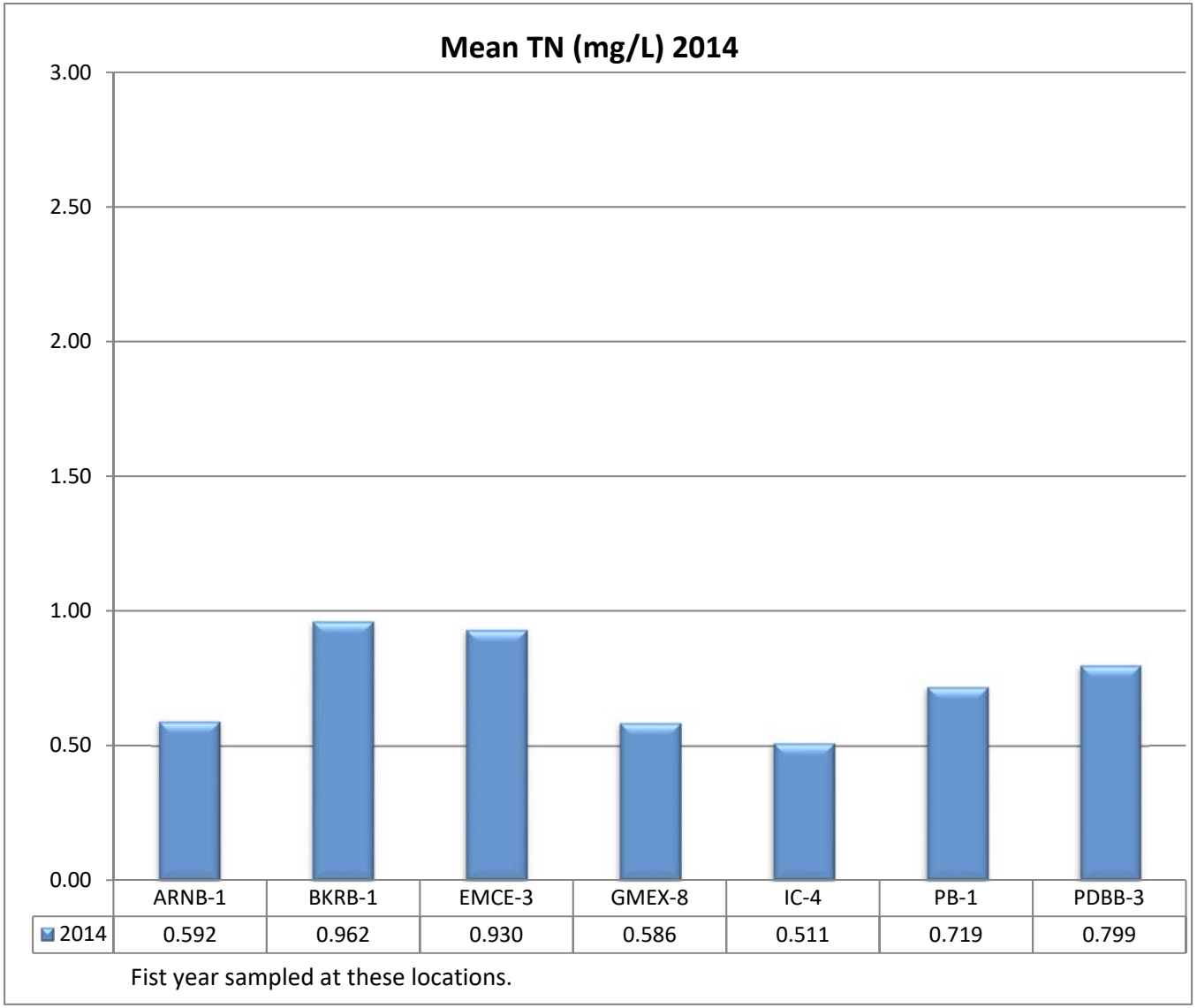
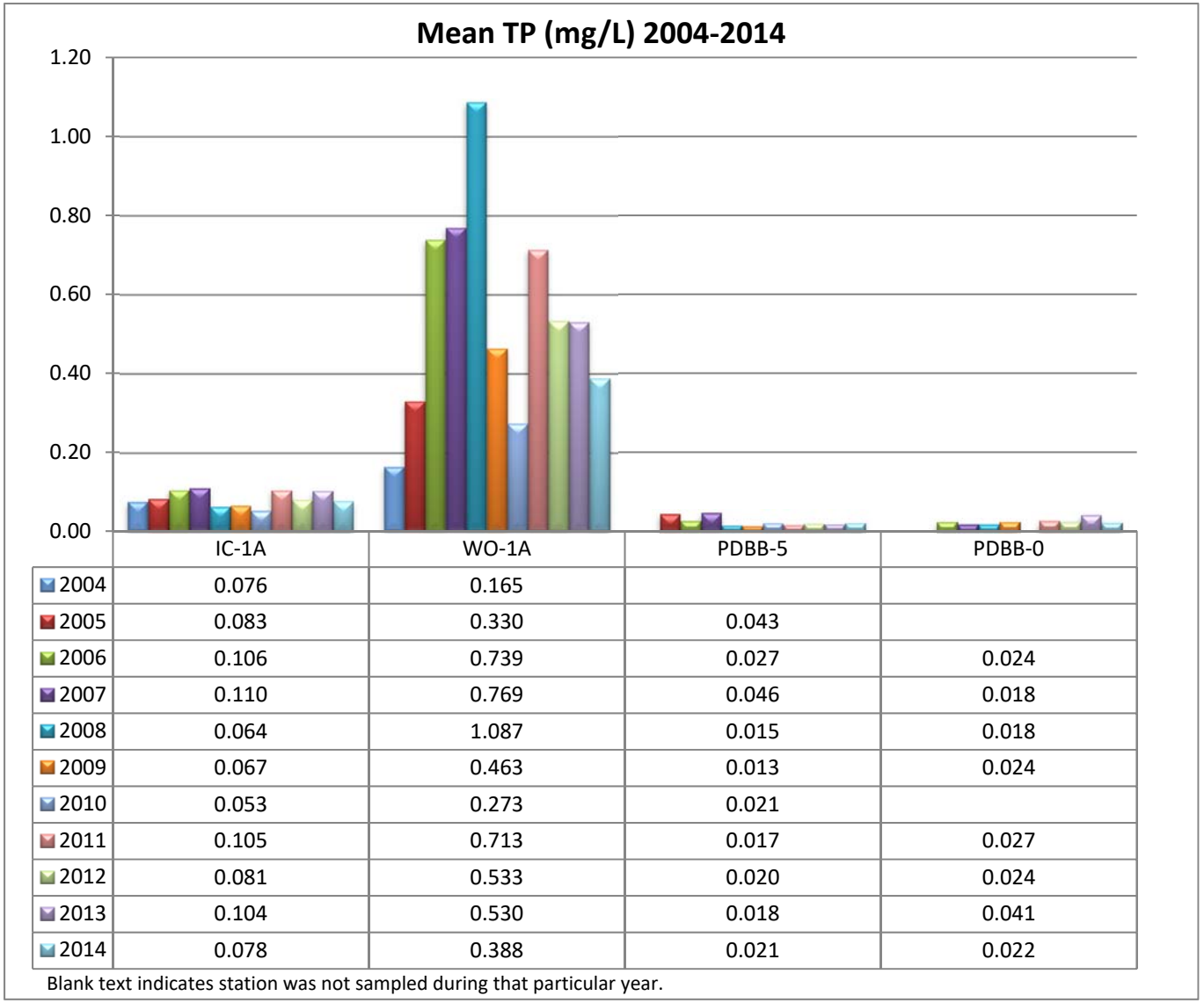


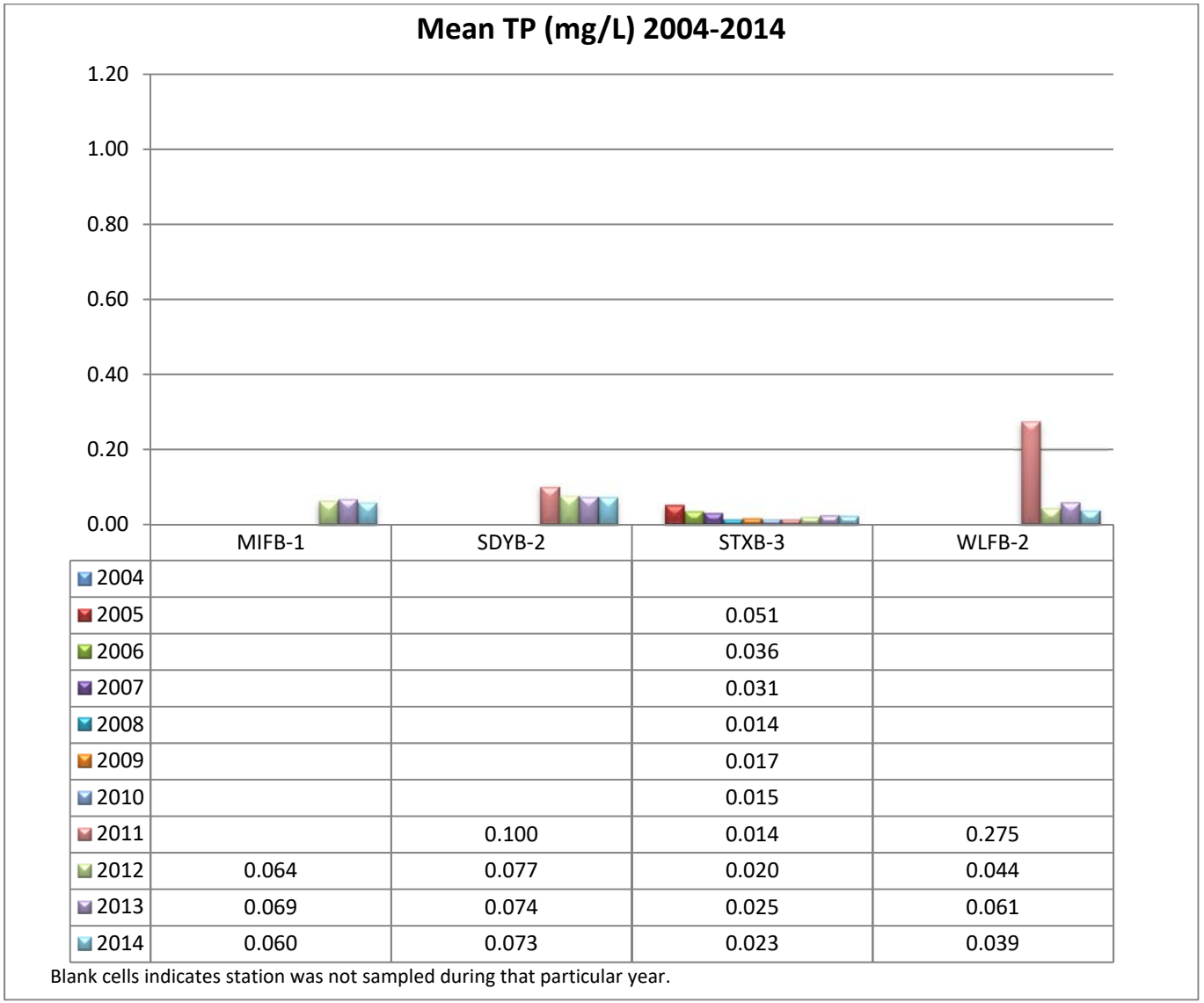
Figure 3. Mean growing season TP measured for the trend stations in the Perdido Sub-Watershed, 2004-2014.



	IC-1A	WO-1A	PDBB-5	PDBB-0
2004	0.076	0.165		
2005	0.083	0.330	0.043	
2006	0.106	0.739	0.027	0.024
2007	0.110	0.769	0.046	0.018
2008	0.064	1.087	0.015	0.018
2009	0.067	0.463	0.013	0.024
2010	0.053	0.273	0.021	
2011	0.105	0.713	0.017	0.027
2012	0.081	0.533	0.020	0.024
2013	0.104	0.530	0.018	0.041
2014	0.078	0.388	0.021	0.022

Blank text indicates station was not sampled during that particular year.

Figure 3. (Continued)



	MIFB-1	SDYB-2	STXB-3	WLFB-2
2004				
2005			0.051	
2006			0.036	
2007			0.031	
2008			0.014	
2009			0.017	
2010			0.015	
2011		0.100	0.014	0.275
2012	0.064	0.077	0.020	0.044
2013	0.069	0.074	0.025	0.061
2014	0.060	0.073	0.023	0.039

Blank cells indicates station was not sampled during that particular year.

Figure 3. (Continued)

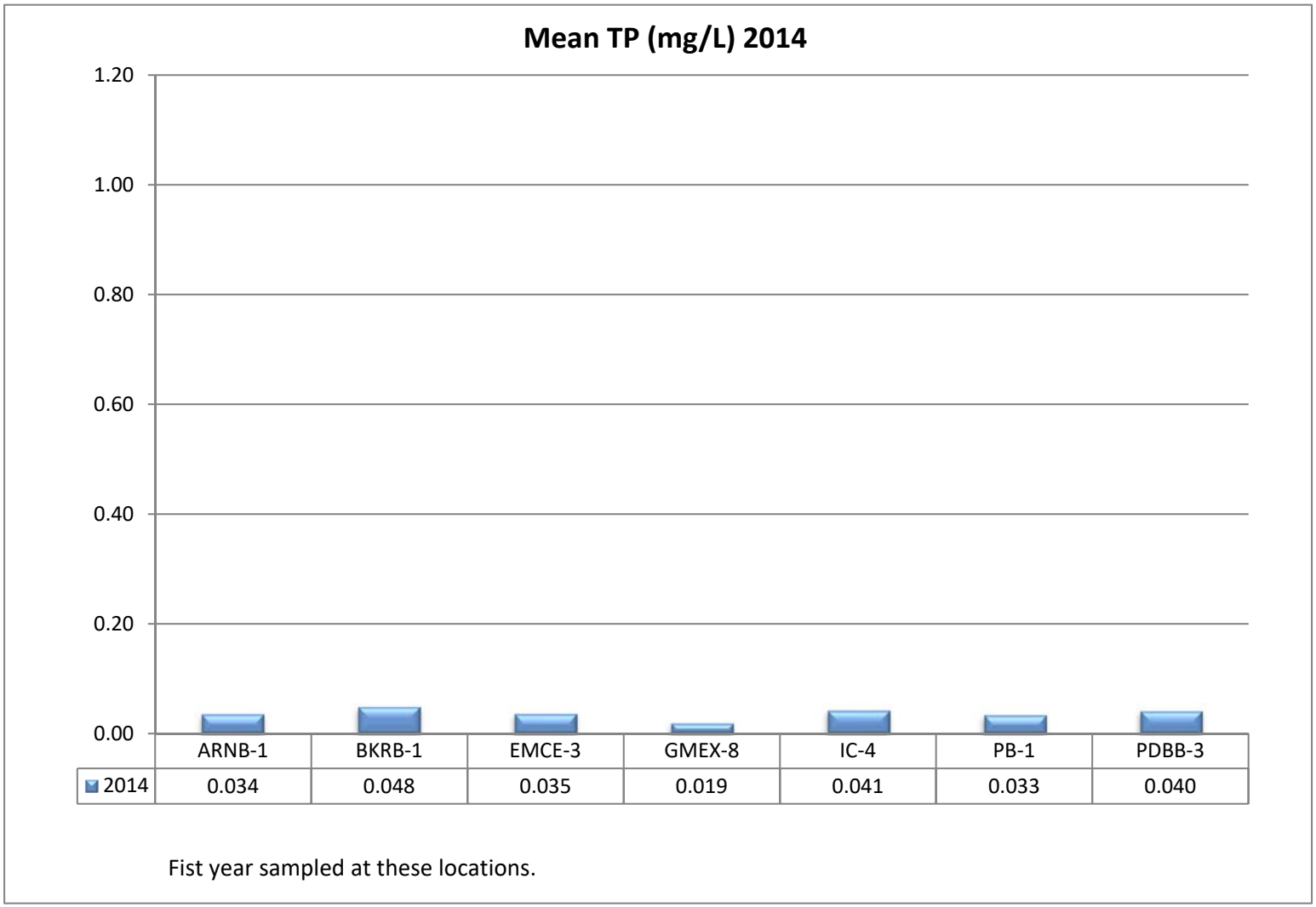
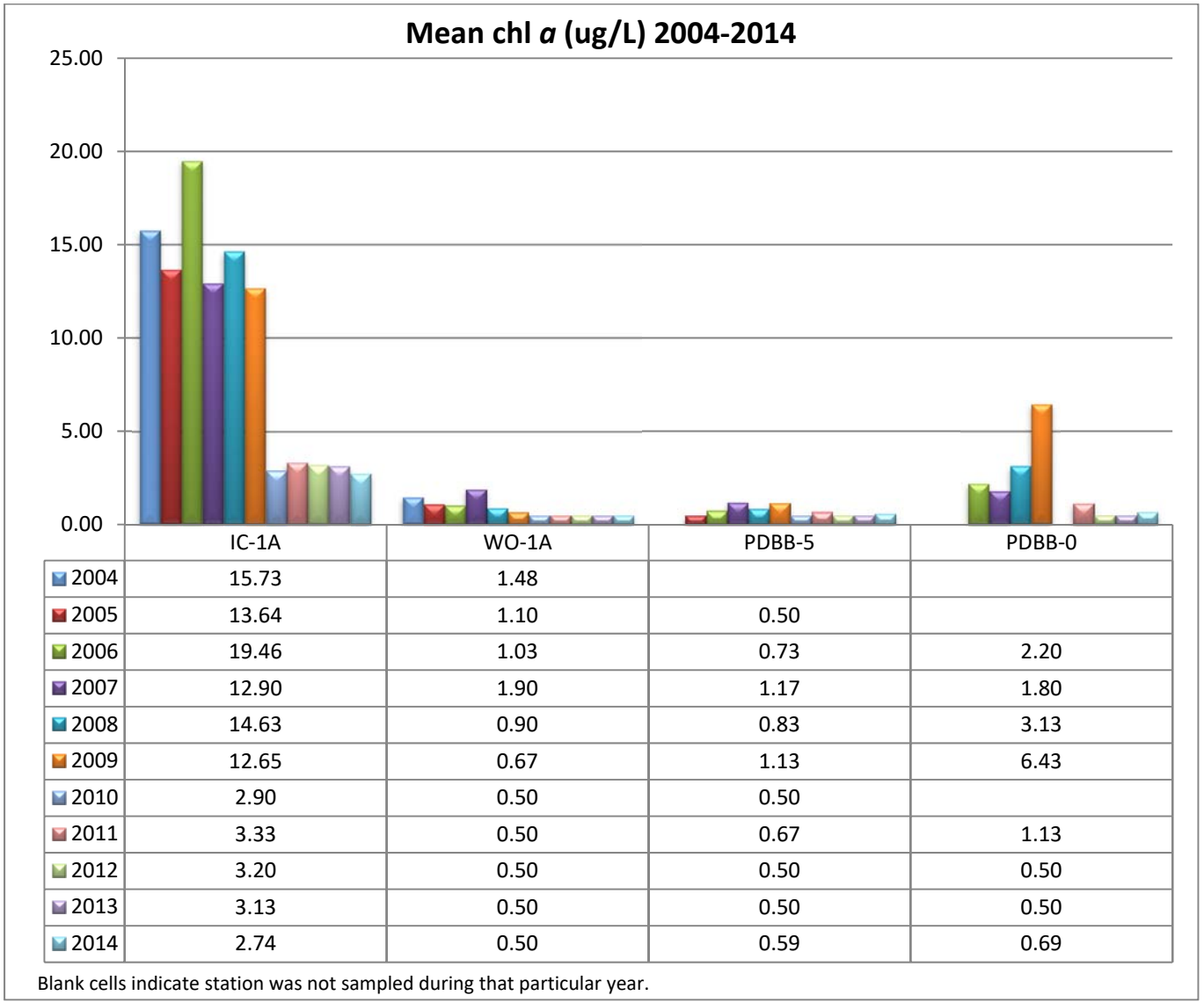


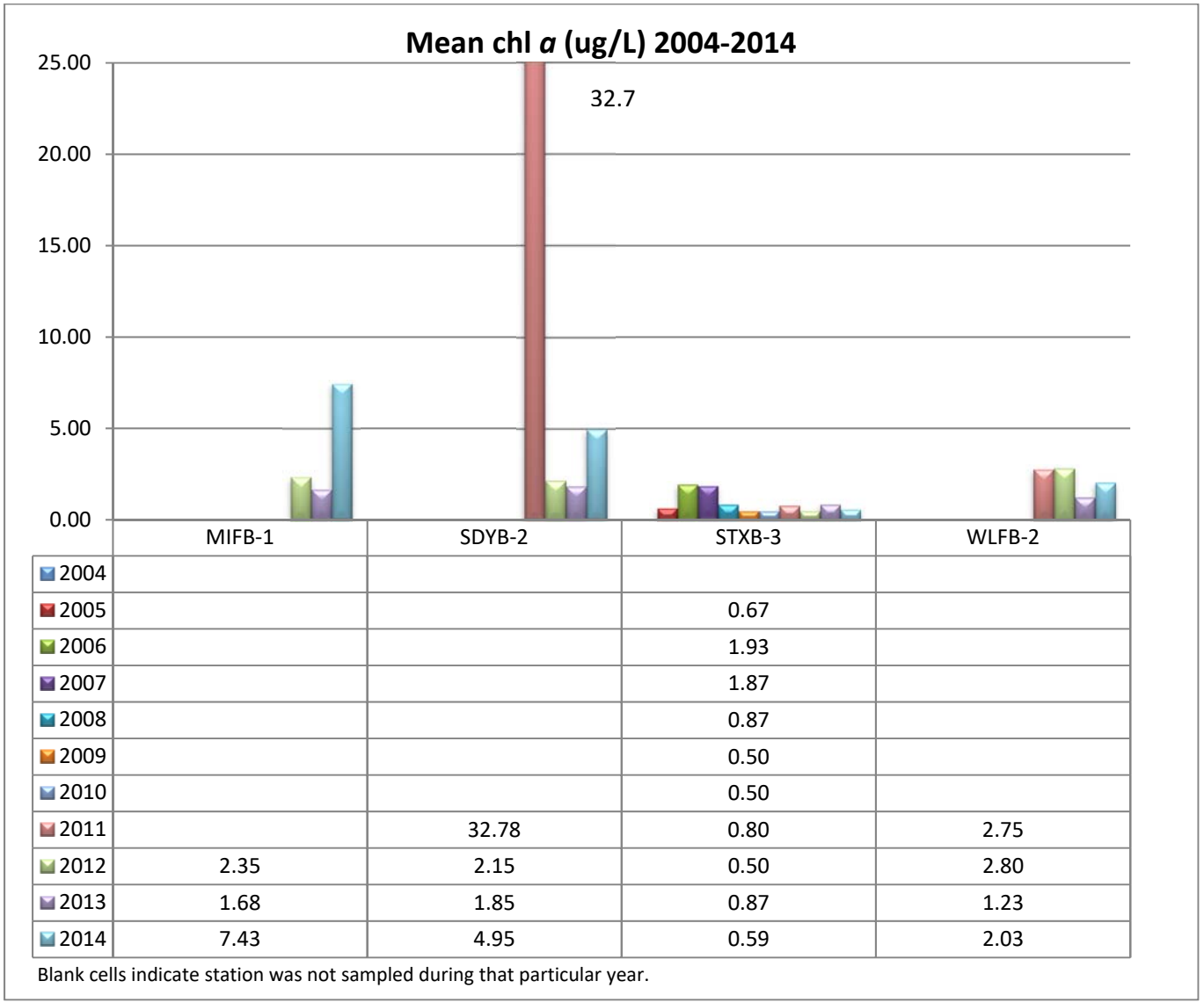
Figure 4. Mean growing season chl *a* measured for the trend stations in the Perdido Sub-Watershed, 2004-2014.



	IC-1A	WO-1A	PDBB-5	PDBB-0
2004	15.73	1.48		
2005	13.64	1.10	0.50	
2006	19.46	1.03	0.73	2.20
2007	12.90	1.90	1.17	1.80
2008	14.63	0.90	0.83	3.13
2009	12.65	0.67	1.13	6.43
2010	2.90	0.50	0.50	
2011	3.33	0.50	0.67	1.13
2012	3.20	0.50	0.50	0.50
2013	3.13	0.50	0.50	0.50
2014	2.74	0.50	0.59	0.69

Blank cells indicate station was not sampled during that particular year.

Figure 4. (Continued)



	MIFB-1	SDYB-2	STXB-3	WLFB-2
2004				
2005			0.67	
2006			1.93	
2007			1.87	
2008			0.87	
2009			0.50	
2010			0.50	
2011		32.78	0.80	2.75
2012	2.35	2.15	0.50	2.80
2013	1.68	1.85	0.87	1.23
2014	7.43	4.95	0.59	2.03

Blank cells indicate station was not sampled during that particular year.

Figure 4. (Continued)

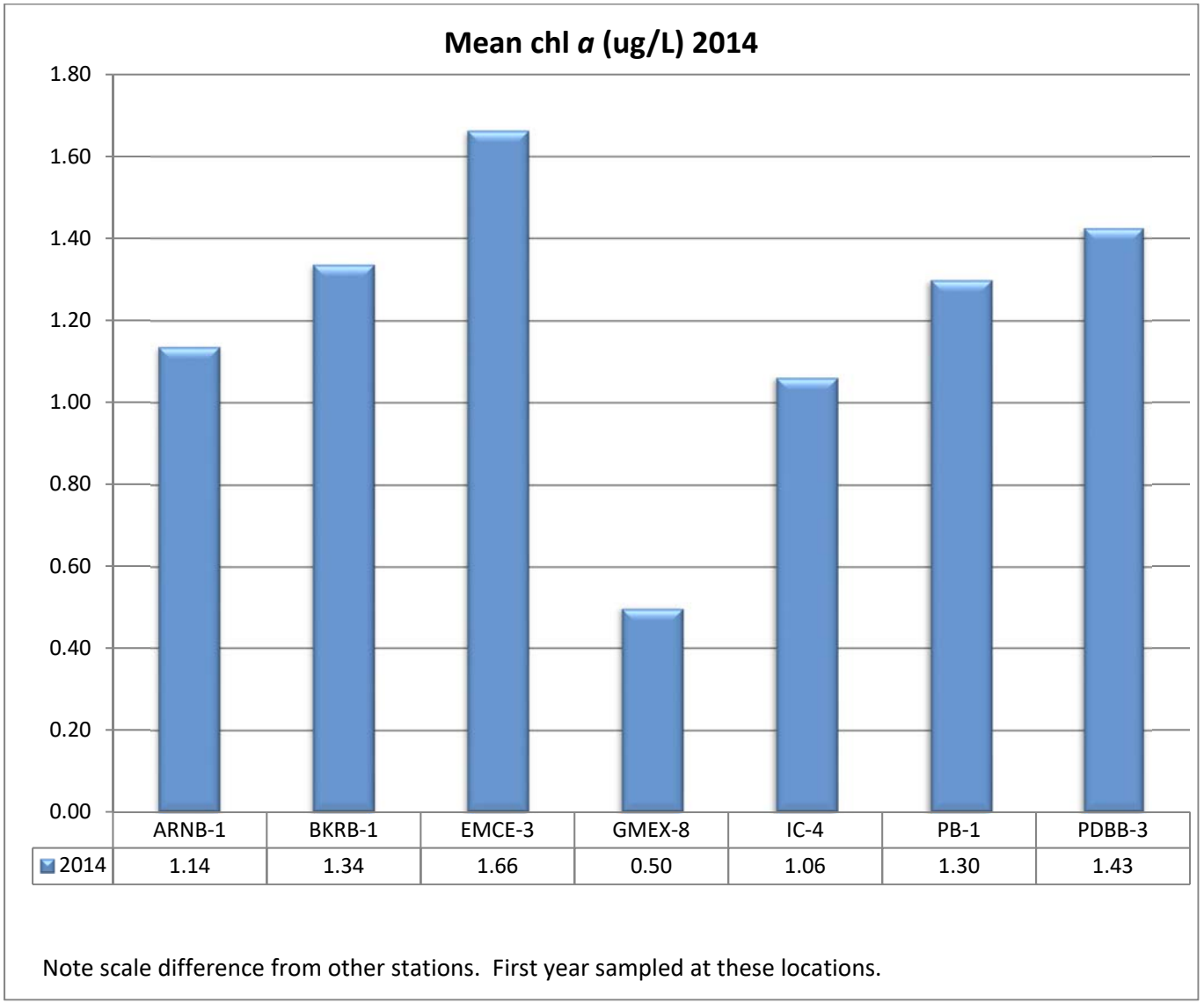
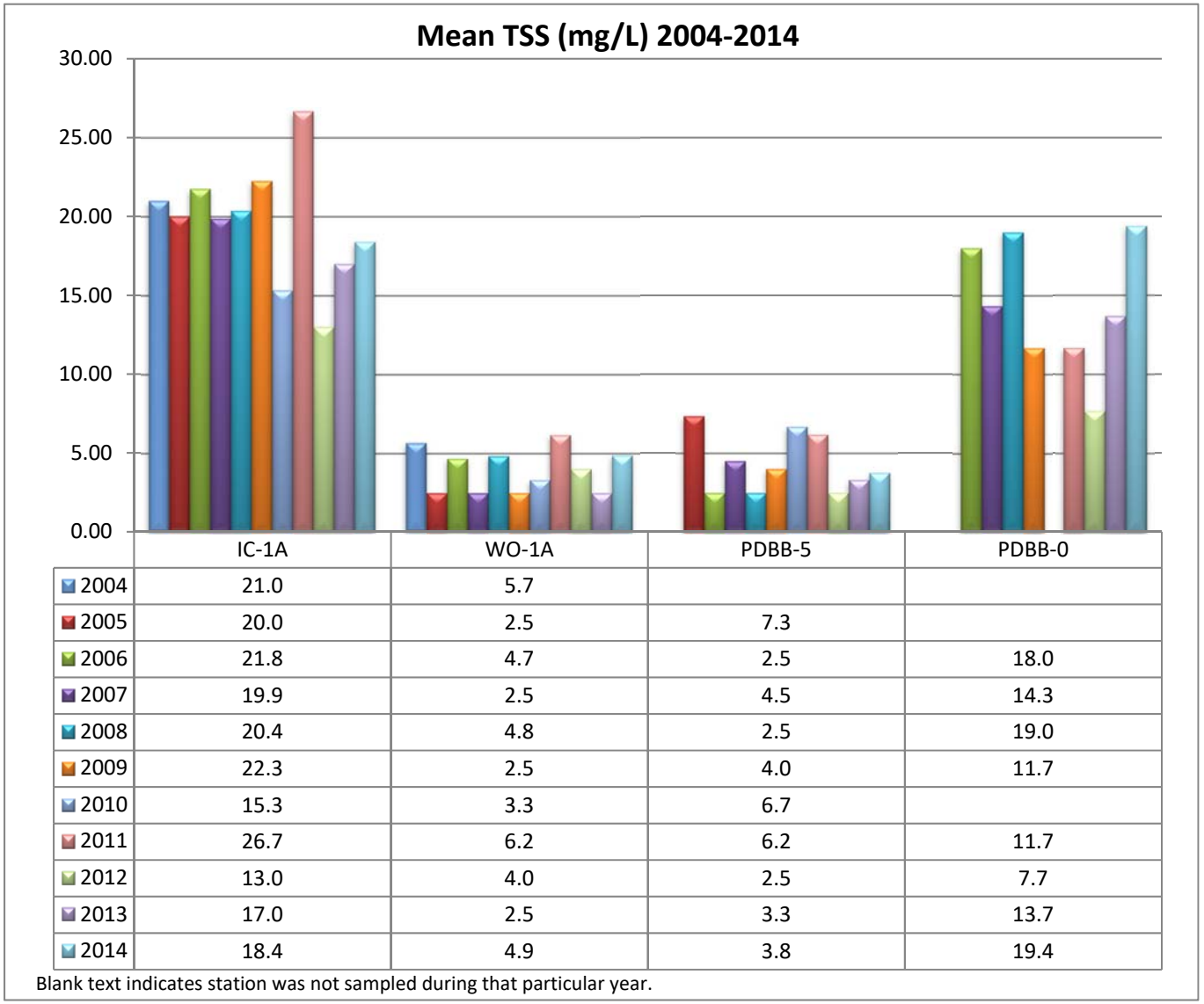


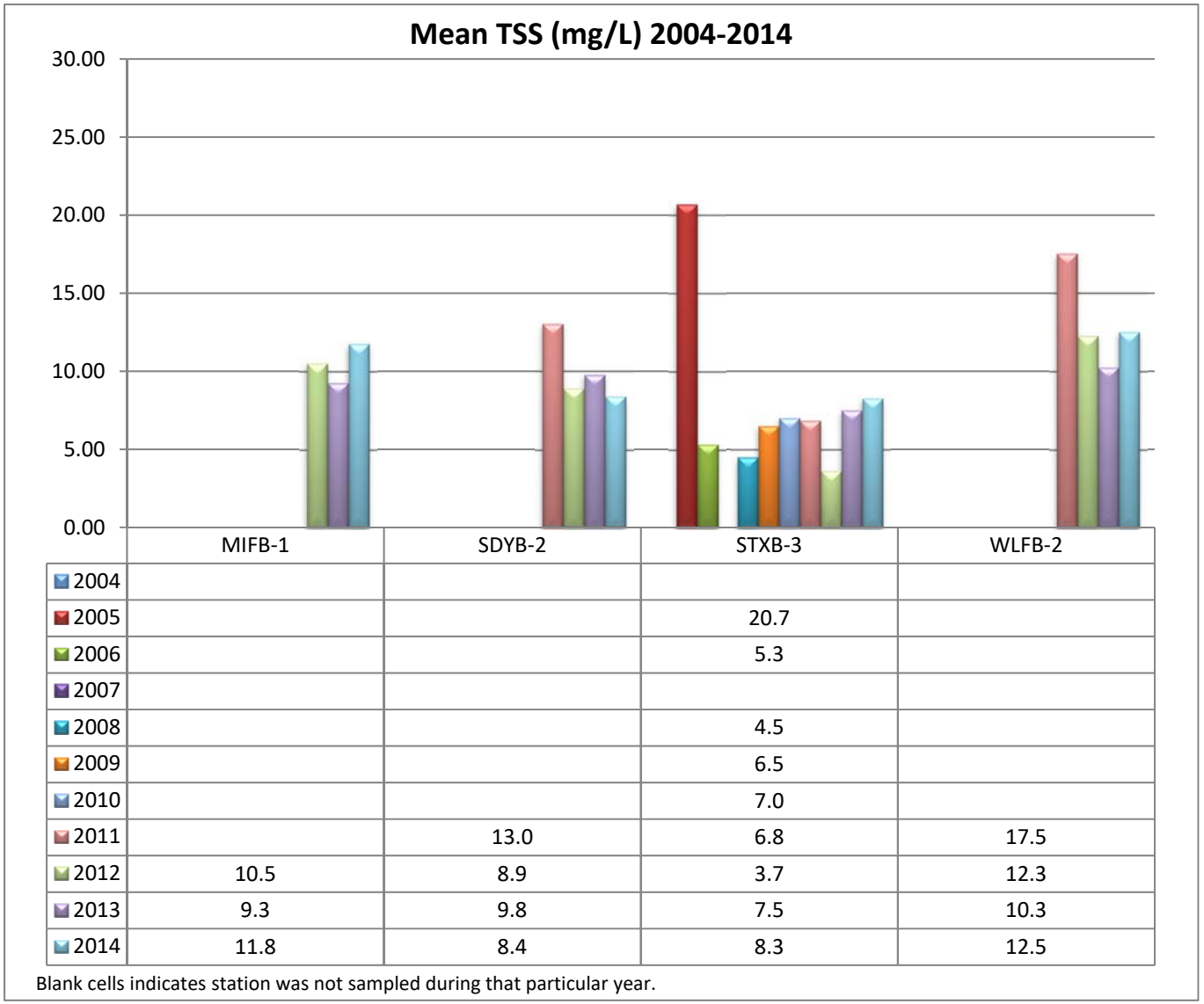
Figure 5. Mean growing season TSS measured for the trend stations in the Perdido Sub-Watershed, 2004-2014.



	IC-1A	WO-1A	PDBB-5	PDBB-0
2004	21.0	5.7		
2005	20.0	2.5	7.3	
2006	21.8	4.7	2.5	18.0
2007	19.9	2.5	4.5	14.3
2008	20.4	4.8	2.5	19.0
2009	22.3	2.5	4.0	11.7
2010	15.3	3.3	6.7	
2011	26.7	6.2	6.2	11.7
2012	13.0	4.0	2.5	7.7
2013	17.0	2.5	3.3	13.7
2014	18.4	4.9	3.8	19.4

Blank text indicates station was not sampled during that particular year.

Figure 5. (Continued)



	MIFB-1	SDYB-2	STXB-3	WLFB-2
2004				
2005			20.7	
2006			5.3	
2007				
2008			4.5	
2009			6.5	
2010			7.0	
2011		13.0	6.8	17.5
2012	10.5	8.9	3.7	12.3
2013	9.3	9.8	7.5	10.3
2014	11.8	8.4	8.3	12.5

Blank cells indicates station was not sampled during that particular year.

Figure 5. (Continued)

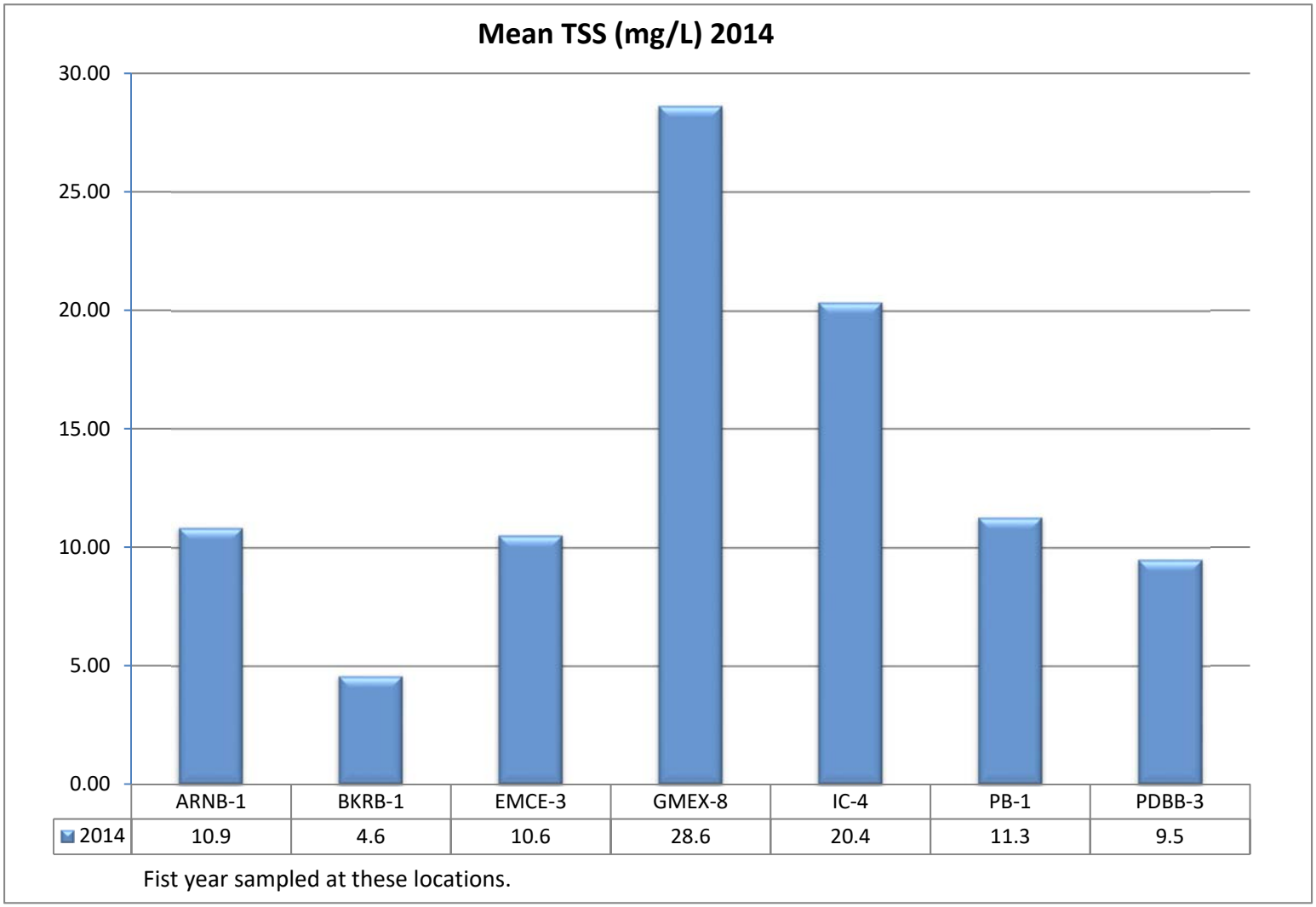
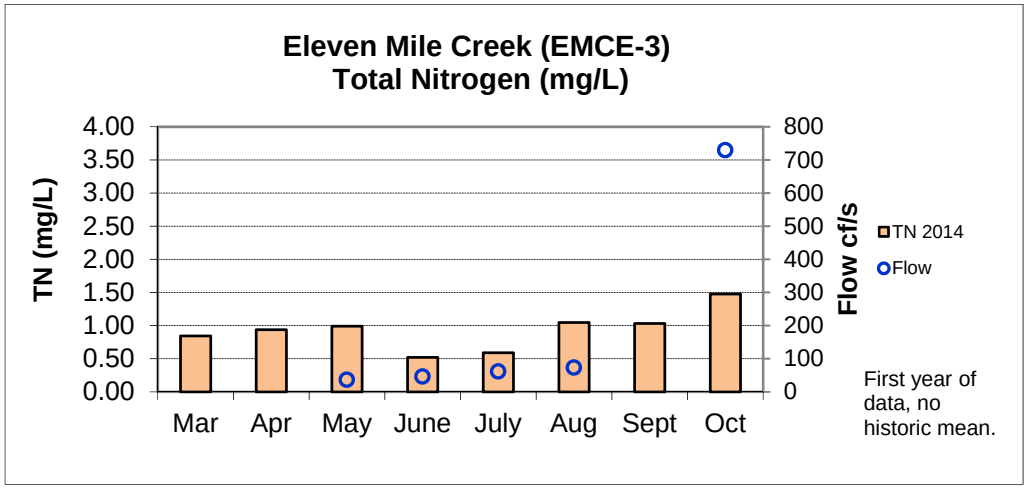
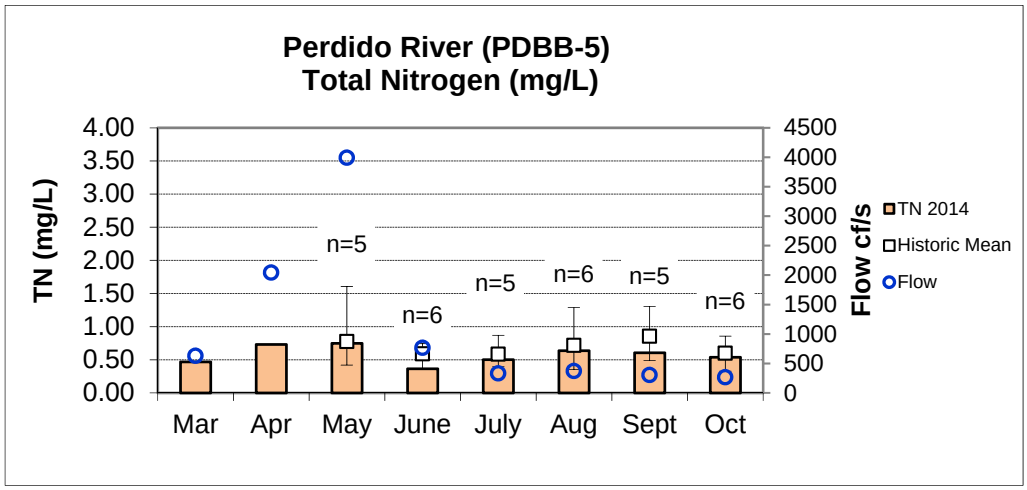
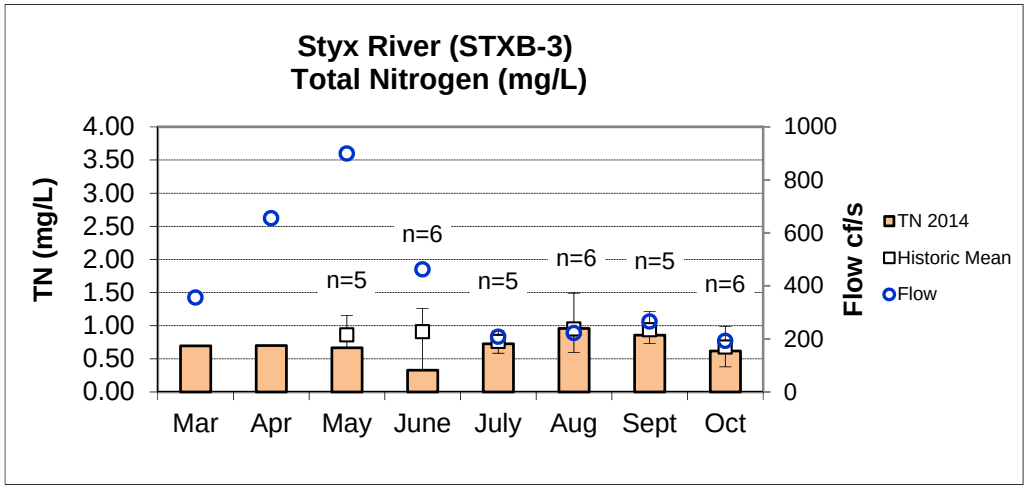


Figure 6. Monthly TN concentrations measured in the Perdido Sub-Watershed, March-October 2014. Each bar graph depicts changes in each station. The historic mean (1990-2014) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Flow measured at several stations.







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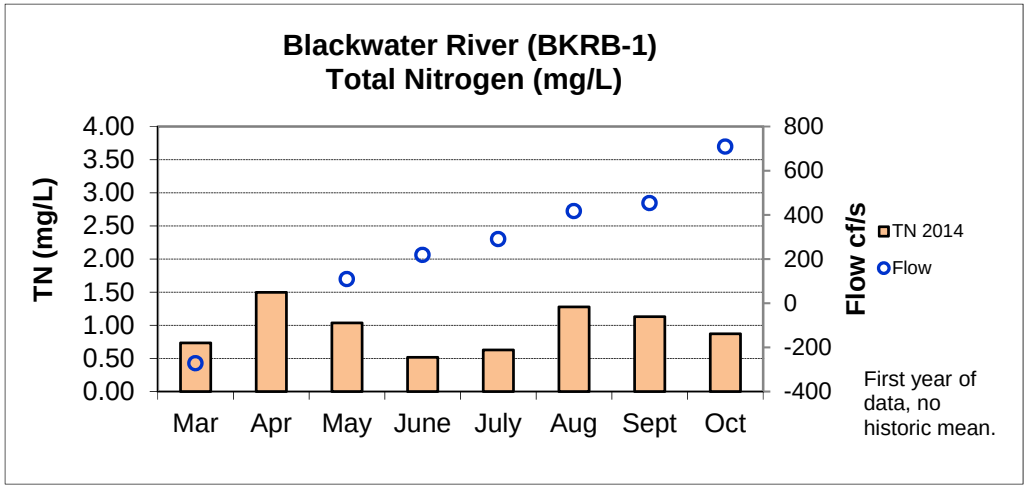

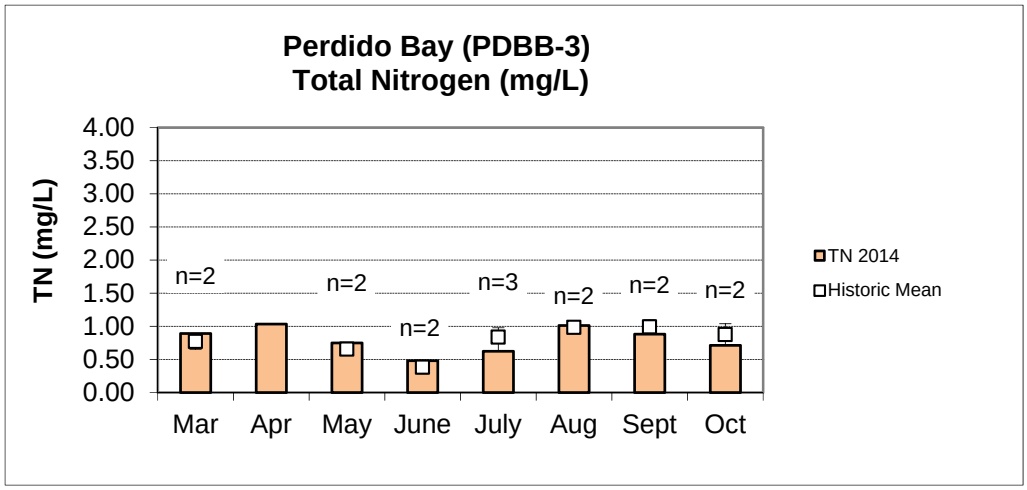

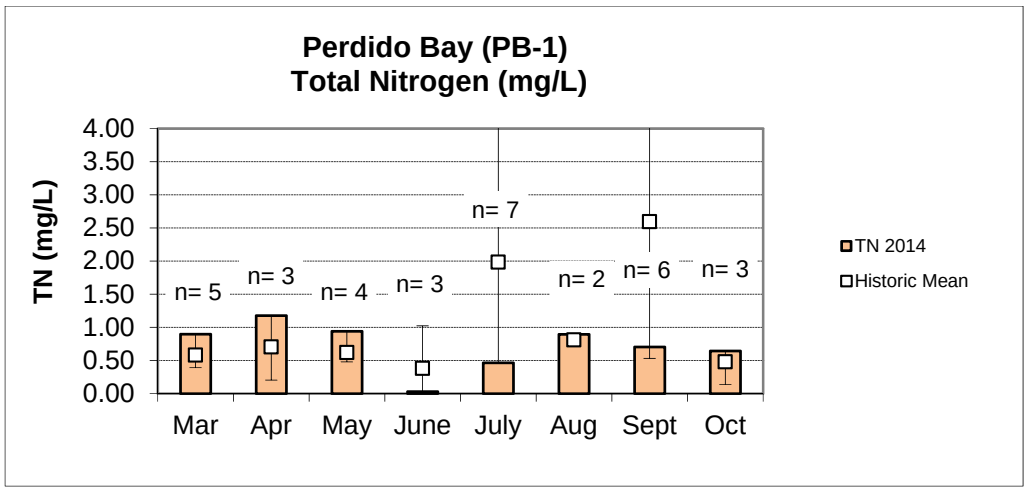

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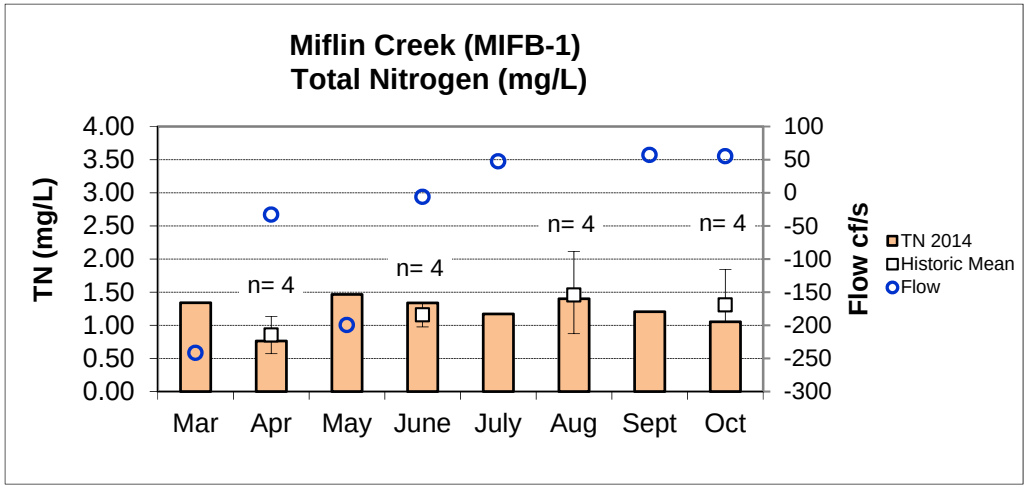

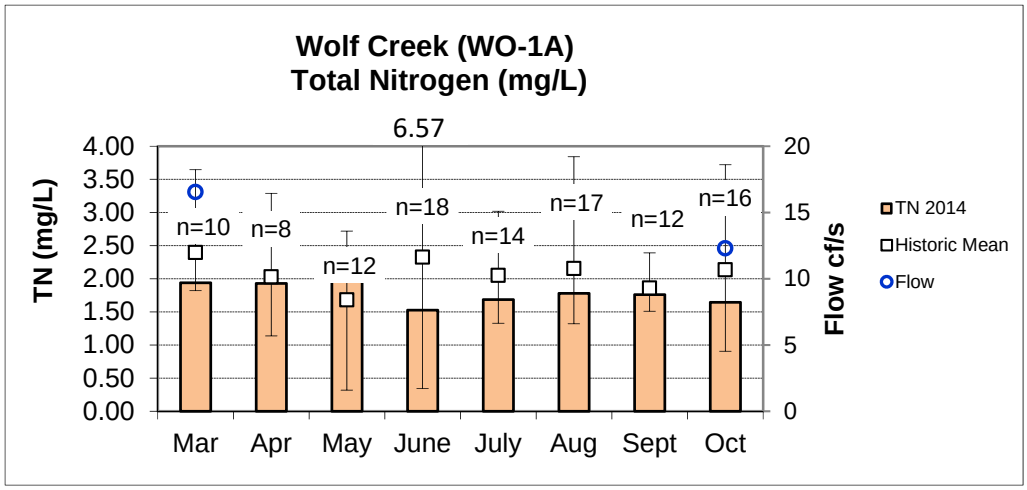

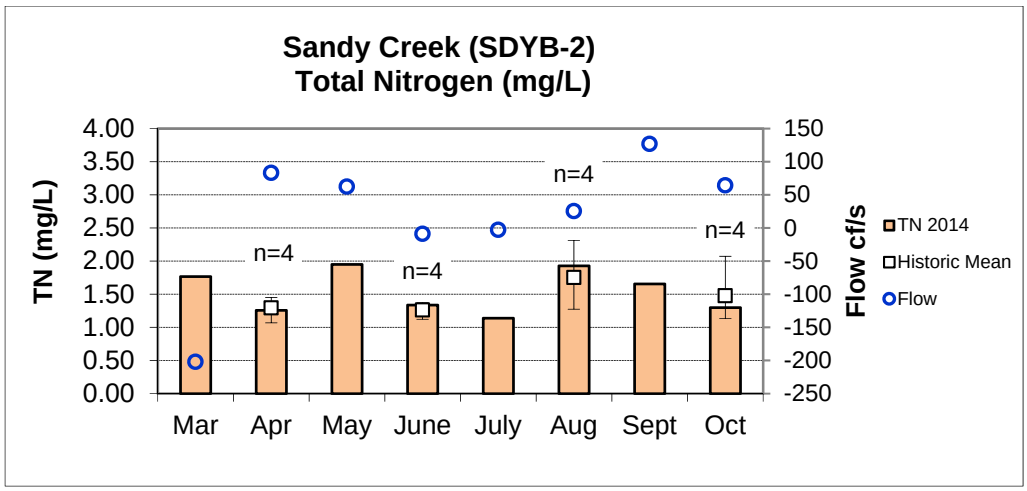

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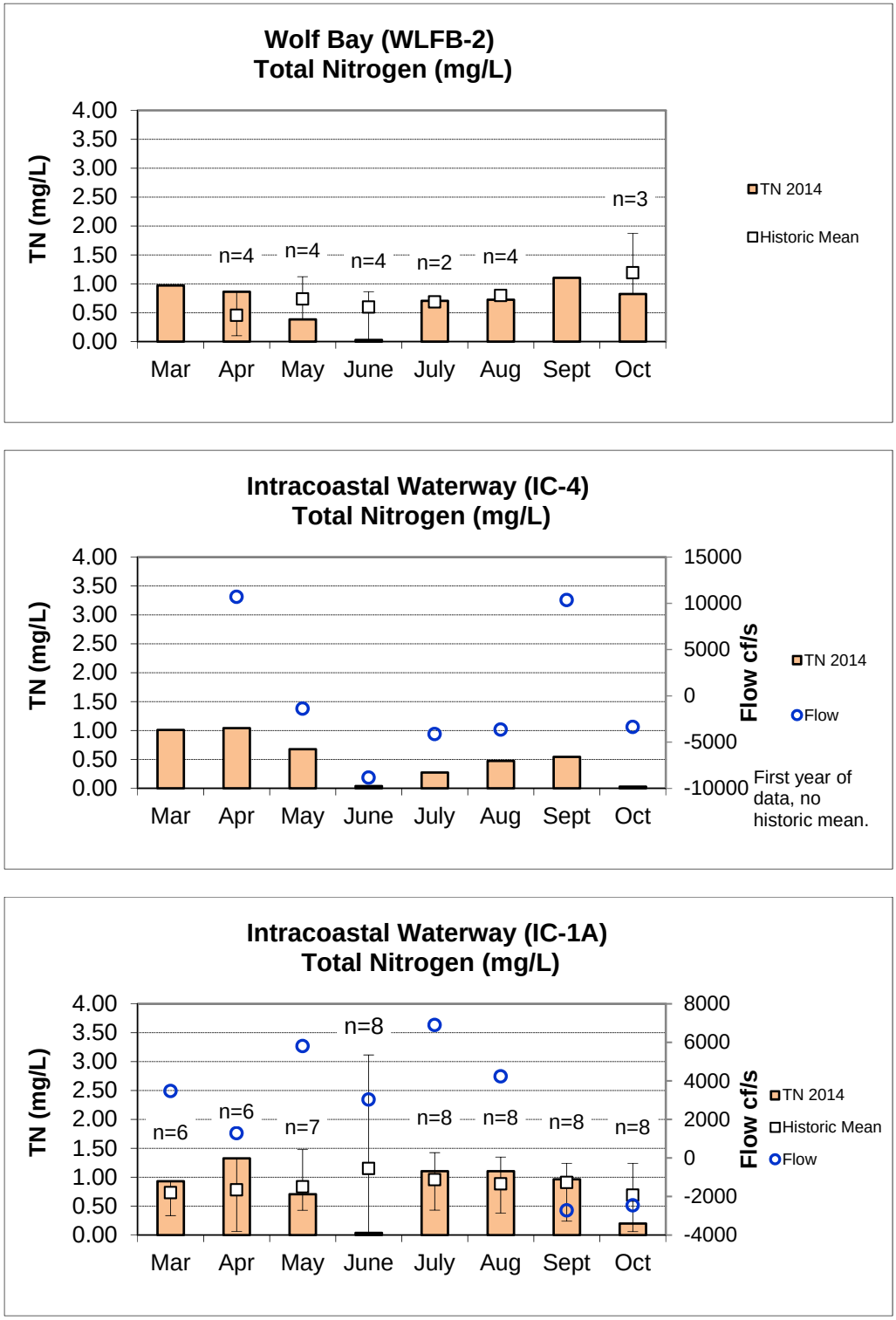

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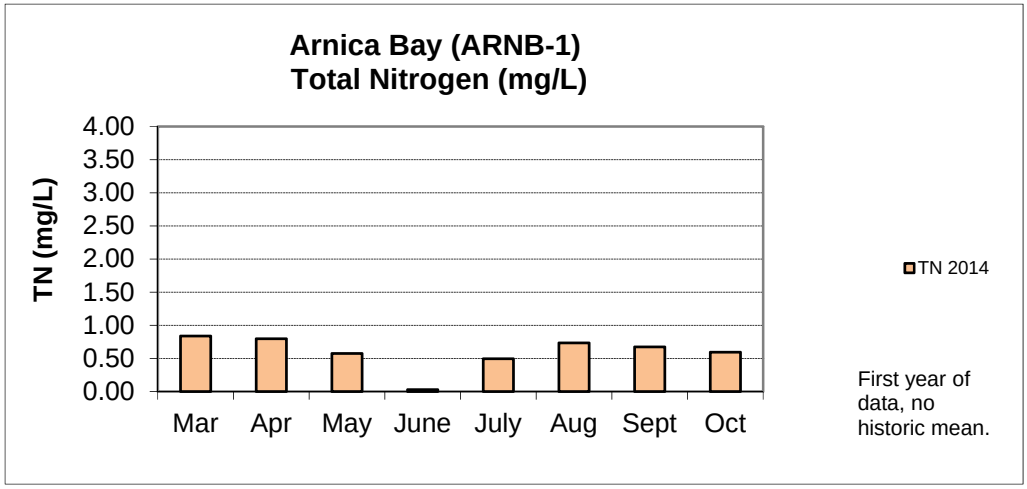
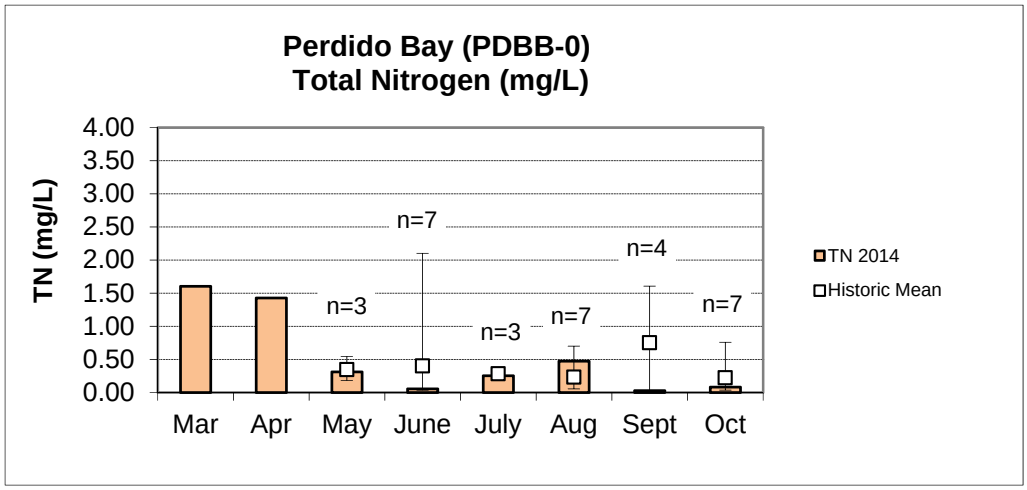




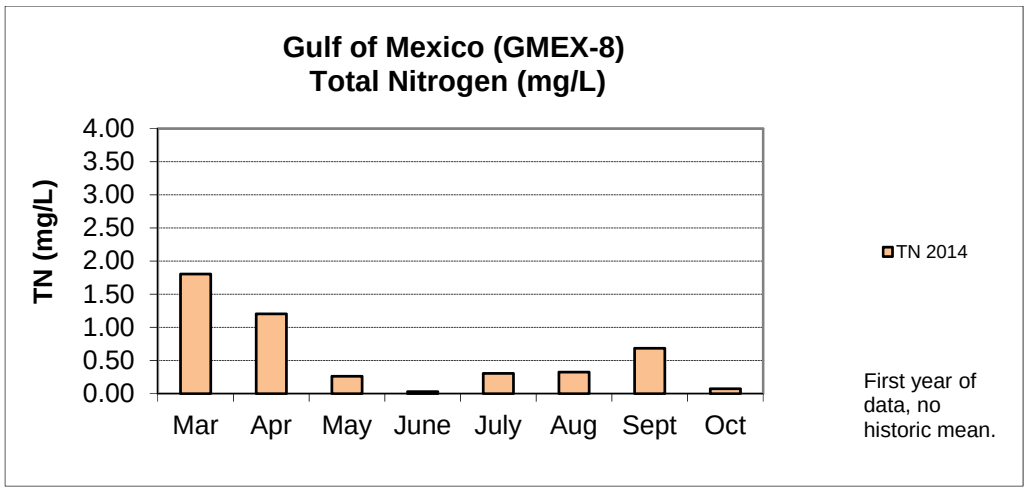
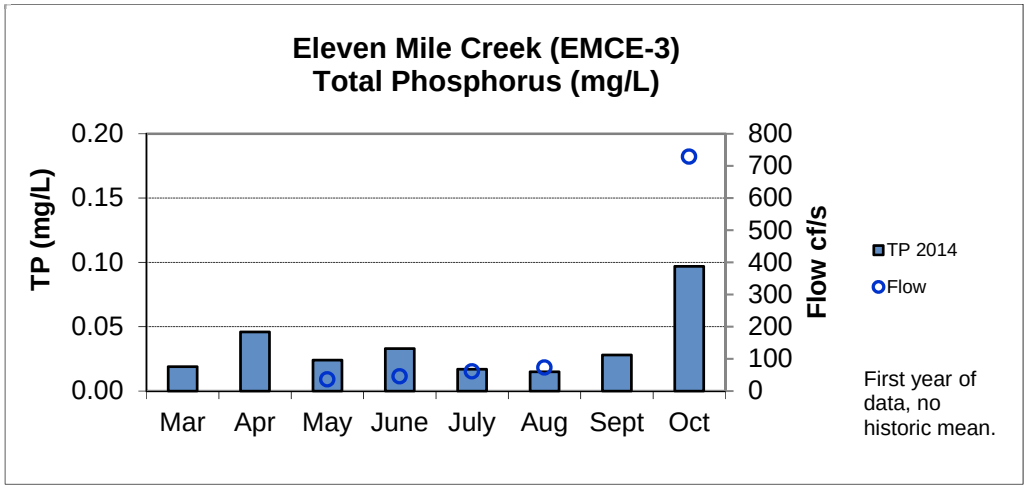
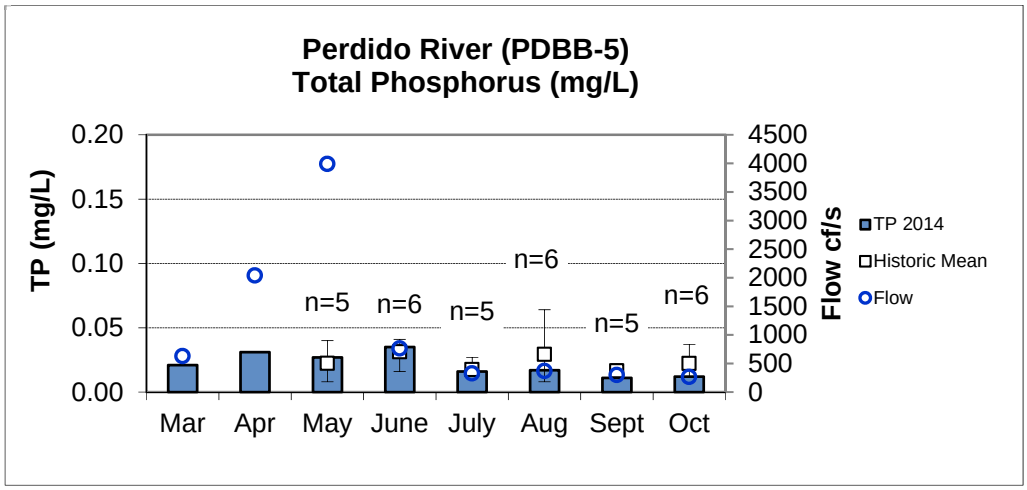
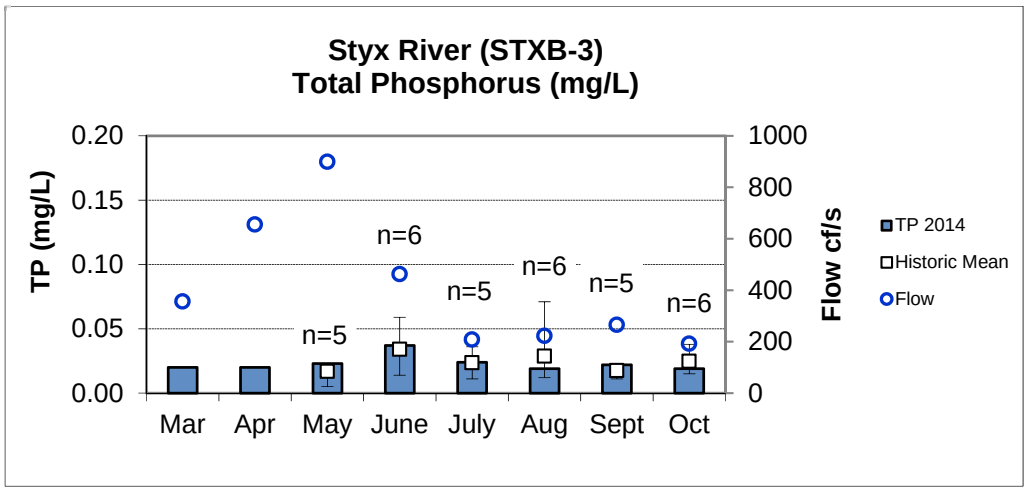


Figure 7. Monthly TP concentrations measured in the Perdido Sub-Watershed, March-October 2014. Each bar graph depicts changes in each station. The historic mean (1990-2014) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations**.** Flow measured at several stations.







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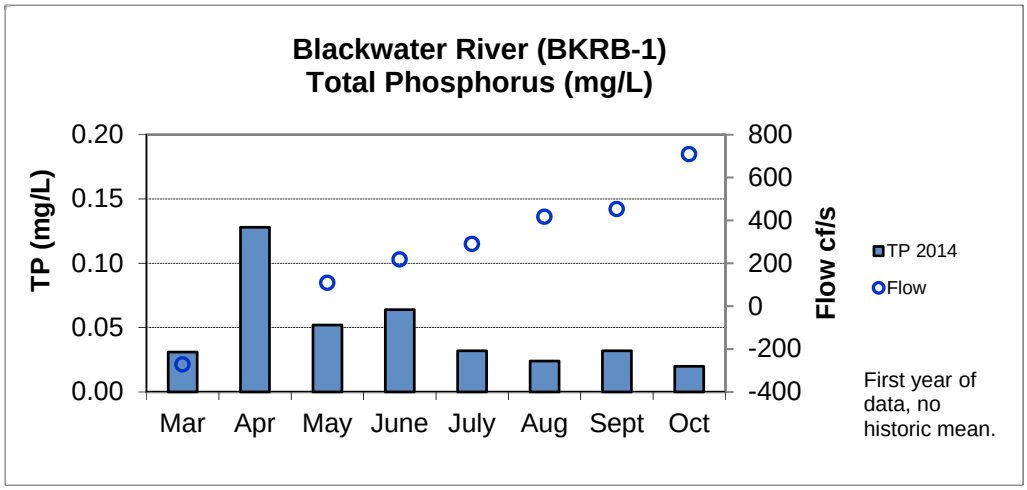

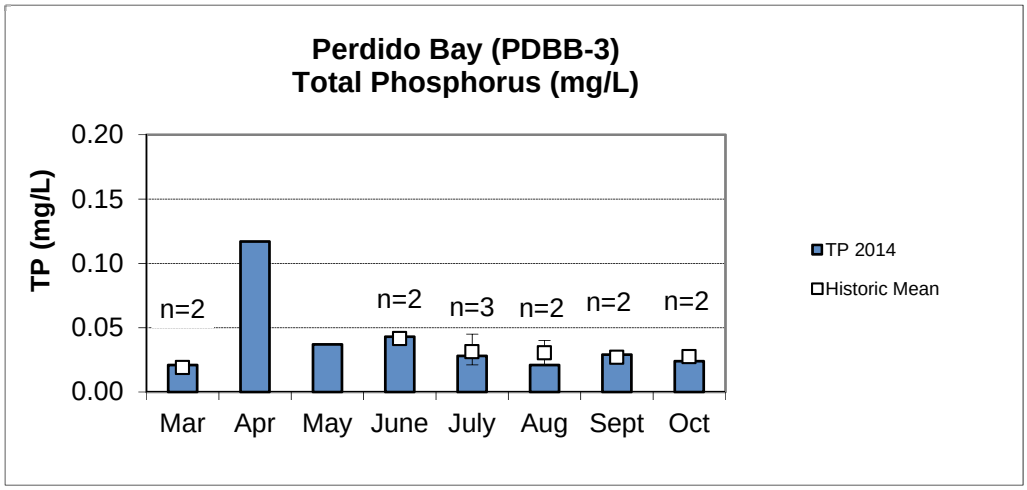

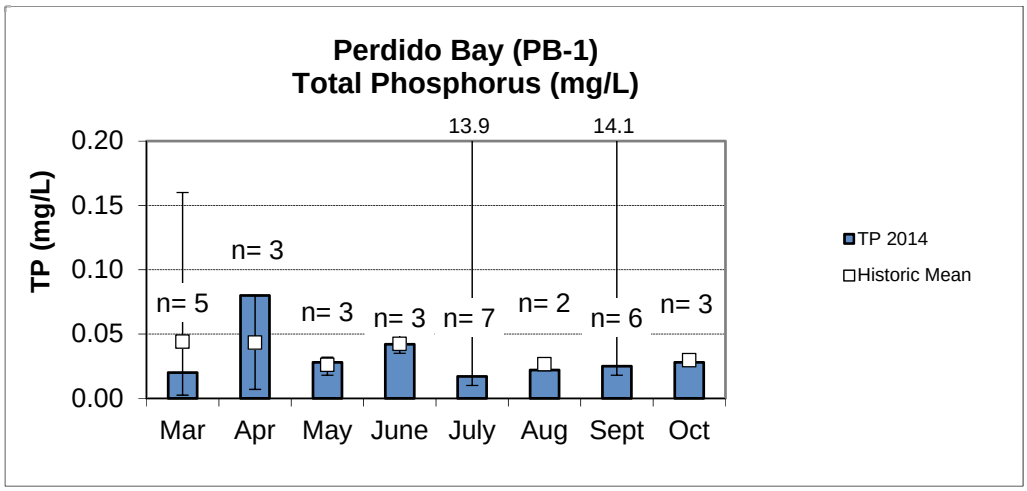

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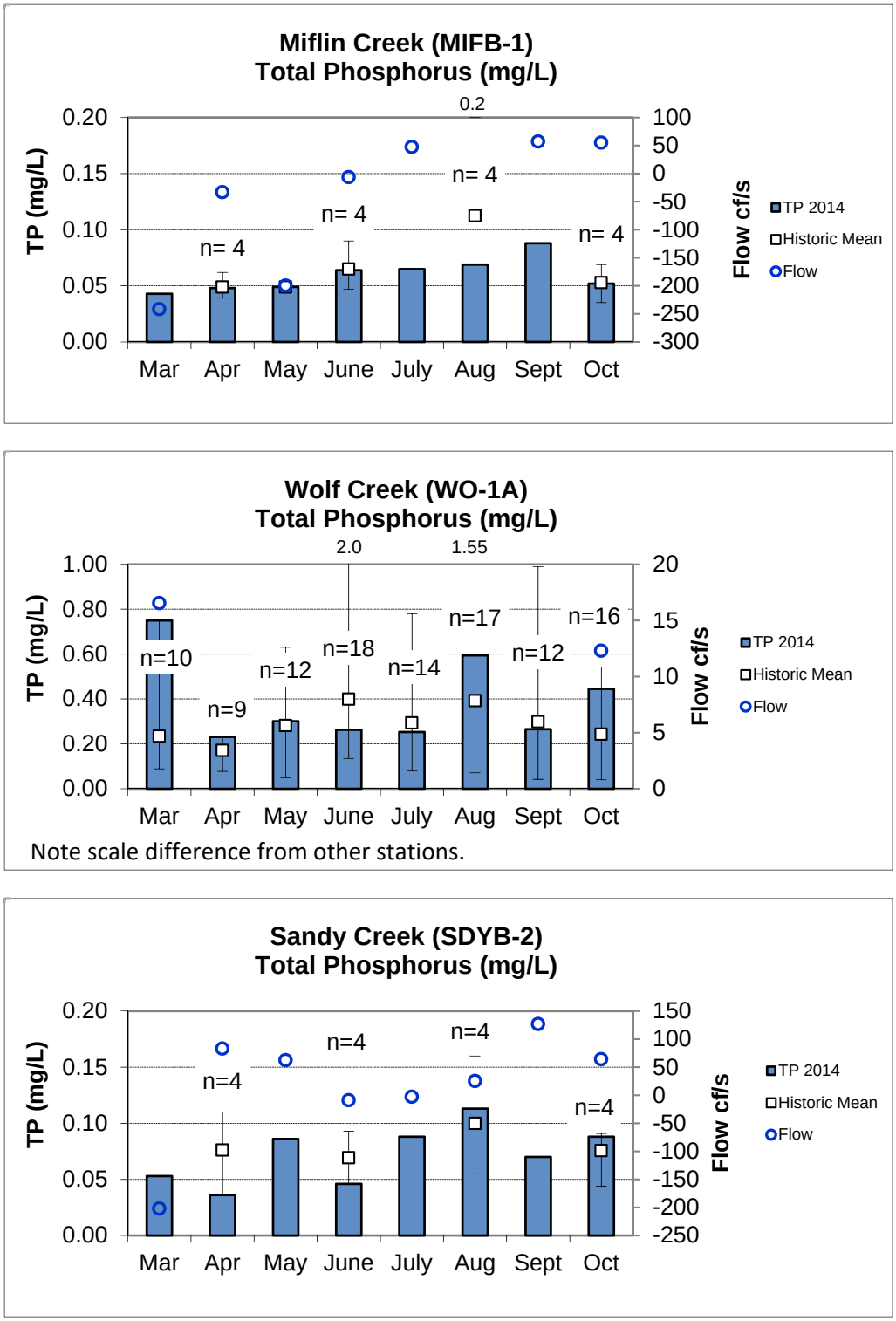

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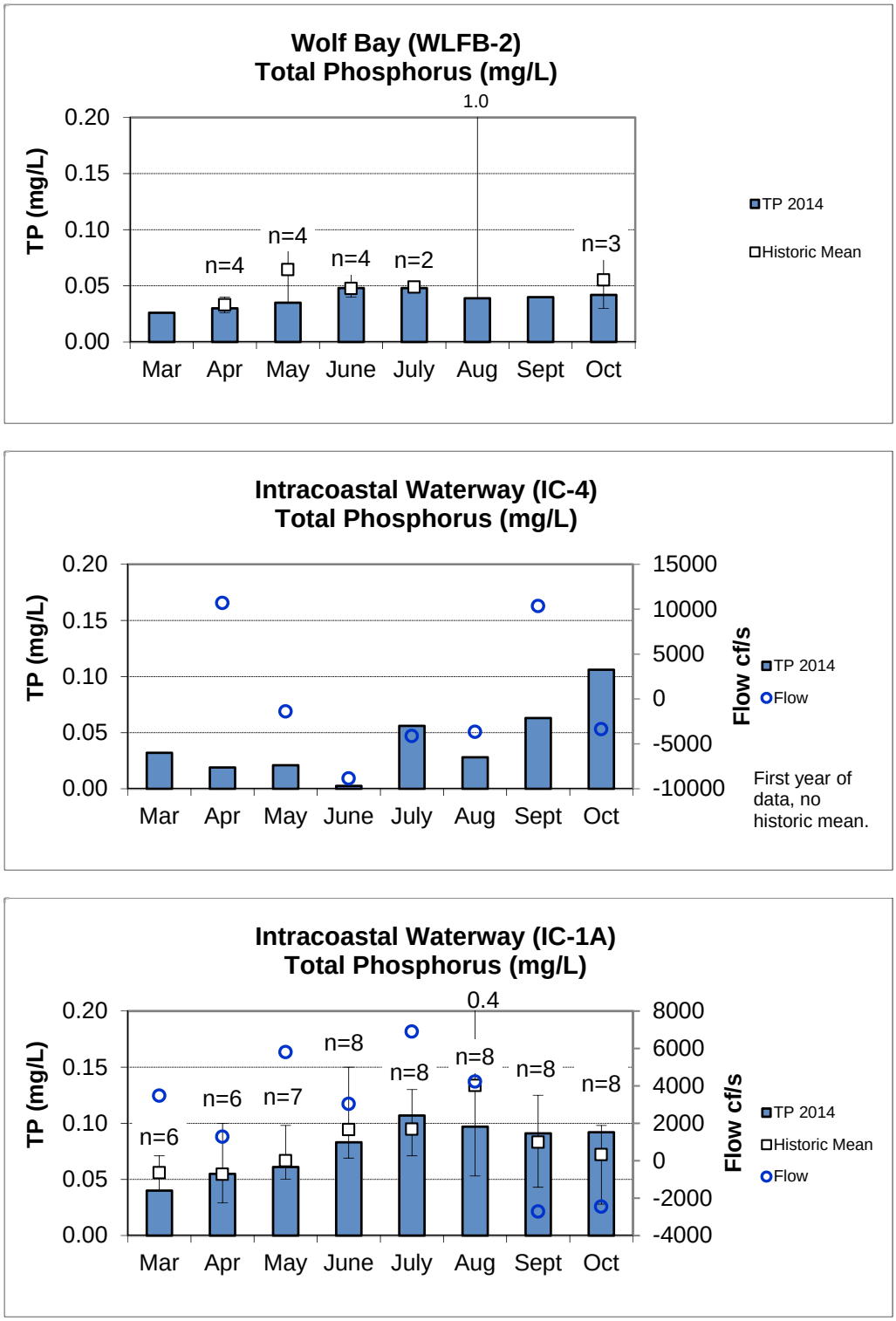

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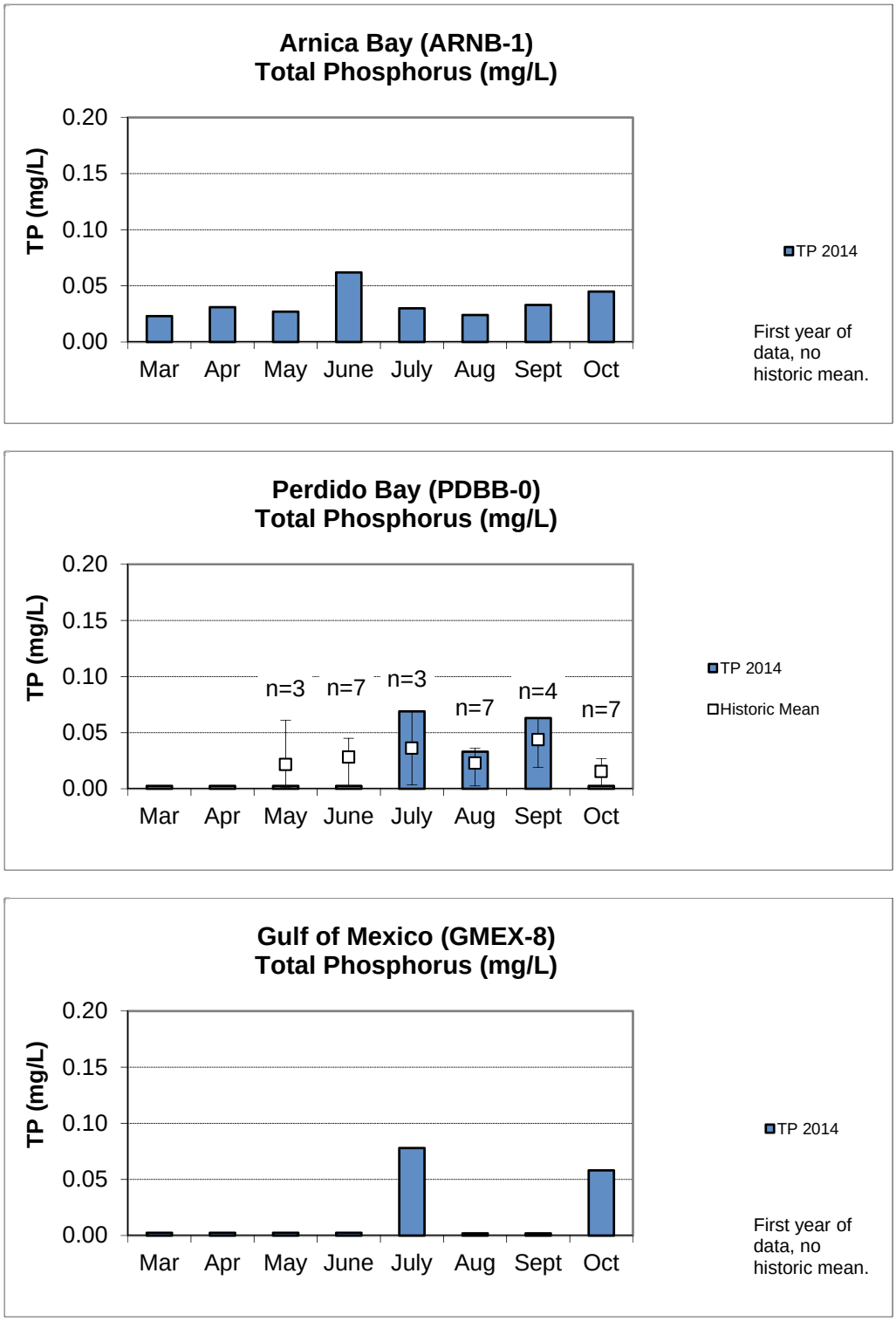
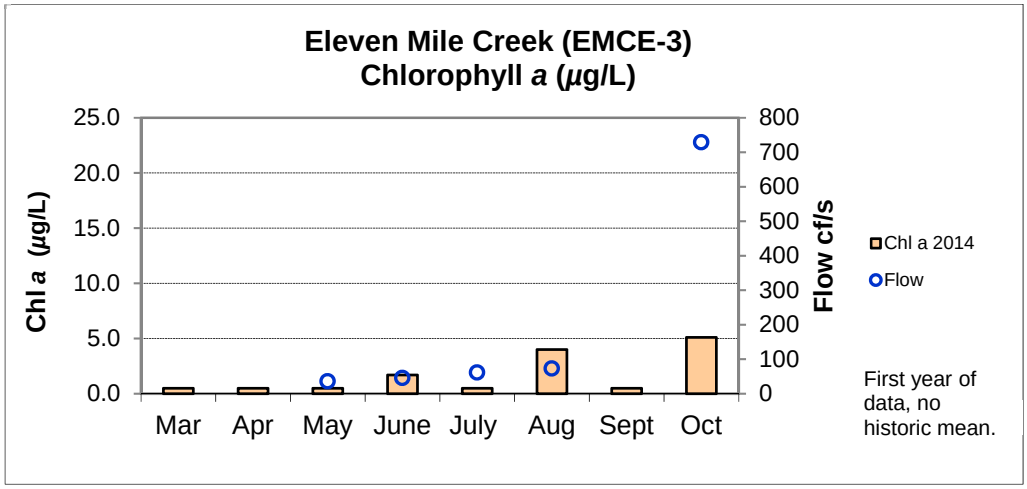
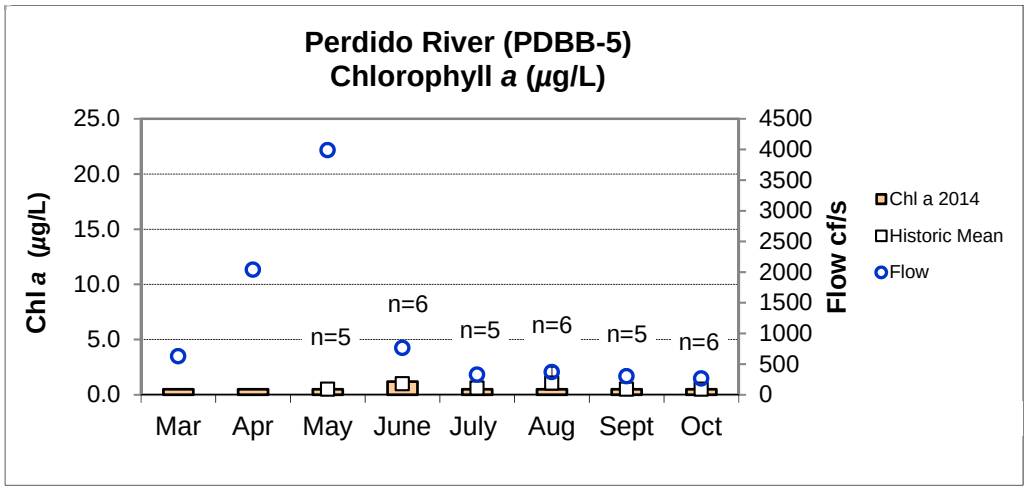
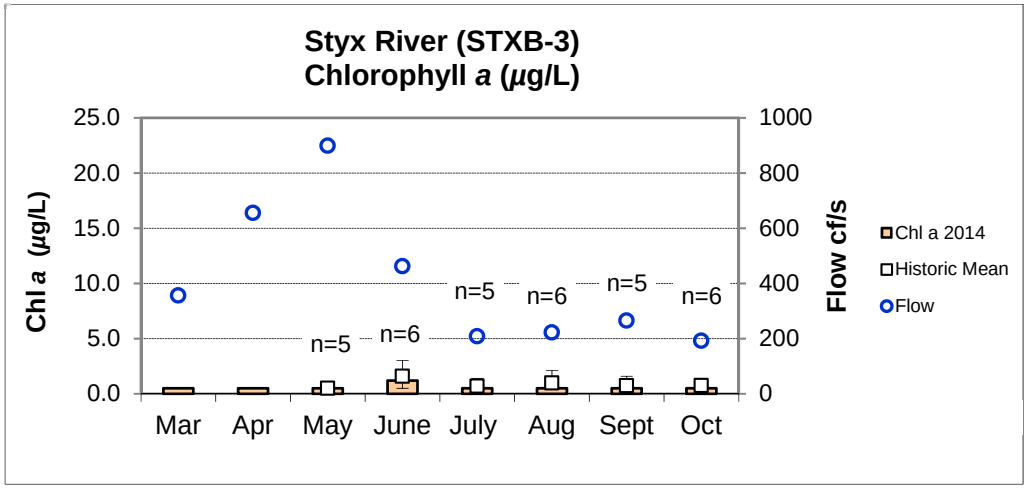


Figure 8. Monthly chl *a* concentrations measured in the Perdido Sub-Watershed, March-October 2014. Each bar graph depicts changes in each station. The historic mean (1990-2014) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Flow measured at several stations.







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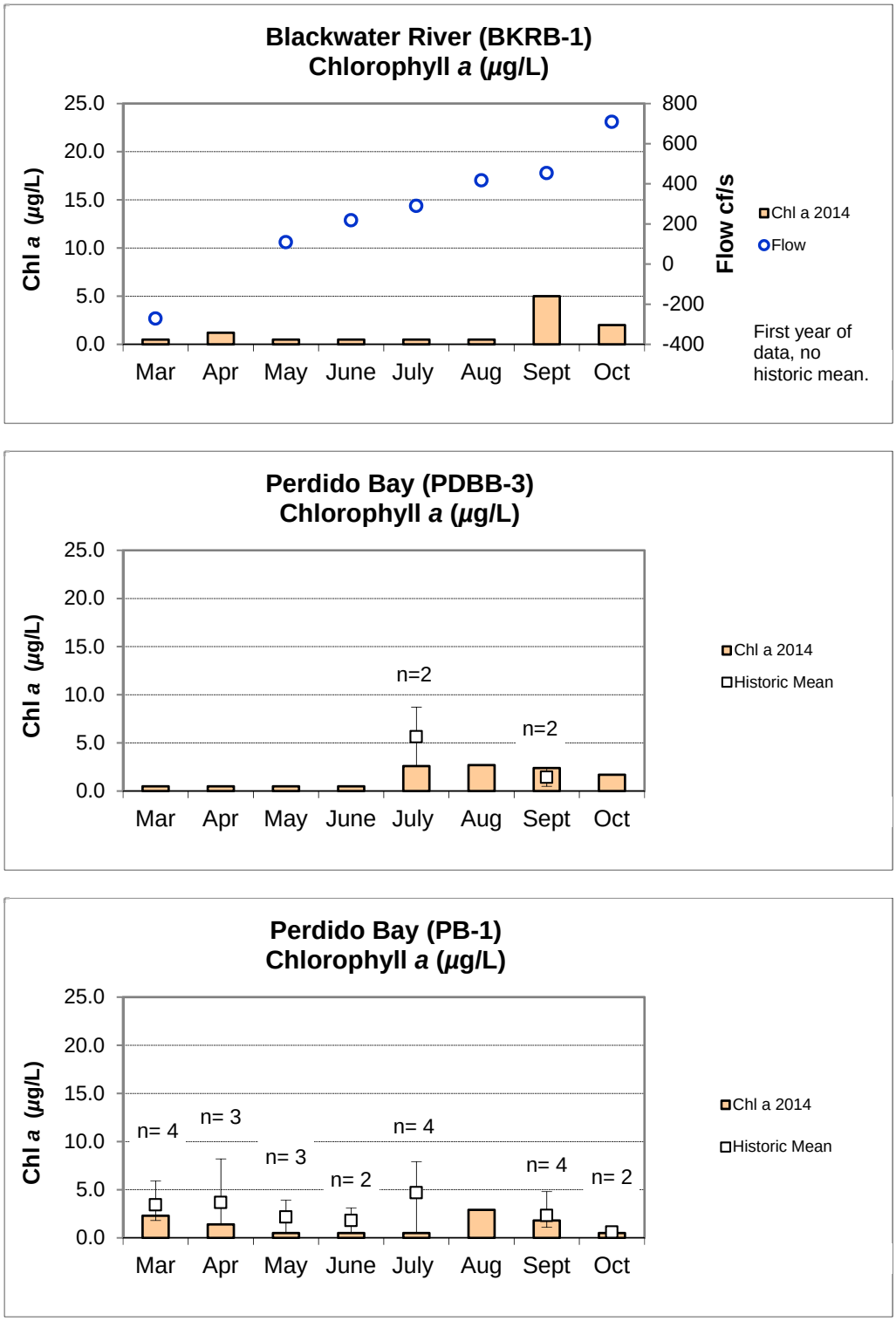

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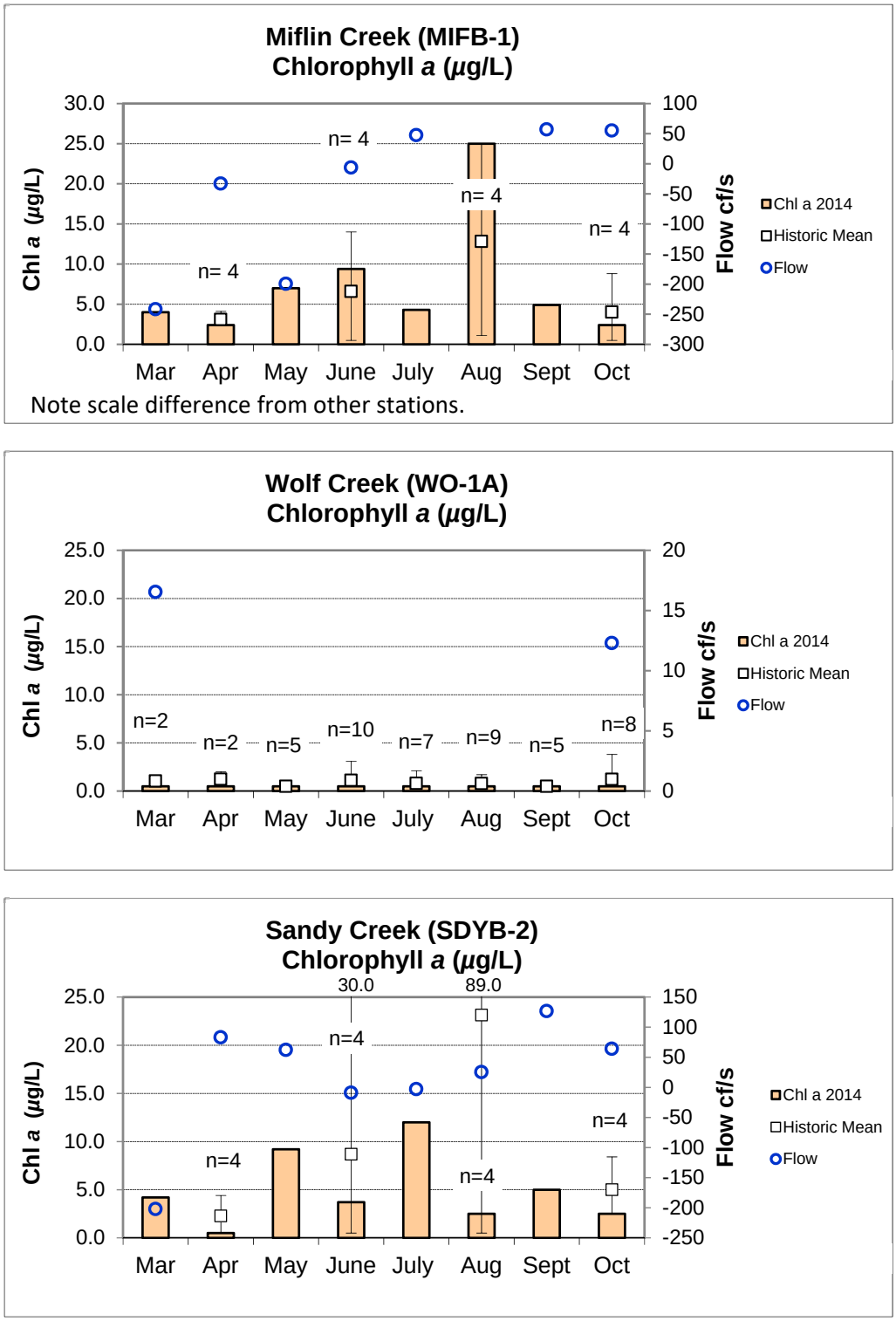

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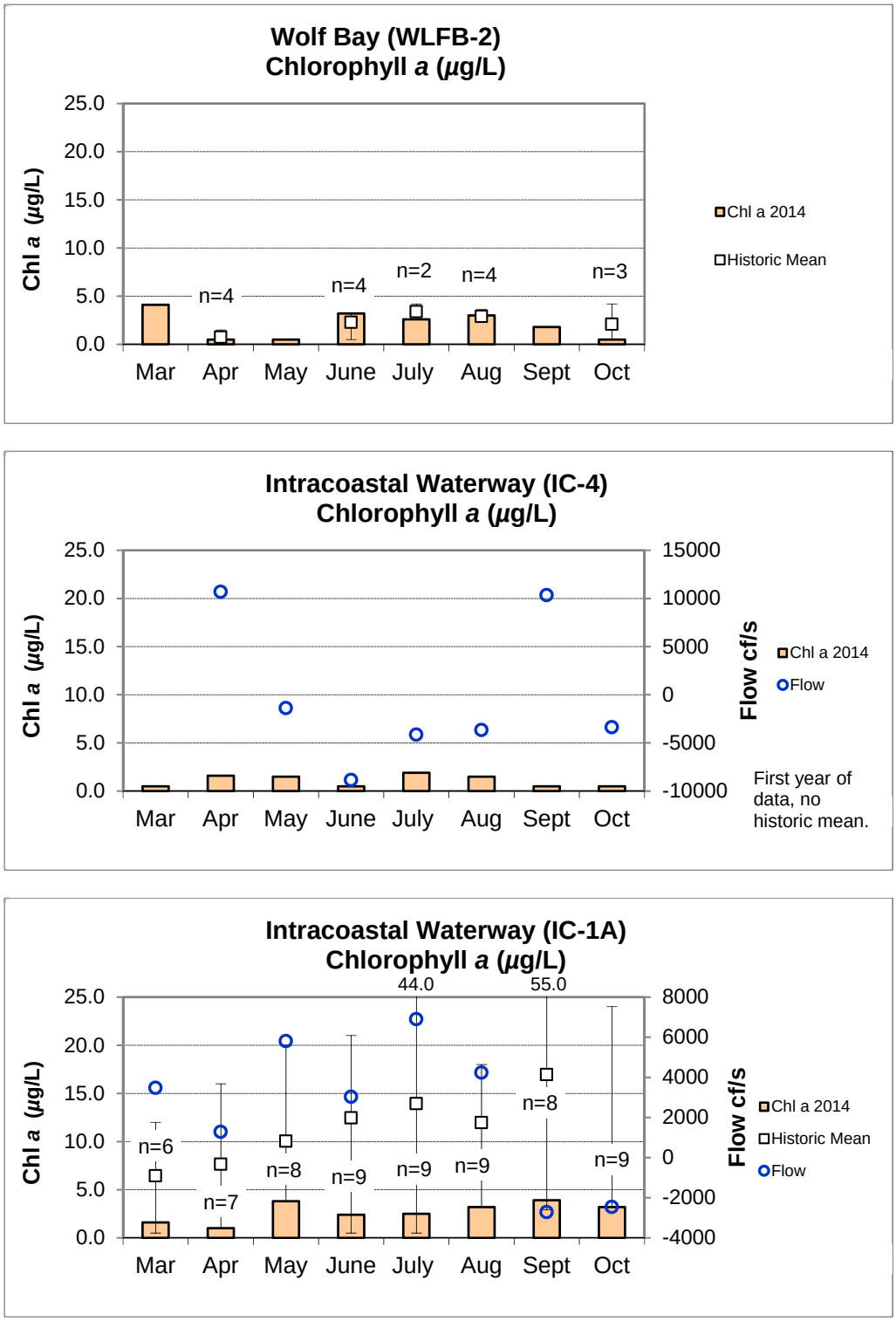

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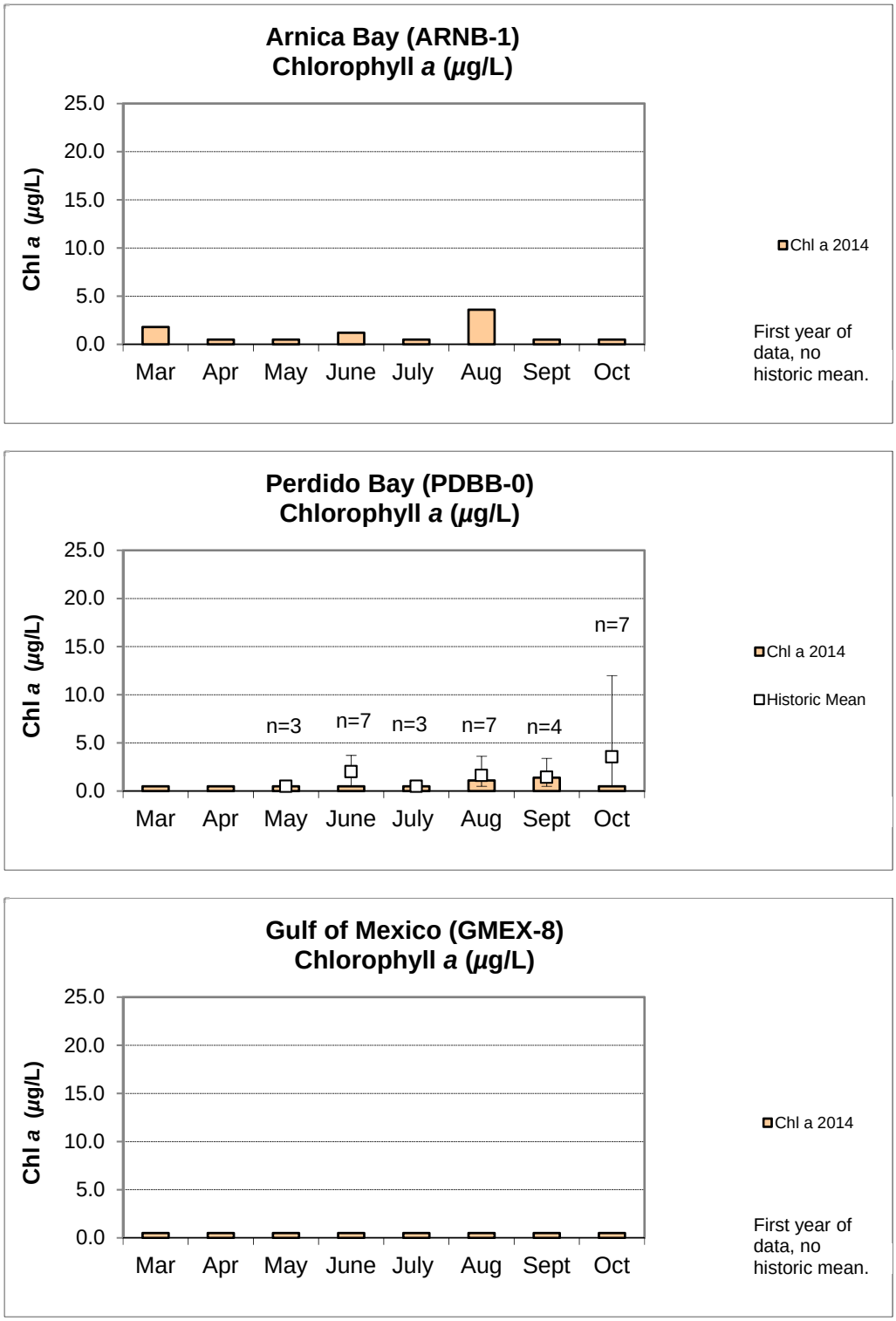
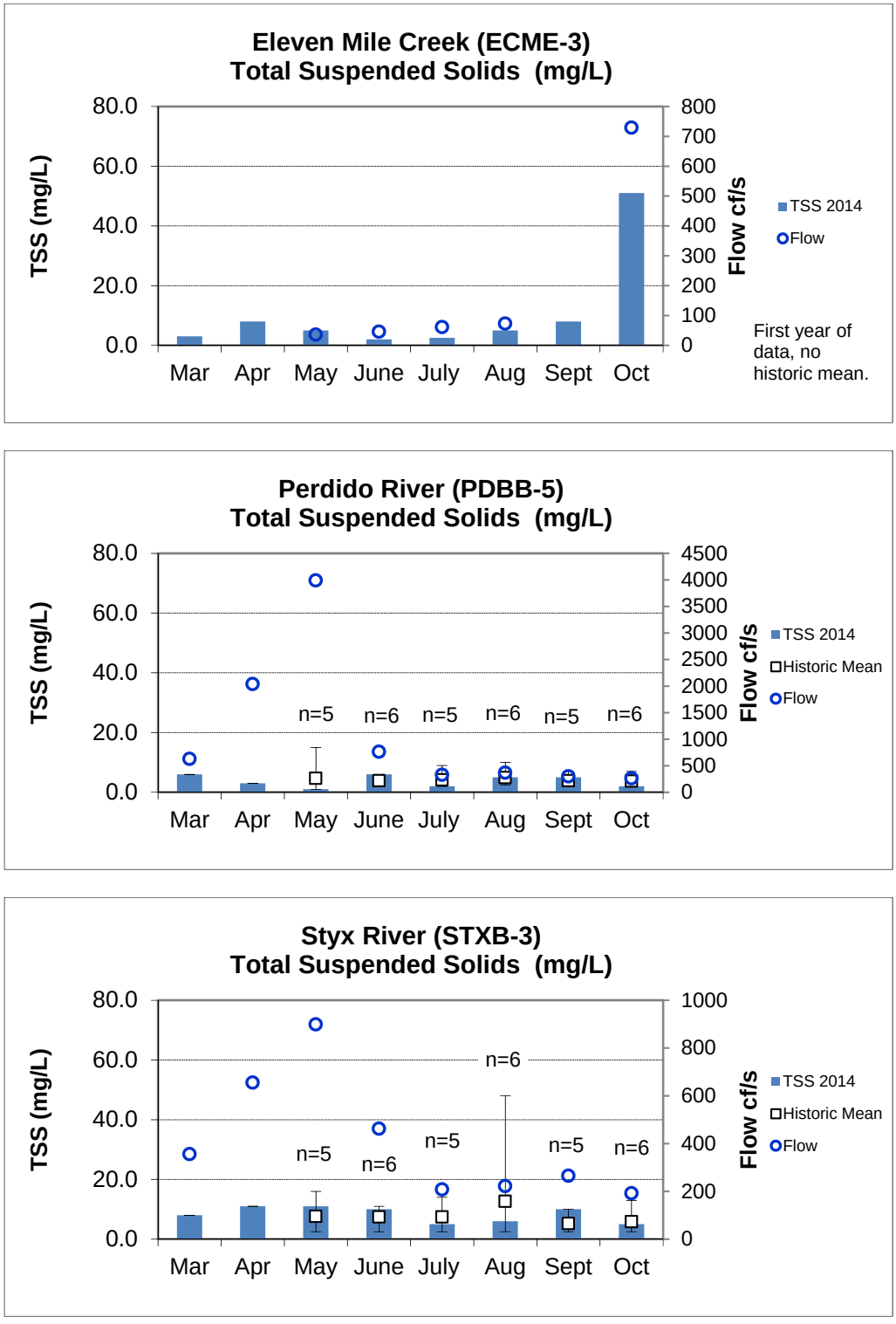


Figure 9. Monthly TSS concentrations measured in the Perdido Sub-Watershed, March-October 2014. Each bar graph depicts changes in each station. The historic mean (1990-2014) and min/max ranges are also displayed for comparison. The "n" value equals the number of data points included in the monthly historic calculations. Flow measured at several stations.



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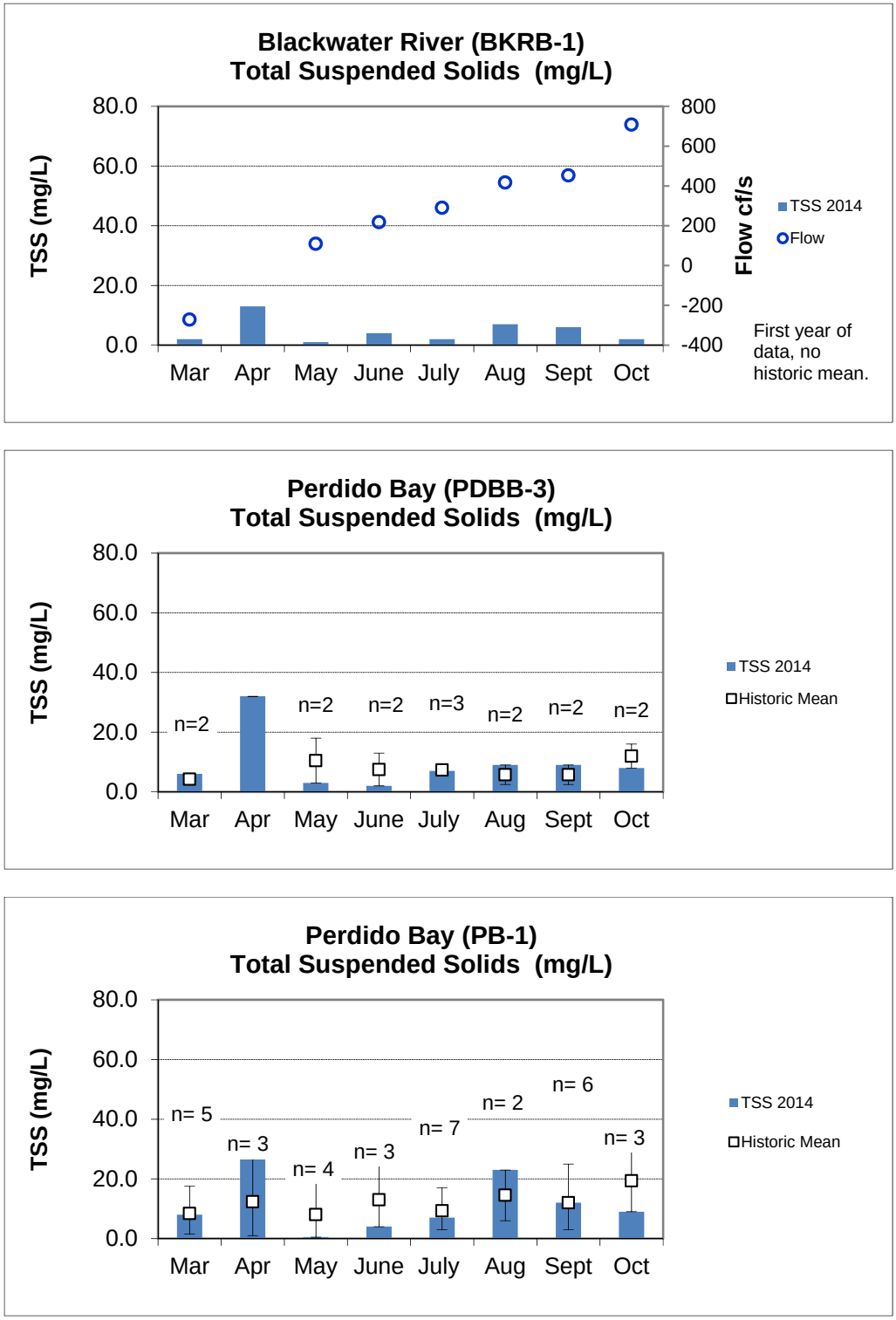

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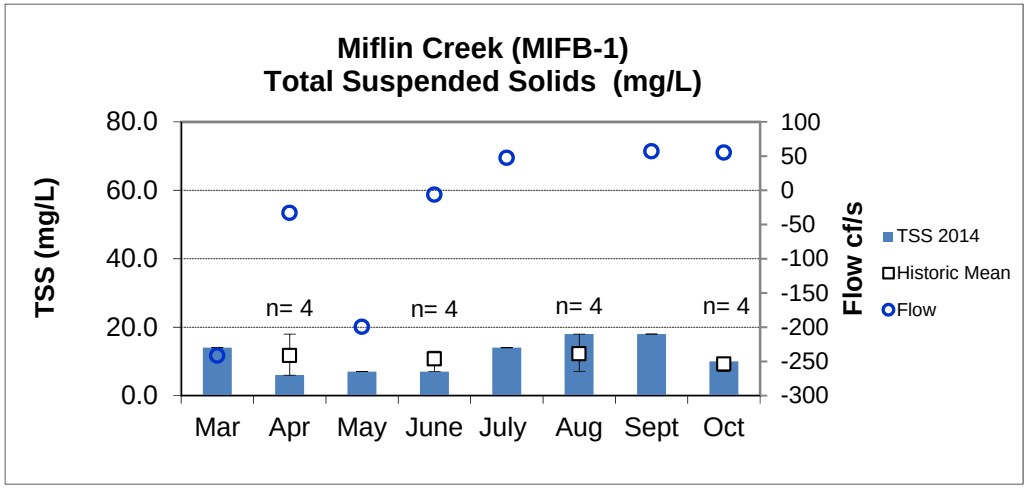

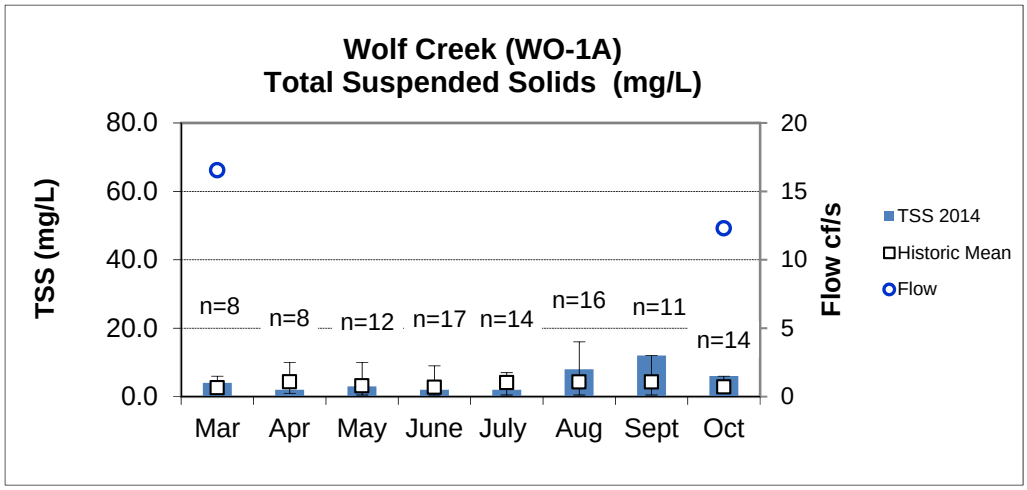

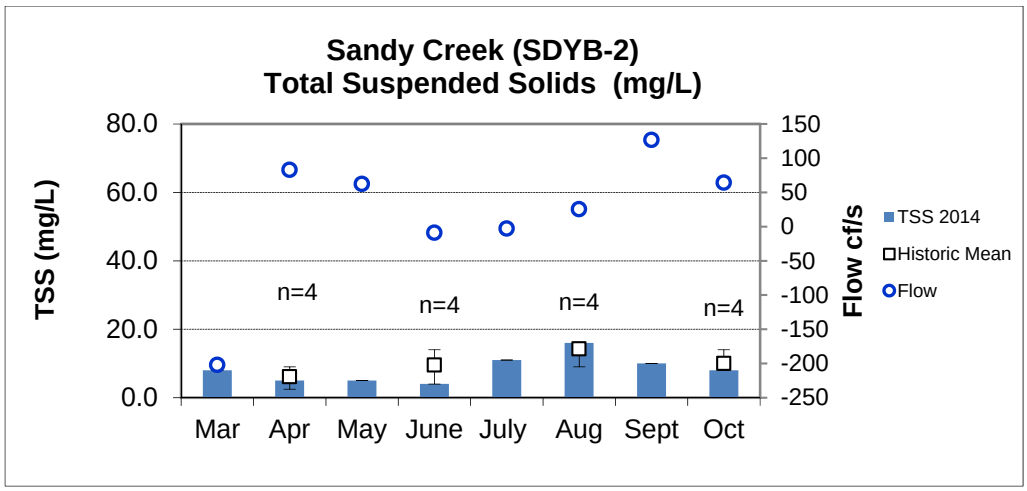

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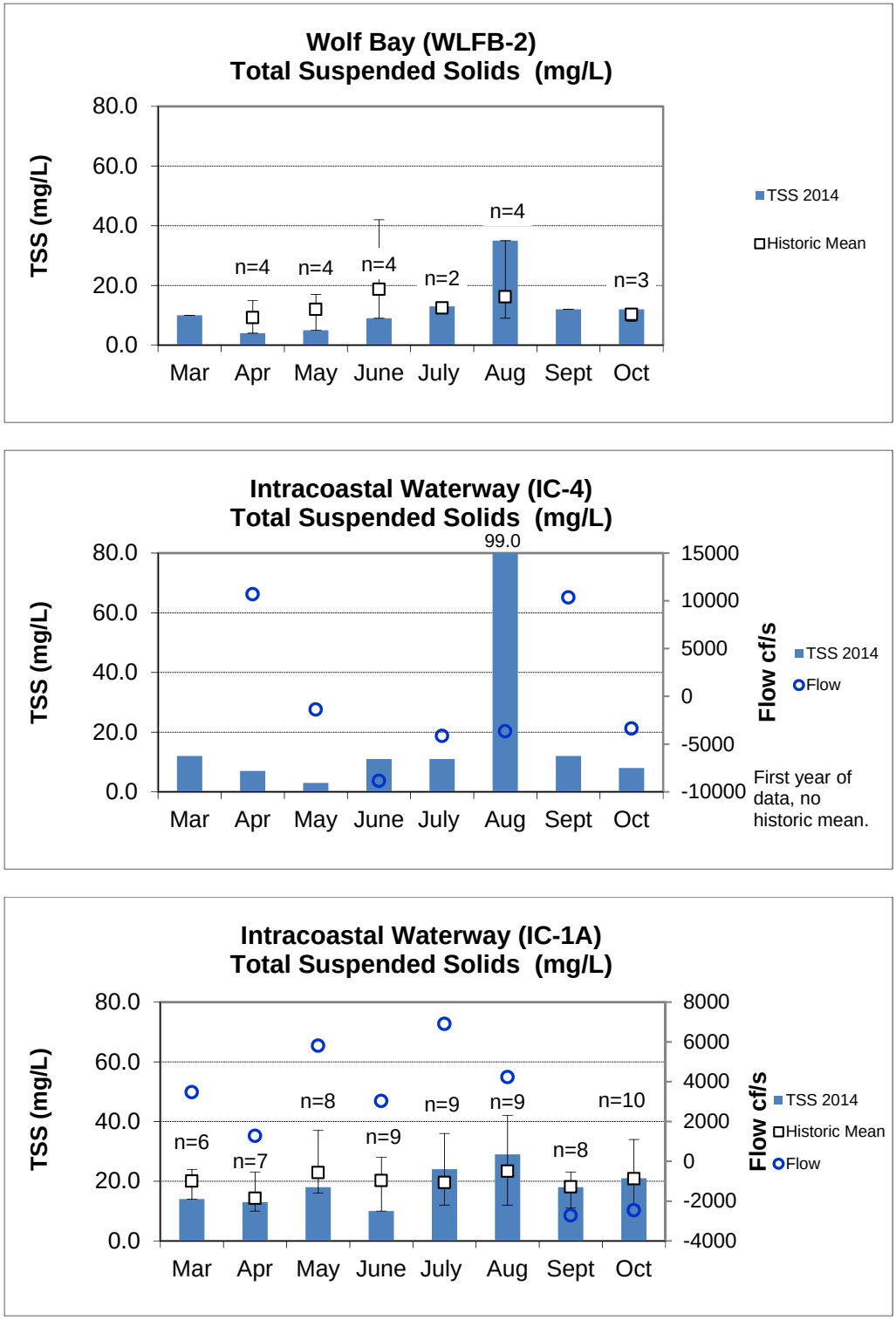

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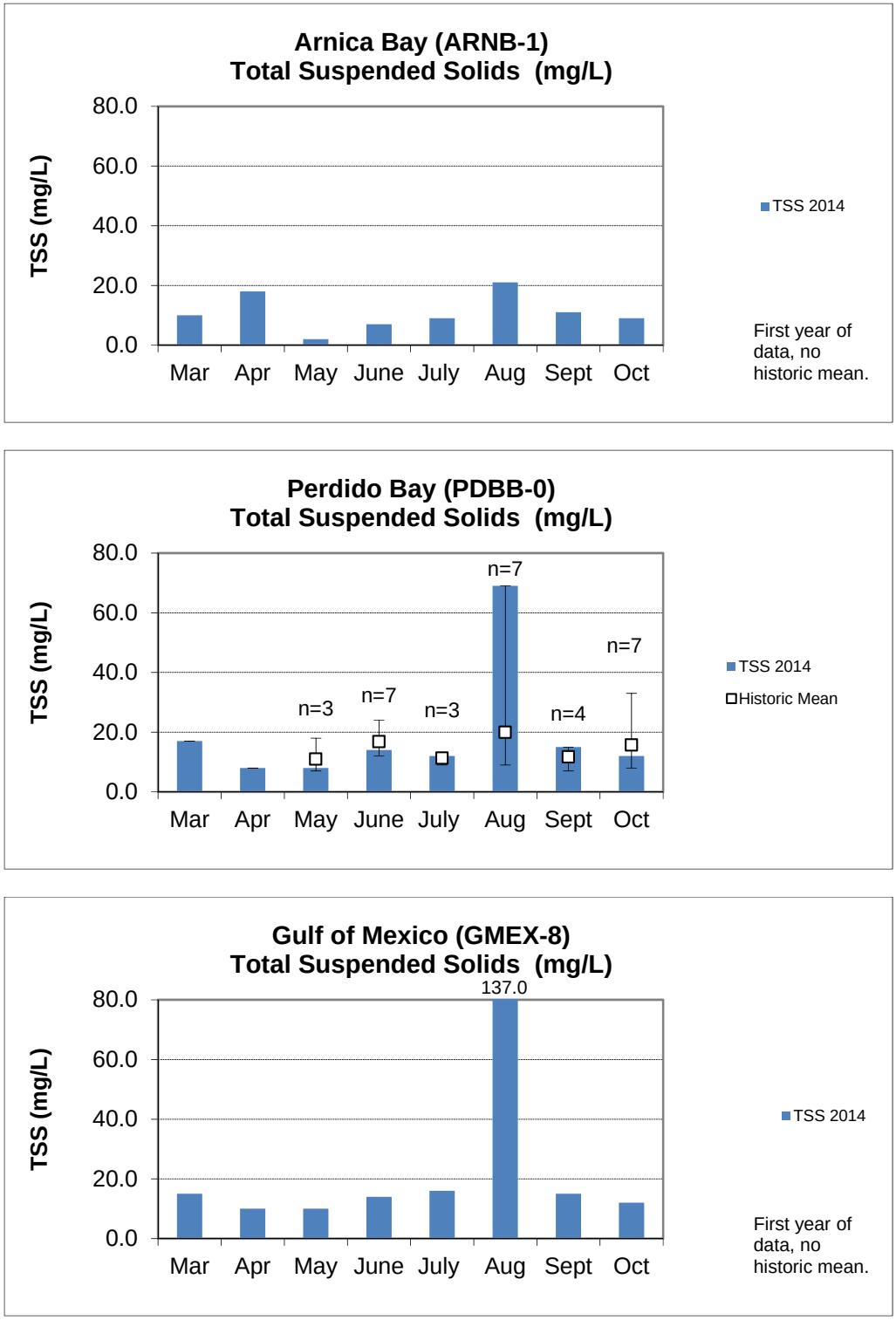
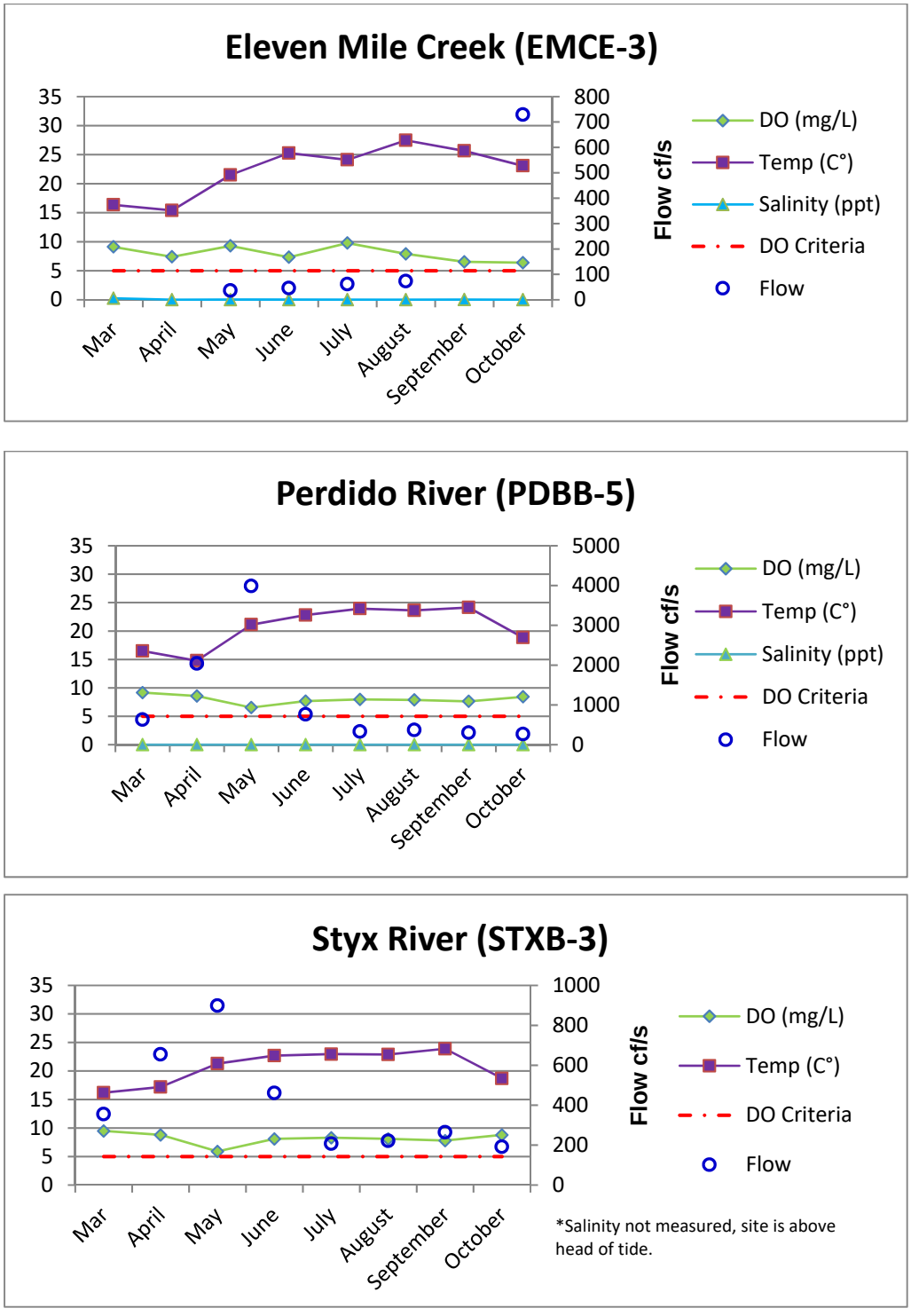


Figure 10. Monthly DO, temperature, and salinity concentrations at 1.5 m (5 ft), or mid-depth, for the Perdido Sub-Watershed stations collected March-October 2014. ADEM Water Quality Criteria requires a DO concentration of 5.0 mg/L at this depth (ADEM 2012). Flow measured at some stations.



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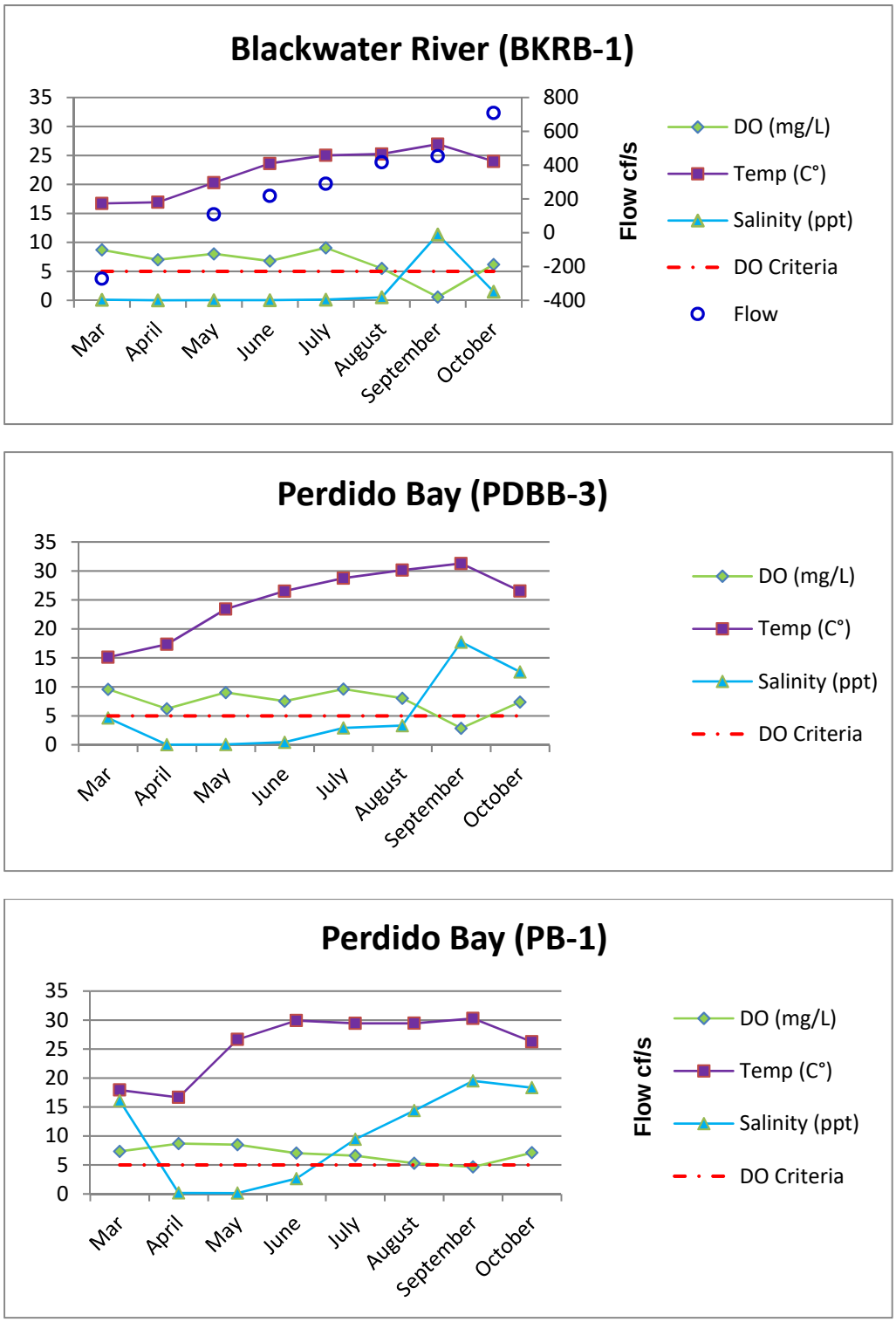

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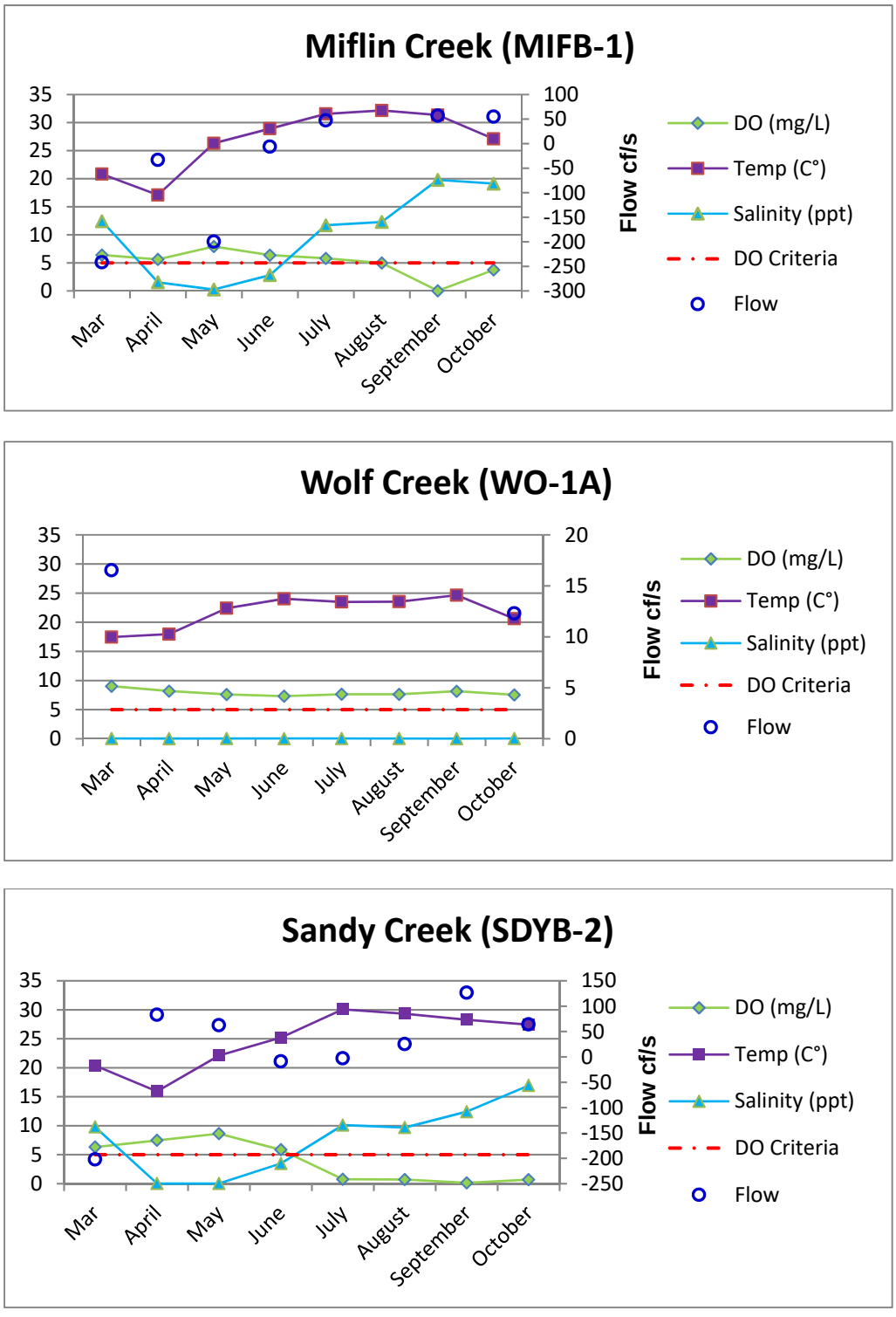

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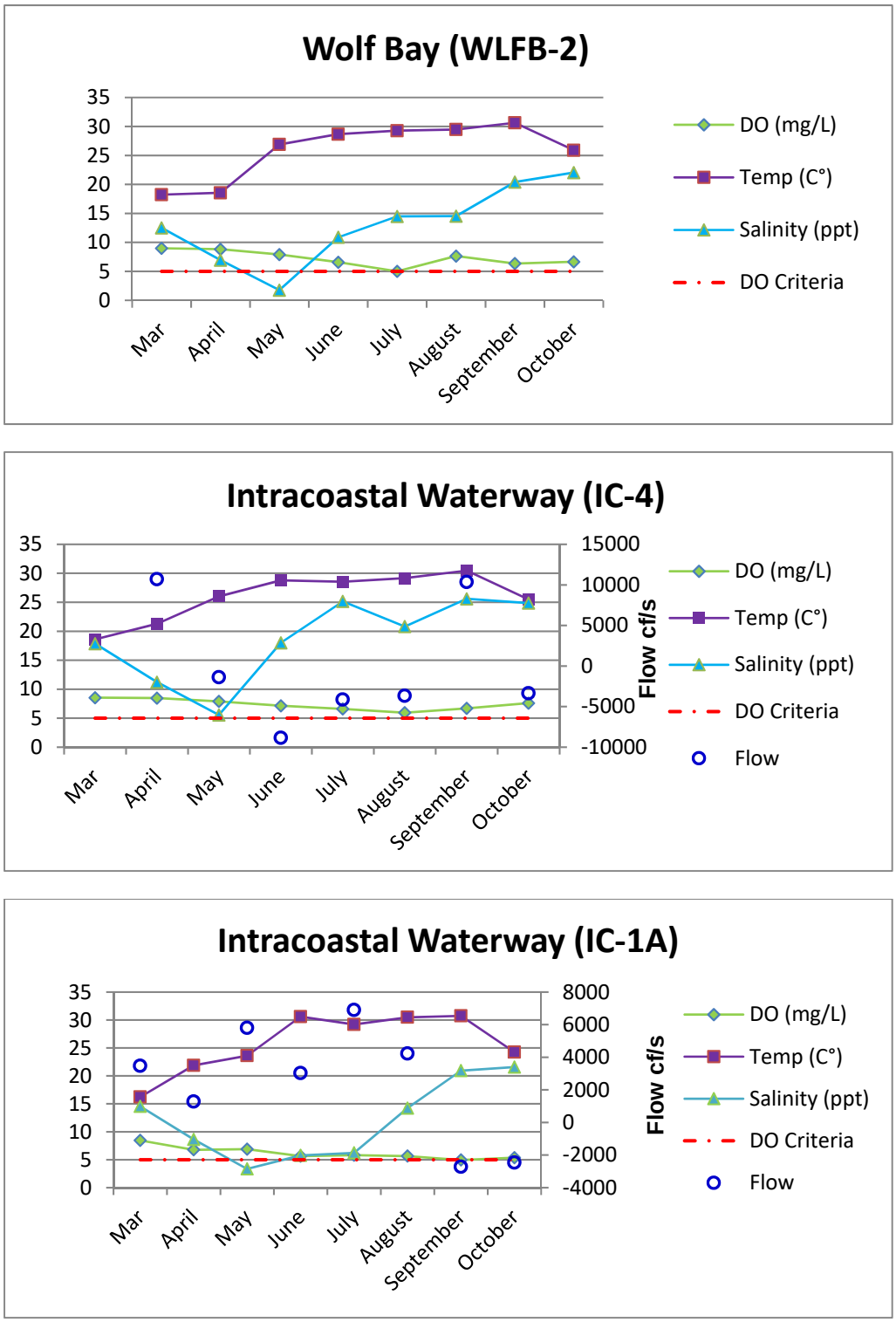

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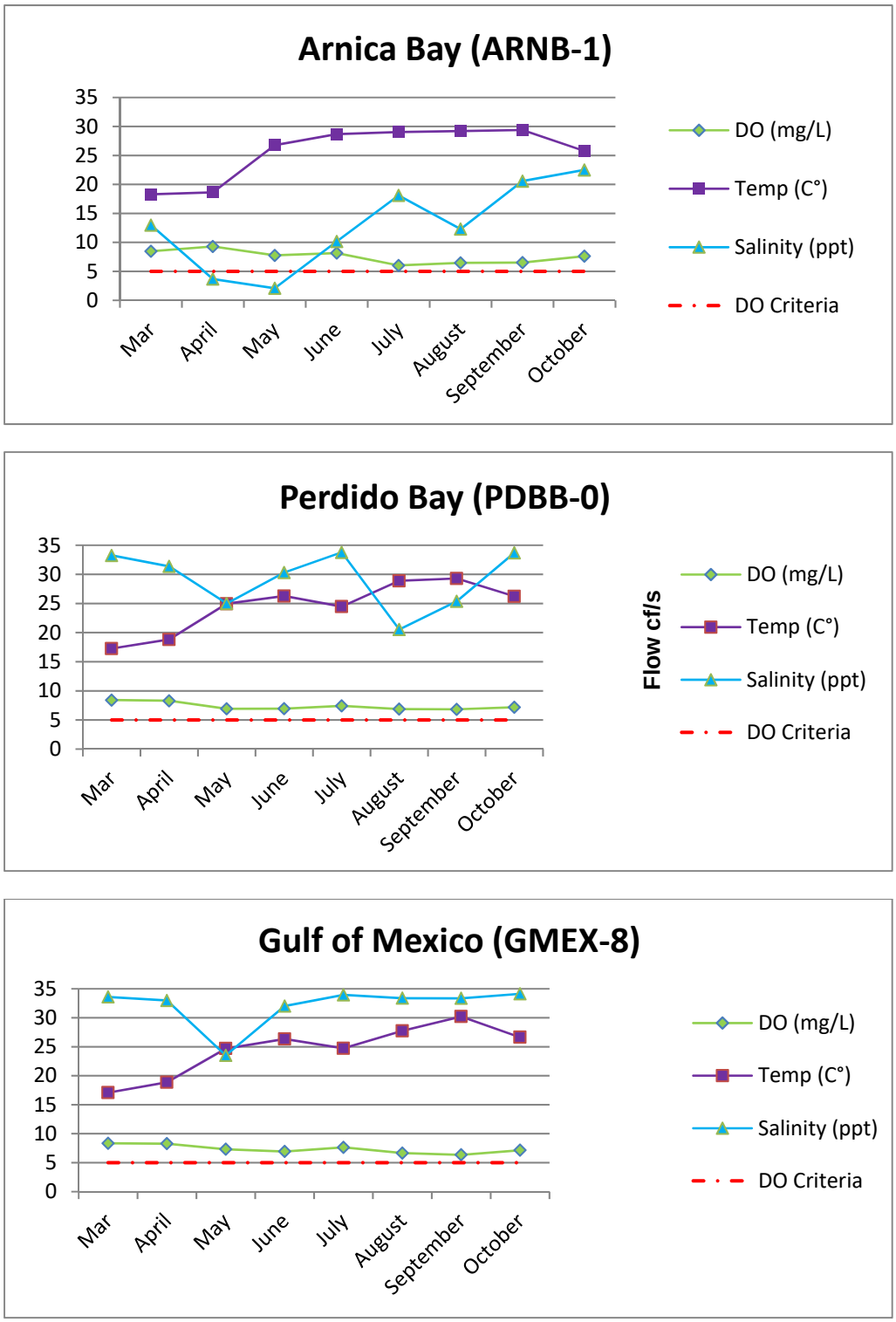
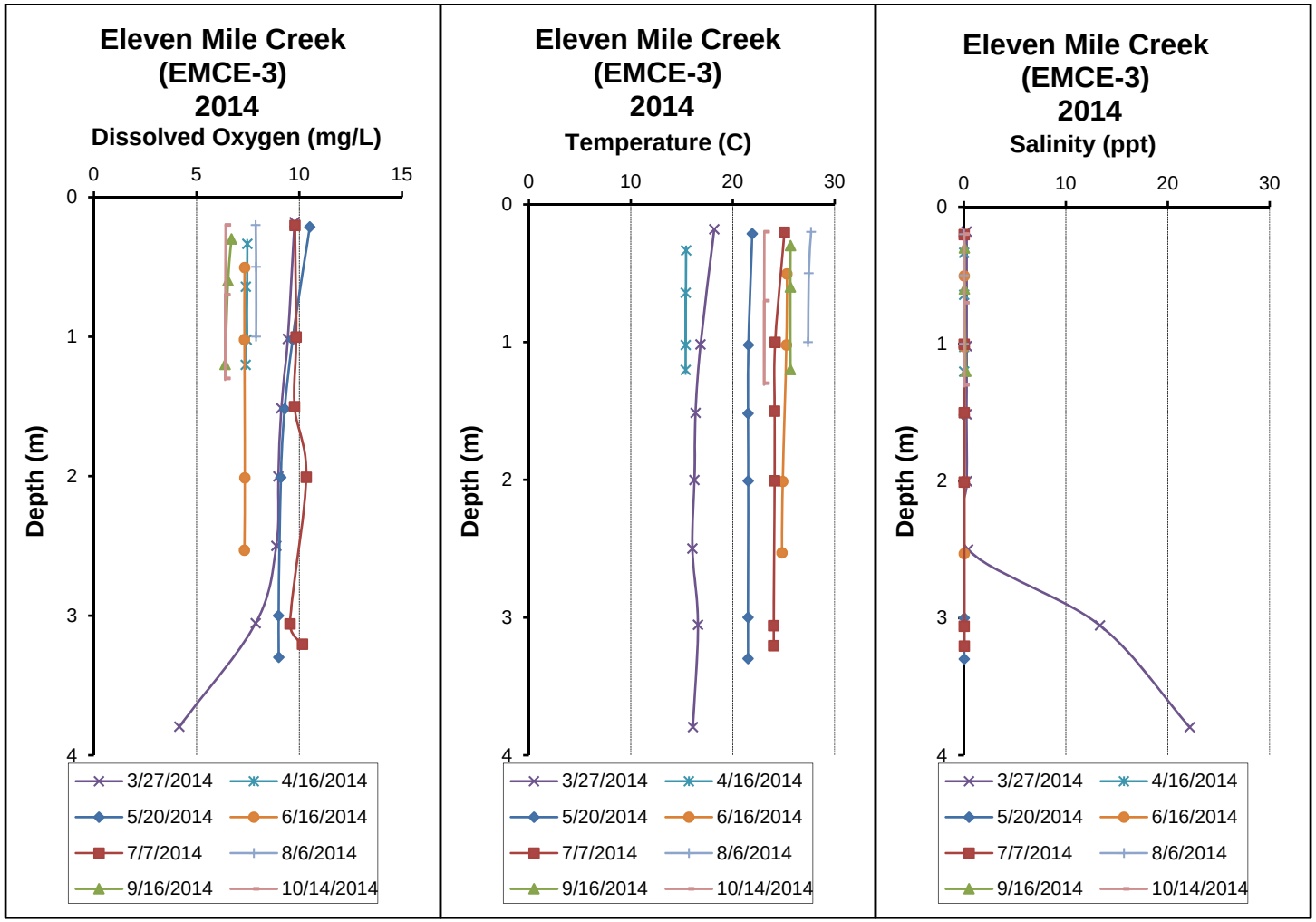


Figure 11. Monthly depth profiles of dissolved oxygen, temperature, and salinity for Perdido Sub-Watershed, March-October 2014.



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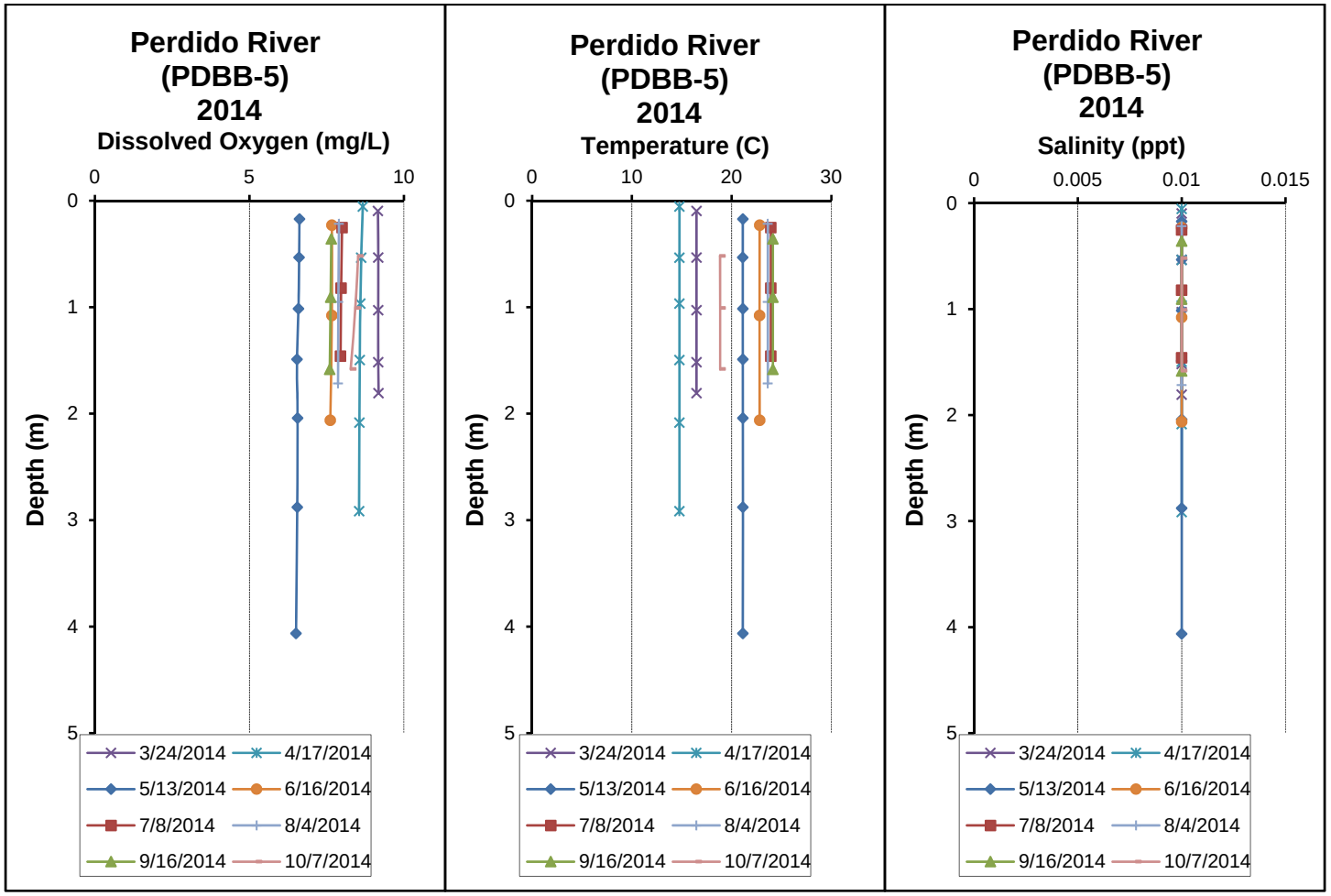
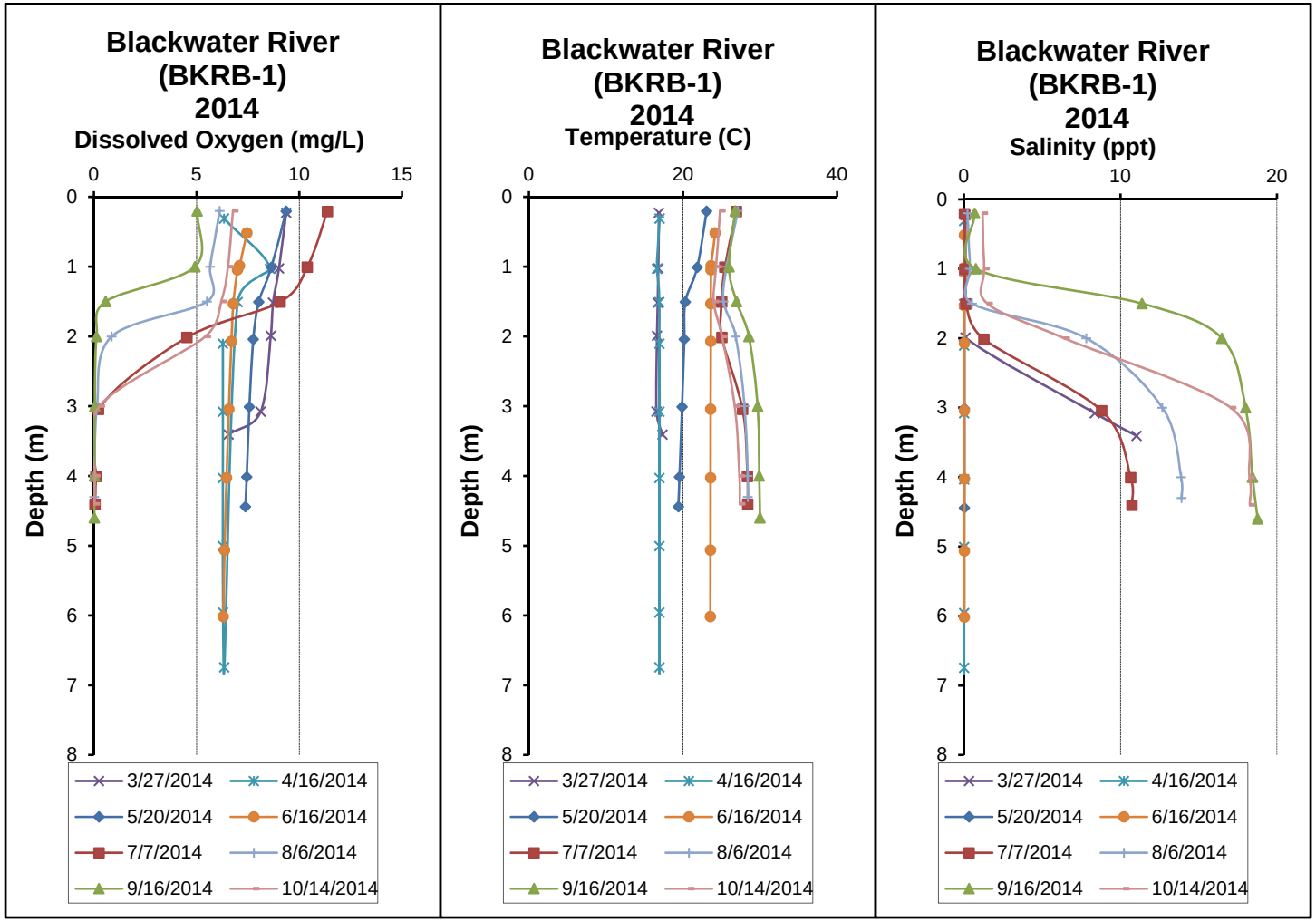


Figure 11. (continued)



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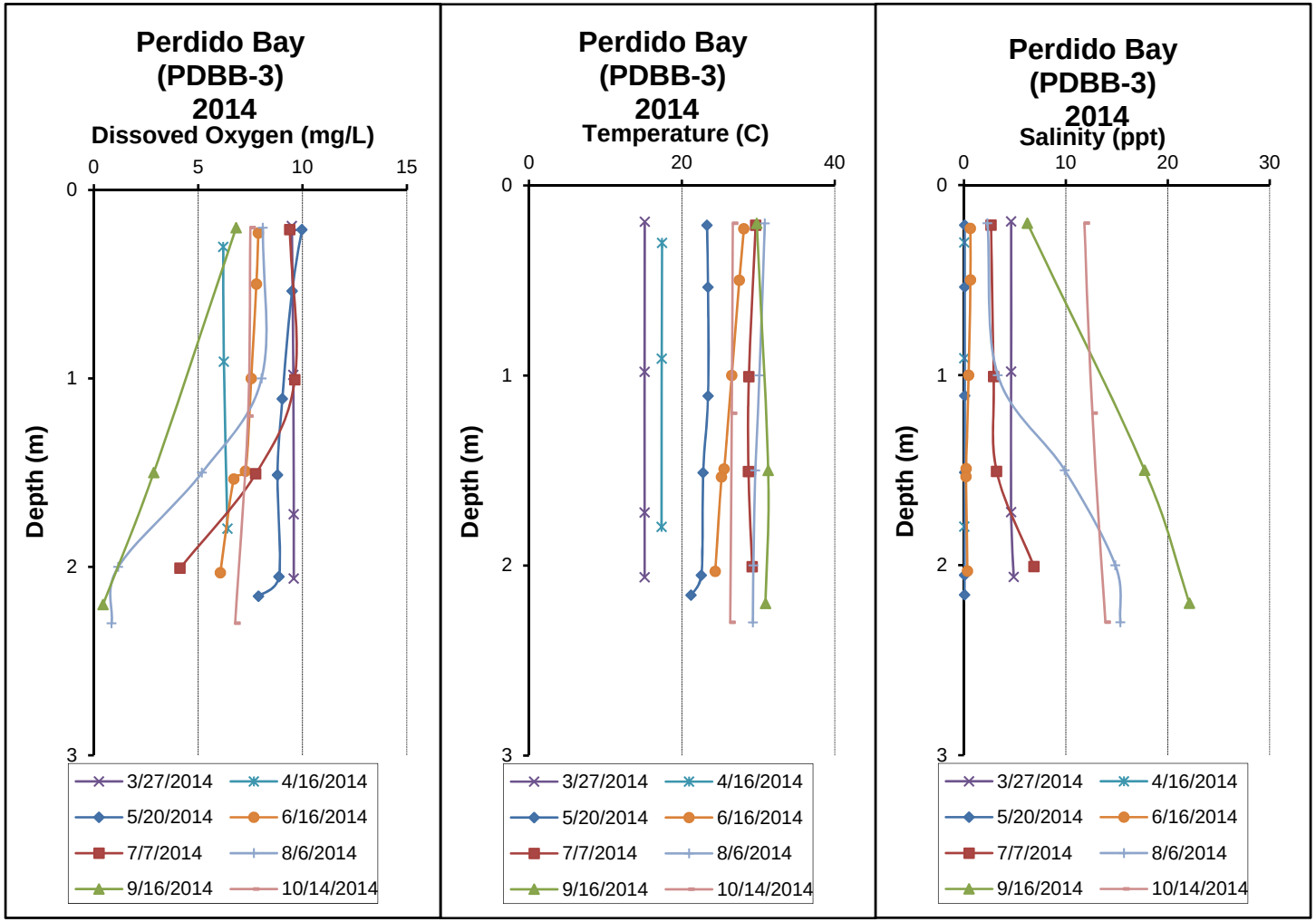
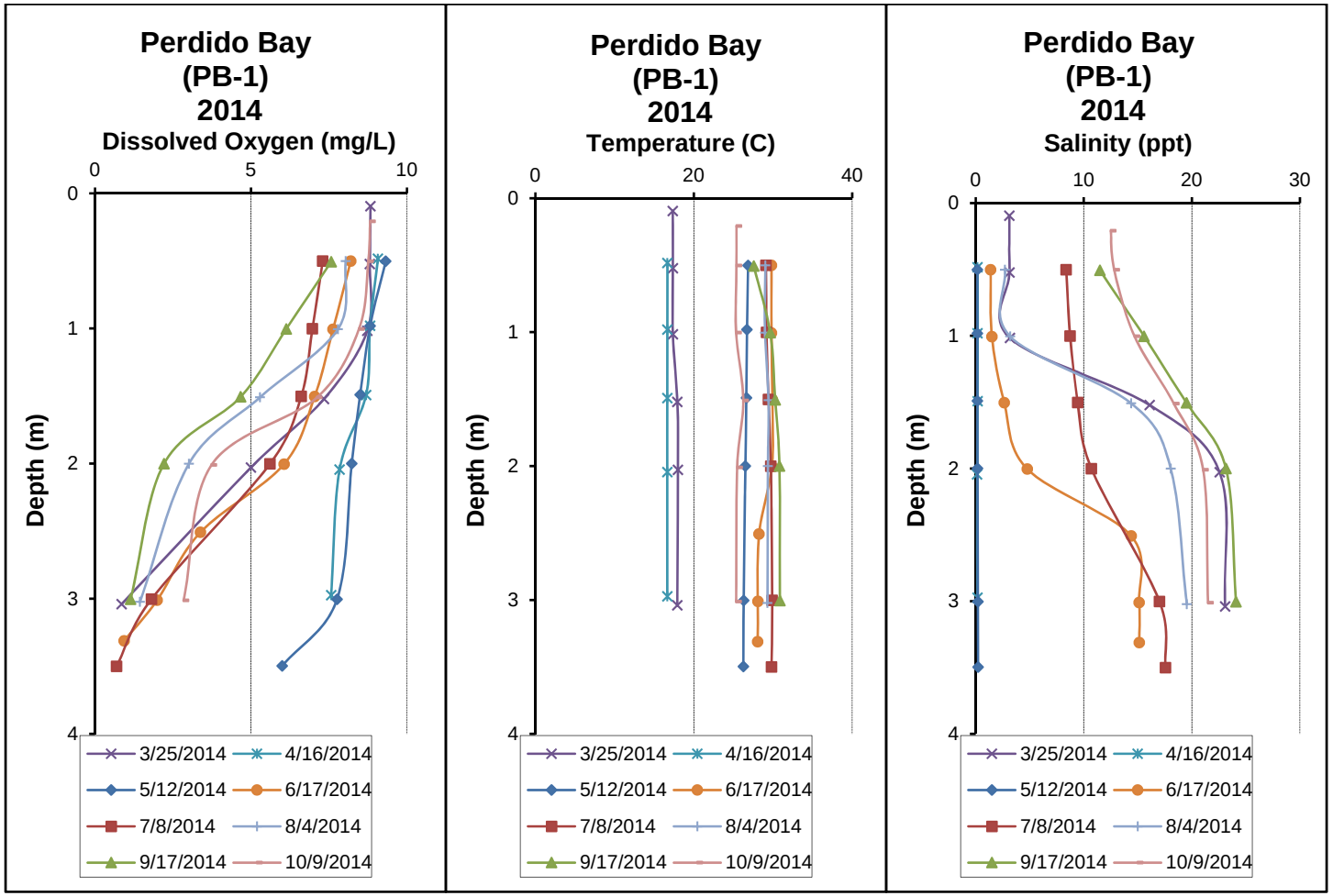


Figure 11. (continued)



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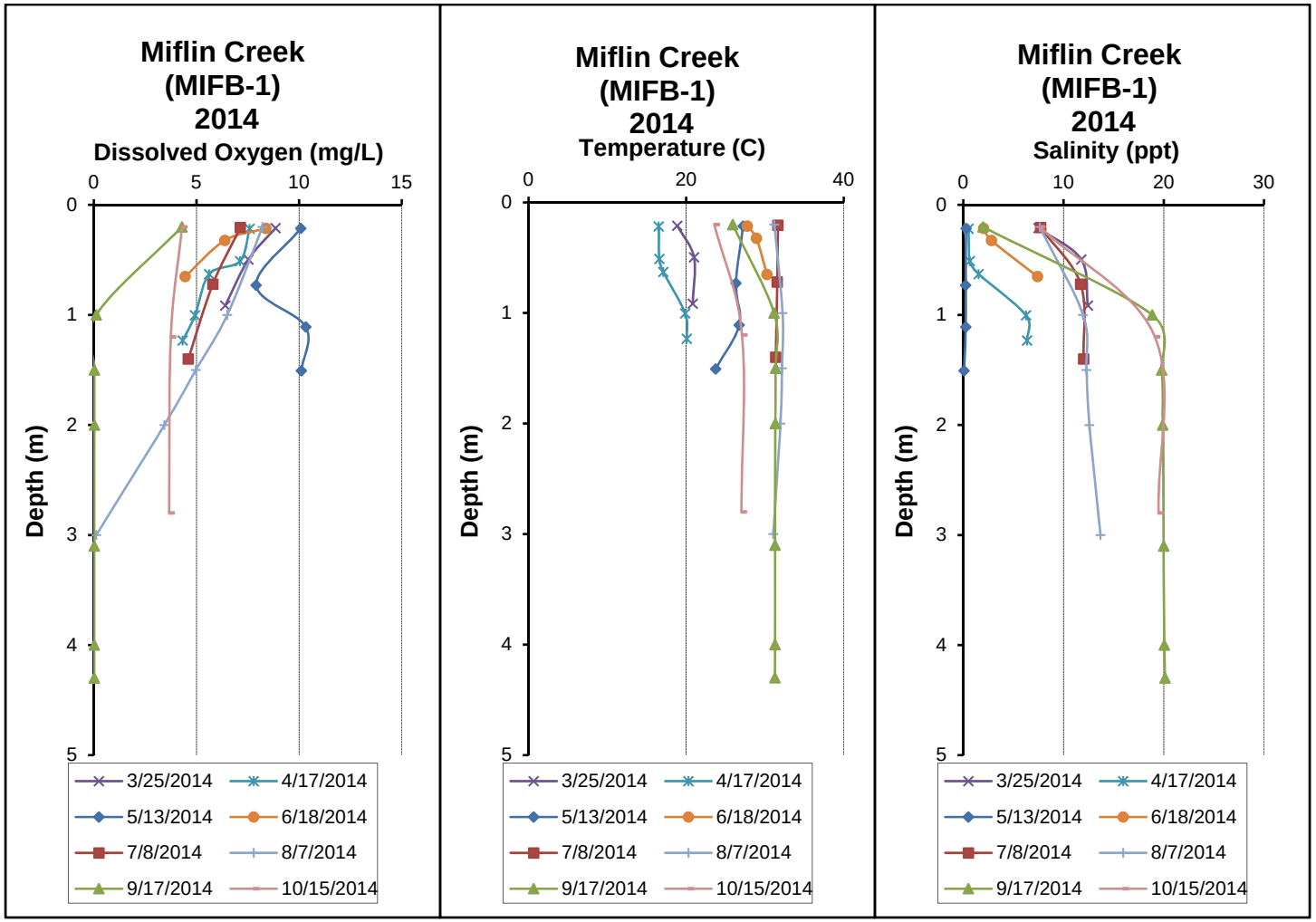

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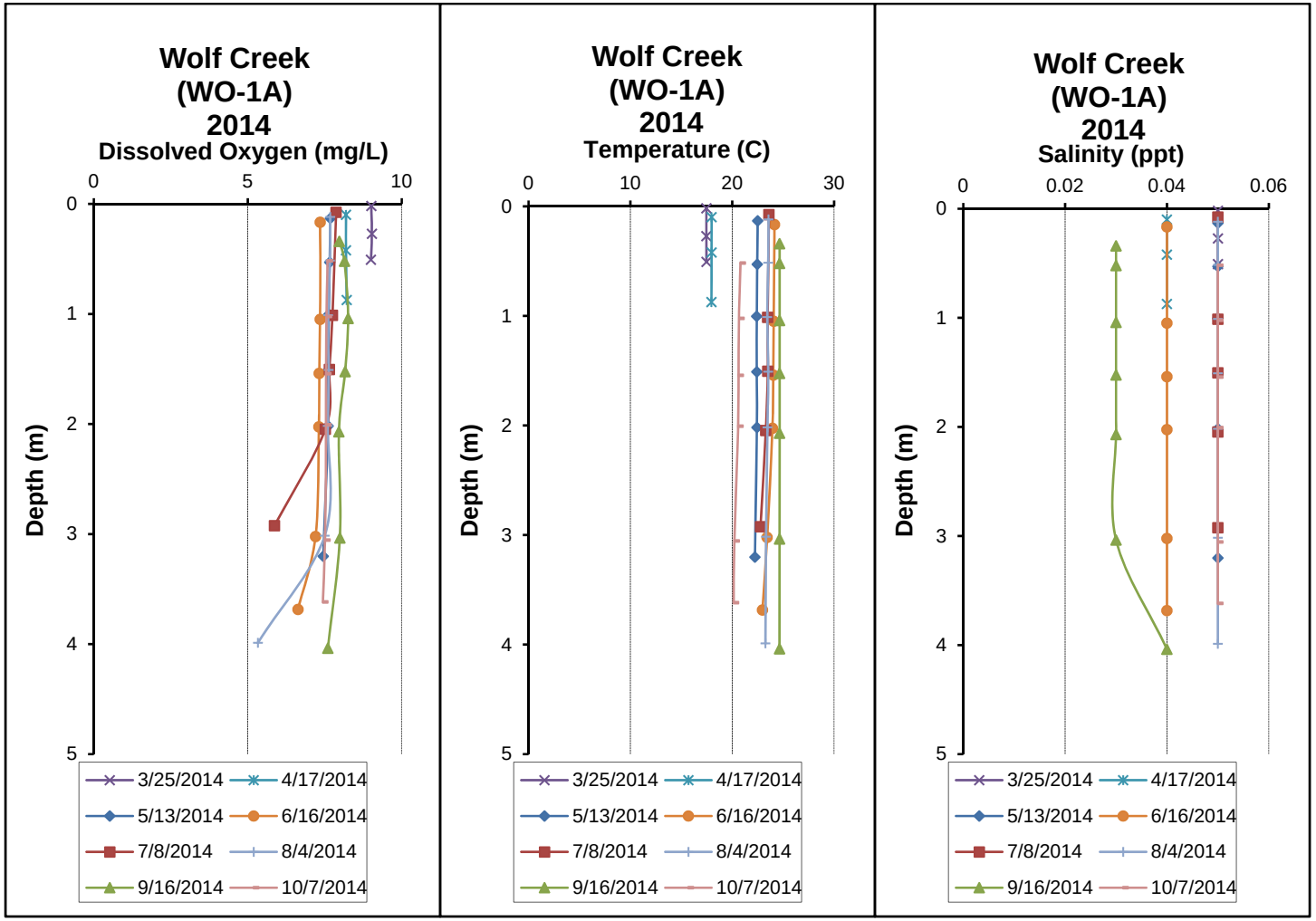

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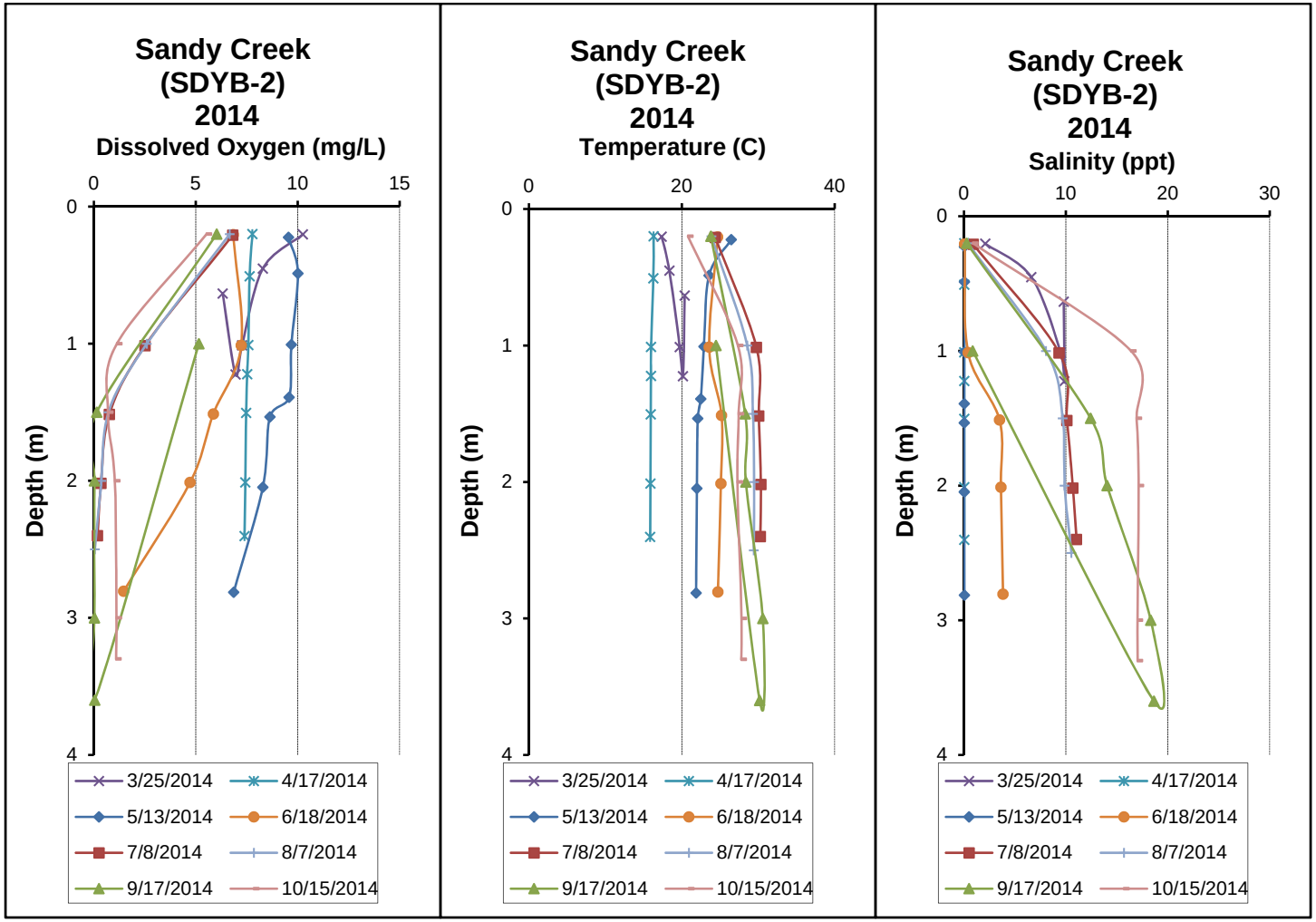

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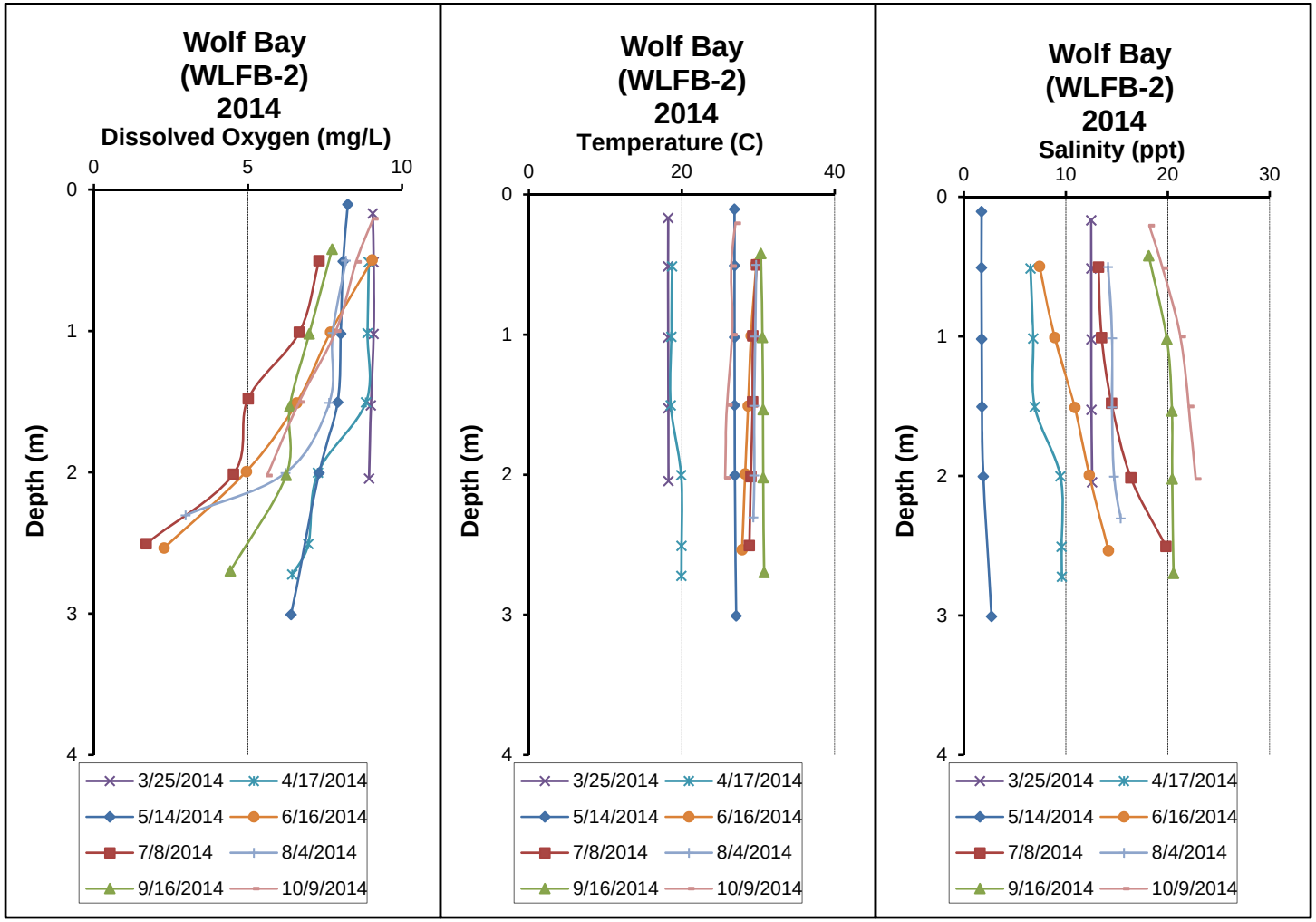

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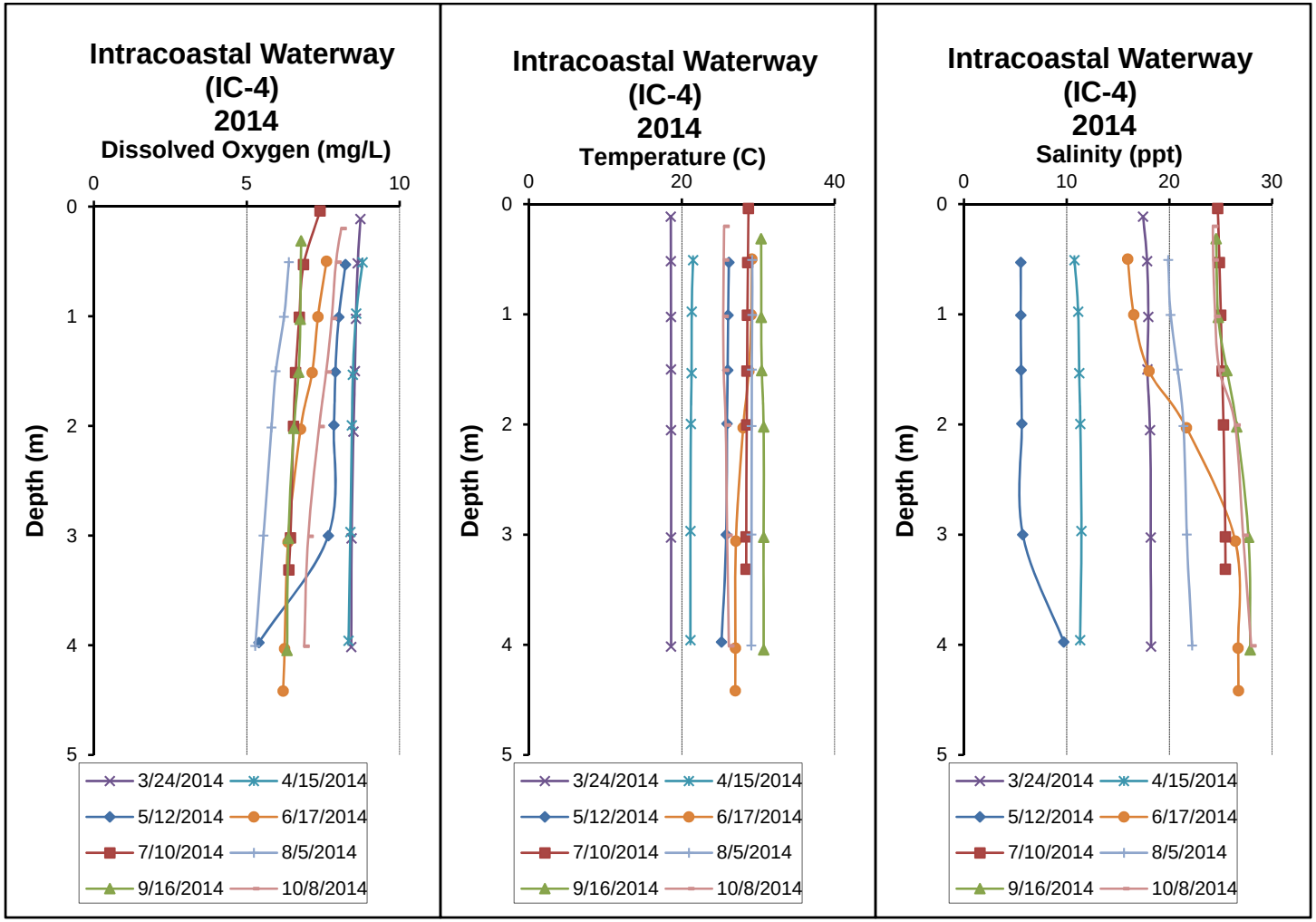

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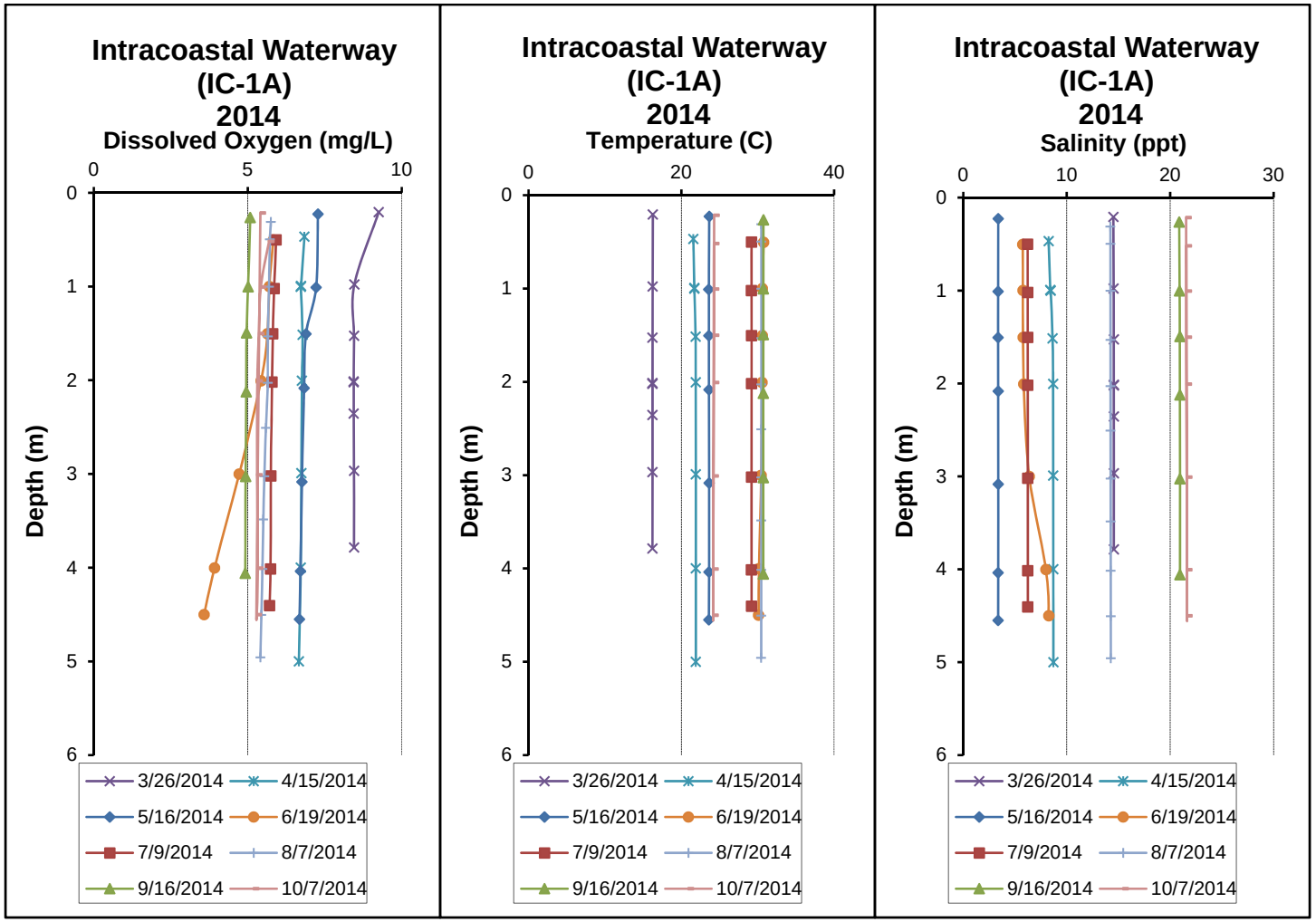

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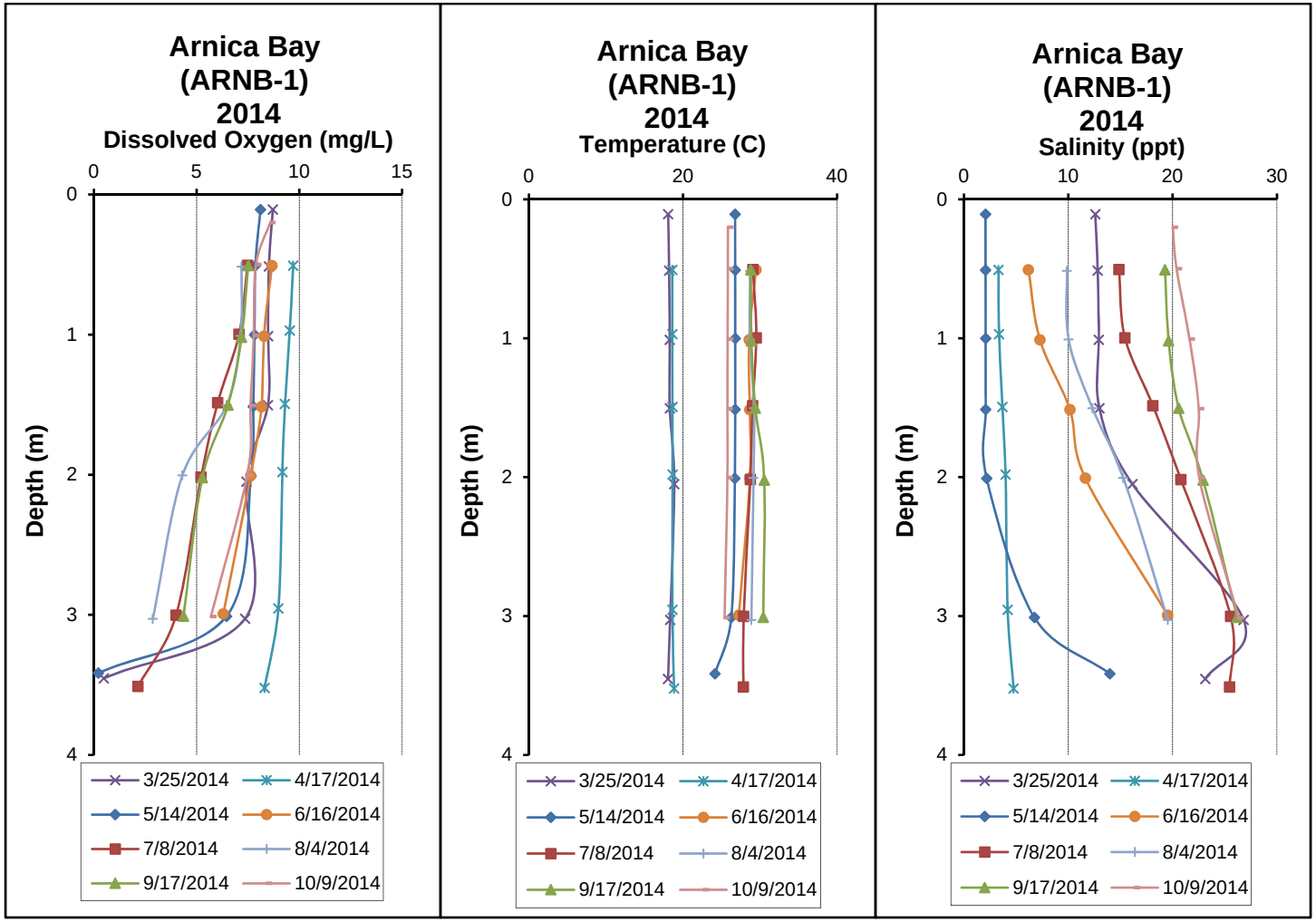

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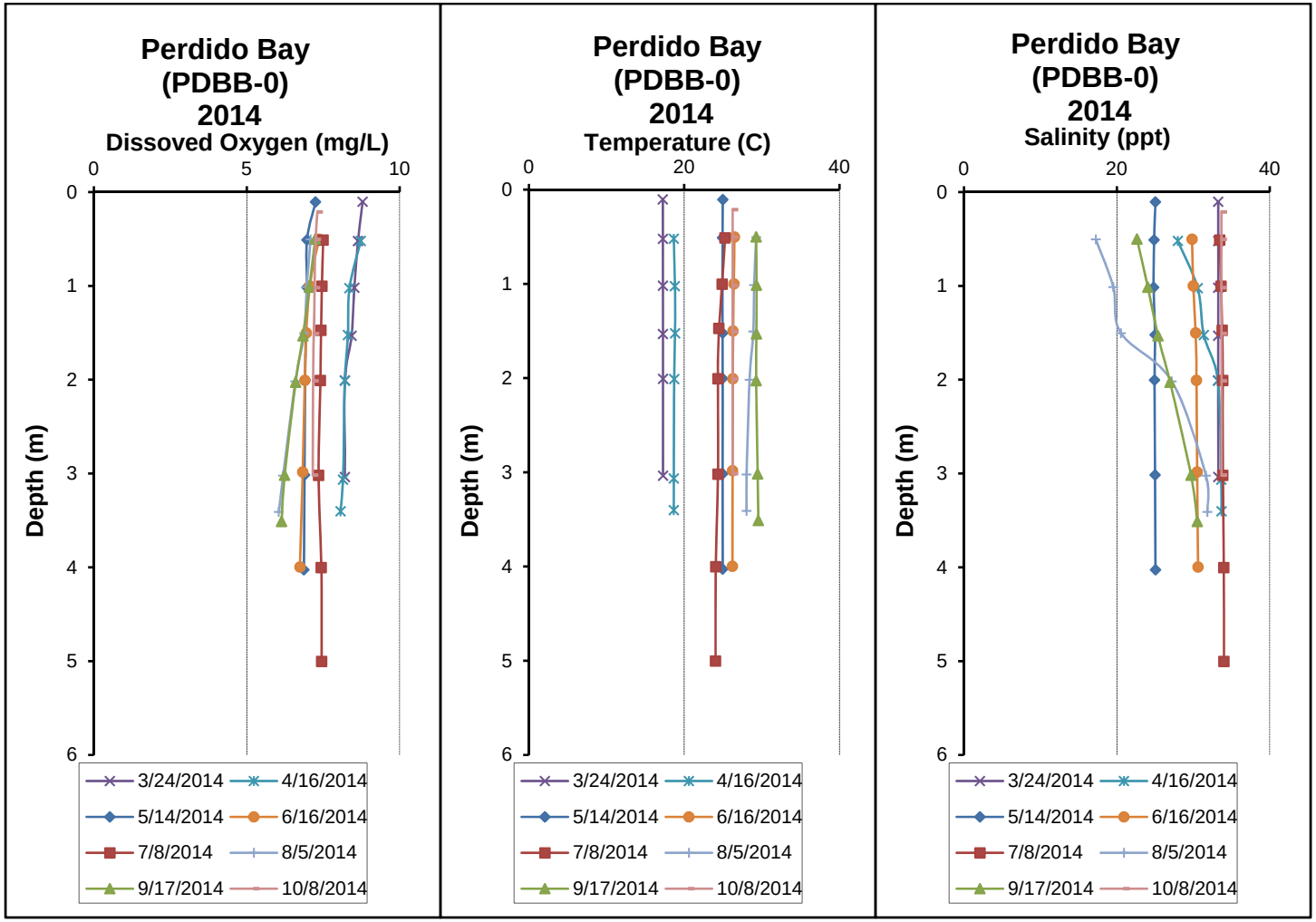

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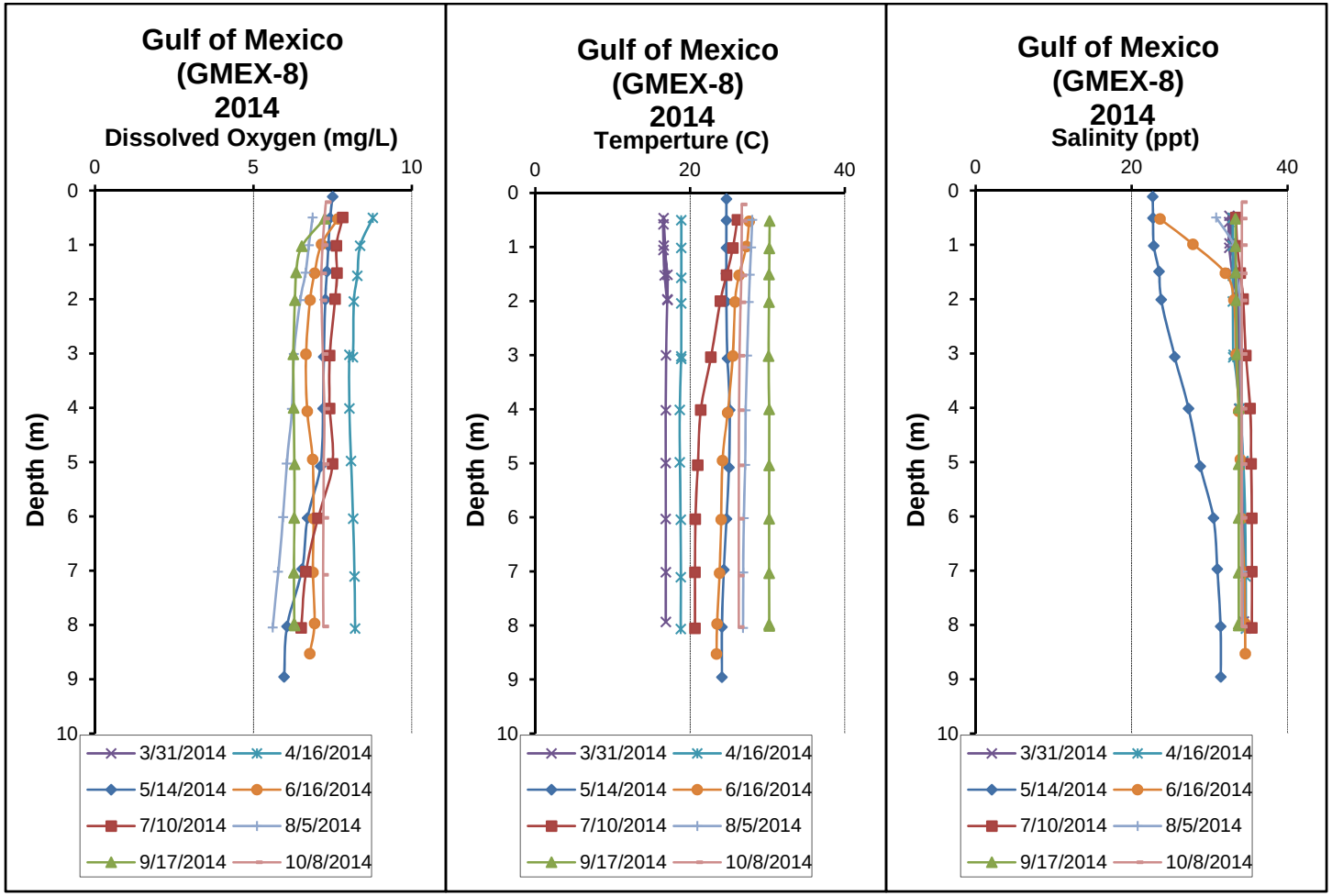

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APPENDIX

Appendix Table 1. Summary of Perdido Sub-Watershed water quality data collected March-October, 2014. 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.

	Parameter	N	Min	Max	Med	Avg	SD	E
EMCE-3	**Physical**							
	Temperature (°C)	7	15.4	27.5	23.1	21.9	4.6	
	Turbidity (NTU)	8	3.8	140.0	6.9	27.1	46.6	
	Total Dissolved Solids (mg/L)	8	41.0	1140.0	65.0	207.0	378.2	
	J Total Suspended Solids (mg/L)	8 <	2.0	51.0	5.0	10.6	16.5	
	Specific Conductance (µmhos/cm)	7	45.2	528.7	66.9	135.5	174.5	
	J Alkalinity (mg/L)	8 <	1.2	16.0	10.5	10.3	4.5	
	Monthly Stream Flow (cfs)	5	36.1	729.0	61.3	189.0	302.2	
	Measured Stream Flow (cfs)	5	36.1	729.0	61.3	189.0	302.2	
	Chemical							
	Dissolved Oxygen (mg/L)	7	6.4	9.8	7.9	8.0	1.4	
	pH (SU)	7	6.0	7.6	6.3	6.4	0.6	
	J Ammonia Nitrogen (mg/L)	8	0.040	0.240	0.085	0.105	0.070	
	Nitrate+Nitrite Nitrogen (mg/L)	8	0.118	0.586	0.377	0.356	0.185	
	J Total Kjeldahl Nitrogen (mg/L)	8 <	0.072	1.300	0.590	0.574	0.409	
	J Dis Reactive Phosphorus (mg/L)	8 <	0.003	< 0.006	0.003	0.003	0.001	
	J Total Phosphorus (mg/L)	8	0.015	0.097	0.026	0.035	0.027	
	J CBOD-5 (mg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0	
	J Chlorides (mg/L)	8	4.3	590.0	7.8	84.0	204.7	
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	5.10	0.50	1.66	1.85	
	J E. coli (MPN/DL)	5	10.0	570.0	25.0	152.2	239.6	
	J,L Enterococci (MPN/DL)	3	10	1700	21	577	973	

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

	Parameter	N	Min	Max	Med	Avg	SD	E	Q
PDBB-5	**Physical**								
	Temperature (°C)	6	14.8	25.1	22.0	21.3	3.6		
	Turbidity (NTU)	10	1.9	13.9	3.5	5.7	4.3		
	Total Dissolved Solids (mg/L)	8	31.0	66.0	39.0	41.1	11.5		
	J Total Suspended Solids (mg/L)	8	1.0	6.0	4.0	3.8	2.0		
	Specific Conductance (µmhos/cm)	6	20.7	26.4	23.6	23.8	2.1		
	J Hardness (mg/L)	1				5.0			
	J Alkalinity (mg/L)	8	1.4	4.0	3.2	3.0	1.1		
	Monthly Stream Flow (cfs)	8	265.0	3990.0	499.5	1086.0	1311.0		
	Measured Stream Flow (cfs)	8	265.0	3990.0	499.5	1086.0	1311.0		
	Chemical								
	Dissolved Oxygen (mg/L)	6	6.5	8.6	7.8	7.6	0.8		
	pH (SU)	6	3.4 [C]	5.8	4.7	4.7	0.8	6	
	J Ammonia Nitrogen (mg/L)	8	< 0.011	0.050	0.020	0.023	0.015		
	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.017	0.357	0.243	0.202	0.144		
	Total Kjeldahl Nitrogen (mg/L)	8	0.190	0.720	0.285	0.372	0.210		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.027	0.006	0.008	0.008		
	J Total Phosphorus (mg/L)	8	0.011	0.035	0.019	0.021	0.009		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	J Chlorides (mg/L)	8	3.1	4.0	3.7	3.6	0.4		
	Total Metals								
	Aluminum (mg/L)	1				0.374			
	Iron (mg/L)	1				0.907			
	J Manganese (mg/L)	1				0.027			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.304			
	Antimony (µg/L)	1				< 0.015			
	J Arsenic (µg/L)	1				0.422 [A]			1
	Cadmium (µg/L)	1				< 0.087			
	J Chromium (µg/L)	1				0.745			
	J Copper (µg/L)	1				1.360 [A]			1
	Iron (mg/L)	1				0.481			
	J Lead (µg/L)	1				0.263 [A]			1
	J Manganese (mg/L)	1				0.027			
	J Nickel (µg/L)	1				0.601			
	Selenium (µg/L)	1				< 0.535			
	Silver (µg/L)	1				< 0.538			
	J Thallium (µg/L)	1				0.034			
	Zinc (µg/L)	1				< 0.087			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	1.20	0.50	0.59	0.25		
	J E. coli (MPN/DL)	8	10.0	70.0	44.5	40.5	24.5		

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

	Parameter	N	Min	Max	Med	Avg	SD	E	Q
STXB-3	**Physical**								
	Temperature (°C)	9	16.2	24.6	22.7	21.2	3.0		
	Turbidity (NTU)	10	3.1	42.7	6.7	13.6	15.5		
	Total Dissolved Solids (mg/L)	8	31.0	57.0	40.0	41.4	9.6		
	Total Suspended Solids (mg/L)	8	5.0	11.0	9.0	8.2	2.6		
	Specific Conductance (µmhos/cm)	9	23.0	44.9	33.0	32.1	6.2		
	J Hardness (mg/L)	1				5.8			
	J Alkalinity (mg/L)	8	1.4	5.0	4.0	3.8	1.2		
	Monthly Stream Flow (cfs)	8	192.0	899.0	310.5	407.4	253.4		
	Measured Stream Flow (cfs)	8	192.0	899.0	310.5	407.4	253.4		
	Chemical								
	Dissolved Oxygen (mg/L)	9	5.9	9.5	8.1	8.1	1.0		
	pH (SU)	9	4.6 C	6.2	5.1	5.1	0.5	8	
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.050	0.014	0.021	0.017		
	Nitrate+Nitrite Nitrogen (mg/L)	8	0.137	0.588	0.360	0.389	0.172		
	J Total Kjeldahl Nitrogen (mg/L)	8	< 0.051	0.530	0.380	0.304	0.196		
	J Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.037	0.005	0.011	0.014		
	J Total Phosphorus (mg/L)	8	0.019	0.037	0.021	0.023	0.006		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	J Chlorides (mg/L)	8	3.4	4.6	4.1	4.0	0.5		
	Total Metals								
	Aluminum (mg/L)	1				0.596			
	Iron (mg/L)	1				0.797			
	J Manganese (mg/L)	1				0.025			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.238			
	Antimony (µg/L)	1				< 0.015			
	J Arsenic (µg/L)	1				0.437 A			1
	Cadmium (µg/L)	1				< 0.087			
	J Chromium (µg/L)	1				0.666			
	J Copper (µg/L)	1				0.997 A			1
	Iron (mg/L)	1				0.400			
	J Lead (µg/L)	1				0.323 A			1
	J Manganese (mg/L)	1				0.023			
	J Nickel (µg/L)	1				0.734			
	Selenium (µg/L)	1				< 0.535			
	Silver (µg/L)	1				< 0.538			
	J Thallium (µg/L)	1				0.016			
	Zinc (µg/L)	1				< 0.087			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	1.20	0.50	0.59	0.25		
	J E. coli (MPN/DL)	8	20.0	86.0	52.5	53.2	27.8		

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

	Parameter	N	Min	Max	Med	Avg	SD	E
BKRB-1	**Physical**							
	Temperature (°C)	10	16.7	27.2	23.8	22.9	3.8	
	Turbidity (NTU)	10	2.0	70.1	4.6	12.5	20.7	
	Total Dissolved Solids (mg/L)	8	55.0	6010.0	96.0	2058.6	2753.0	
	[J] Total Suspended Solids (mg/L)	8	1.0	13.0	3.0	4.6	4.0	
	Specific Conductance (µmhos/cm)	10	30.5	19217.0	242.7	3298.8	6283.9	
	[J] Alkalinity (mg/L)	8 <	1.0	35.0	10.5	15.6	13.7	
	Monthly Stream Flow (cfs)	7	-272.1	708.6	290.0	274.8	308.2	
	Measured Stream Flow (cfs)	7	-272.1	708.6	290.0	274.8	308.2	
	Chemical							
	Dissolved Oxygen (mg/L)	10	0.6 [C]	9.1	6.5	6.2	2.4	1
	pH (SU)	10	5.1 [C]	7.9	6.2	6.3	0.7	1
	[J] Ammonia Nitrogen (mg/L)	8 <	0.013	0.110	0.045	0.047	0.034	
	[J] Nitrate+Nitrite Nitrogen (mg/L)	8	0.096	0.604	0.452	0.404	0.180	
	[J] Total Kjeldahl Nitrogen (mg/L)	8 <	0.072	1.400	0.490	0.557	0.441	
	[J] Dis Reactive Phosphorus (mg/L)	8 <	0.006	0.029	0.010	0.012	0.008	
	[J] Total Phosphorus (mg/L)	8	0.020	0.128	0.032	0.048	0.036	
	[J] CBOD-5 (mg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0	
	[J] Chlorides (mg/L)	8	5.8	3100.0	40.5	1113.1	1509.6	
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	5.00	0.50	1.34	1.58	
	[J,L] E. coli (MPN/DL)	5	1.0	1000.0	13.0	209.3	442.1	
	[L] Enterococci (MPN/DL)	3	10	10	5	7	3	

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

	Parameter	N	Min	Max	Med	Avg	SD	E
PDBB-3	**Physical**							
	Temperature (°C)	6	15.1	28.8	25.0	23.0	5.5	
	Turbidity (NTU)	8	5.6	78.6	6.6	16.0	25.3	
	Total Dissolved Solids (mg/L)	8	81.0	12800.0	3875.0	4788.0	5053.0	
	[J] Total Suspended Solids (mg/L)	8	2.0	32.0	7.5	9.5	9.4	
	Specific Conductance (µmhos/cm)	6	73.8	21086.0	3192.8	5996.4	8101.8	
	[J] Alkalinity (mg/L)	8	1.0	67.0	16.0	23.0	22.5	
	Chemical							
	Dissolved Oxygen (mg/L)	6	6.2	9.6	8.3	8.2	1.4	
	pH (SU)	6	5.6 [C]	7.8	7.3	7.0	0.9	1
	[J] Ammonia Nitrogen (mg/L)	8	< 0.013	0.120	0.014	0.035	0.041	
	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.008	0.152	0.082	0.069	0.053	
	[J] Total Kjeldahl Nitrogen (mg/L)	8	0.330	0.960	0.750	0.730	0.201	
	[J] Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.011	0.003	0.004	0.004	
	[J] Total Phosphorus (mg/L)	8	0.021	0.117	0.028	0.040	0.032	
	[J] CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8	17.0	8600.0	2250.0	3042.9	3295.8	
	Biological							
	Chlorophyll a (mg/m³)	8	< 1.00	2.70	1.10	1.42	1.03	
	[L] Enterococci (COL/DL)	1				10		
	[J,L] Enterococci (MPN/DL)	7	10	110	10	22	39	

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

	Parameter	N	Min	Max	Med	Avg	SD	E
PB-1	**Physical**							
	Temperature (°C)	8	16.7	30.3 [C]	28.0	25.8	5.5	1
	Turbidity (NTU)	8	2.8	48.5	4.5	10.1	15.6	
	Total Dissolved Solids (mg/L)	8	177.0	17600.0	8890.0	8381.1	6803.2	
	[J] Total Suspended Solids (mg/L)	8	< 1.0	27.0	8.5	11.3	9.2	
	Specific Conductance (µmhos/cm)	8	321.5	31527.3	20052.2	16650.8	13115.6	
	[J] Alkalinity (mg/L)	8	< 1.0	59.0	47.0	33.1	26.2	
	Chemical							
	Dissolved Oxygen (mg/L)	8	4.7 [C]	8.7	7.1	6.9	1.4	1
	pH (SU)	8	6.6	7.9	7.5	7.3	0.5	
	[J] Ammonia Nitrogen (mg/L)	8	< 0.013	0.120	0.020	0.050	0.046	
	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.008	0.078	0.004	0.027	0.032	
	[J] Total Kjeldahl Nitrogen (mg/L)	8	< 0.051	1.100	0.765	0.692	0.330	
	[J] Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.013	0.003	0.004	0.004	
	[J] Total Phosphorus (mg/L)	8	0.017	0.080	0.026	0.033	0.020	
	[J] CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
	[J] Chlorides (mg/L)	8	73.0	10000.0	6100.0	5056.1	3958.1	
	Biological							
	Chlorophyll a (mg/m³)	8	< 1.00	2.90	0.95	1.30	0.95	
	[L] Fecal Coliform (COL/DL)	3	1	910	1	304	525	
	[J,L] Enterococci (MPN/DL)	7	10	60	5	13	21	

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

	Parameter	N	Min	Max	Med	Avg	SD	E
MIFB-1	**Physical**							
	Temperature (°C)	6	17.1	32.2 [C]	28.8	26.6	6.3	3
	Turbidity (NTU)	8	7.1	13.5	8.2	8.8	2.1	
	Total Dissolved Solids (mg/L)	8	296.0	14800.0	10550.0	8305.8	5145.8	
	Total Suspended Solids (mg/L)	8	6.0	18.0	12.0	11.8	4.9	
	Specific Conductance (µmhos/cm)	6	497.9	31793.0	19770.4	15896.8	11916.5	
	Alkalinity (mg/L)	8	22.0	68.0	41.5	42.2	16.5	
	Monthly Stream Flow (cfs)	7	-242.4	57.1	-7.7	-46.2	124.6	
	Measured Stream Flow (cfs)	7	-242.4	57.1	-7.7	-46.2	124.6	
	Chemical							
	Dissolved Oxygen (mg/L)	6	0.0 [C]	7.9	5.7	5.3	2.8	1
	pH (SU)	6	6.0	7.8	7.4	7.2	0.7	
	[J] Ammonia Nitrogen (mg/L)	8	< 0.013	0.200	0.008	0.042	0.067	
	Nitrate+Nitrite Nitrogen (mg/L)	8	0.052	0.695	0.173	0.251	0.221	
	[J] Total Kjeldahl Nitrogen (mg/L)	8	0.360	1.300	1.050	0.966	0.286	
	[J] Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.045	0.004	0.011	0.015	
	[J] Total Phosphorus (mg/L)	8	0.043	0.088	0.058	0.060	0.015	
	[J] CBOD-5 (mg/L)	8	< 2.0	4.6	2.8	2.8	1.4	
	Chlorides (mg/L)	8	130.0	9400.0	6250.0	5166.2	3294.0	
	Biological							
	Chlorophyll a (mg/m³)	8	2.40	25.00	4.60	7.42	7.48	
	[J,L] Enterococci (MPN/DL)	8	10	3600	8	474	1264	

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

	Parameter	N	Min	Max	Med	Avg	SD	E	Q
WO-1A	**Physical**								
	Temperature (°C)	6	20.6	24.6	23.5	23.1	1.4		
	Turbidity (NTU)	8	2.0	41.6	3.8	10.2	14.1		
	Total Dissolved Solids (mg/L)	8	65.0	88.0	73.5	74.9	8.8		
	J Total Suspended Solids (mg/L)	8	2.0	12.0	3.5	4.9	3.6		
	Specific Conductance (µmhos/cm)	6	77.0	109.9	104.4	100.0	12.6		
	Hardness (mg/L)	1				22.0			
	Alkalinity (mg/L)	8	12.0	22.0	16.0	16.2	2.8		
	Monthly Stream Flow (cfs)	2	12.3	16.5	14.4	14.4	3.0		
	Measured Stream Flow (cfs)	2	12.3	16.5	14.4	14.4	3.0		
	Chemical								
	Dissolved Oxygen (mg/L)	6	7.3	8.2	7.6	7.6	0.3		
	pH (SU)	6	5.6 C	6.1	5.9	5.9	0.1	3	
	J Ammonia Nitrogen (mg/L)	8	< 0.013	0.180	0.050	0.057	0.055		
	J Nitrate+Nitrite Nitrogen (mg/L)	8	1.020	1.870	1.545	1.535	0.239		
	J Total Kjeldahl Nitrogen (mg/L)	8	< 0.050	0.740	0.160	0.250	0.263		
	J Dis Reactive Phosphorus (mg/L)	8	0.151	0.644	0.207	0.309	0.191		
	J Total Phosphorus (mg/L)	8	0.231	0.750	0.283	0.388	0.192		
	J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
	Chlorides (mg/L)	8	8.8	15.0	12.5	12.3	2.4		
	Total Metals								
	Aluminum (mg/L)	1				0.312			
	Iron (mg/L)	1				0.480			
	Manganese (mg/L)	1				0.063			
	Dissolved Metals								
	J Aluminum (mg/L)	1				0.130			
	J Antimony (µg/L)	1				0.026			
	J Arsenic (µg/L)	1				0.519 A			1
	Cadmium (µg/L)	1				< 0.087			
	J Chromium (µg/L)	1				0.988			
	J Copper (µg/L)	1				1.370			
	Iron (mg/L)	1				0.287			
	J Lead (µg/L)	1				0.283			
	Manganese (mg/L)	1				0.059			
	J Nickel (µg/L)	1				0.705			
	Selenium (µg/L)	1				< 0.535			
	Silver (µg/L)	1				< 0.538			
	J Thallium (µg/L)	1				0.019			
	Zinc (µg/L)	1				7.130			
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	< 1.00	0.50	0.50	0.00		
	J E. coli (MPN/DL)	8	34.0	830.0	73.5	161.0	271.3		

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

	Parameter	N	Min	Max	Med	Avg	SD	E
SDYB-2	**Physical**							
	Temperature (°C)	5	16.0	28.3	22.5	22.9	5.1	
	Turbidity (NTU)	8	4.1	24.3	6.7	9.4	6.6	
	Total Dissolved Solids (mg/L)	8	59.0	11700.0	3500.0	4241.2	4256.5	
	[J] Total Suspended Solids (mg/L)	8	4.0	16.0	8.0	8.4	4.0	
	Specific Conductance (µmhos/cm)	5	65.9	27628.0	16629.0	13030.5	12467.6	
	[J] Alkalinity (mg/L)	8	8.0	59.0	21.5	27.8	19.6	
	Monthly Stream Flow (cfs)	8	-203.8	126.6	43.8	18.4	99.9	
	Measured Stream Flow (cfs)	8	-203.8	126.6	43.8	18.4	99.9	
	Chemical							
	Dissolved Oxygen (mg/L)	5	0.1 [C]	9.6	6.3	4.8	4.2	2
	pH (SU)	5	5.6 [C]	7.3	6.7	6.6	0.7	1
	[J] Ammonia Nitrogen (mg/L)	8 <	0.013	0.060	0.030	0.031	0.023	
	Nitrate+Nitrite Nitrogen (mg/L)	8	0.197	1.010	0.748	0.654	0.303	
	[J] Total Kjeldahl Nitrogen (mg/L)	8	0.340	1.200	0.970	0.888	0.320	
	[J] Dis Reactive Phosphorus (mg/L)	8 <	0.003	0.196	0.011	0.036	0.066	
	[J] Total Phosphorus (mg/L)	8	0.036	0.113	0.078	0.072	0.026	
	[J] CBOD-5 (mg/L)	8 <	2.0	5.0	2.4	2.4	1.5	
	Chlorides (mg/L)	8	11.0	7800.0	1965.0	2612.2	2803.1	
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	12.00	3.95	4.95	3.81	
	[J,L] Enterococci (MPN/DL)	8	10	2100	15	309	730	

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

	Parameter	N	Min	Max	Med	Avg	SD	E
WLFB-2	**Physical**							
	Temperature (°C)	3	18.2	26.9	26.6	23.9	4.9	
	Turbidity (NTU)	8	4.0	7.7	5.4	5.7	1.0	
	Total Dissolved Solids (mg/L)	8	1910.0	16500.0	13150.0	11475.0	4978.1	
	[J] Total Suspended Solids (mg/L)	8	4.0	35.0	11.0	12.5	9.7	
	Specific Conductance (µmhos/cm)	3	3389.0	33929.1	20786.7	19368.3	15319.4	
	[J] Alkalinity (mg/L)	8	1.0	73.0	47.5	41.9	27.4	
	Chemical							
	Dissolved Oxygen (mg/L)	3	7.8	9.1	7.9	8.3	0.7	
	pH (SU)	3	7.7	8.0	7.9	7.9	0.2	
	[J] Ammonia Nitrogen (mg/L)	8 <	0.013	0.070	0.014	0.022	0.022	
	Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.008	0.101	0.004	0.022	0.036	
	[J] Total Kjeldahl Nitrogen (mg/L)	8 <	0.051	1.100	0.740	0.678	0.334	
	[J] Dis Reactive Phosphorus (mg/L)	8 <	0.003	0.008	0.003	0.003	0.002	
	[J] Total Phosphorus (mg/L)	8	0.026	0.048	0.040	0.038	0.008	
	[J] CBOD-5 (mg/L)	8 <	2.0	2.4	1.0	1.3	0.6	
	Chlorides (mg/L)	8	1000.0	12000.0	7650.0	7175.0	3562.8	
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	4.10	2.20	2.02	1.41	
	[J,L] Fecal Coliform (COL/DL)	4	1	140	2	36	69	
	[J,L] Enterococci (MPN/DL)	8	10	50	5	11	16	

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

	Parameter	N	Min	Max	Med	Avg	SD	E
IC-4	**Physical**							
	Temperature (°C)	8	18.6	30.5 [C]	27.3	26.0	4.2	1
	Turbidity (NTU)	8	2.2	4.6	2.7	2.8	0.8	
	Total Dissolved Solids (mg/L)	8	5530.0	23500.0	16800.0	16266.2	6053.0	
	[J] Total Suspended Solids (mg/L)	8	3.0	99.0	11.0	20.4	31.9	
	Specific Conductance (µmhos/cm)	8	9907.5	40297.8	31331.8	29905.6	10830.4	
	Alkalinity (mg/L)	8	17.0	89.0	72.0	59.5	28.9	
	Monthly Stream Flow (cfs)	7	-8847.9	10700.2	-3358.4	-46.8	7567.1	
	Measured Stream Flow (cfs)	7	-8847.9	10700.2	-3358.4	-46.8	7567.1	
	Chemical							
	Dissolved Oxygen (mg/L)	8	6.0	8.5	7.4	7.4	0.9	
	pH (SU)	8	7.1	8.1	8.0	7.8	0.3	
	[J] Ammonia Nitrogen (mg/L)	8 <	0.013	0.110	0.008	0.028	0.037	
	[J] Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.008	0.057	0.007	0.017	0.020	
	[J] Total Kjeldahl Nitrogen (mg/L)	8 <	0.050	1.000	0.505	0.494	0.382	
	[J] Dis Reactive Phosphorus (mg/L)	8 <	0.003	< 0.006	0.002	0.002	0.001	
	[J] Total Phosphorus (mg/L)	8 <	0.005	0.106	0.030	0.041	0.033	
	[J] CBOD-5 (mg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8	3300.0	16000.0	11500.0	11237.5	4411.0	
	Biological							
	Chlorophyll a (mg/m^3)	8 <	1.00	1.90	1.00	1.06	0.61	
	[J,L] Fecal Coliform (COL/DL)	4	1	8	3	4	4	
	[L] Enterococci (COL/DL)	1				10		
	[J,L] Enterococci (MPN/DL)	7	10	10	5	6	2	

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

Parameter	N	Min	Max	Med	Avg	SD	E	Q
Physical								
Temperature (°C)	8	16.2	30.7 [C]	26.7	25.9	5.3	3	
Turbidity (NTU)	8	9.4	23.6	10.8	13.5	5.3		
Total Dissolved Solids (mg/L)	7	3800.0	17500.0	13900.0	11317.1	5095.1		
Total Suspended Solids (mg/L)	7	13.0	29.0	18.0	19.6	5.6		
Specific Conductance (µmhos/cm)	8	6177.2	34354.7	19245.5	17073.4	13985.5		
Hardness (mg/L)	1				1000.0			
Alkalinity (mg/L)	7	37.0	94.0	64.0	63.6	20.9		
Monthly Stream Flow (cfs)	8	-2723.4	6898.3	3251.2	2441.0	3542.2		
Measured Stream Flow (cfs)	8	-2723.4	6898.3	3251.2	2441.0	3542.2		
Chemical								
Dissolved Oxygen (mg/L)	8	5.0	8.4	5.7	6.2	1.1		
pH (SU)	8	6.5	7.8	7.4	7.3	0.5		
[J] Ammonia Nitrogen (mg/L)	7 <	0.013	0.150	0.040	0.063	0.061		
Nitrate+Nitrite Nitrogen (mg/L)	7 <	0.008	0.046	0.028	0.022	0.018		
Total Kjeldahl Nitrogen (mg/L)	7	0.170	1.300	0.960	0.883	0.372		
[J] Dis Reactive Phosphorus (mg/L)	7 <	0.006	0.045	0.021	0.023	0.019		
[J] Total Phosphorus (mg/L)	7	0.040	0.107	0.091	0.078	0.025		
[J] CBOD-5 (mg/L)	7 <	2.0	3.0	1.0	1.3	0.8		
Chlorides (mg/L)	7	2200.0	12000.0	7900.0	7342.8	3911.5		
Total Metals								
Aluminum (mg/L)	1				0.458			
Iron (mg/L)	1				0.201			
Manganese (mg/L)	1				0.060			
Dissolved Metals								
[J] Aluminum (mg/L)	1				0.104			
[J] Antimony (µg/L)	1				0.396			
[J] Arsenic (µg/L)	1				3.090 [A]			1
Cadmium (µg/L)	1				< 0.087			
[J] Chromium (µg/L)	1				0.807			
Copper (µg/L)	1				34.100			
Iron (mg/L)	1				< 0.009			
[J] Lead (µg/L)	1				0.165			
[J] Manganese (mg/L)	1				0.011			
[J] Nickel (µg/L)	1				2.480			
Selenium (µg/L)	1				9.900 [A]		1	
Silver (µg/L)	1				< 0.538			
[J] Thallium (µg/L)	1				0.281 [A]		1	
Zinc (µg/L)	1				< 0.087			
Biological								
Chlorophyll a (mg/m³)	7	1.00	3.90	3.20	2.74	1.10		
[J,L] Enterococci (MPN/DL)	8	10	660	10	89	231		

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	Parameter	N	Min	Max	Med	Avg	SD	E
ARNB-1	**Physical**							
	Temperature (°C)	8	18.3	29.4	27.7	25.7	4.7	
	Turbidity (NTU)	7	1.9	11.7	3.2	4.2	3.4	
	Total Dissolved Solids (mg/L)	8	2450.0	22700.0	12050.0	12092.5	6794.0	
	[J] Total Suspended Solids (mg/L)	8	2.0	21.0	9.5	10.9	6.0	
	Specific Conductance (µmhos/cm)	8	3966.7	35733.1	21126.2	21062.0	11600.9	
	[J] Alkalinity (mg/L)	8 <	1.2	69.0	54.5	39.7	29.0	
	Chemical							
	Dissolved Oxygen (mg/L)	8	6.0	9.3	7.7	7.5	1.1	
	pH (SU)	8	7.4	8.1	7.8	7.8	0.2	
	[J] Ammonia Nitrogen (mg/L)	8 <	0.013	0.110	0.014	0.030	0.035	
	[J] Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.008	0.108	0.004	0.021	0.037	
	[J] Total Kjeldahl Nitrogen (mg/L)	8 <	0.051	0.800	0.630	0.571	0.241	
	[J] Dis Reactive Phosphorus (mg/L)	8 <	0.003	0.007	0.003	0.003	0.002	
	[J] Total Phosphorus (mg/L)	8	0.023	0.062	0.030	0.034	0.013	
	[J] CBOD-5 (mg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8	1400.0	13000.0	7750.0	7537.5	4245.0	
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	3.60	0.50	1.14	1.10	
	[J] Fecal Coliform (COL/DL)	4	1	460	1	116	230	
	[L] Enterococci (COL/DL)	1				10		
	[J,L] Enterococci (MPN/DL)	7	10	40	5	10	13	

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	Parameter	N	Min	Max	Med	Avg	SD	E
PDBB-0	**Physical**							
	Temperature (°C)	8	17.3	29.3	25.6	24.5	4.4	
	Turbidity (NTU)	8	0.7	2.8	1.2	1.5	0.7	
	Total Dissolved Solids (mg/L)	8	17800.0	30700.0	27050.0	25850.0	4466.7	
	Total Suspended Solids (mg/L)	8	8.0	69.0	13.0	19.4	20.3	
	Specific Conductance (µmhos/cm)	8	32983.0	51413.7	47388.5	45044.7	6847.5	
	Hardness (mg/L)	1				3417.2		
	Alkalinity (mg/L)	8	49.0	116.0	79.5	85.9	22.1	
	Chemical							
	Dissolved Oxygen (mg/L)	8	6.8	8.4	7.1	7.4	0.6	
	pH (SU)	8	7.8	8.0	8.0	8.0	0.1	
	J Ammonia Nitrogen (mg/L)	8 <	0.013	0.020	0.007	0.008	0.005	
	Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.008	0.043	0.004	0.015	0.016	
	J Total Kjeldahl Nitrogen (mg/L)	8 <	0.050	1.600	0.260	0.515	0.628	
	J Dis Reactive Phosphorus (mg/L)	8 <	0.003	< 0.006	0.003	0.002	0.001	
	J Total Phosphorus (mg/L)	8 <	0.005	0.069	0.002	0.022	0.029	
	J CBOD-5 (mg/L)	8 <	2.0	3.5	1.0	1.3	0.9	
	Chlorides (mg/L)	8	11000.0	20000.0	17500.0	16750.0	3453.8	
	Total Metals							
	J Aluminum (mg/L)	1				0.107		
	J Iron (mg/L)	1				0.029		
	Manganese (mg/L)	1				< 0.006		
	Dissolved Metals							
	J Aluminum (mg/L)	1				0.067		
	J Antimony (µg/L)	1				0.387		
	Arsenic (µg/L)	1				5.370 A		1
	Cadmium (µg/L)	1				< 0.348		
	J Chromium (µg/L)	1				1.620		
	Copper (µg/L)	1				50.300		
	Iron (mg/L)	1				< 0.009		
	J Lead (µg/L)	1				0.792		
	Manganese (mg/L)	1				< 0.006		
	J Nickel (µg/L)	1				1.460		
	Selenium (µg/L)	1				28.800 A		1
	Silver (µg/L)	1				< 2.150		
	Thallium (µg/L)	1				< 0.028		
	Zinc (µg/L)	1				22.100		
	Biological							
	Chlorophyll a (mg/m³)	8 <	1.00	1.40	0.50	0.69	0.36	
	J,L Fecal Coliform (COL/DL)	4	1	20	1	5	10	
	J,L Enterococci (MPN/DL)	8	10	20	5	7	5	

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	Parameter	N	Min		Max	Med	Avg	SD	E
GMEX-8	**Physical**								
	Temperature (°C)	8	17.1		30.2 [C]	25.5	24.5	4.4	1
	Turbidity (NTU)	8	0.0		1.4	0.5	0.6	0.4	
	Total Dissolved Solids (mg/L)	8	24200.0		33100.0	28750.0	28712.5	3251.1	
	Total Suspended Solids (mg/L)	8	10.0		137.0	14.5	28.6	43.8	
	Specific Conductance (µmhos/cm)	8	37137.3		51939.9	51014.2	49140.7	4930.1	
	Alkalinity (mg/L)	8	48.0		123.0	104.5	97.1	24.8	
	Chemical								
	Dissolved Oxygen (mg/L)	8	6.4		8.3	7.2	7.3	0.7	
	pH (SU)	8	7.8		8.1	8.0	7.9	0.1	
	[J] Ammonia Nitrogen (mg/L)	8	< 0.013		0.020	0.007	0.008	0.005	
	Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.008		0.021	0.004	0.006	0.006	
	[J] Total Kjeldahl Nitrogen (mg/L)	8	< 0.051		1.800	0.310	0.579	0.622	
	[J] Dis Reactive Phosphorus (mg/L)	8	< 0.003	<	0.006	0.002	0.002	0.001	
	[J] Total Phosphorus (mg/L)	8	< 0.004		0.078	0.002	0.019	0.031	
	[J] CBOD-5 (mg/L)	8	< 2.0	<	2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8	15000.0		21000.0	19500.0	19000.0	1851.6	
	Biological								
	Chlorophyll a (mg/m³)	8	< 1.00	<	1.00	0.50	0.50	0.00	
	[L] Fecal Coliform (COL/DL)	4	1		1	1	1	0	
	[J,L] Enterococci (MPN/DL)	8	10		10	5	6	2	

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