# *2015 Mobile Delta Sub-Estuary Report*

Alabama Department of Environmental Management

Field Operations Division
Environmental Assessment Section
Water Unit
August 2020

# Coastal Waters Monitoring Program

# 2015

# Mobile Delta Sub-Estuary Report

**Alabama Department of Environmental Management**
**Environmental Assessment Section**
**Water Unit**

August 2020

# TABLE OF CONTENTS

# 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 |

# LIST OF FIGURES

# LIST OF TABLES

# INTRODUCTION

The Mobile Delta is the second largest delta in the contiguous United States, encompassing approximately 260,000 acres. The northern end of the delta is formed by the confluence of the Tombigbee and Alabama Rivers and the southern end is at the head of Mobile Bay. The Mobile Delta is contained within Mobile, Baldwin, Clarke, Monroe, and Washington Counties. The rivers within the delta include the Mobile, Tensaw, Apalachee, Middle, Blakeley, and Spanish Rivers. This watershed provides valuable resources to the area including agriculture, spawning habitats for fish and shellfish, and recreational activities such as birdwatching, hunting, boating, fishing, and swimming.

The Alabama Department of Environmental Management (ADEM) monitored stations within the Mobile Delta watershed as part of the 2015 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 within the Mobile Delta sub-estuary that remain on the 303(d) list as impaired. Figure 1 shows a map of waterbodies within the Mobile Delta watershed that are on the 2014 CWA 303(d) list.

The purpose of this report is to summarize data collected at fourteen stations within the Mobile Delta watershed during the 2015 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. Bay Minette Creek, Bayou Sara, Chickasaw Creek, Mobile River, Tensaw River, and Threemile Creek were sampled within the Mobile Delta watershed.

Water quality assessments were conducted monthly, bi-monthly, or quarterly March-October. Sampling frequency varied year-to-year dependent on available resources. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operation Procedures (ADEM 2015), Surface Water Quality Assurance Project Plan (2015), 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, 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 Mobile Delta Sub-Estuary.

| Assessment Unit ID | Waterbody Name | County | Uses | Causes | Sources | Date of Data | Size | Year Listed | Draft TMDL Date |
|---|---|---|---|---|---|---|---|---|---|
| AL03160204-0403-112 | Mobile River | Baldwin Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2000 | 20.90 miles | 2000 | 2020 |
| AL03160204-0106-112 | Mobile River | Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2011 | 2.37 miles | 2014 | 2020 |
| AL03160204-0103-100 | Mobile River | Baldwin Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2011 | 5.72 miles | 2014 | 2020 |
| AL03160204-0105-111 | Cold Creek | Mobile | Fish & Wildlife | Metals (Mercury) | Contaminated sediments | 1993 | 4.21 miles | 1996 | 2020 |
| AL03160204-0305-101 | Chickasaw Creek | Mobile | Limited Warmwater Fishery | Metals (Mercury) | Atmospheric deposition | 2000 | 4.43 miles | 2000 | 2020 |
| AL03160204-0305-102 | Chickasaw Creek | Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2000 | 6.64 miles | 2000 | 2020 |
| AL03160204-0303-100 | Chickasaw Creek | Mobile | Swimming Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2000 | 26.82 miles | 2000 | 2020 |
| AL03160204-0503-102 | Bay Minette Creek | Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2011 | 18.15 miles | 2014 | 2020 |
| AL03160204-0504-300 | Toulmins Spring Branch | Mobile | Fish & Wildlife | Nutrients | Urban runoff/storm sewers | 2000-01 | 3.22 miles | 2008 | 2021 |
| AL03160204-0504-500 | UT to Threemile Creek | Mobile | Fish & Wildlife | Nutrients | Urban runoff/storm sewers | 2000-01 | 1.04 miles | 2008 | 2018 |

Table 1. (continued)

| Assessment Unit ID | Waterbody Name | County | Uses | Causes | Sources | Date of Data | Size | Year Listed | Draft TMDL Date |
|---|---|---|---|---|---|---|---|---|---|
| AL03160204-0505-201 | Tensaw River | Baldwin | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2002 | 6.51 miles | 2002 | 2020 |
| AL03160204-0505-202 | Tensaw River | Baldwin | Outstanding Alabama Water Swimming Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2002 | 21.73 miles | 2002 | 2020 |
| AL03160204-0106-302 | Tensaw River | Baldwin | Outstanding Alabama Water Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2002 | 2.93 miles | 2002 | 2020 |
| AL03160204-0106-303 | Tensaw River | Baldwin Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2002 | 10.98 miles | 2002 | 2020 |
| AL03160204-0202-200 | Middle River | Baldwin Mobile | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2011 | 9.72 miles | 2014 | 2020 |
| AL03160204-0202-300 | Mifflin Lake | Baldwin | Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2011 | .73 square miles | 2014 | 2020 |
| AL03160205-0202-210 | Polecat Creek | Baldwin | Swimming Fish & Wildlife | Metals (Mercury) | Atmospheric deposition | 2005 | 7.89 miles | 2006 | 2020 |

Figure 1. 2015 Mobile Delta stations & impaired waterbodies.

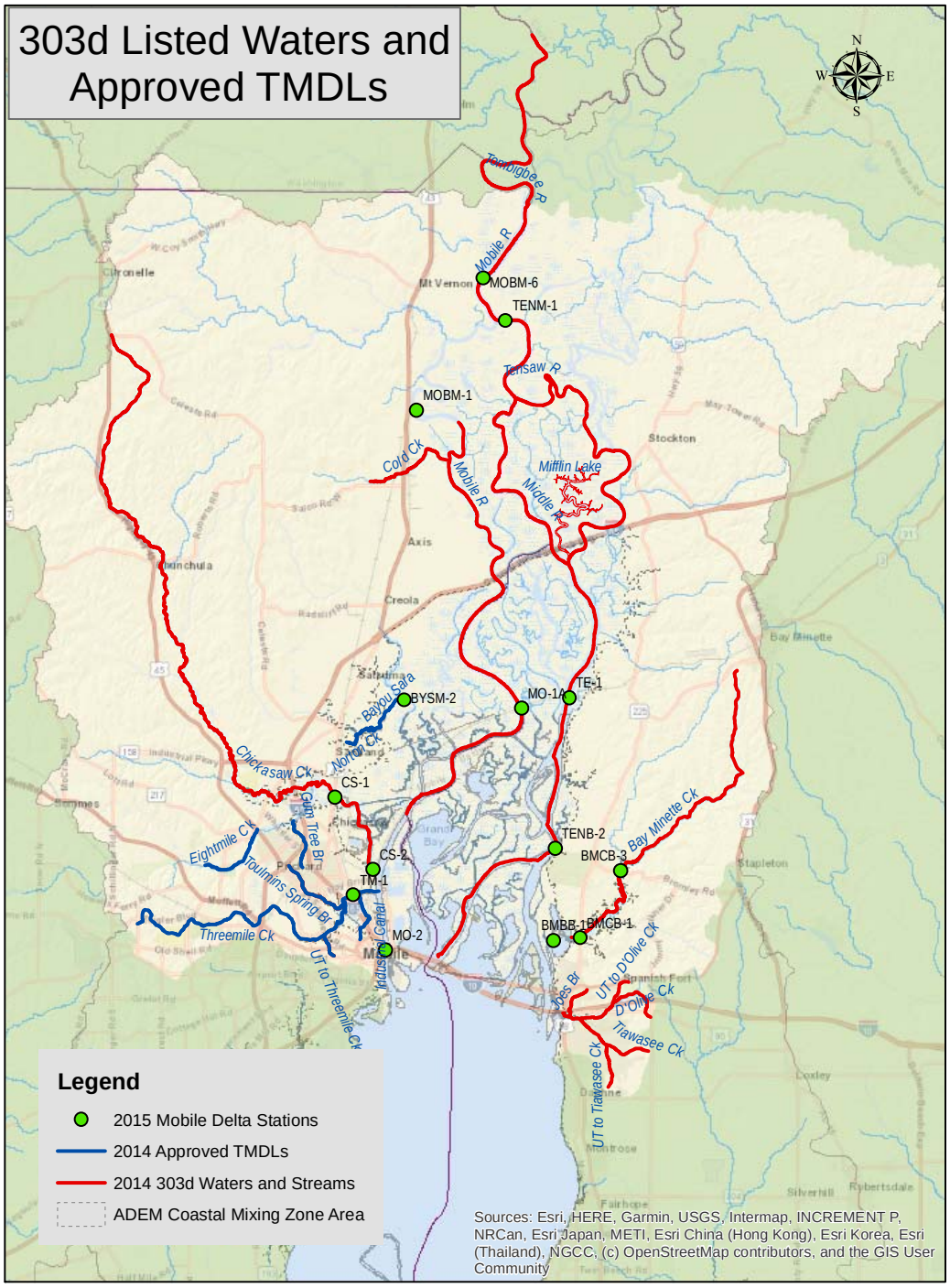


Table 2. Descriptions for the monitoring stations in 2015 for the Mobile Delta Sub-Watershed.

| HUC8 | County | Station Number | Use Classification | Waterbody Name | Station Description | Latitude | Longitude |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 3160204 | Baldwin | BMBB-1 | F&W | Bay Minette Basin | Middle of Bay Minette Basin (widened portion of Minette Creek just upstream of Blakely River). | 30.6978 | -87.9206 |
| 3160204 | Baldwin | BMCB-1 | F&W | Bay Minette Ck | Bay Minette Ck, Baldwin Co. in the vicinity of Hwy 225 bridge. Lat/ Lon calculated at bridge crossing. | 30.699472 | -87.902194 |
| 3160204 | Baldwin | BMCB-3 | F&W | Bay Minette Ck | Bay Minette Ck at Bromely Rd. | 30.7399 | -87.8746 |
| 3160204 | Mobile | BYSM-2 | S/F&W | Bayou Sara | Bayou Sara at pipeline crossing downstream of Gunnison Creek. | 30.8406 | -88.0252 |
| 3160204 | Mobile | CS-1 | LWF | Chickasaw Ck | Chickasaw Ck at US Hwy 43 crossing. | 30.78224 | -88.072481 |
| 3160204 | Mobile | CS-2 | LWF | Chickasaw Ck | Chickasaw Ck at CSX Railroad crossing bridge at confluence with Mobile River. | 30.73925 | -88.04571 |
| 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 at Government Street (Bankhead Tunnel) in Mobile at Alabama State Docks. | 30.69137 | -88.03646 |
| 3160204 | Mobile | MOBM-1 | PWS/F&W | Mobile R | Mobile River at Bucks near the MAWSS water intake. | 31.0137 | -88.01853 |

Table 2. (continued)

| HUC8 | County | Station Number | Use Classification | Waterbody Name | Station Description | Latitude | Longitude |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 3160204 | Mobile | MOBM-6 | F&W | Mobile R | Mobile River at David Lake, river mile 41.3. | 31.092917 | -87.973111 |
| 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 downstream of power line (near Blakely Park and Steam Mill Landing). | 30.75291 | -87.91987 |
| 3160204 | Mobile | TENM-1 | F&W | Tensaw R | Tensaw River approximately 0.4 miles from the Mobile River. | 31.06764057 | -87.95725229 |
| 3160204 | Mobile | TM-1 | A&I | Three Mile Ck | Three Mile Creek between US Hwy 43 & railroad crossing. | 30.723983 | -88.059119 |

# 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 2015 are presented in Appendix Table 1. The table contains the minimum, maximum, median, mean, and standard deviation of each parameter analyzed.

Stations with the highest concentrations of nutrients, chlorophyll, and TSS are noted in the paragraphs to follow. Though stations with 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 2015, mean TN values in Threemile Creek (TM-1) were higher than any other station monitored in the Mobile Delta (Fig. 2). While mean TN values were lower than when monitoring began at several locations, overall trends appear to be increasing since 2010 or 2011 at Chickasaw Creek (CS-1 and CS-2), Mobile River (MO-1A and MO-2), Tensaw River (TENB-2) and Bay Minette Creek and Basin (BMBB-1, BMCB-1 and BMCB-3). Monthly TN concentrations at Bay Minette Creek (BMCB-1) and Bay Minette Basin (BMBB-1) were highest in October (Fig. 6). Highest monthly concentrations at all other locations were measured in the spring. Concentrations were generally at or below historical means.

In each year sampled, the highest mean growing season TP value was for Threemile Creek (TM-1) with all other stations much lower and similar in mean concentrations (Fig. 3). Monthly TP concentrations in Bay Minette Creek and Bay Minette Basin (BMBB-1 and BMCB-1) and

Chickasaw Creek at CS-2 were highest during the summer months while concentrations at the Bayou Sara (BYSM-2), Mobile River (MO-1A, MO-2, MOBM-1 and MOBM-6) and Tensaw River (TE-1 and TENB-2) locations were highest in the spring and declined through the summer (Fig. 7). Monthly TP concentrations in 2015, for most locations, varied little from historic means.

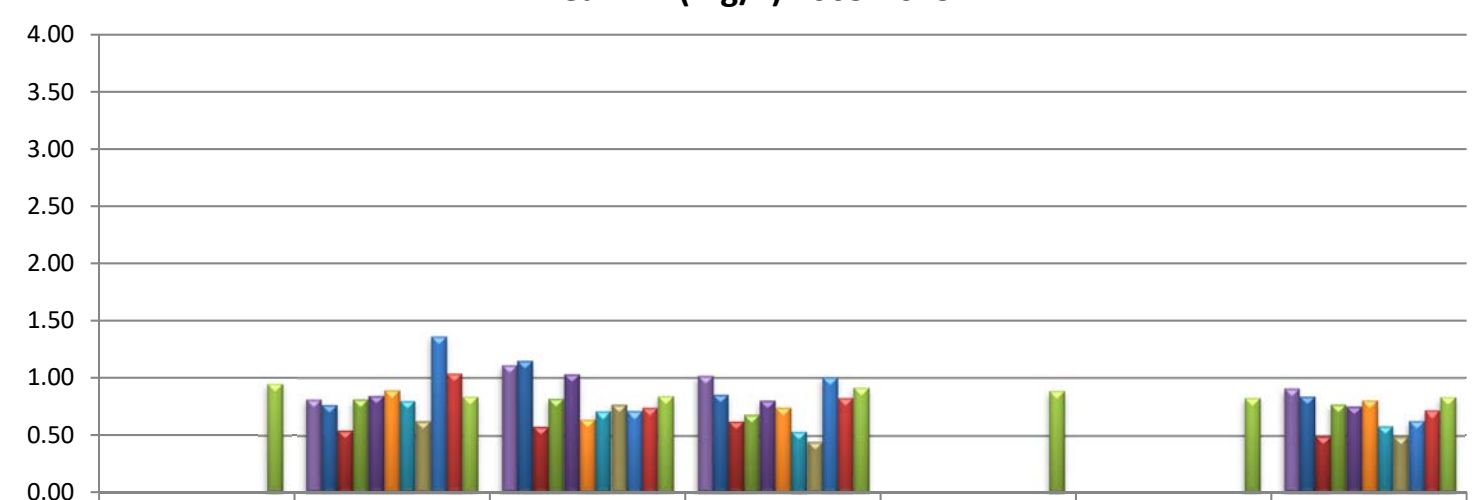
The highest mean growing season chl *a* values, 2005-2015, have been in Threemile Creek (TM-1), though concentrations have declined in all locations in recent years (Fig. 4). Monthly chl *a* concentrations for most months monitored in 2015 were near or below historic means at most locations (Fig. 8).

From 2005 through 2015 the highest mean growing season TSS values have been in the Mobile River stations MO-1A and MOBM-1 (Fig. 5). Monthly concentrations were the highest for 2015 in March at Mobile River (MO-1A) and the lowest overall concentrations were at Bay Minette Creek (BMCB-3) in March and July and Chickasaw Creek (CS-1) in March (Fig. 9). Most 2015 monthly TSS concentrations were close to or below historic means.

Dissolved oxygen concentrations in Bay Minette Creek (BMCB-1) were below the ADEM criteria limit of 5.0 mg/L in June (ADEM Admin. Code R. 335-6-10-09) (Fig. 10). DO concentrations in Bayou Sara (BYSM-2) were below the criteria in July and September, Chickasaw Creek (CS-1) was below in September, (CS-2) was below in October, Mobile River (MO-2) was below in July, August, and September, and Threemile Creek (TM-1) was below the limit in June, August, September, and October. All measurements of DO concentrations in Bay Minette Basin (BMBB-1), Bay Minette Creek (BMCB-3), Mobile River (MO-1A, MOBM-1 and

MOBM-6) and Tensaw River (TE-1, TENB-2 and TENM-1) were above the ADEM criteria. Monthly depth profiles of dissolved oxygen, temperature, and salinity can be found in Figure 11.

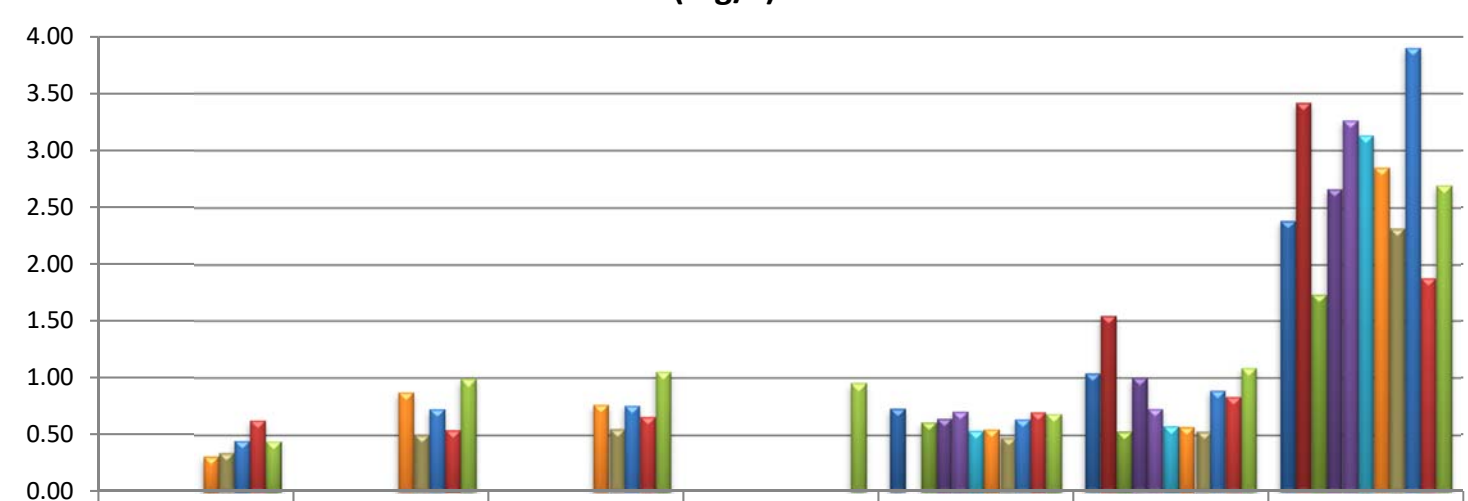
Figure 2. Mean growing season TN measured for the trend stations in the Mobile Delta Sub-Watershed, 2005-2015.




| | MOBM-6 | MOBM-1 | MO-1A | MO-2 | TENM-1 | TE-1 | TENB-2 |
|---|---|---|---|---|---|---|---|
| 2005 | | 0.809 | 1.110 | 1.016 | | | 0.906 |
| 2006 | | 0.762 | 1.147 | 0.851 | | | 0.835 |
| 2007 | | 0.545 | 0.578 | 0.623 | | | 0.495 |
| 2008 | | 0.809 | 0.814 | 0.680 | | | 0.765 |
| 2009 | | 0.841 | 1.029 | 0.799 | | | 0.748 |
| 2010 | | 0.891 | 0.640 | 0.738 | | | 0.803 |
| 2011 | | 0.797 | 0.708 | 0.536 | | | 0.582 |
| 2012 | | 0.626 | 0.765 | 0.447 | | | 0.490 |
| 2013 | | 1.359 | 0.709 | 1.002 | | | 0.628 |
| 2014 | | 1.036 | 0.736 | 0.823 | | | 0.716 |
| 2015 | 0.948 | 0.832 | 0.838 | 0.911 | 0.884 | 0.822 | 0.830 |

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

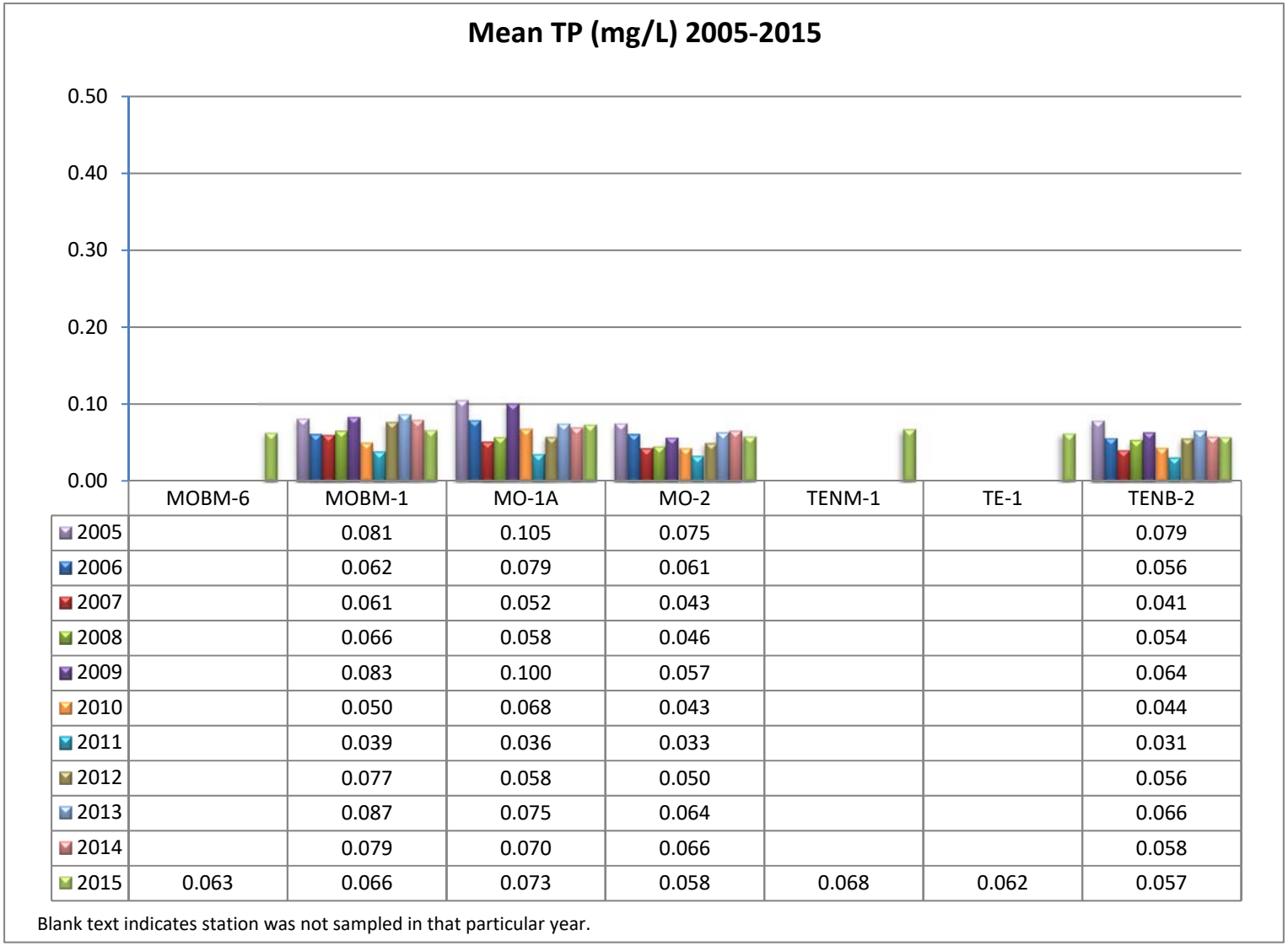
Figure 2. (continued)




| | BMCB-3 | BMCB-1 | BMBB-1 | BYSM-2 | CS-1 | CS-2 | TM-1 |
|---|---|---|---|---|---|---|---|
| 2005 | | | | | 0.733 | 1.037 | 2.385 |
| 2006 | | | | | | 1.543 | 3.416 |
| 2007 | | | | | 0.613 | 0.533 | 1.729 |
| 2008 | | | | | 0.645 | 0.999 | 2.664 |
| 2009 | | | | | 0.707 | 0.731 | 3.262 |
| 2010 | | | | | 0.540 | 0.578 | 3.130 |
| 2011 | 0.313 | 0.875 | 0.767 | | 0.554 | 0.571 | 2.852 |
| 2012 | 0.343 | 0.502 | 0.553 | | 0.477 | 0.531 | 2.319 |
| 2013 | 0.450 | 0.728 | 0.760 | | 0.639 | 0.890 | 3.900 |
| 2014 | 0.630 | 0.545 | 0.661 | | 0.702 | 0.835 | 1.872 |
| 2015 | 0.447 | 0.987 | 1.051 | 0.952 | 0.685 | 1.083 | 2.694 |

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

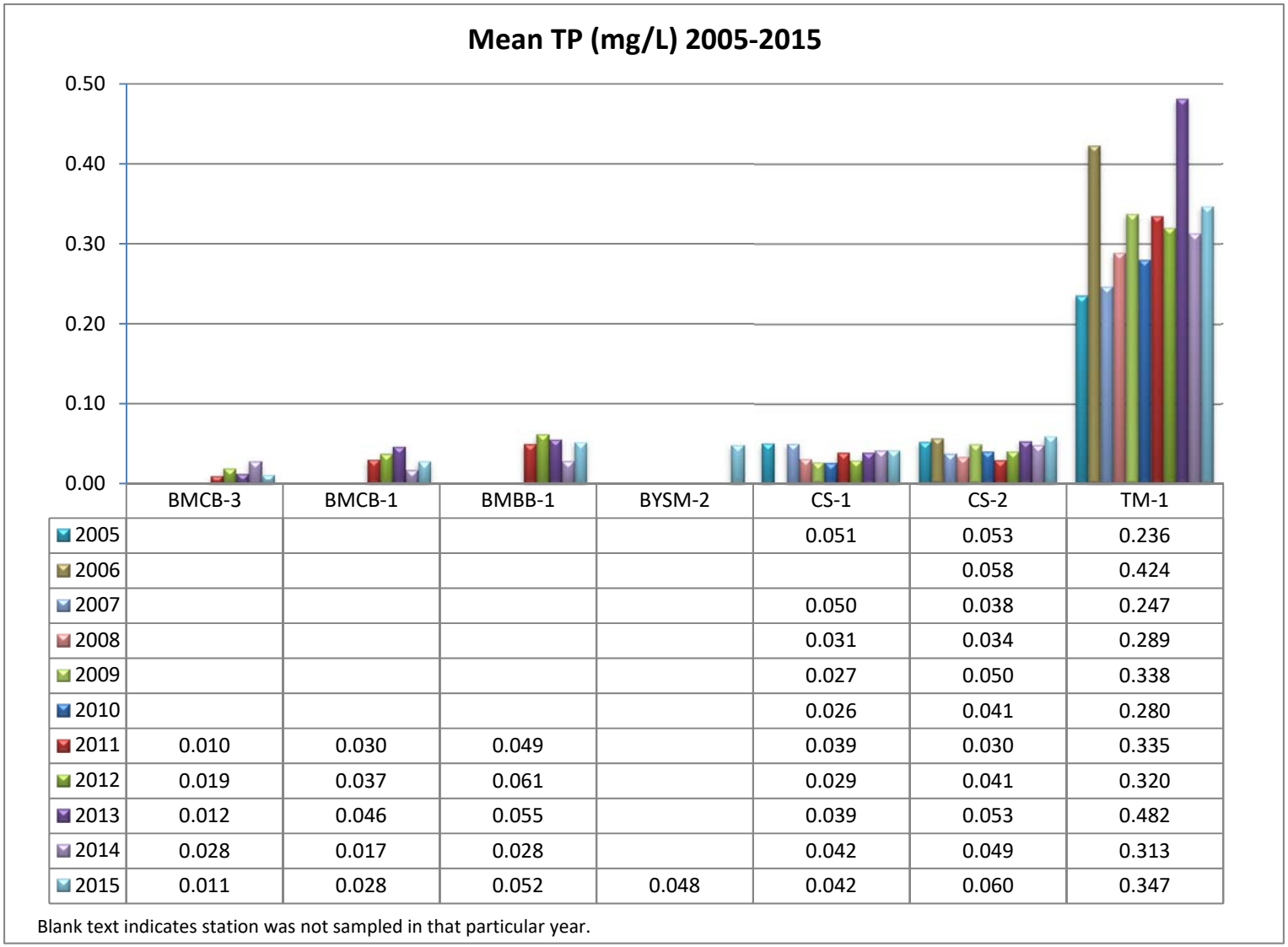
Figure 3. Mean growing season TP measured for the trend stations in the Mobile Delta Sub-Watershed, 2005-2015.




| | MOBM-6 | MOBM-1 | MO-1A | MO-2 | TENM-1 | TE-1 | TENB-2 |
|---|---|---|---|---|---|---|---|
| 2005 | | 0.081 | 0.105 | 0.075 | | | 0.079 |
| 2006 | | 0.062 | 0.079 | 0.061 | | | 0.056 |
| 2007 | | 0.061 | 0.052 | 0.043 | | | 0.041 |
| 2008 | | 0.066 | 0.058 | 0.046 | | | 0.054 |
| 2009 | | 0.083 | 0.100 | 0.057 | | | 0.064 |
| 2010 | | 0.050 | 0.068 | 0.043 | | | 0.044 |
| 2011 | | 0.039 | 0.036 | 0.033 | | | 0.031 |
| 2012 | | 0.077 | 0.058 | 0.050 | | | 0.056 |
| 2013 | | 0.087 | 0.075 | 0.064 | | | 0.066 |
| 2014 | | 0.079 | 0.070 | 0.066 | | | 0.058 |
| 2015 | 0.063 | 0.066 | 0.073 | 0.058 | 0.068 | 0.062 | 0.057 |

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

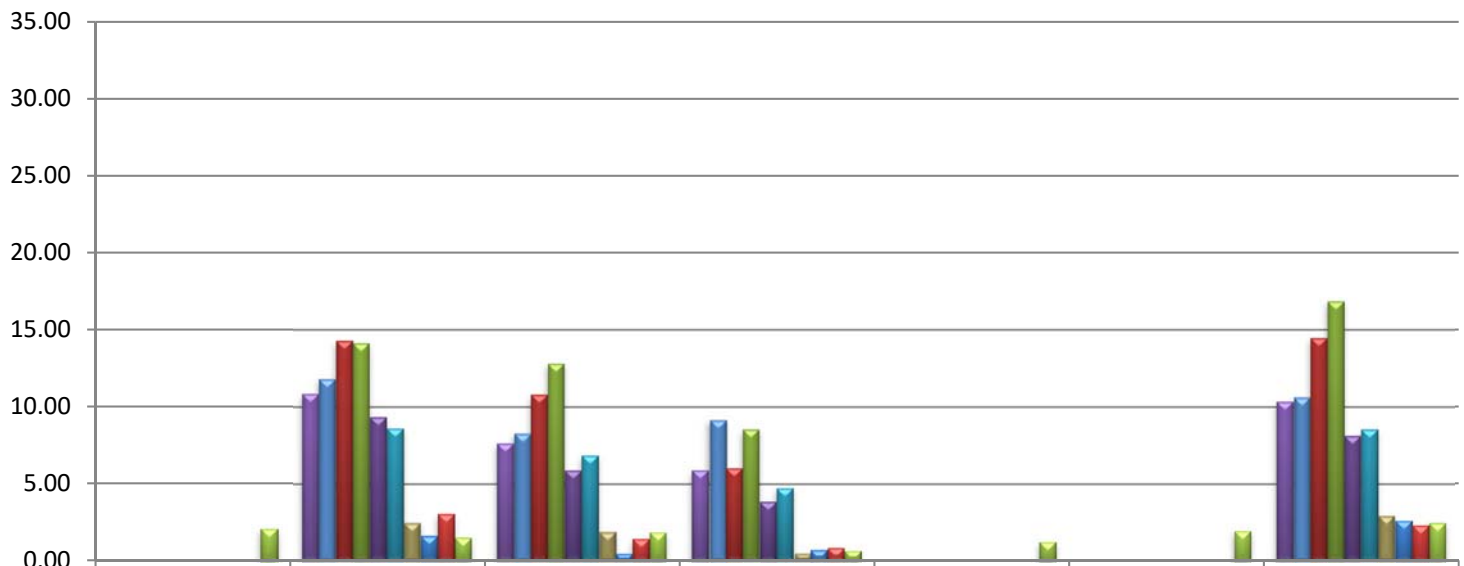
Figure 3. (continued)




| | BMCB-3 | BMCB-1 | BMBB-1 | BYSM-2 | CS-1 | CS-2 | TM-1 |
|---|---|---|---|---|---|---|---|
| 2005 | | | | | 0.051 | 0.053 | 0.236 |
| 2006 | | | | | | 0.058 | 0.424 |
| 2007 | | | | | 0.050 | 0.038 | 0.247 |
| 2008 | | | | | 0.031 | 0.034 | 0.289 |
| 2009 | | | | | 0.027 | 0.050 | 0.338 |
| 2010 | | | | | 0.026 | 0.041 | 0.280 |
| 2011 | 0.010 | 0.030 | 0.049 | | 0.039 | 0.030 | 0.335 |
| 2012 | 0.019 | 0.037 | 0.061 | | 0.029 | 0.041 | 0.320 |
| 2013 | 0.012 | 0.046 | 0.055 | | 0.039 | 0.053 | 0.482 |
| 2014 | 0.028 | 0.017 | 0.028 | | 0.042 | 0.049 | 0.313 |
| 2015 | 0.011 | 0.028 | 0.052 | 0.048 | 0.042 | 0.060 | 0.347 |

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

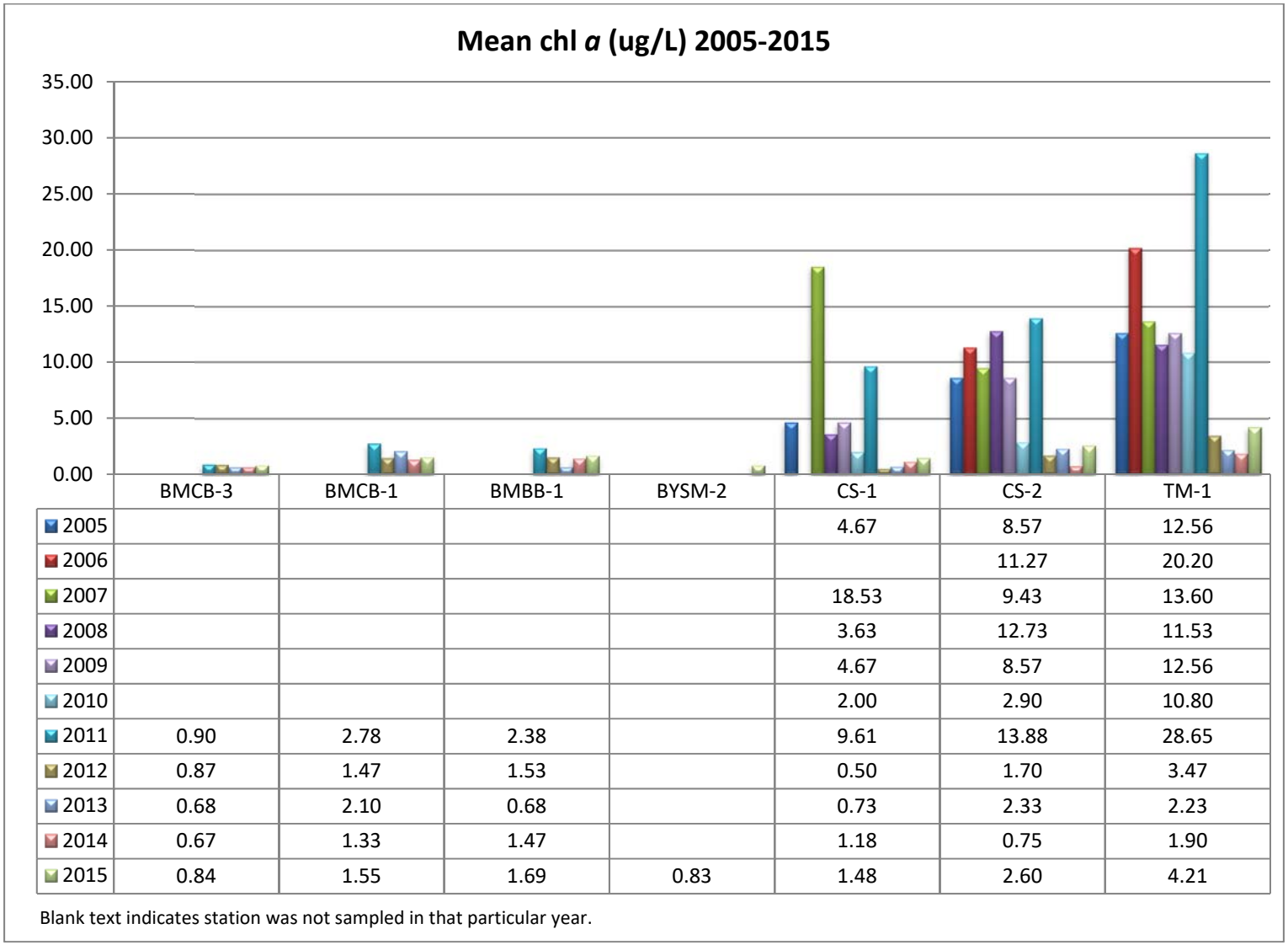
Figure 4. Mean growing season chl *a* measured for the trend stations in the Mobile Delta Sub-Watershed, 2005-2015.




| | MOBM-6 | MOBM-1 | MO-1A | MO-2 | TENM-1 | TE-1 | TENB-2 |
|---|---|---|---|---|---|---|---|
| 2005 | | 10.84 | 7.63 | 5.89 | | | 10.33 |
| 2006 | | 11.80 | 8.26 | 9.14 | | | 10.60 |
| 2007 | | 14.26 | 10.79 | 6.01 | | | 14.45 |
| 2008 | | 14.11 | 12.79 | 8.53 | | | 16.83 |
| 2009 | | 9.33 | 5.88 | 3.86 | | | 8.11 |
| 2011 | | 8.59 | 6.84 | 4.73 | | | 8.53 |
| 2012 | | 2.48 | 1.90 | 0.50 | | | 2.93 |
| 2013 | | 1.64 | 0.50 | 0.73 | | | 2.63 |
| 2014 | | 3.06 | 1.45 | 0.88 | | | 2.33 |
| 2015 | 2.04 | 1.53 | 1.88 | 0.68 | 1.26 | 1.96 | 2.49 |

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

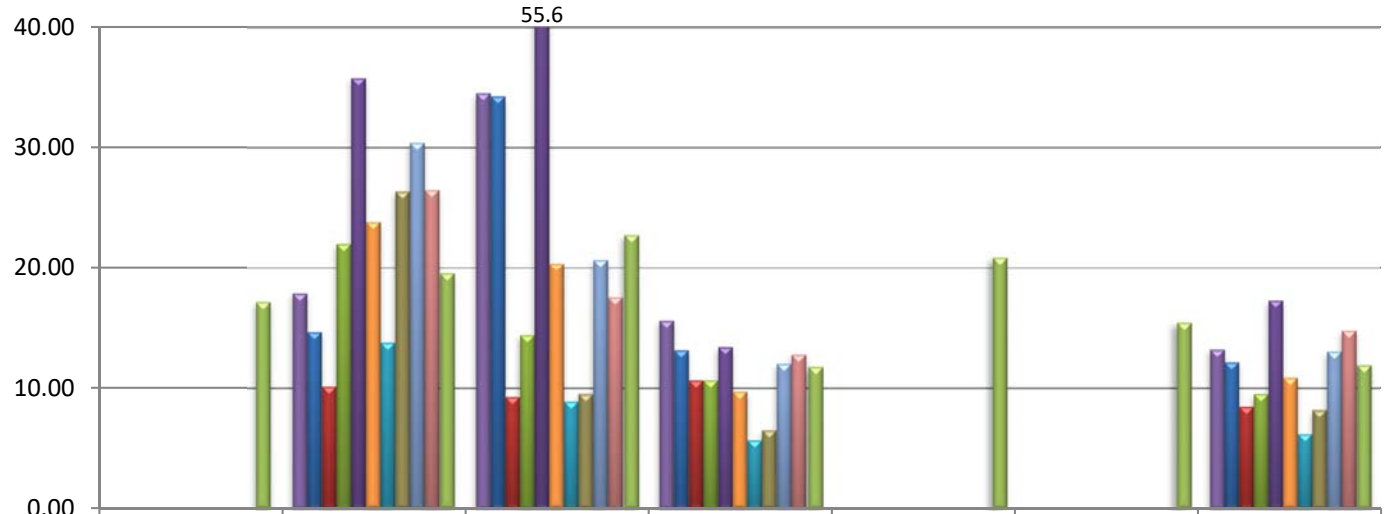
Figure 4. (continued)




| | BMCB-3 | BMCB-1 | BMBB-1 | BYSM-2 | CS-1 | CS-2 | TM-1 |
|---|---|---|---|---|---|---|---|
| 2005 | | | | | 4.67 | 8.57 | 12.56 |
| 2006 | | | | | | 11.27 | 20.20 |
| 2007 | | | | | 18.53 | 9.43 | 13.60 |
| 2008 | | | | | 3.63 | 12.73 | 11.53 |
| 2009 | | | | | 4.67 | 8.57 | 12.56 |
| 2010 | | | | | 2.00 | 2.90 | 10.80 |
| 2011 | 0.90 | 2.78 | 2.38 | | 9.61 | 13.88 | 28.65 |
| 2012 | 0.87 | 1.47 | 1.53 | | 0.50 | 1.70 | 3.47 |
| 2013 | 0.68 | 2.10 | 0.68 | | 0.73 | 2.33 | 2.23 |
| 2014 | 0.67 | 1.33 | 1.47 | | 1.18 | 0.75 | 1.90 |
| 2015 | 0.84 | 1.55 | 1.69 | 0.83 | 1.48 | 2.60 | 4.21 |

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

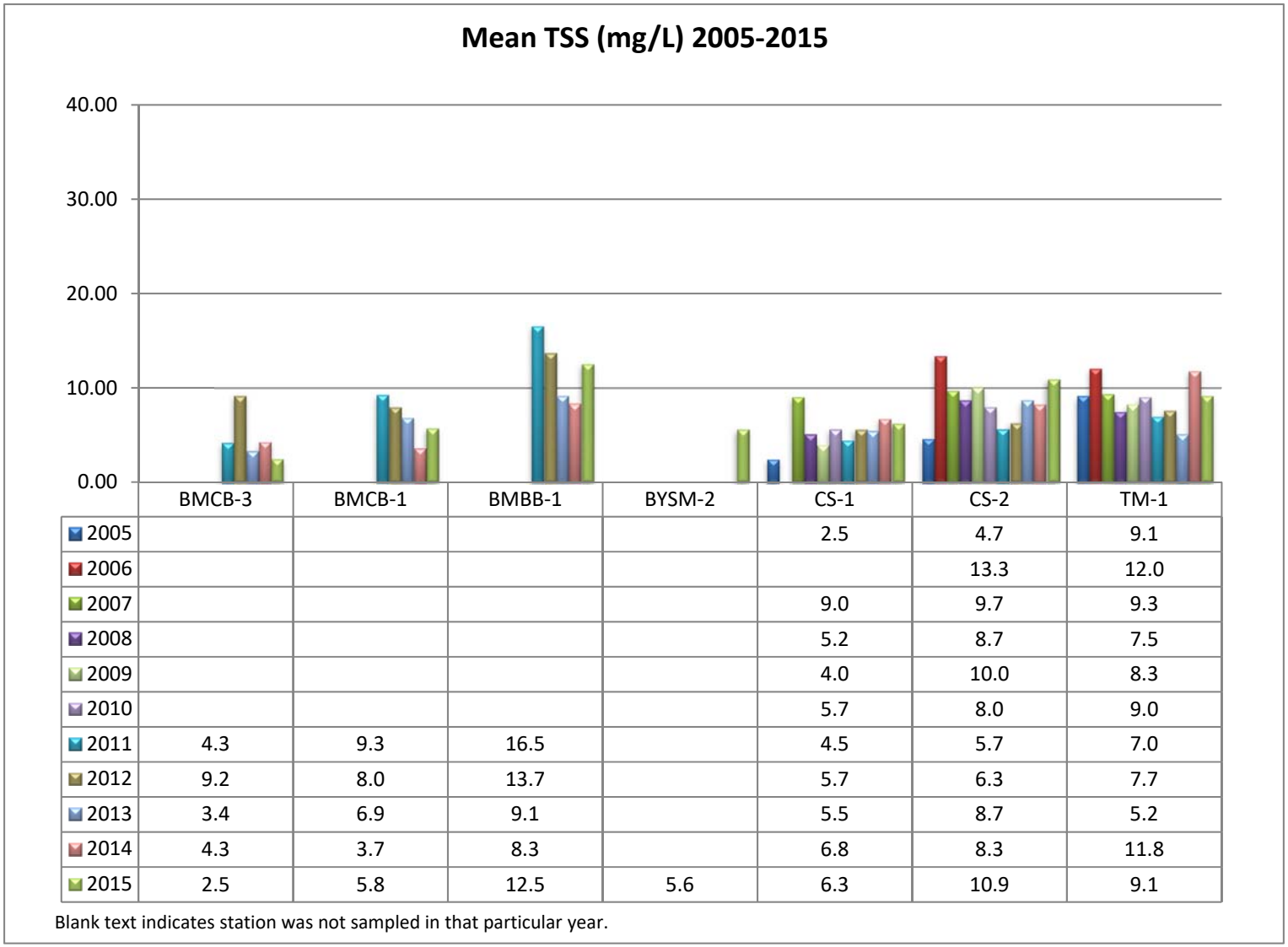
Figure 5. Mean growing season TSS measured for the trend stations in the Mobile Delta Sub-Watershed, 2005-2015.




| | MOBM-6 | MOBM-1 | MO-1A | MO-2 | TENM-1 | TE-1 | TENB-2 |
|---|---|---|---|---|---|---|---|
| 2005 | | 17.9 | 34.5 | 15.6 | | | 13.3 |
| 2006 | | 14.6 | 34.3 | 13.1 | | | 12.1 |
| 2007 | | 10.1 | 9.3 | 10.6 | | | 8.4 |
| 2008 | | 22.0 | 14.4 | 10.6 | | | 9.5 |
| 2009 | | 35.8 | 55.6 | 13.4 | | | 17.3 |
| 2010 | | 23.9 | 20.3 | 9.7 | | | 10.8 |
| 2011 | | 13.8 | 8.9 | 5.7 | | | 6.2 |
| 2012 | | 26.4 | 9.5 | 6.5 | | | 8.2 |
| 2013 | | 30.4 | 20.7 | 12.0 | | | 13.0 |
| 2014 | | 26.5 | 17.5 | 12.8 | | | 14.8 |
| 2015 | 17.1 | 19.5 | 22.8 | 11.8 | 20.9 | 15.4 | 11.9 |

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

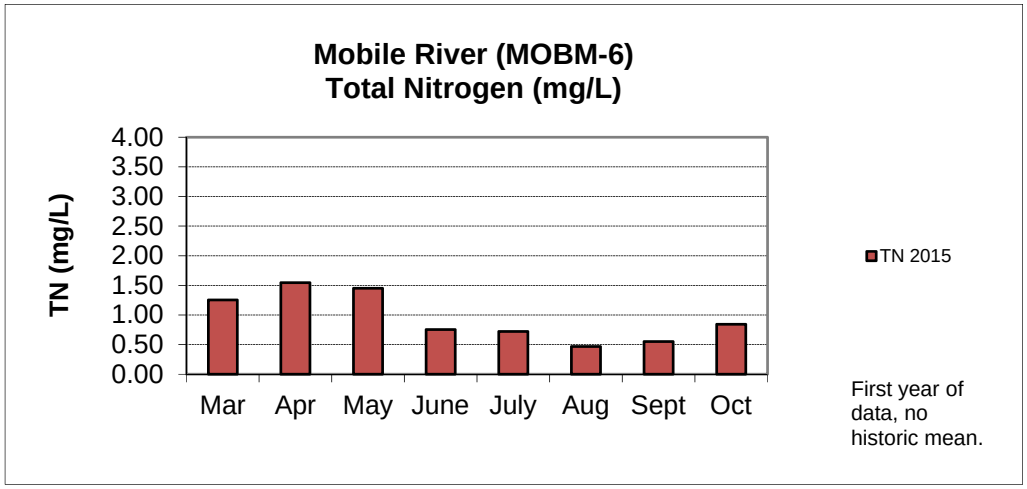
Figure 5. (continued)

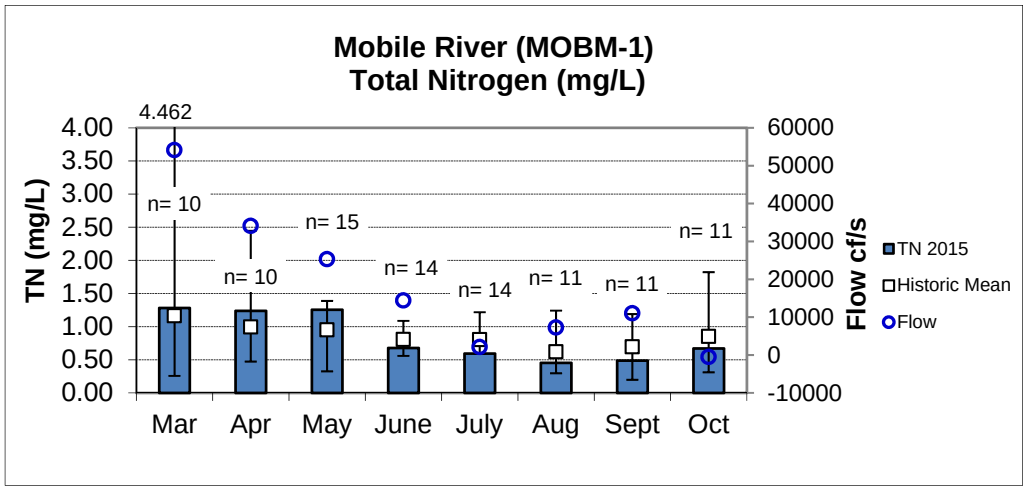



| | BMCB-3 | BMCB-1 | BMBB-1 | BYSM-2 | CS-1 | CS-2 | TM-1 |
|---|---|---|---|---|---|---|---|
| 2005 | | | | | 2.5 | 4.7 | 9.1 |
| 2006 | | | | | | 13.3 | 12.0 |
| 2007 | | | | | 9.0 | 9.7 | 9.3 |
| 2008 | | | | | 5.2 | 8.7 | 7.5 |
| 2009 | | | | | 4.0 | 10.0 | 8.3 |
| 2010 | | | | | 5.7 | 8.0 | 9.0 |
| 2011 | 4.3 | 9.3 | 16.5 | | 4.5 | 5.7 | 7.0 |
| 2012 | 9.2 | 8.0 | 13.7 | | 5.7 | 6.3 | 7.7 |
| 2013 | 3.4 | 6.9 | 9.1 | | 5.5 | 8.7 | 5.2 |
| 2014 | 4.3 | 3.7 | 8.3 | | 6.8 | 8.3 | 11.8 |
| 2015 | 2.5 | 5.8 | 12.5 | 5.6 | 6.3 | 10.9 | 9.1 |

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

Figure 6. Monthly TN concentrations measured in the Mobile Delta Sub-Watershed, March-October 2015. Each bar graph depicts changes in each station. The historic mean (1990-2015) 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 from station or nearest upstream station, as indicated.



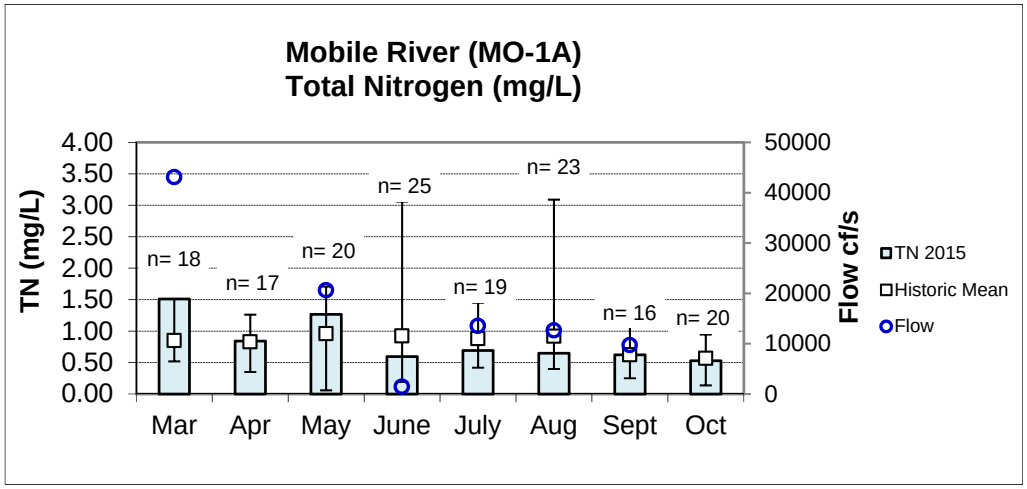
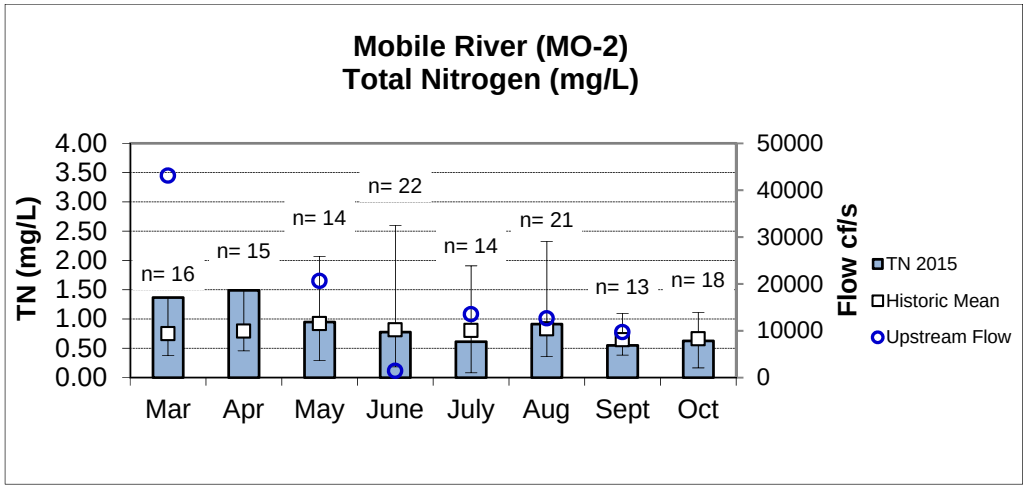
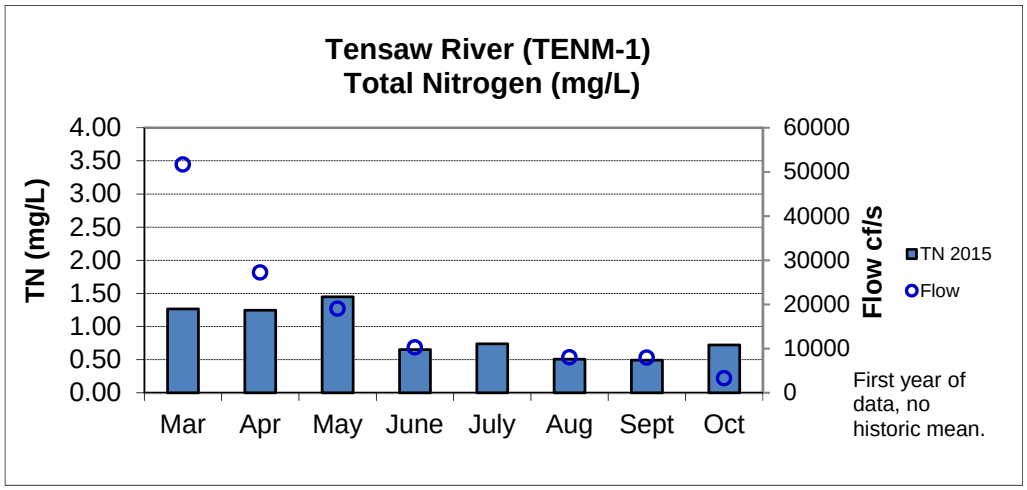



Figure 6. (continued)



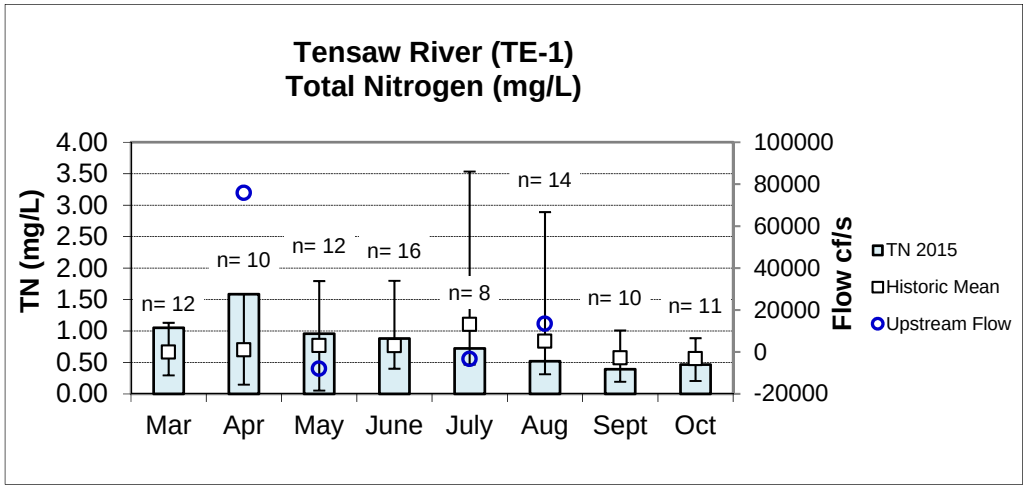
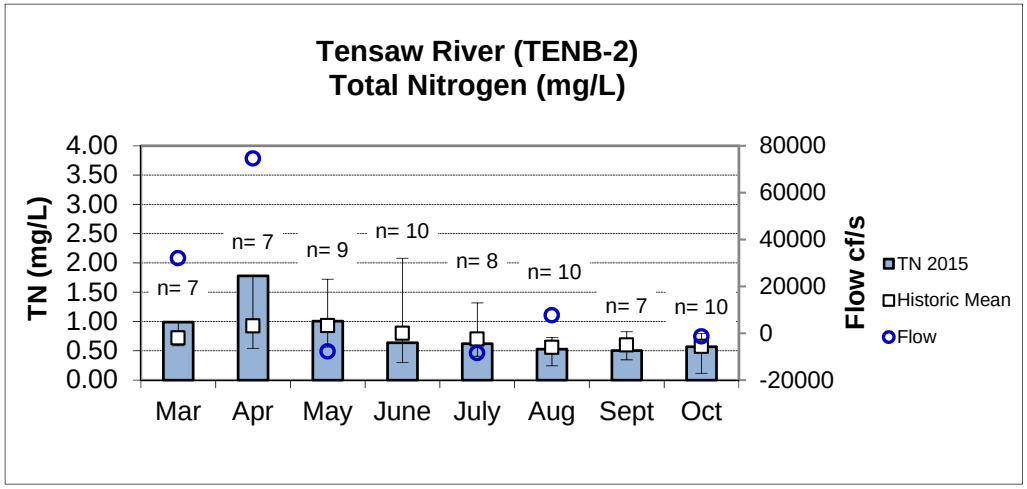
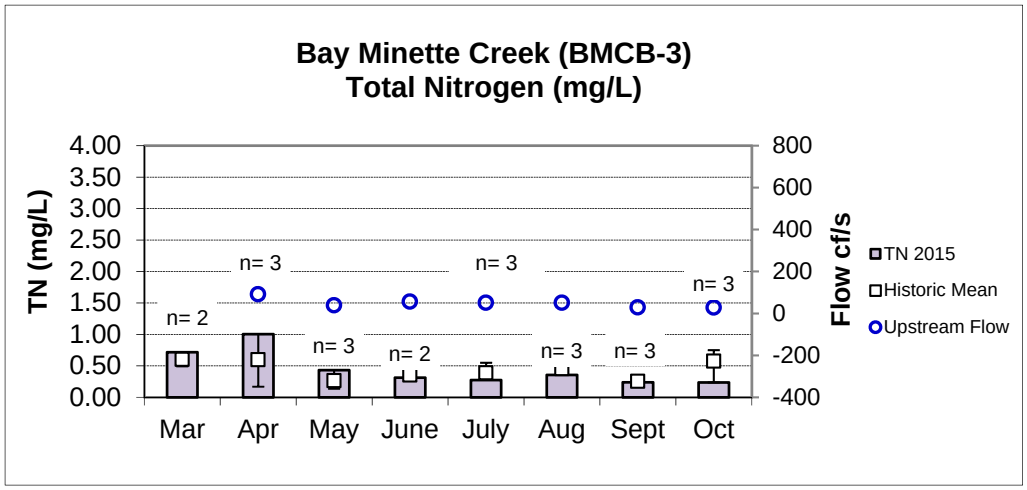



Figure 6. (continued)



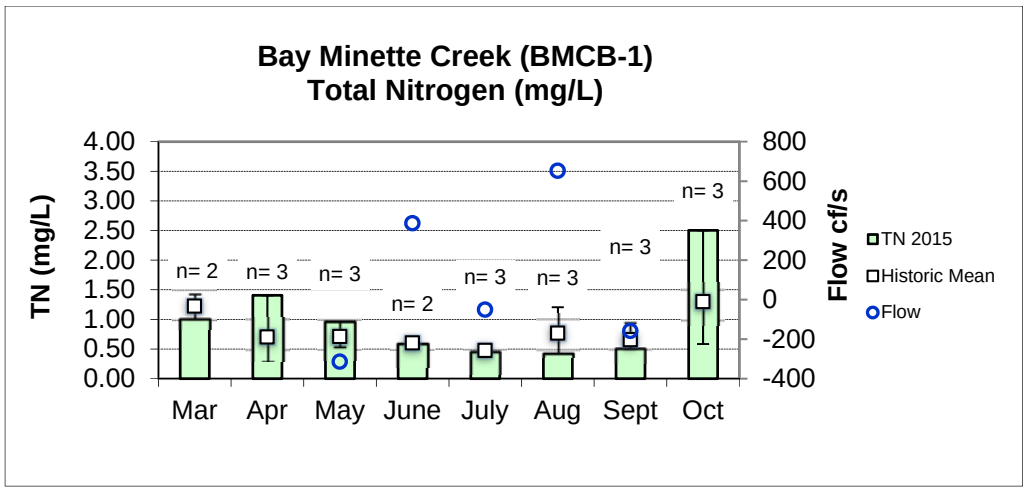
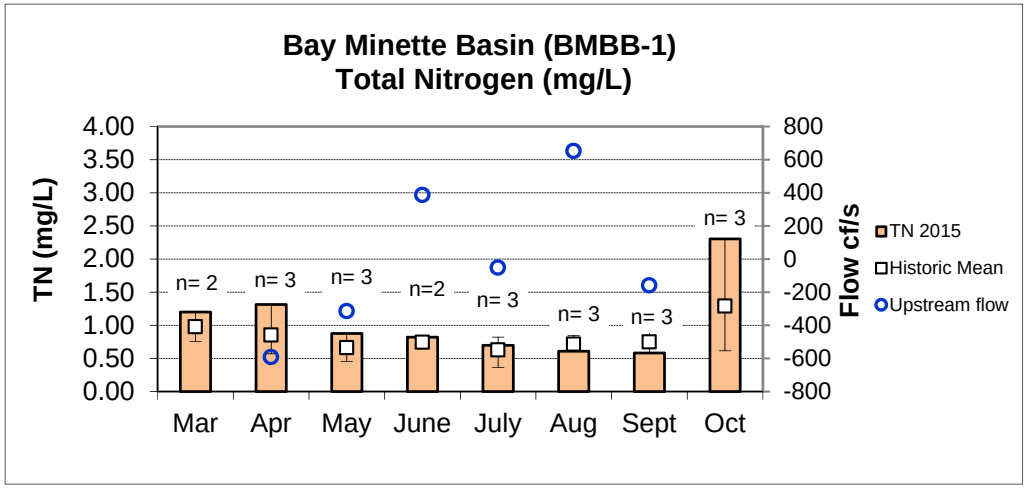
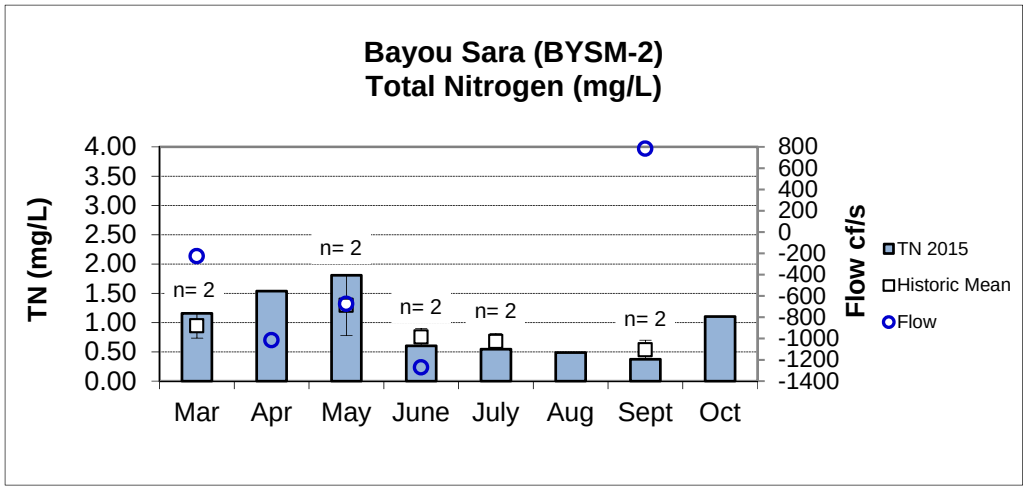



Figure 6. (continued)



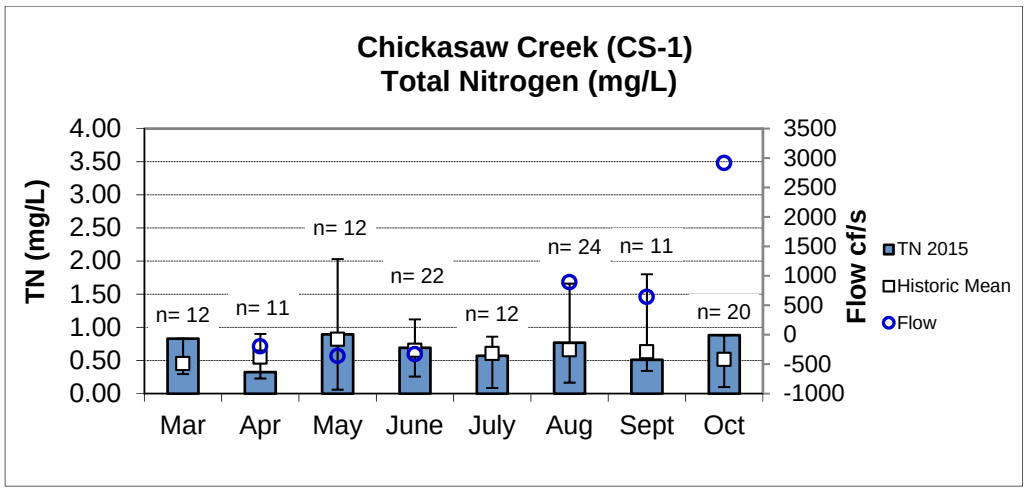
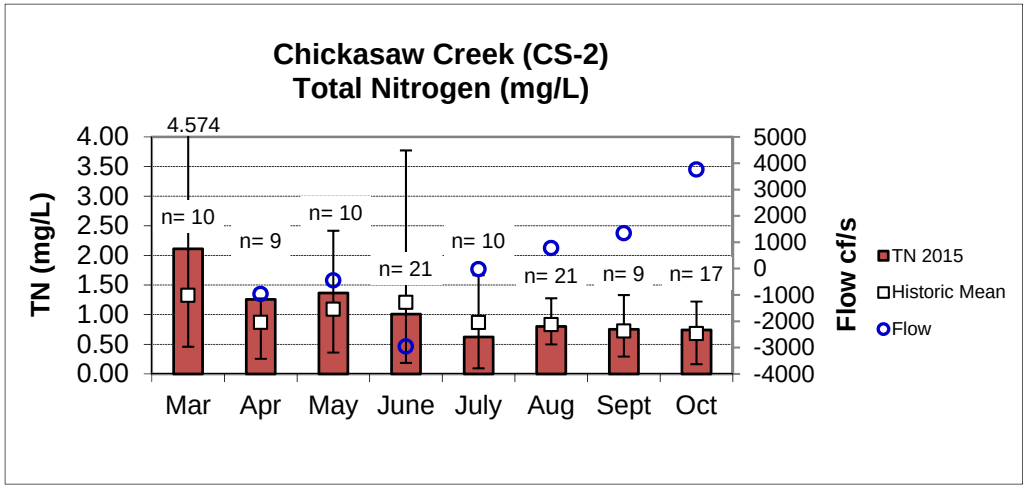
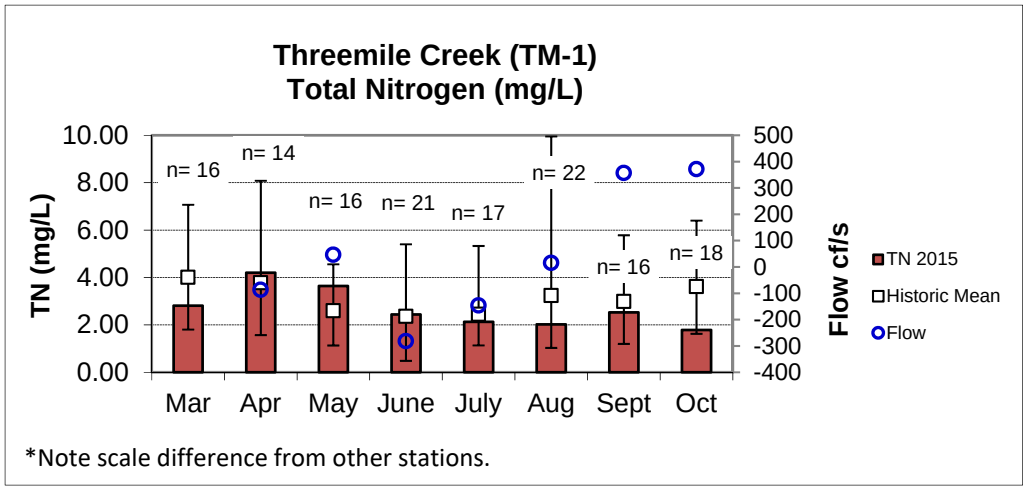



Figure 6. (continued)




*Note scale difference from other stations.

Figure 7. Monthly TP concentrations measured in the Mobile Delta Sub-Watershed, March-October 2015. Each bar graph depicts changes in each station. The historic mean (1990-2015) 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 from station or nearest upstream station, as indicated.

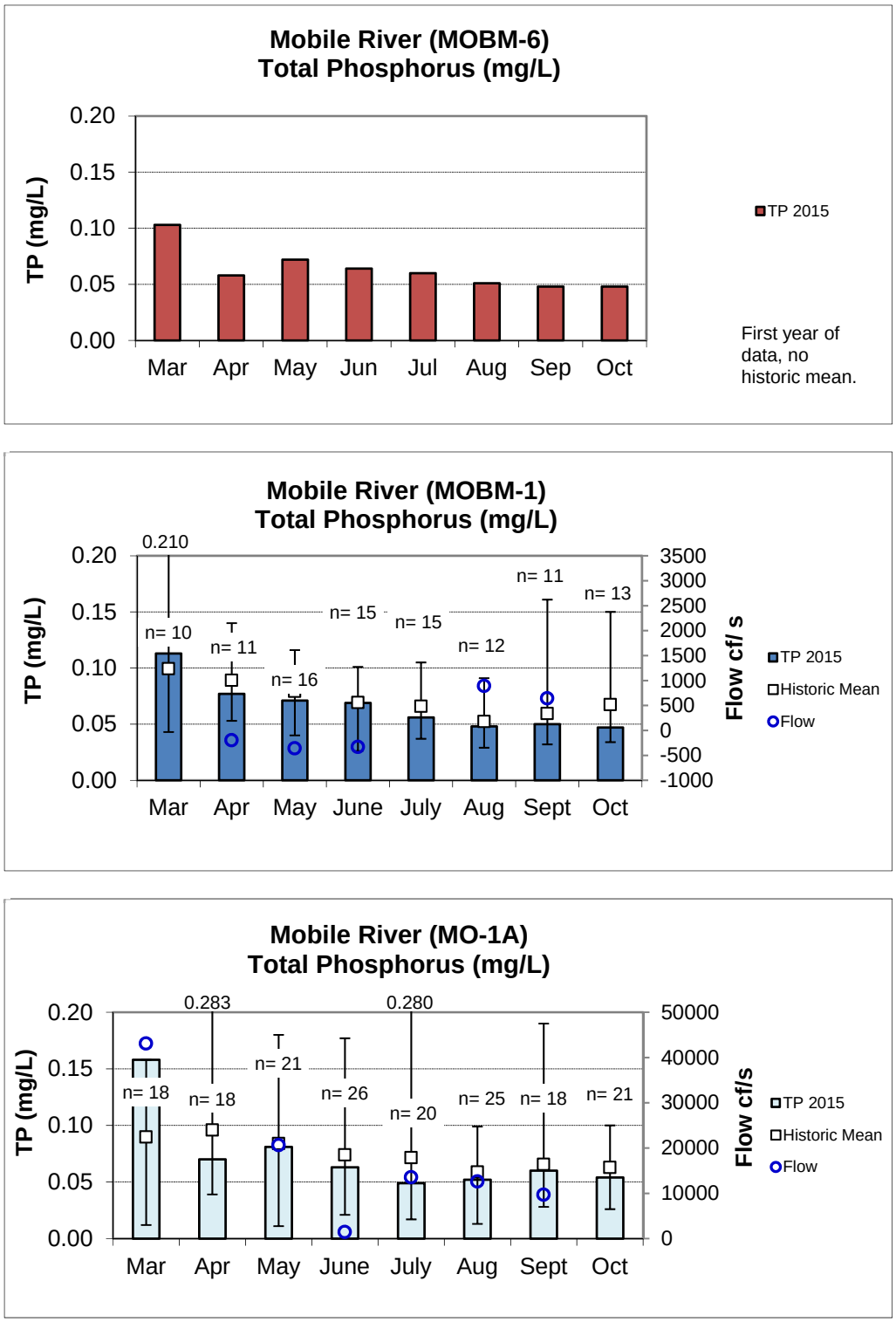
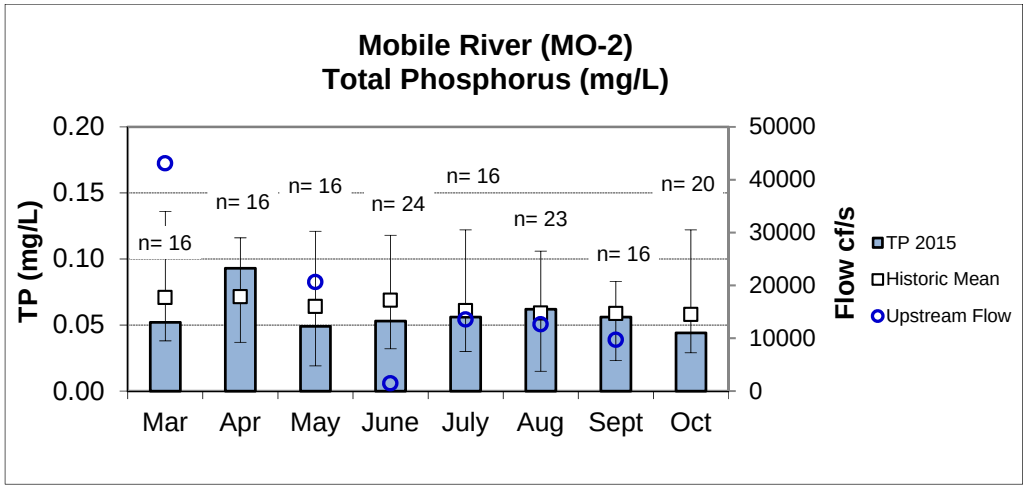
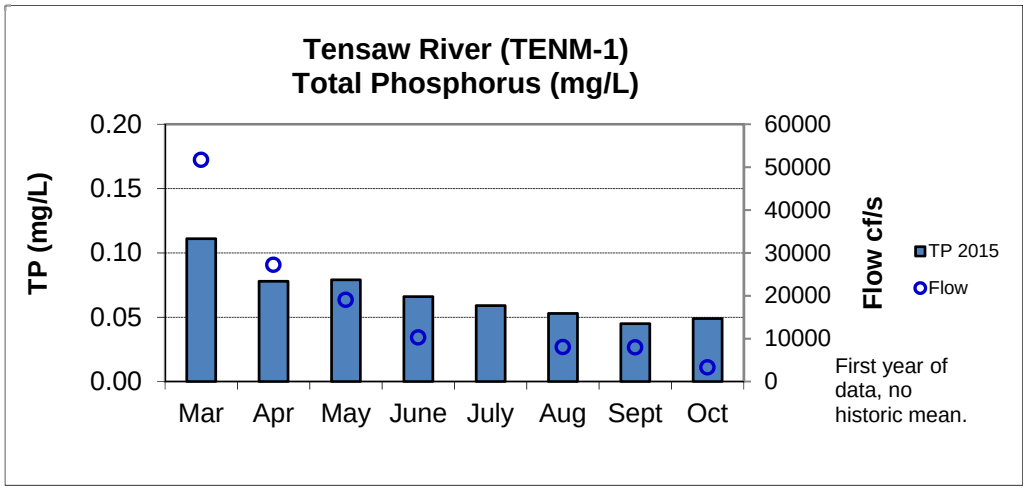


Figure 7. (continued)



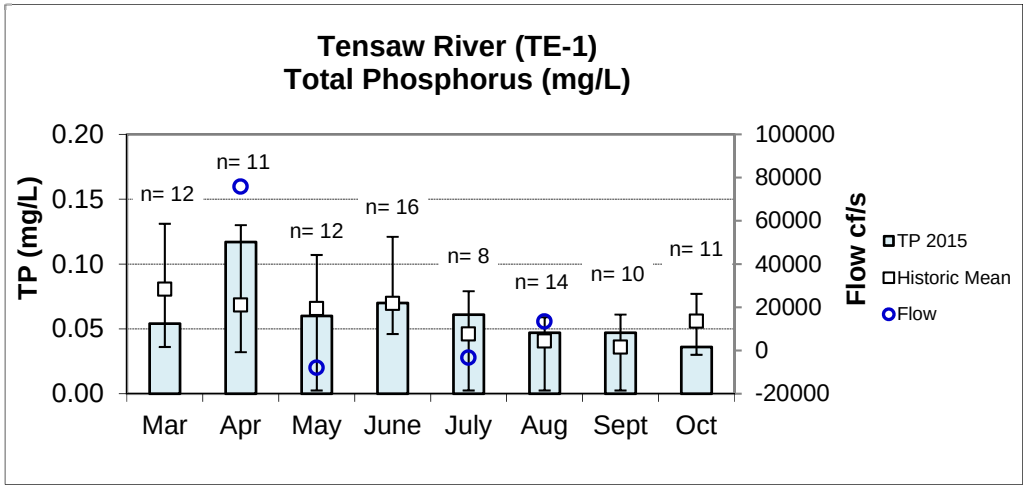



Figure 7. (continued)

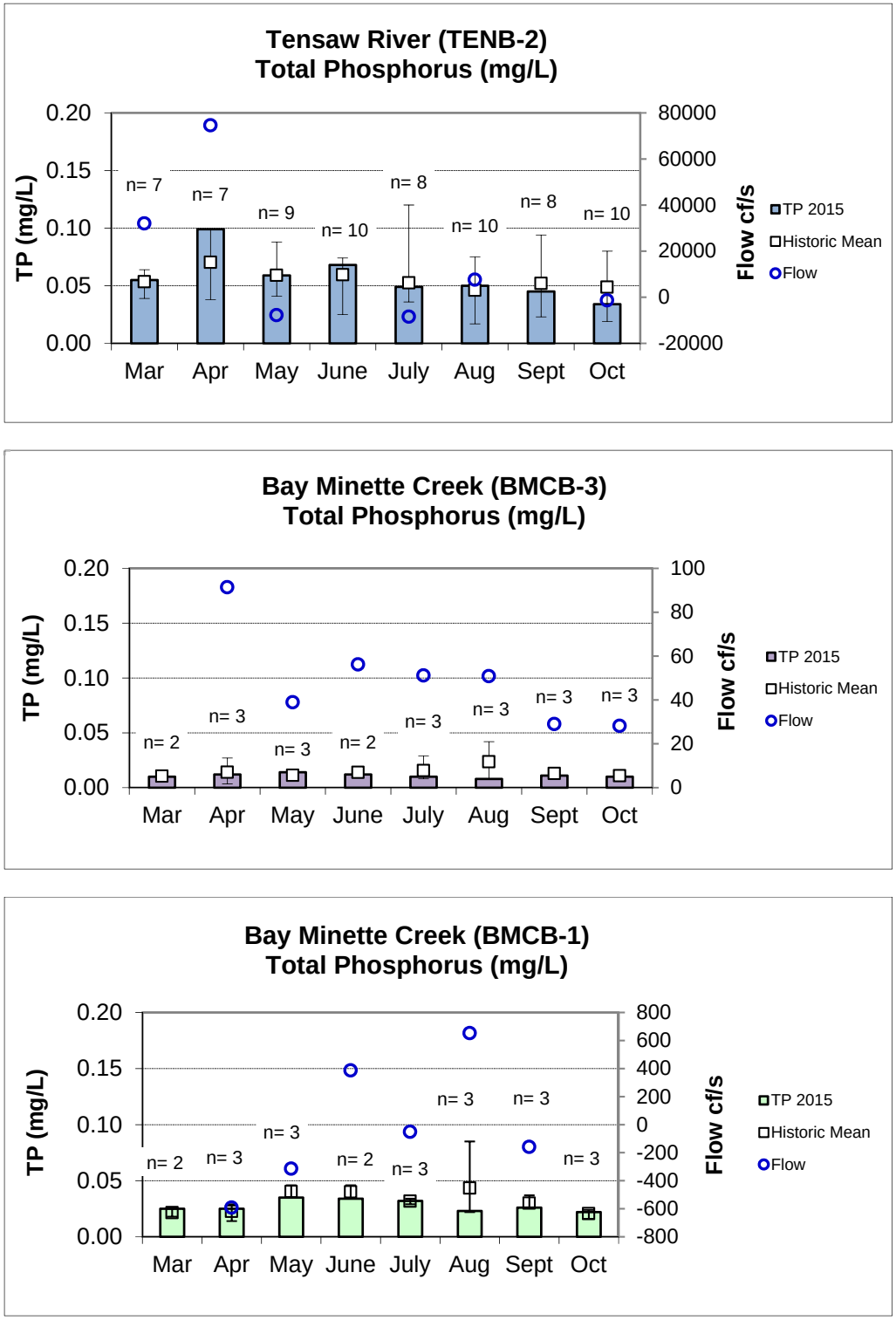
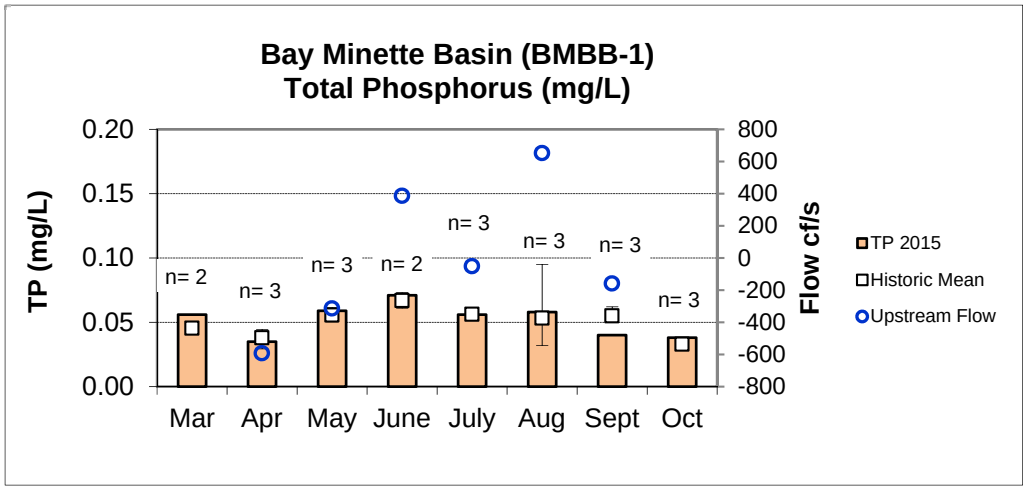
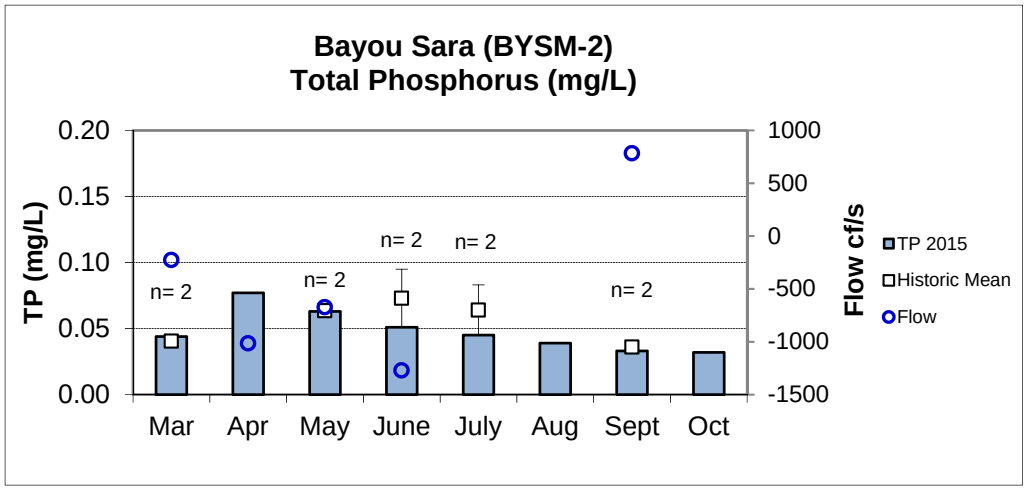


Figure 7. (continued)



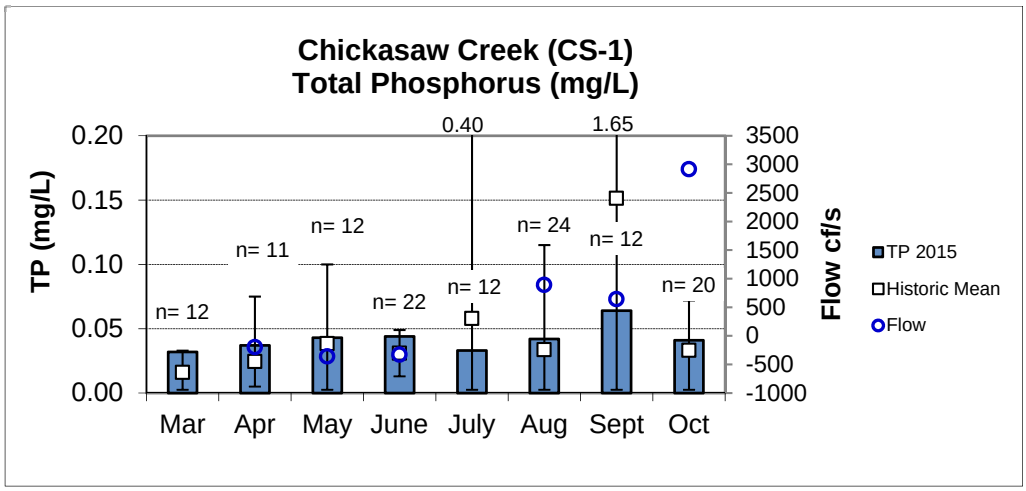
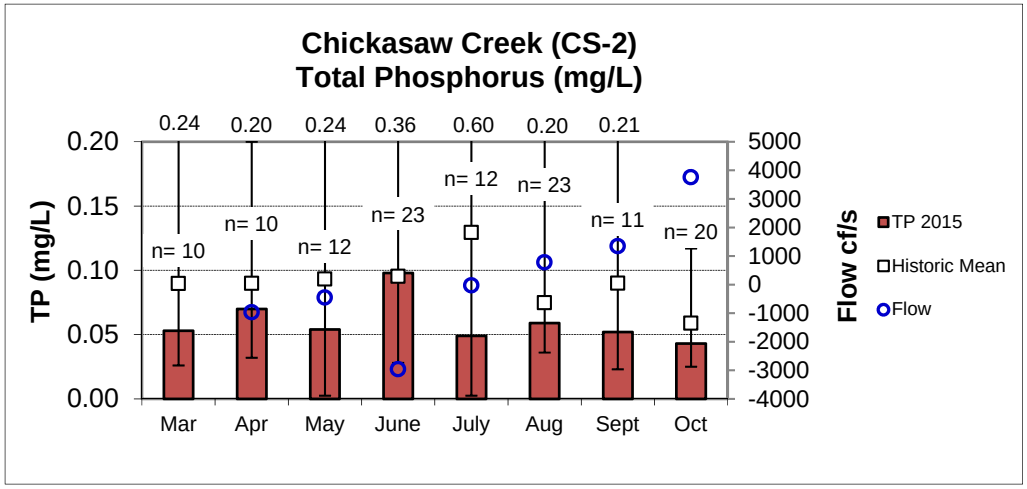



Figure 7. (continued)



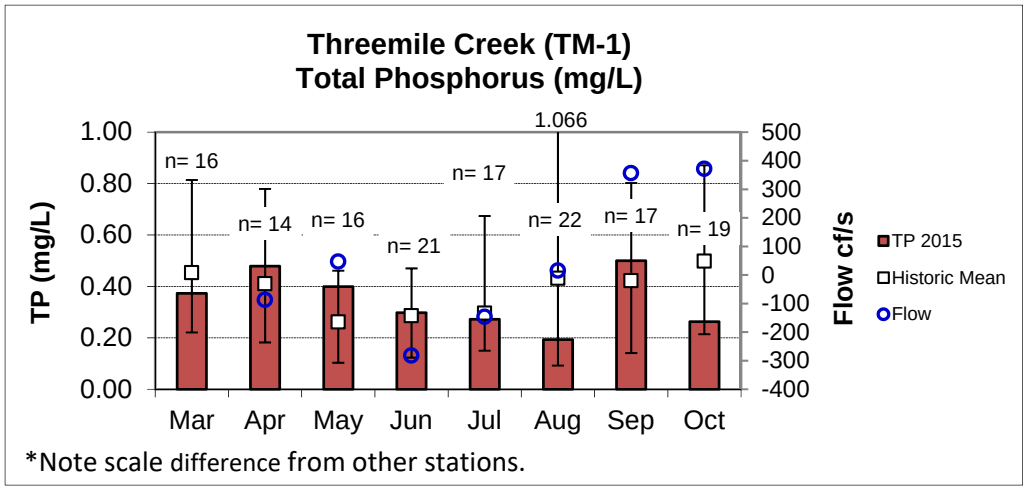
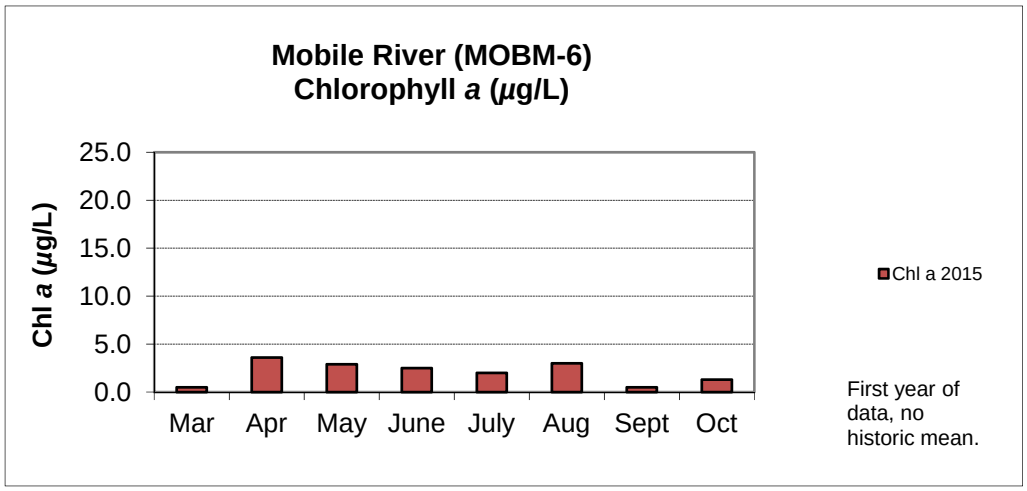
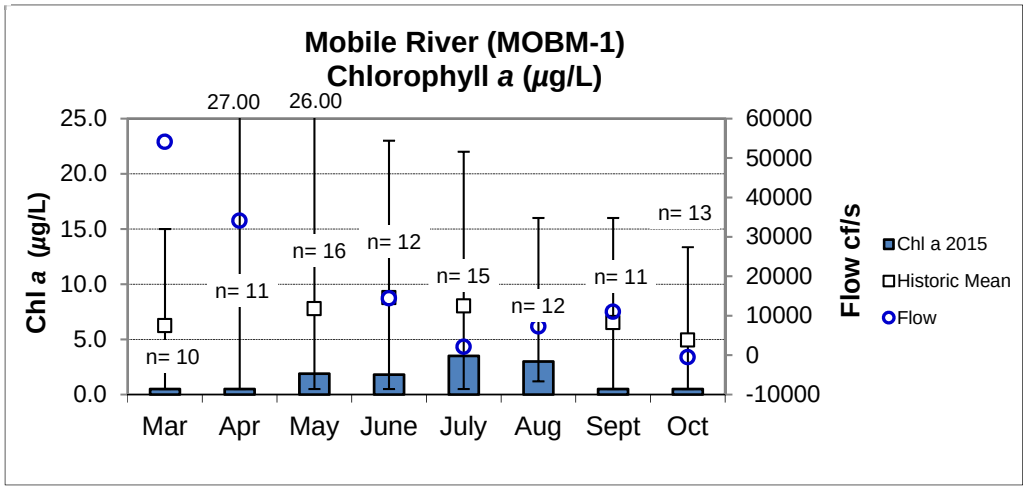



Figure 8. Monthly chl *a* concentrations measured in the Mobile Delta Sub-Watershed, March-October 2015. Each graph depicts changes in each station. The historic mean (1990-2015) and min/max ranges are also displayed. The "n" value equals the number of data points included in the monthly historic calculations. Flow is from station or nearest upstream station, as indicated.



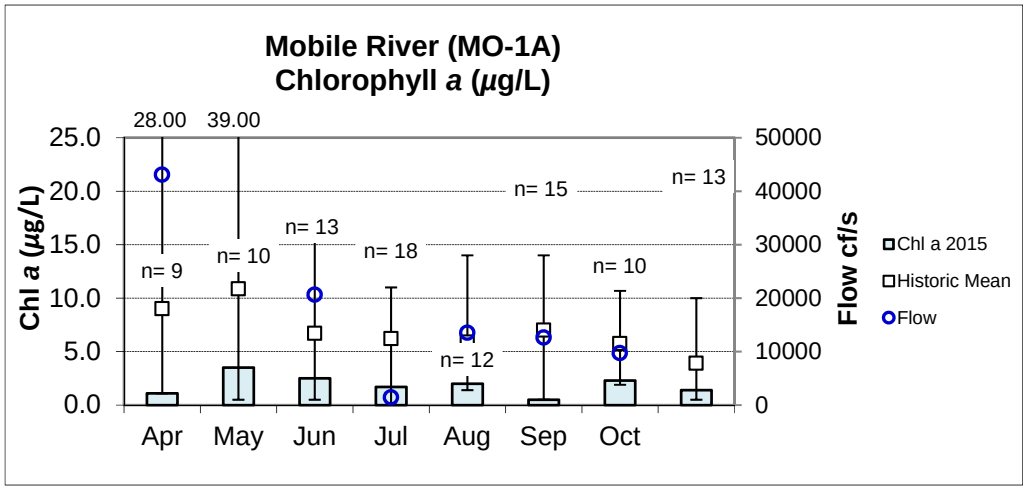
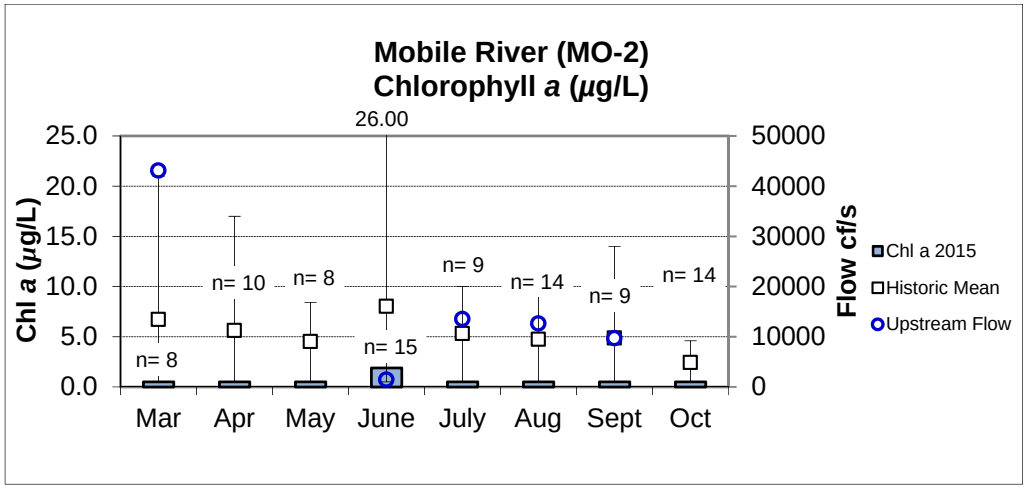
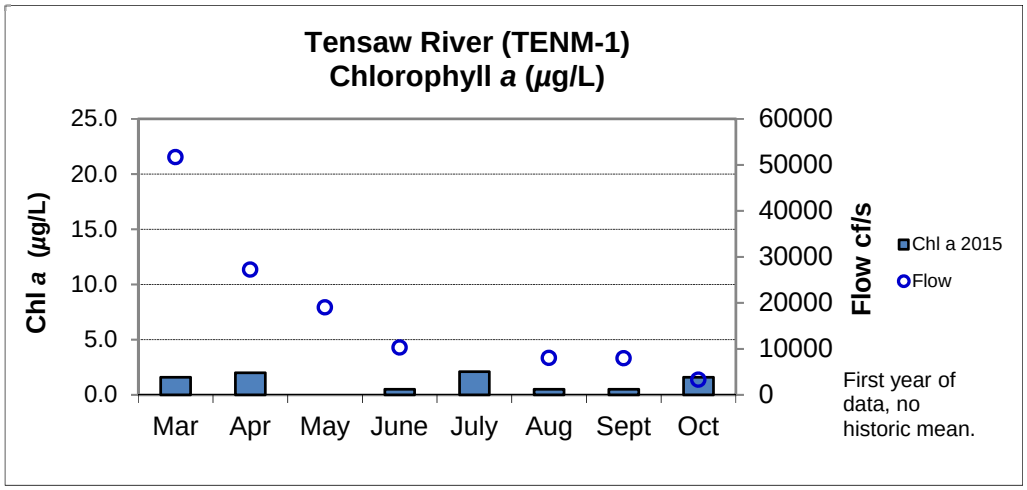



Figure 8. (continued)



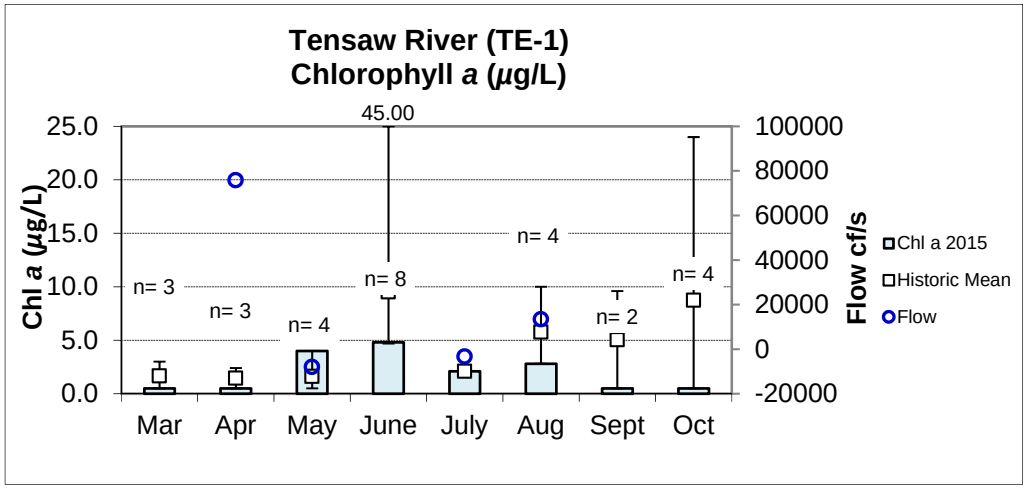
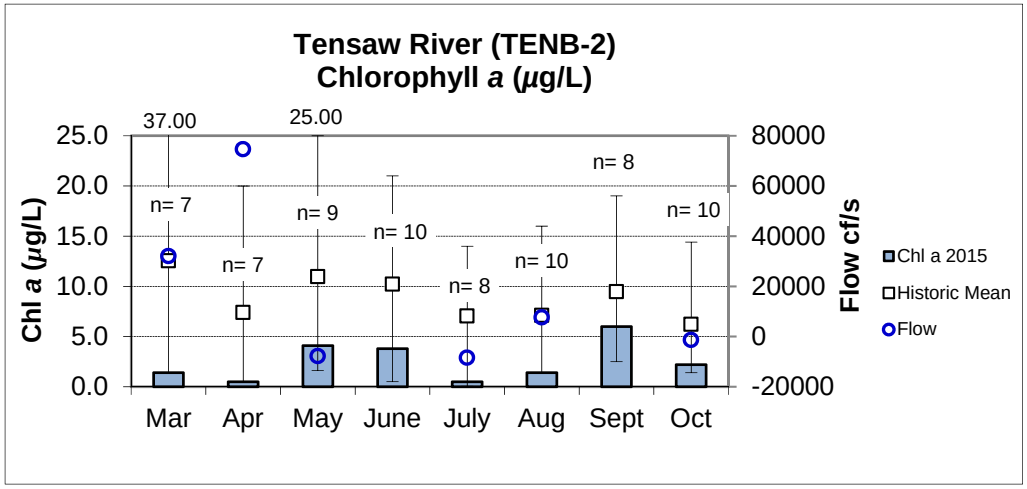
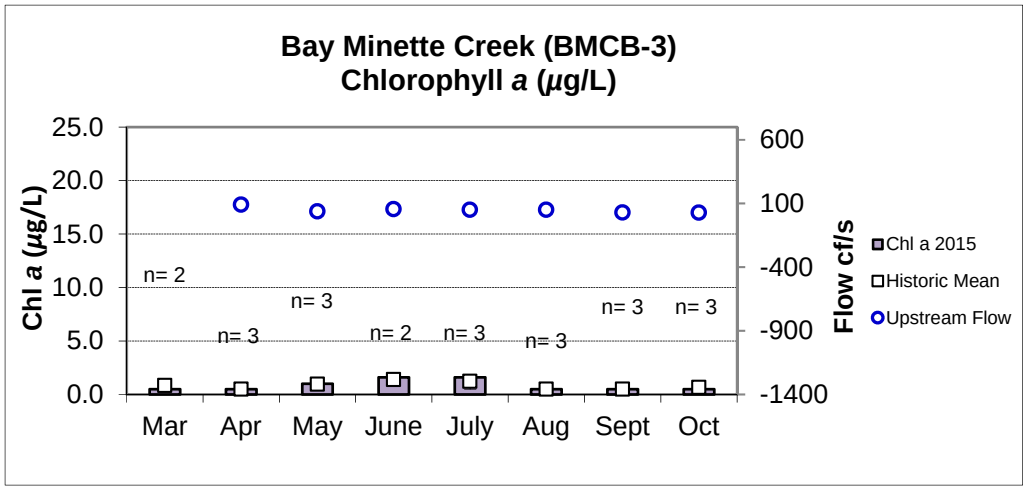



Figure 8. (continued)



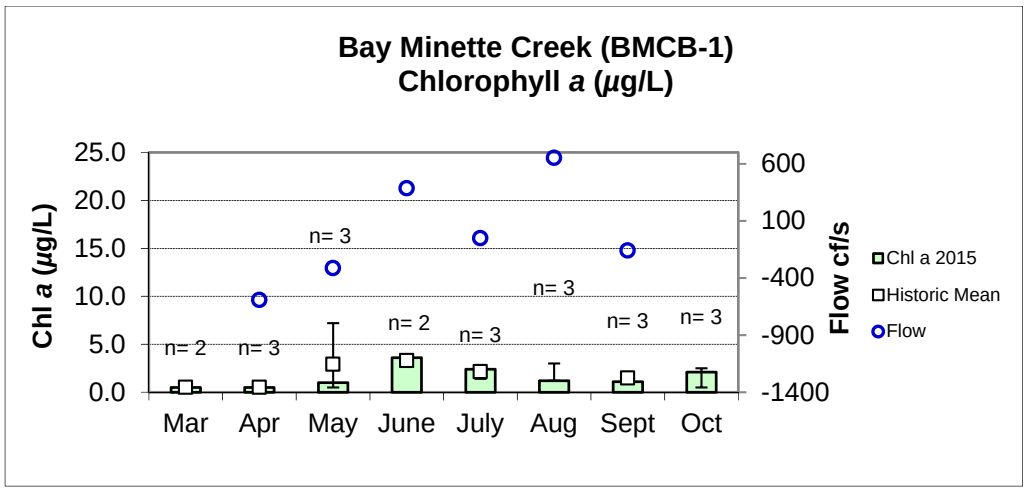
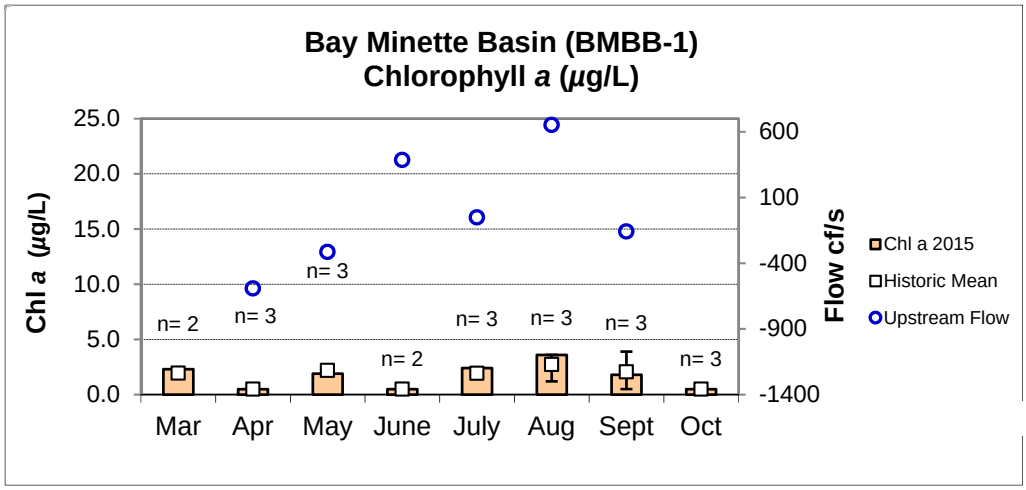
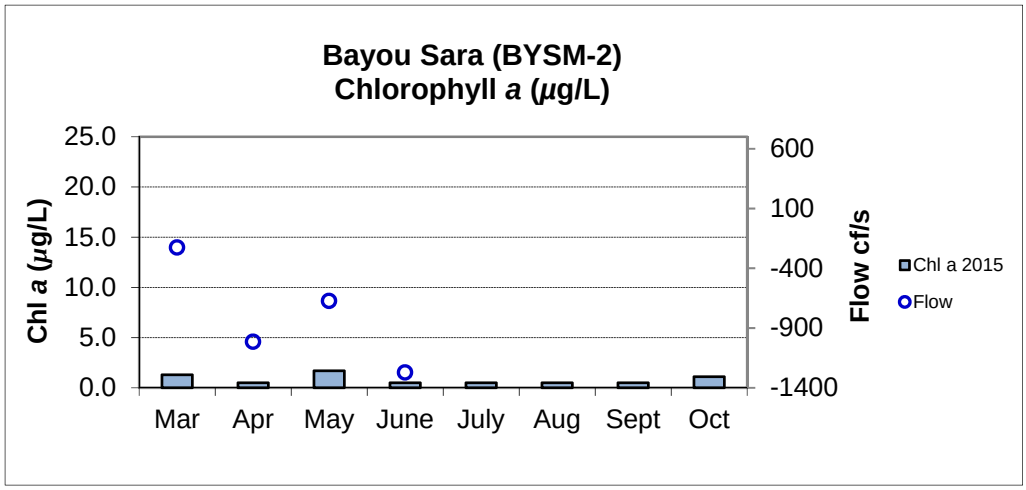



Figure 8. (continued)



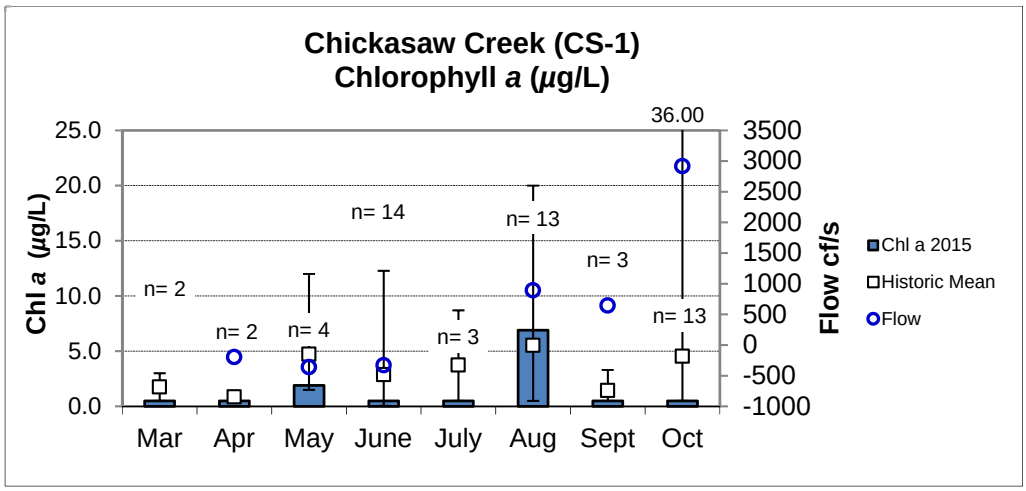
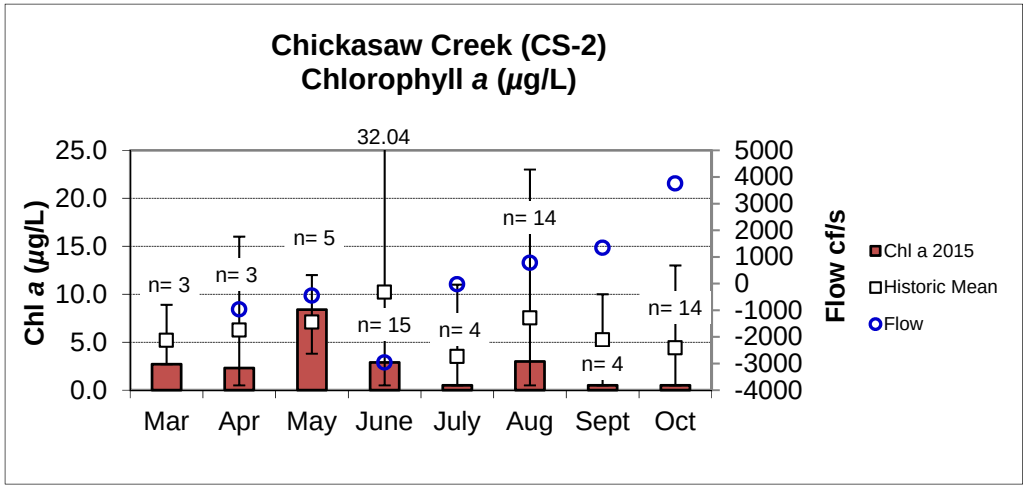



Figure 8. (continued)



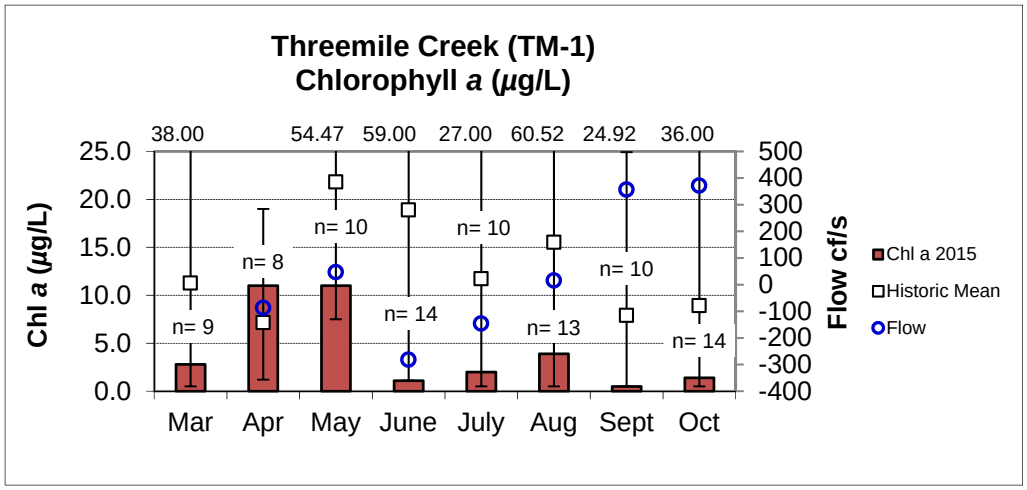
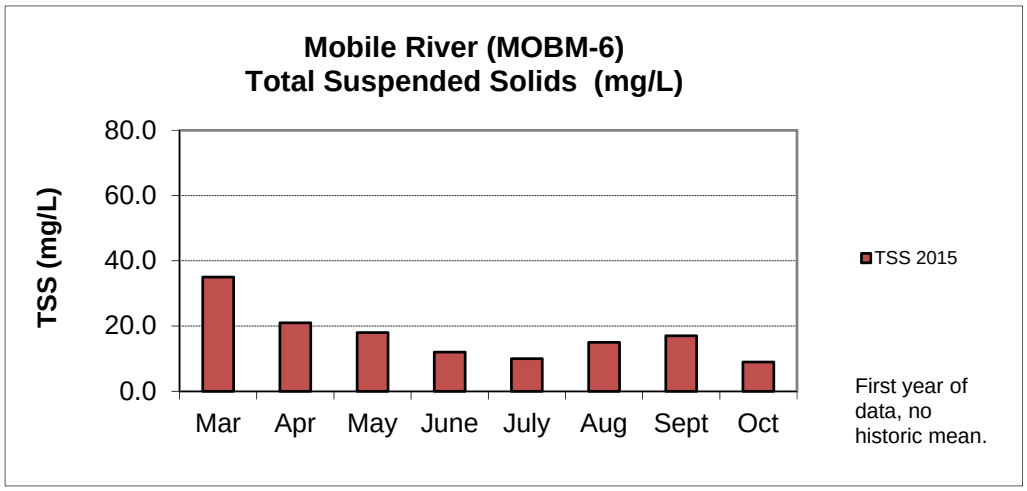
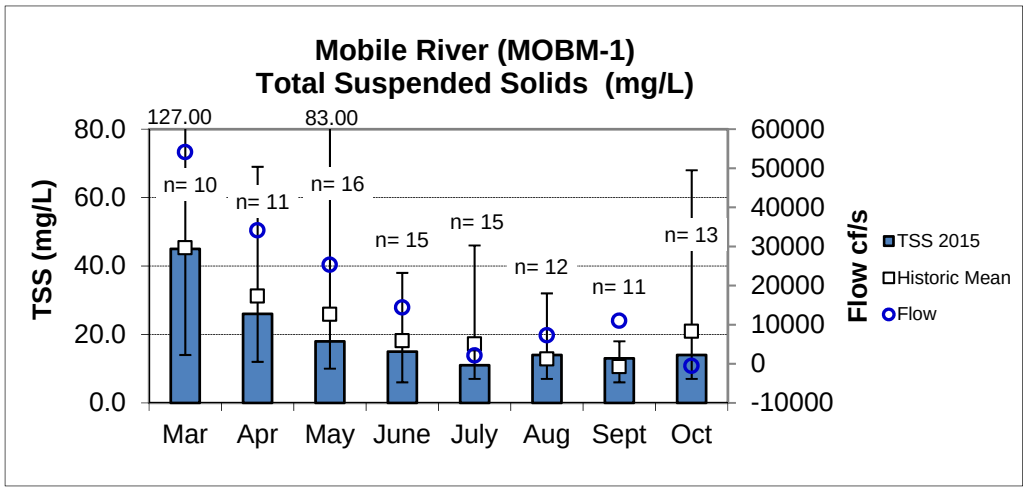



Figure 9. Monthly TSS concentrations measured in the Mobile Delta Sub-Watershed, March-October 2015. Each bar graph depicts changes in each station. The historic mean (1990-2015) and min/max ranges are also displayed. The "n" value equals the number of data points included in the monthly historic calculations. Flow is from station or nearest upstream station, as indicated.



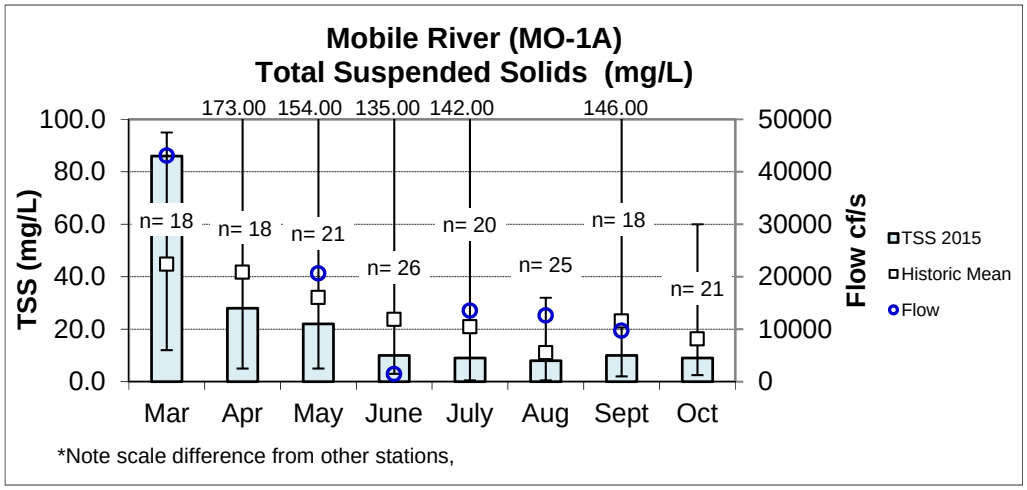
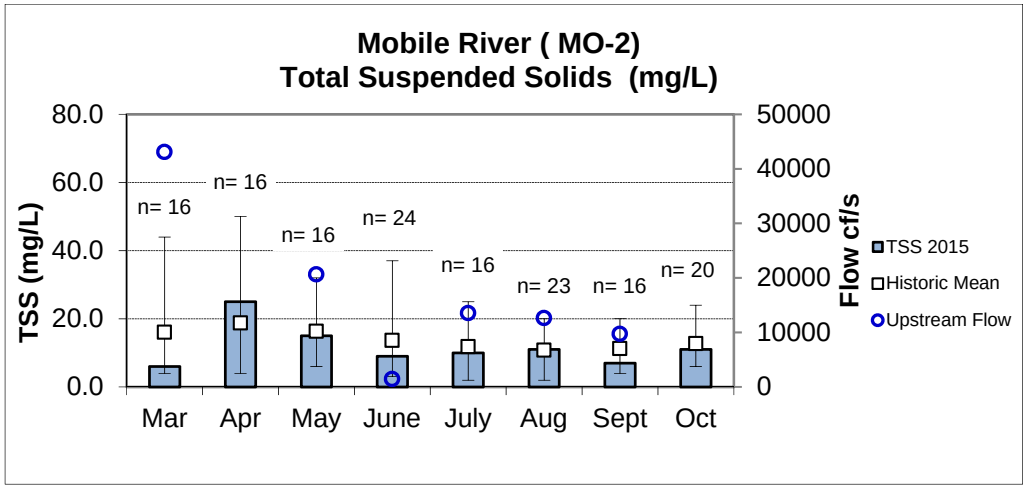
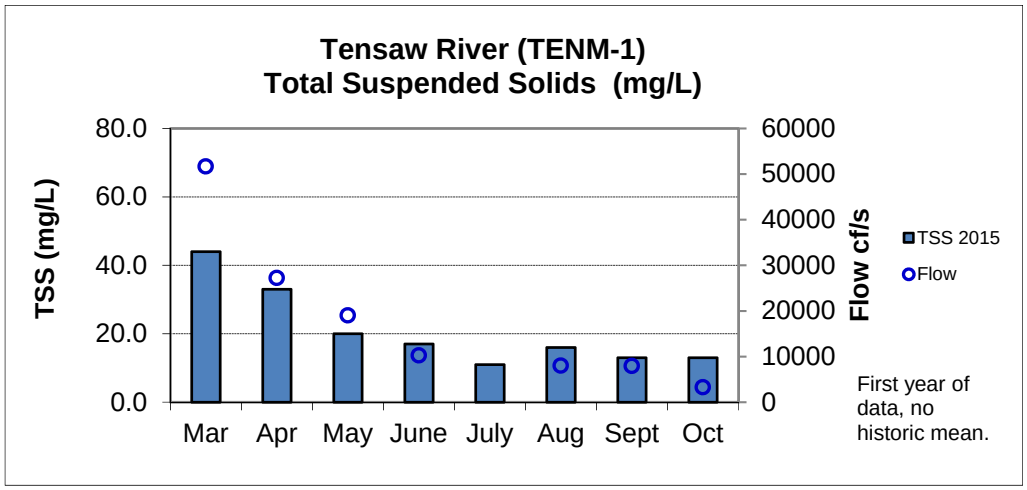



Figure 9. (continued)



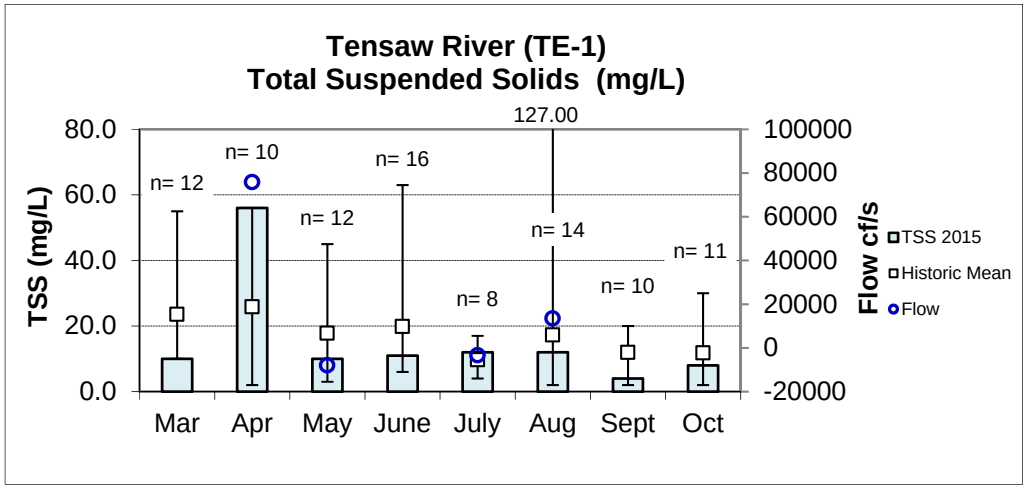
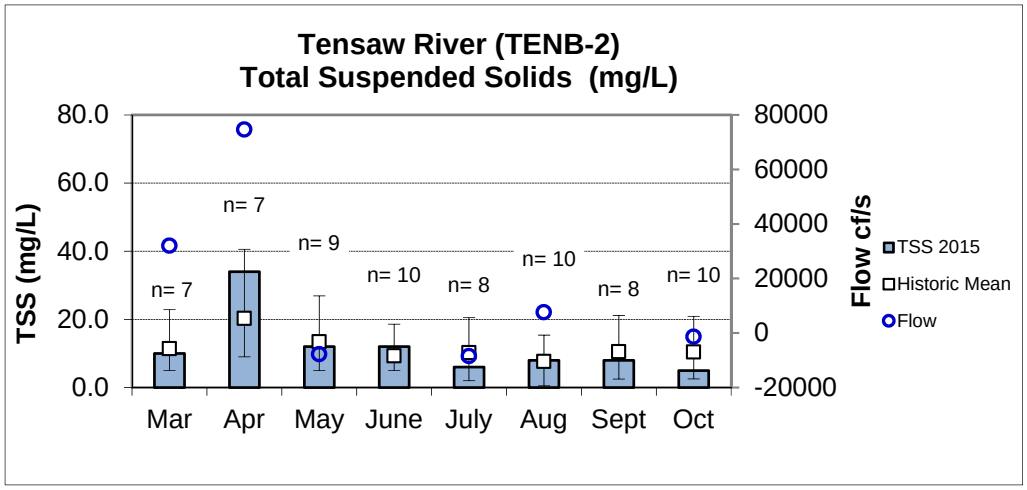
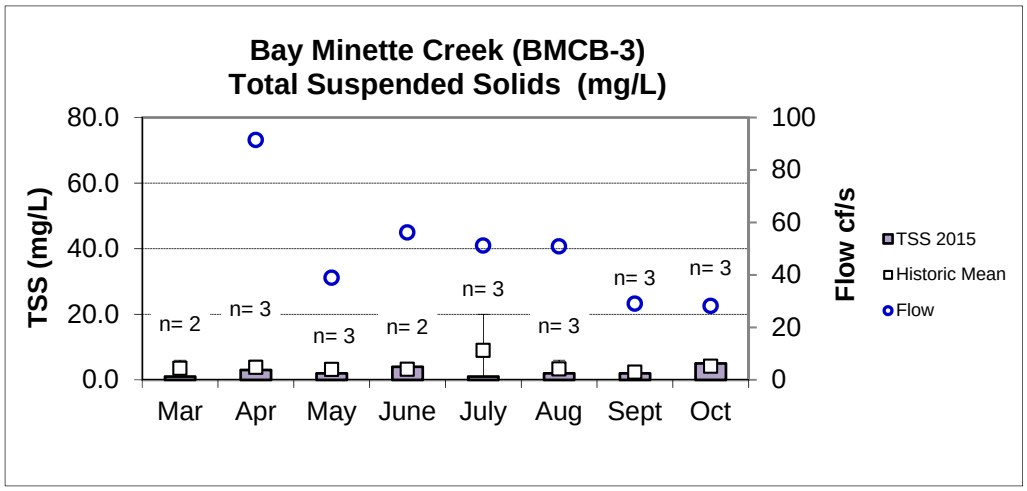



Figure 9. (continued)



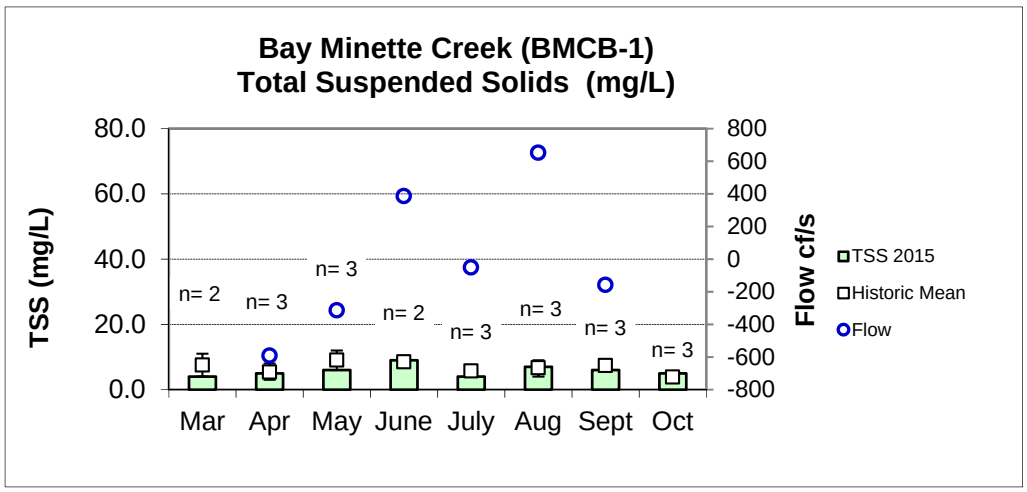



Figure 9. (continued)

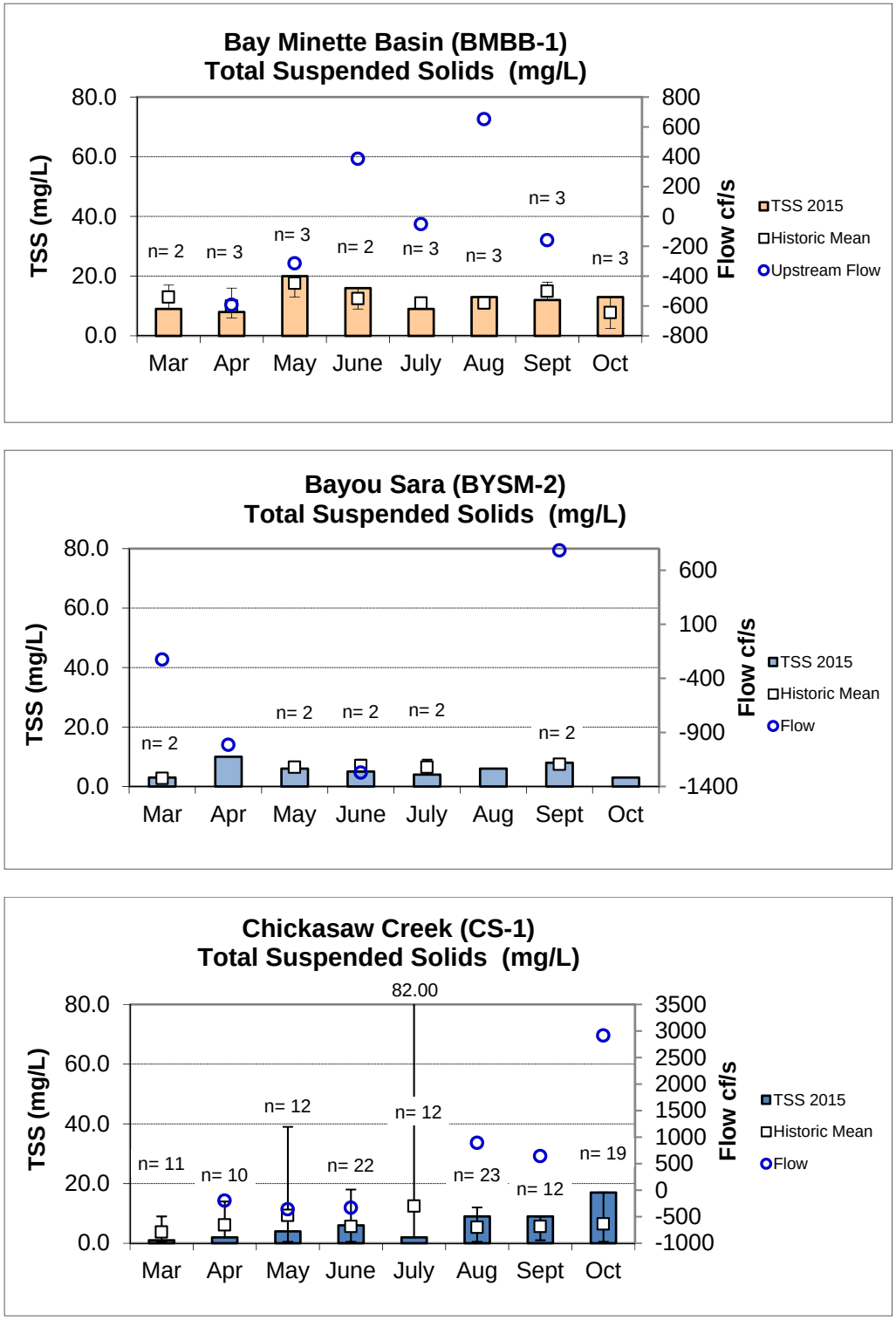
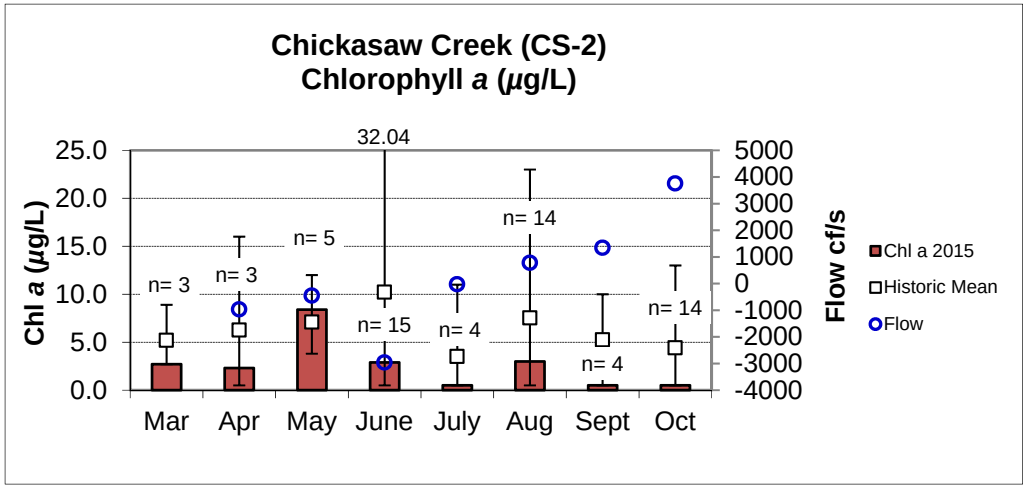


Figure 9. (continued)



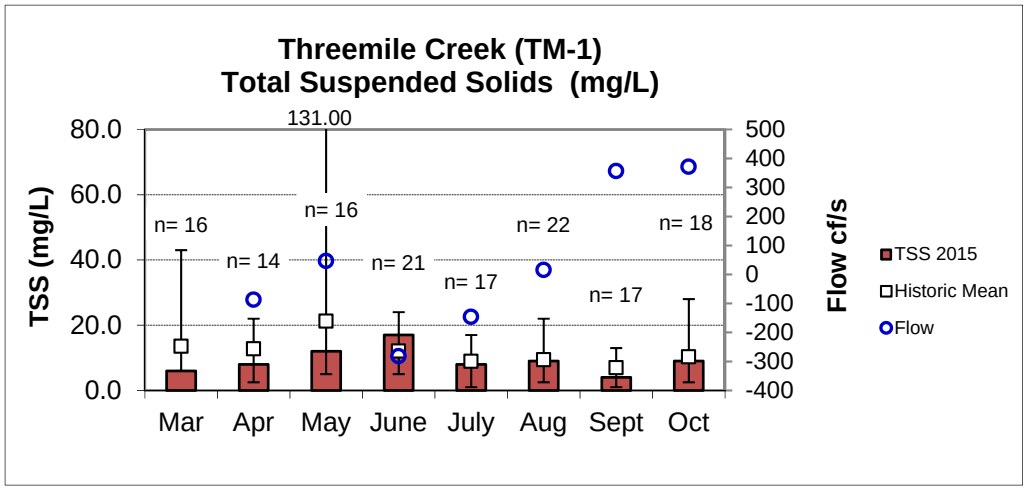



Figure 10. Monthly DO, temperature, and salinity concentrations at 1.5 m (5 ft), or mid-depth, for the Mobile Delta Sub-Watershed stations collected March-October 2015. ADEM Water Quality Criteria requires a DO concentration of 5.0 mg/L at this depth (ADEM 2012). Flow is from station or nearest upstream station, as indicated.

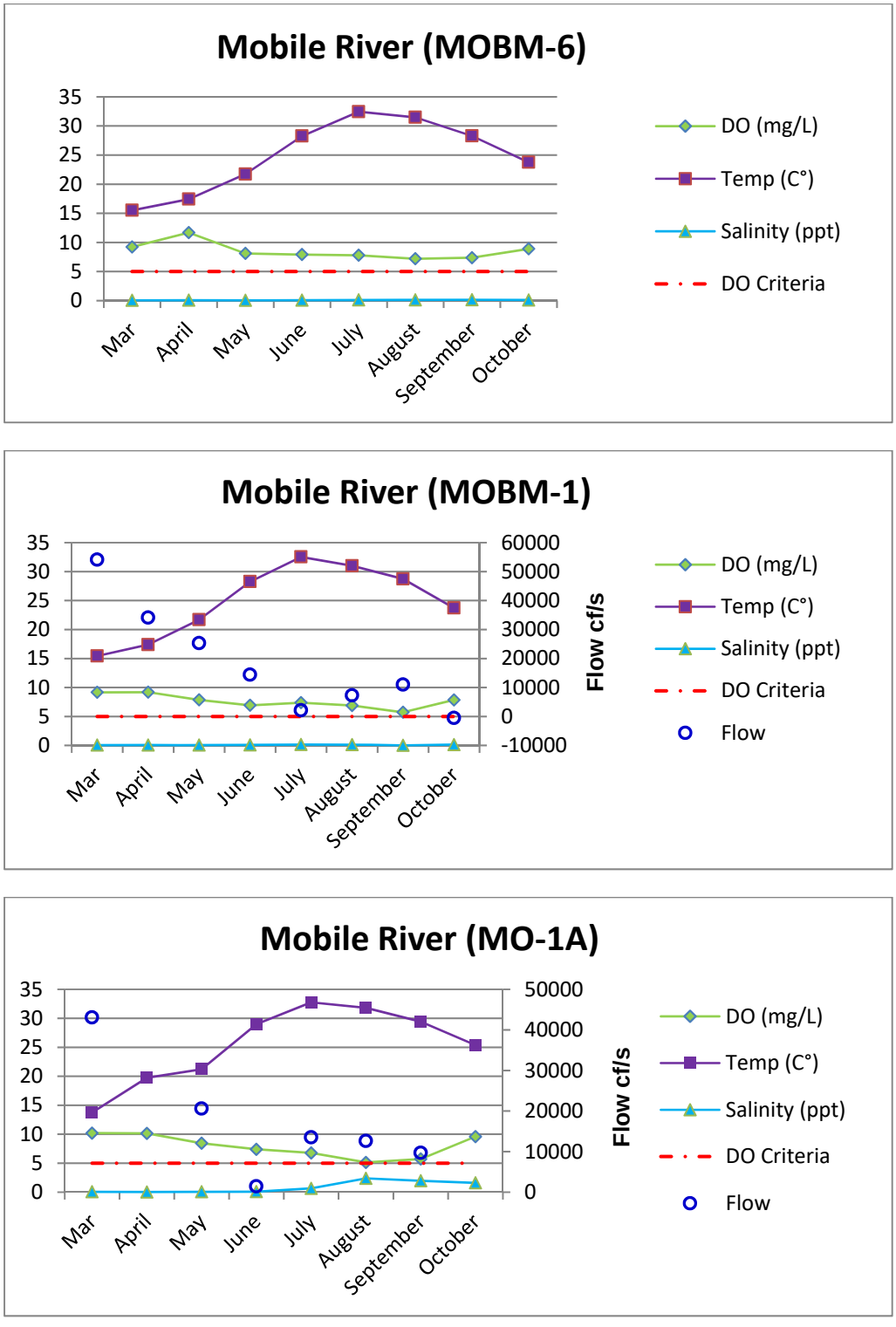
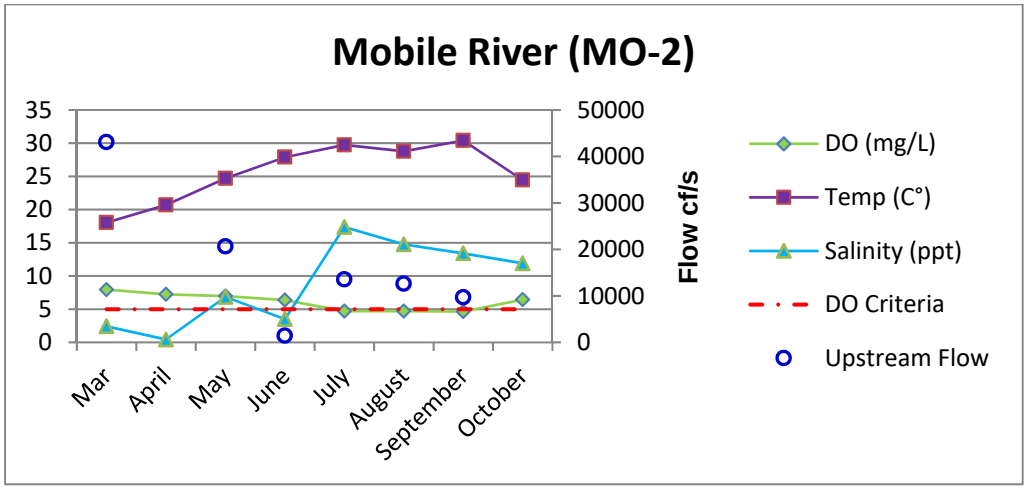
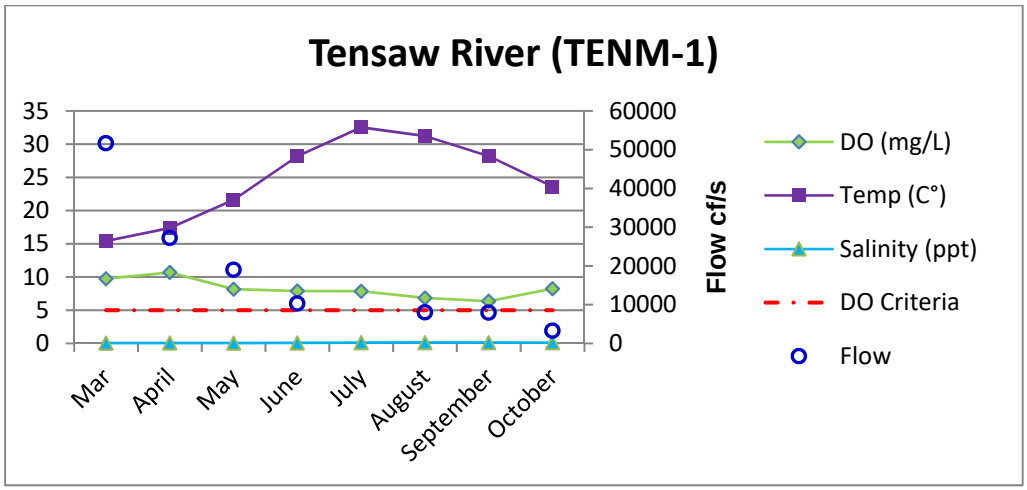


Figure 10. (continued)



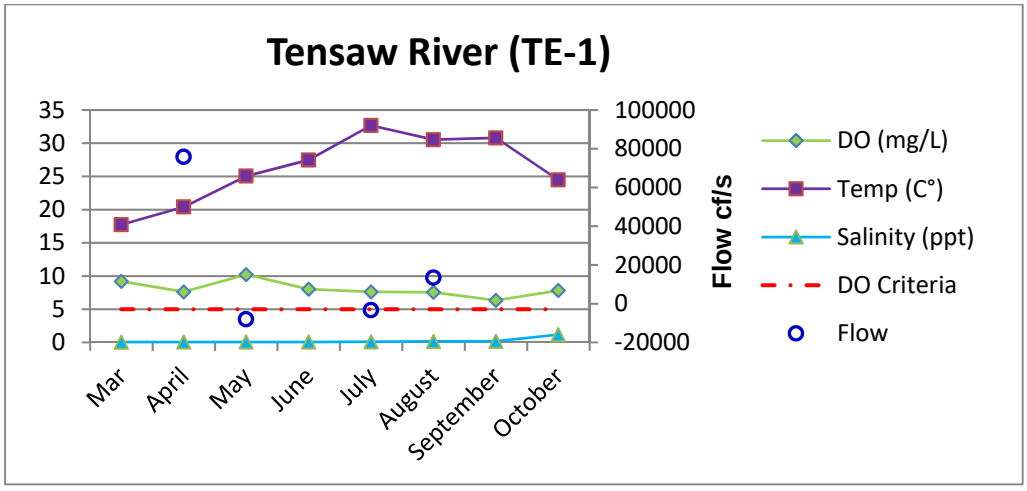



Figure 10. (continued)

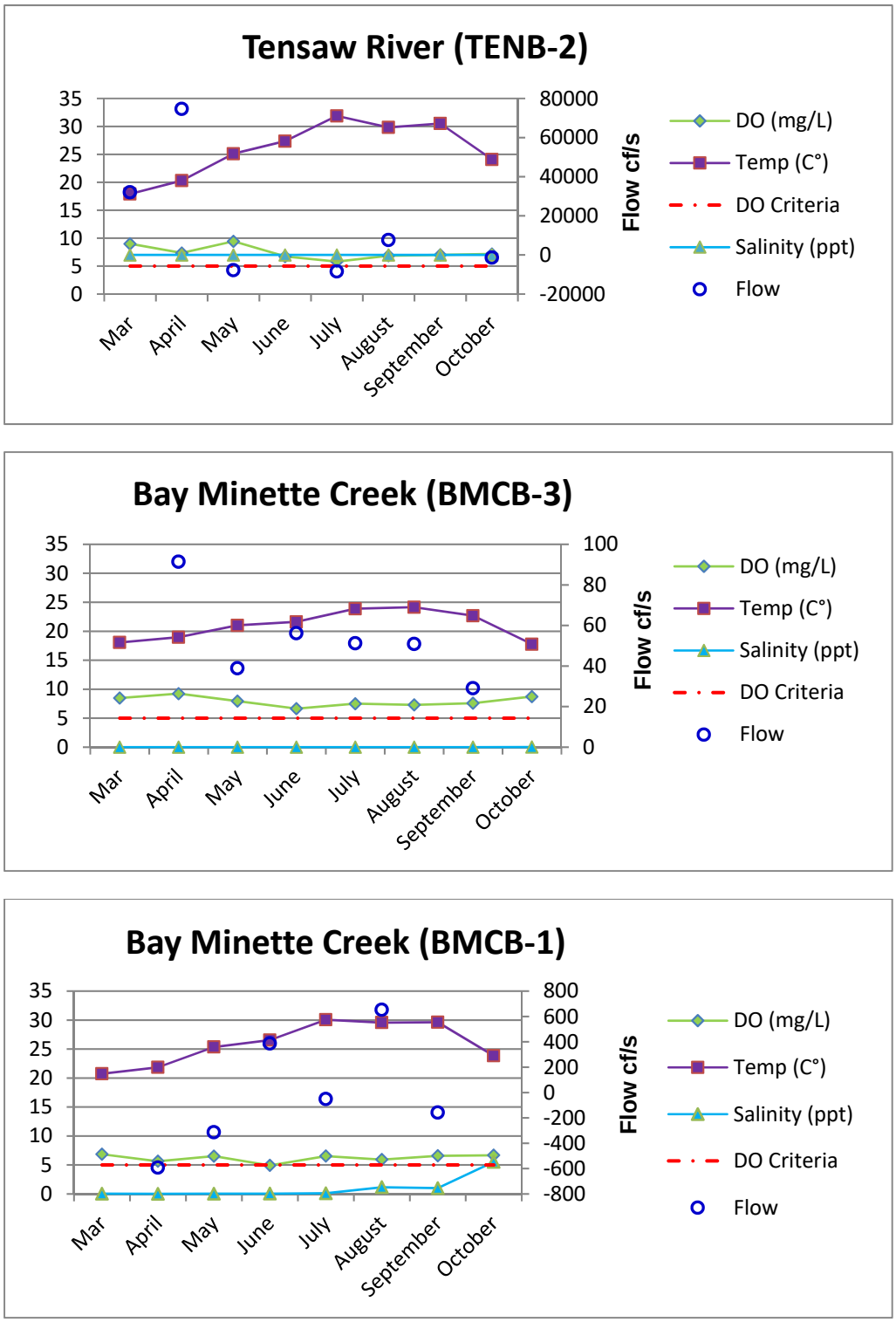


Figure 10. (continued)

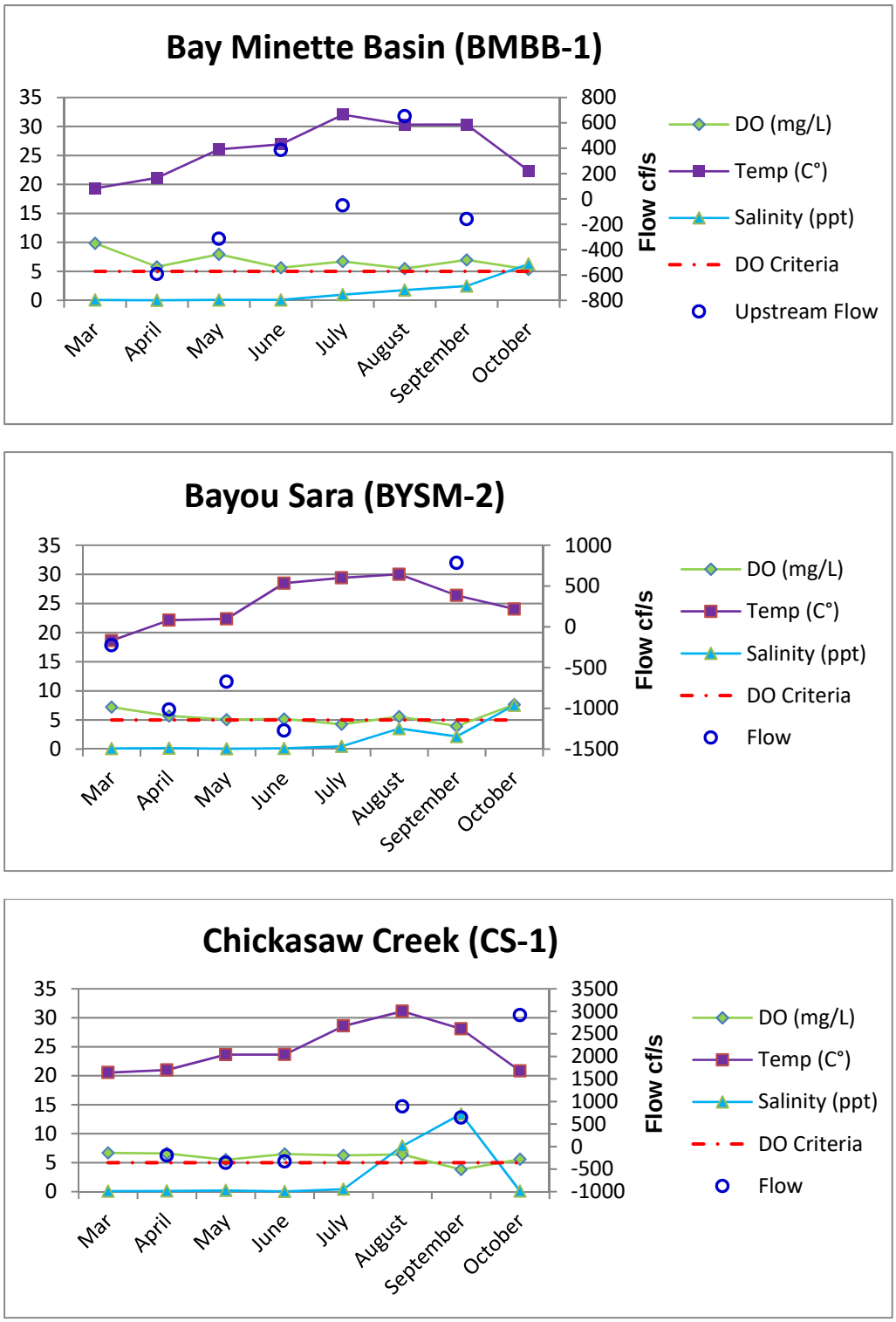
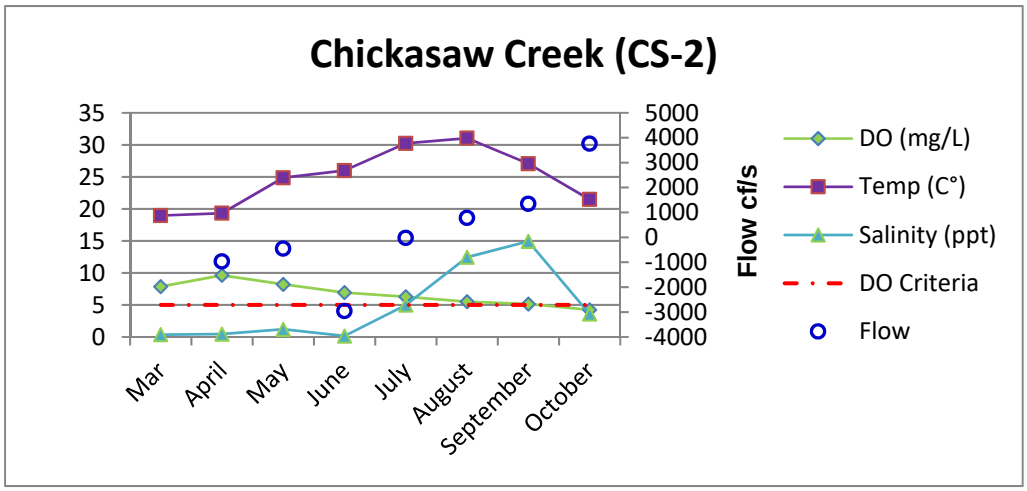


Figure 10. (continued)



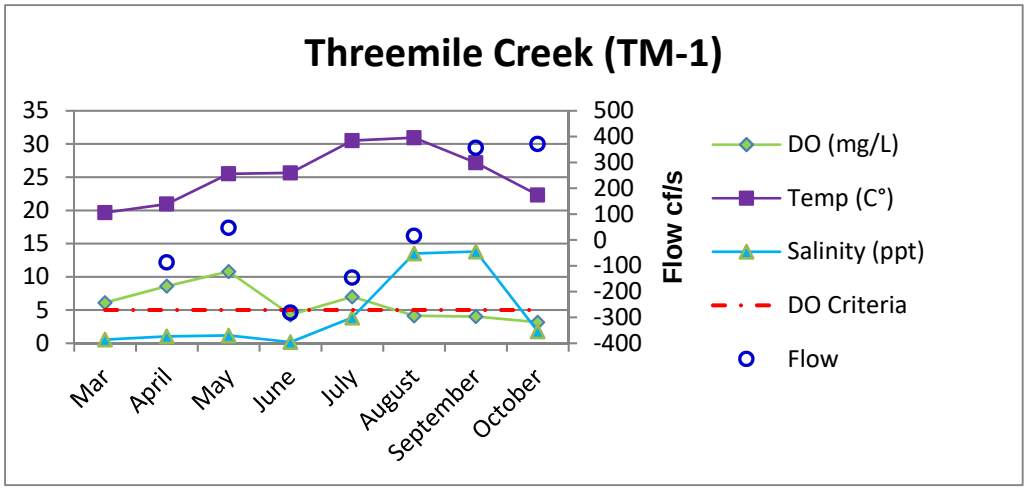



Figure 11. Monthly depth profiles of dissolved oxygen, temperature, and salinity for Mobile Delta Sub-Watershed, March-October 2015.

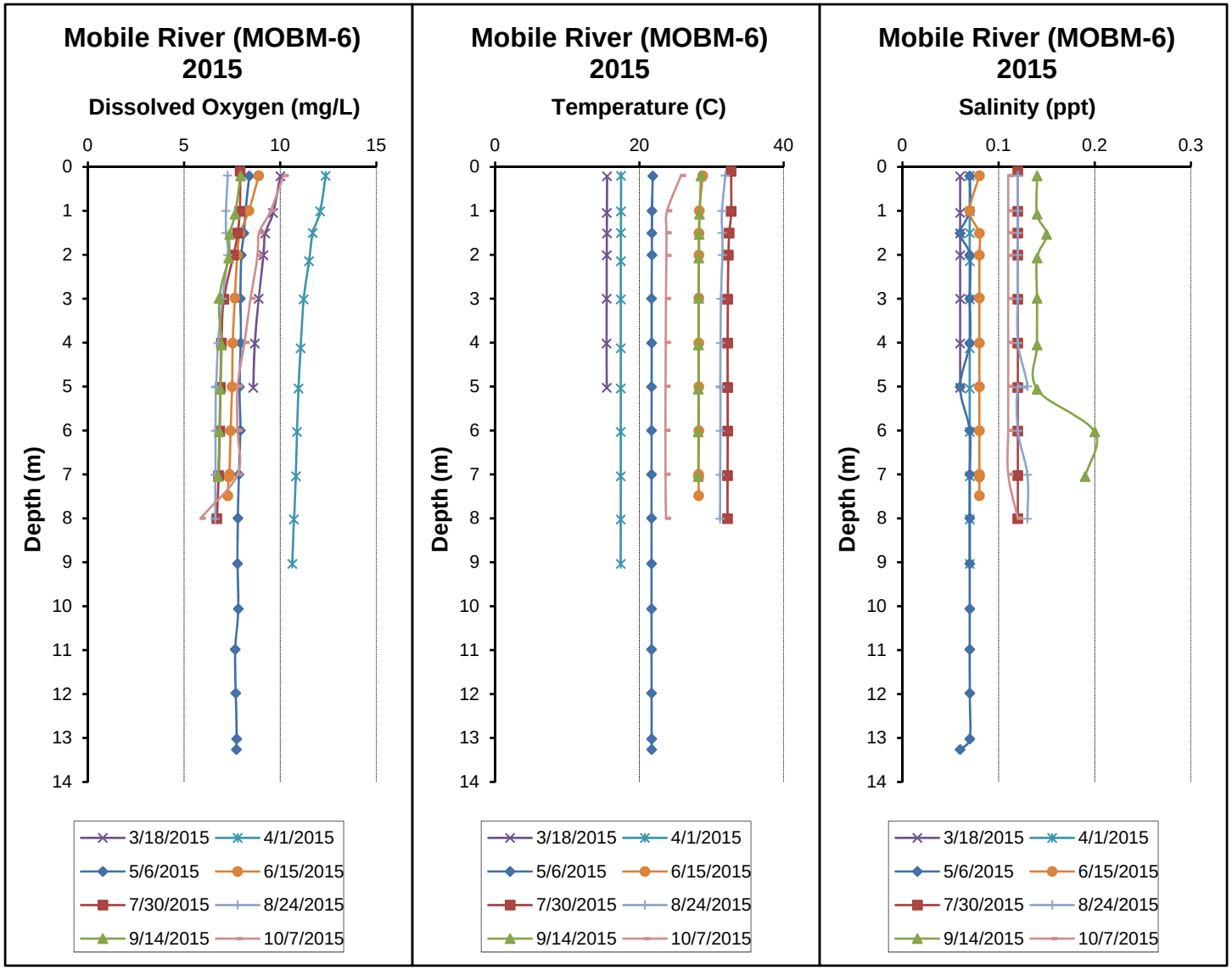


Figure 11. (continued)

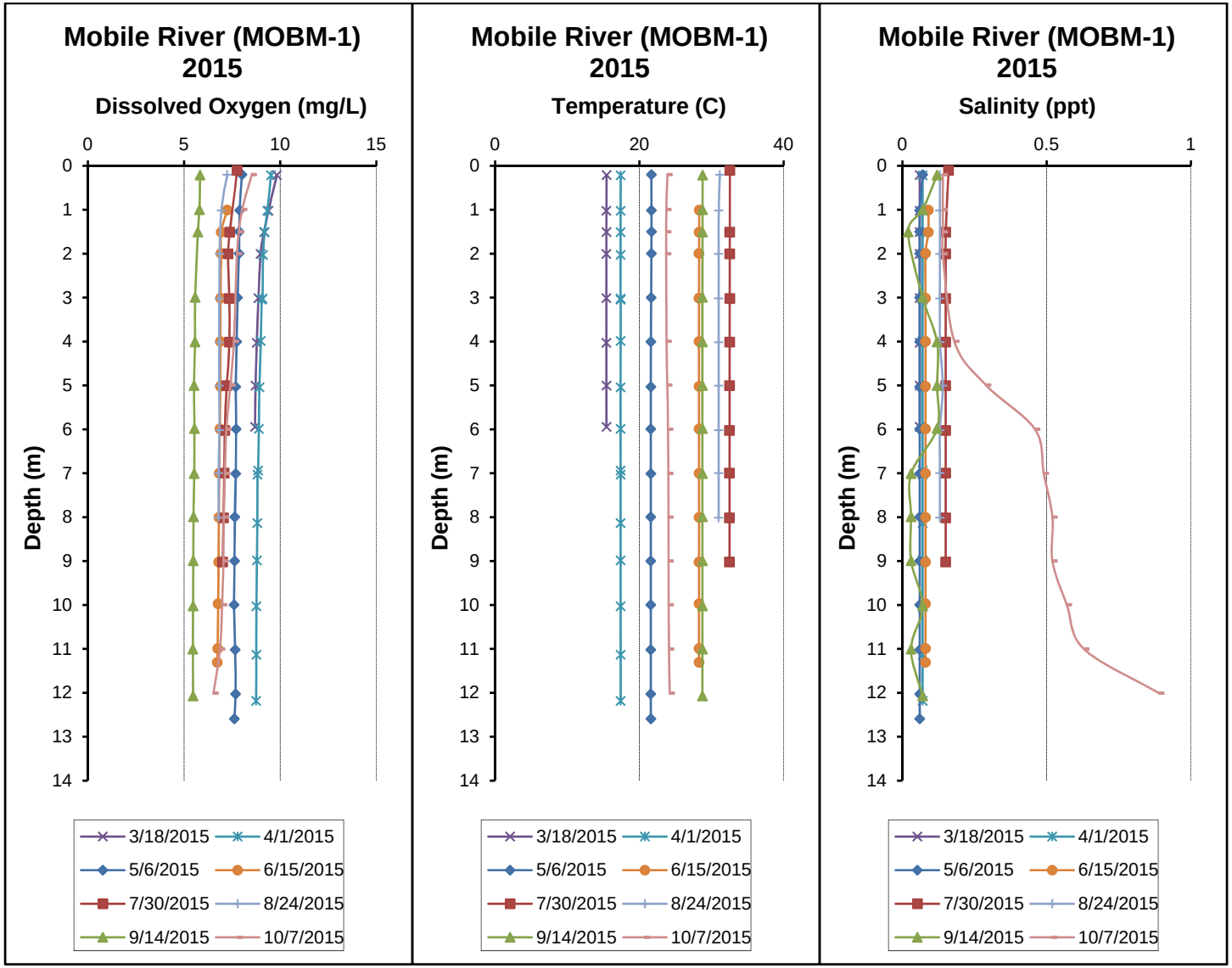


Figure 11. (continued)

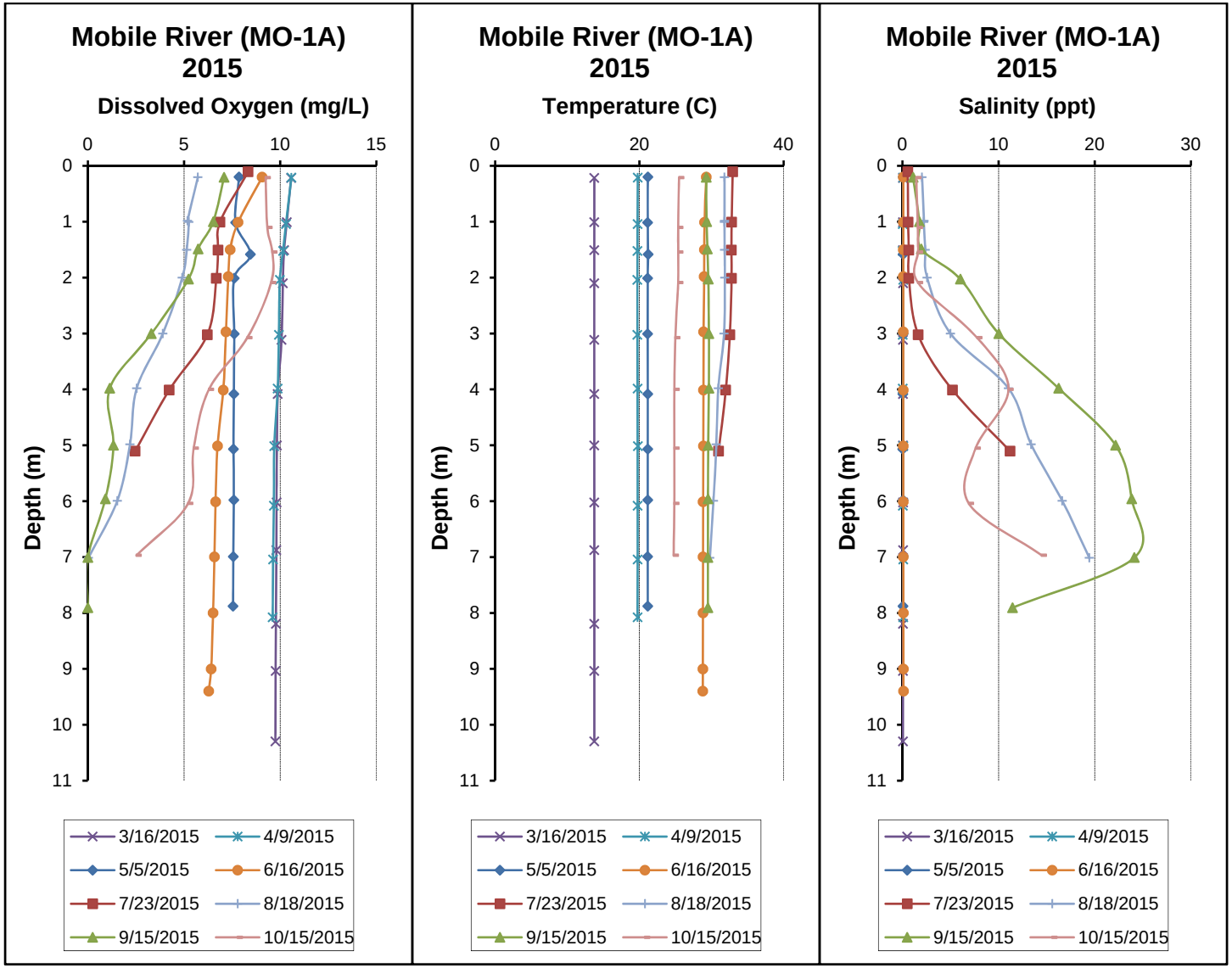


Figure 11. (continued)

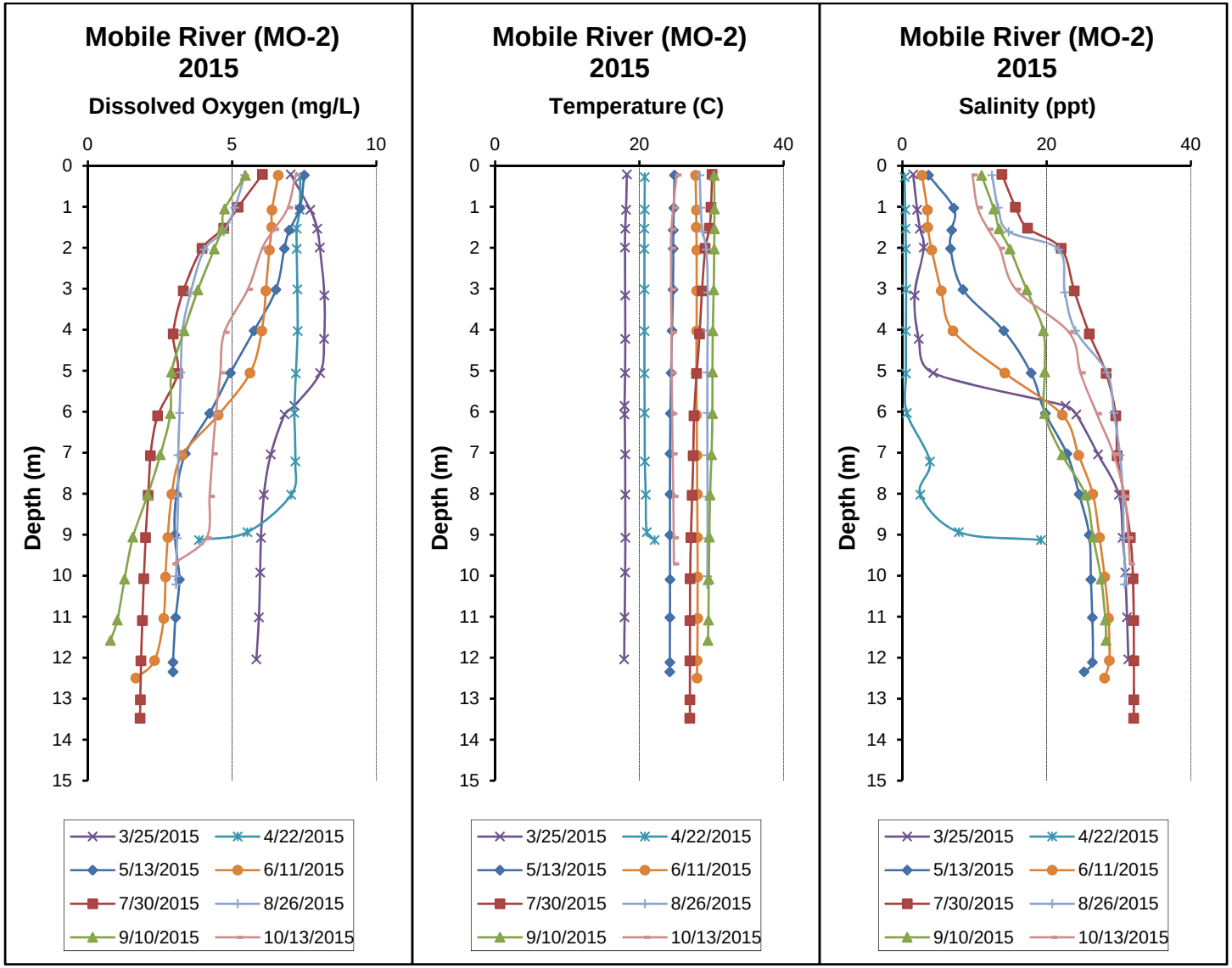


Figure 11. (continued)

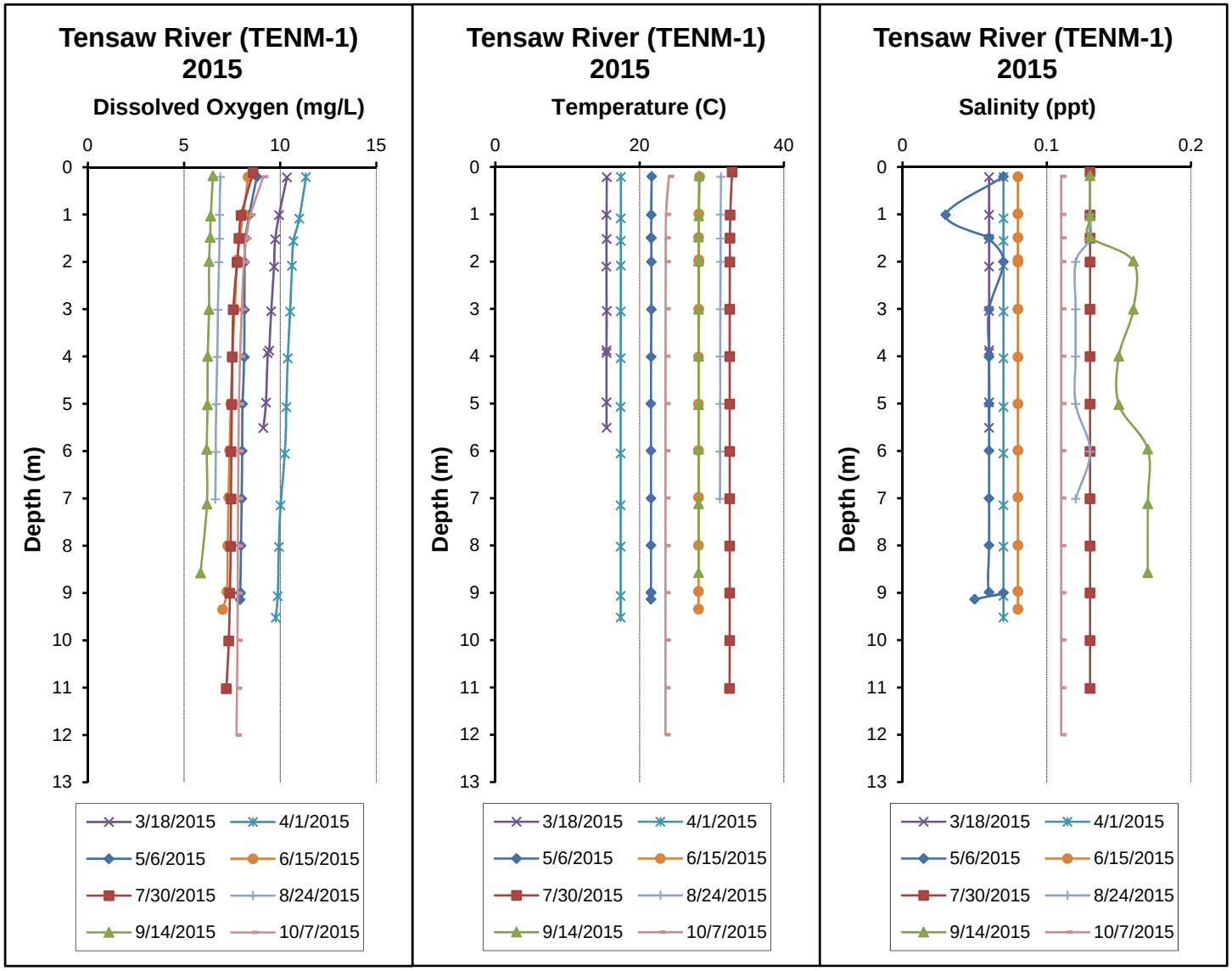


Figure 11. (continued)

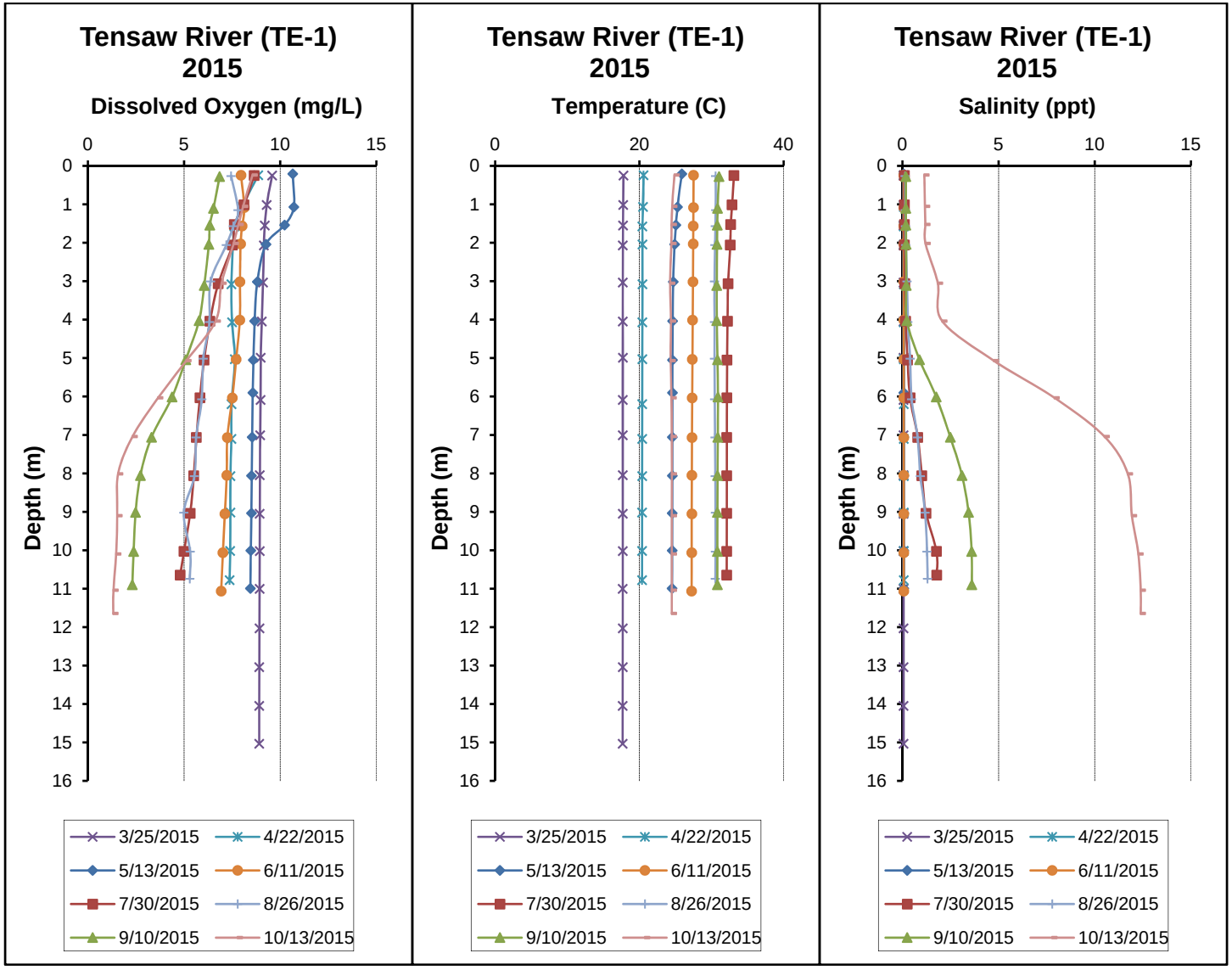


Figure 11. (continued)

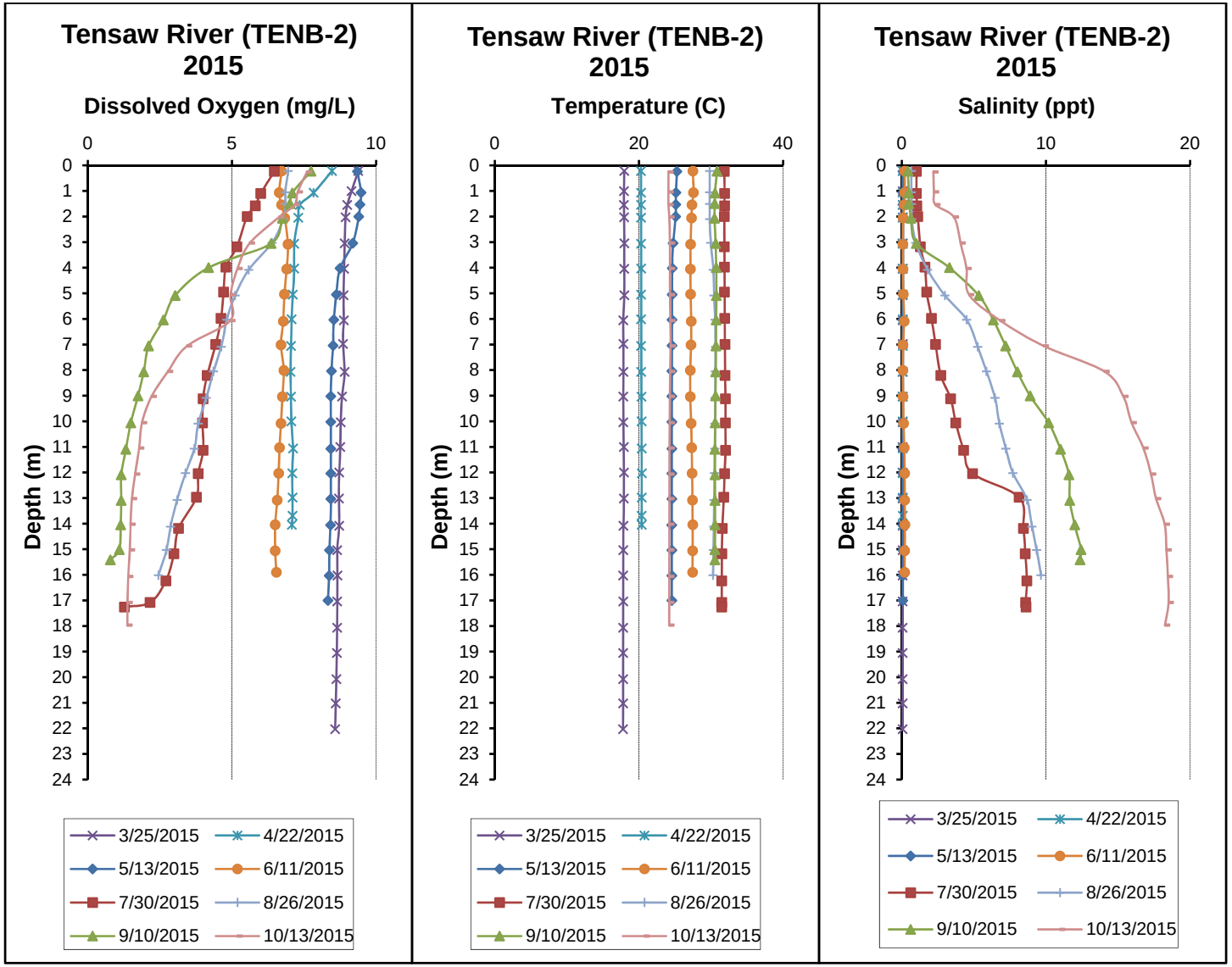


Figure 11. (continued)

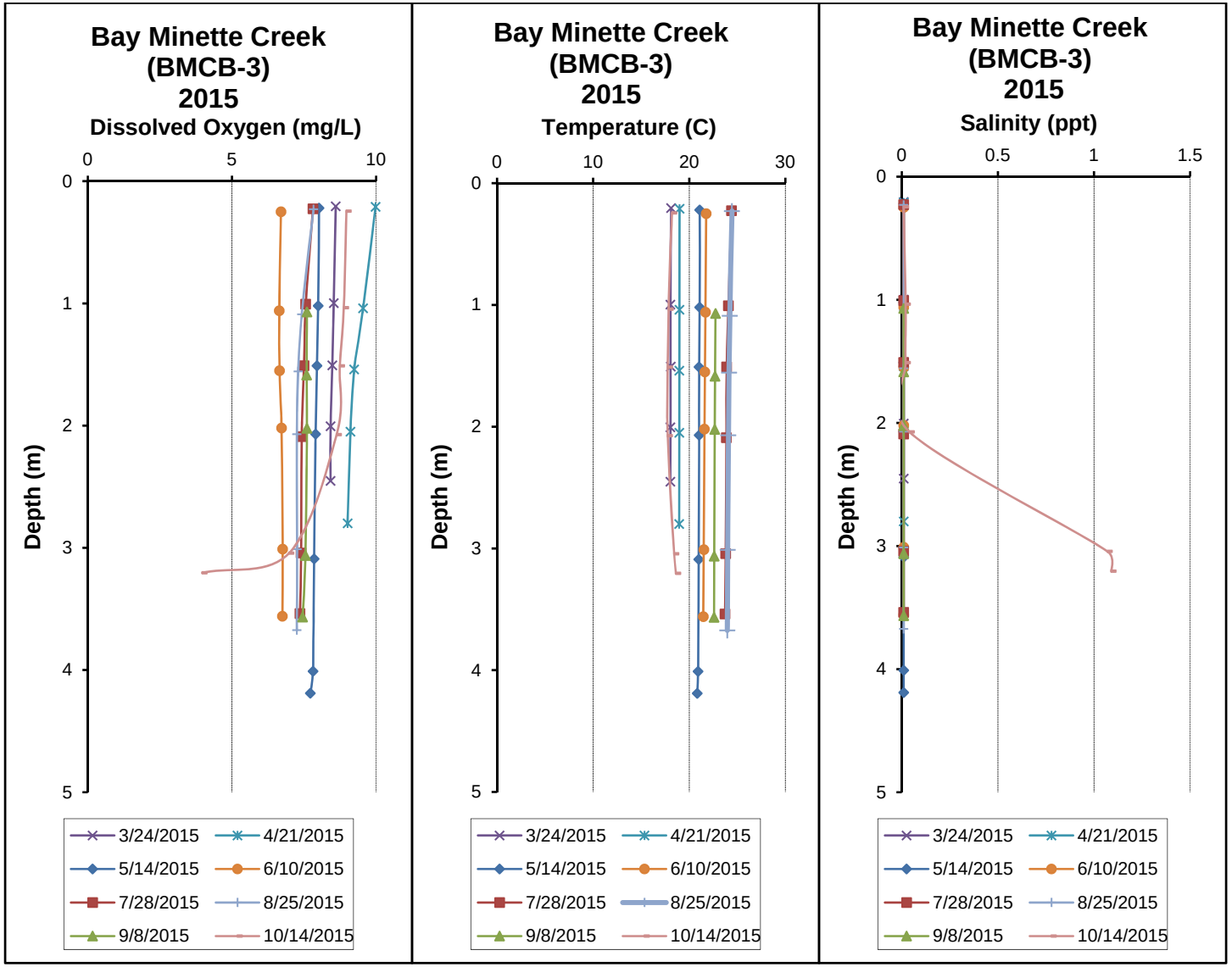


Figure 11. (continued)

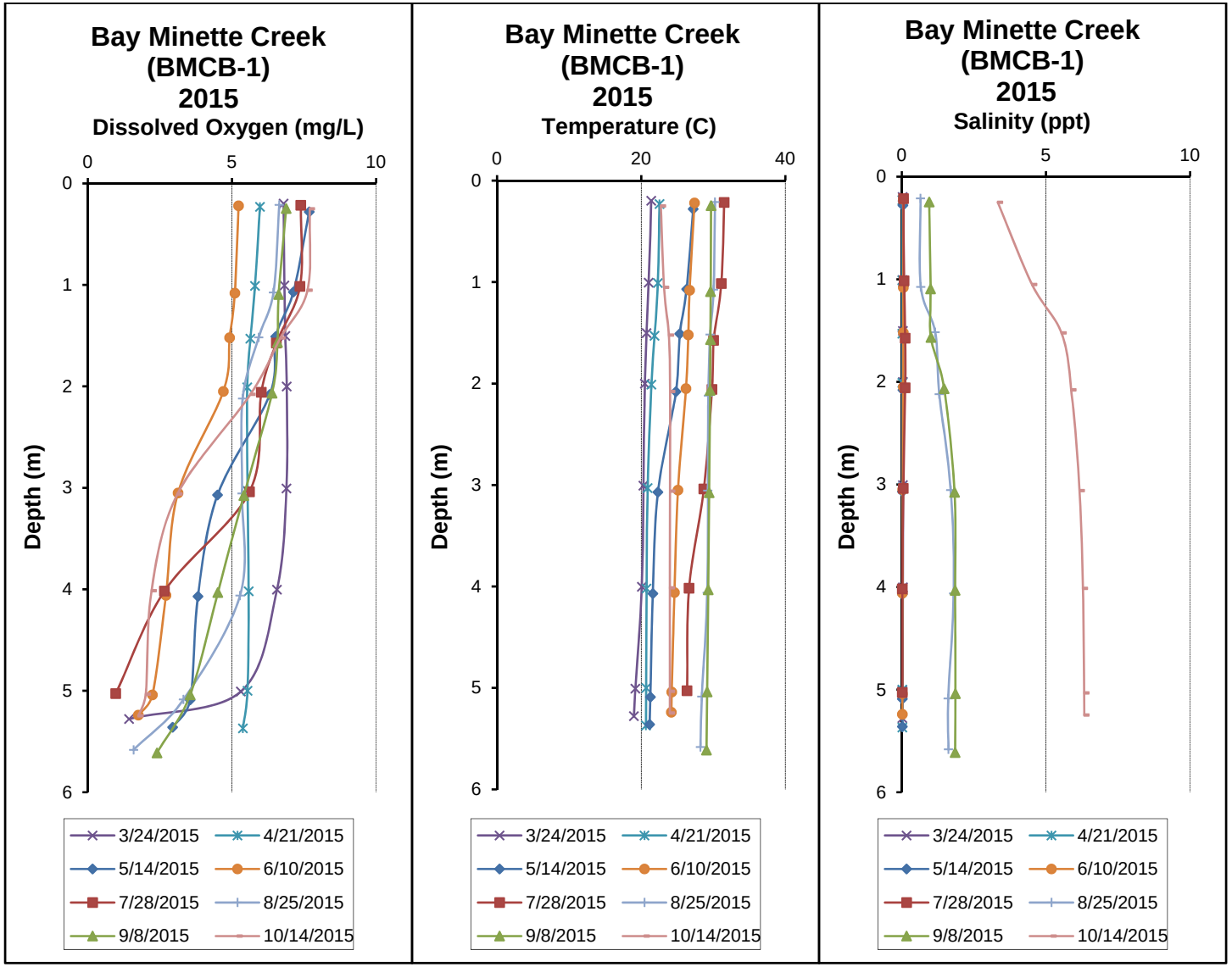


Figure 11. (continued)

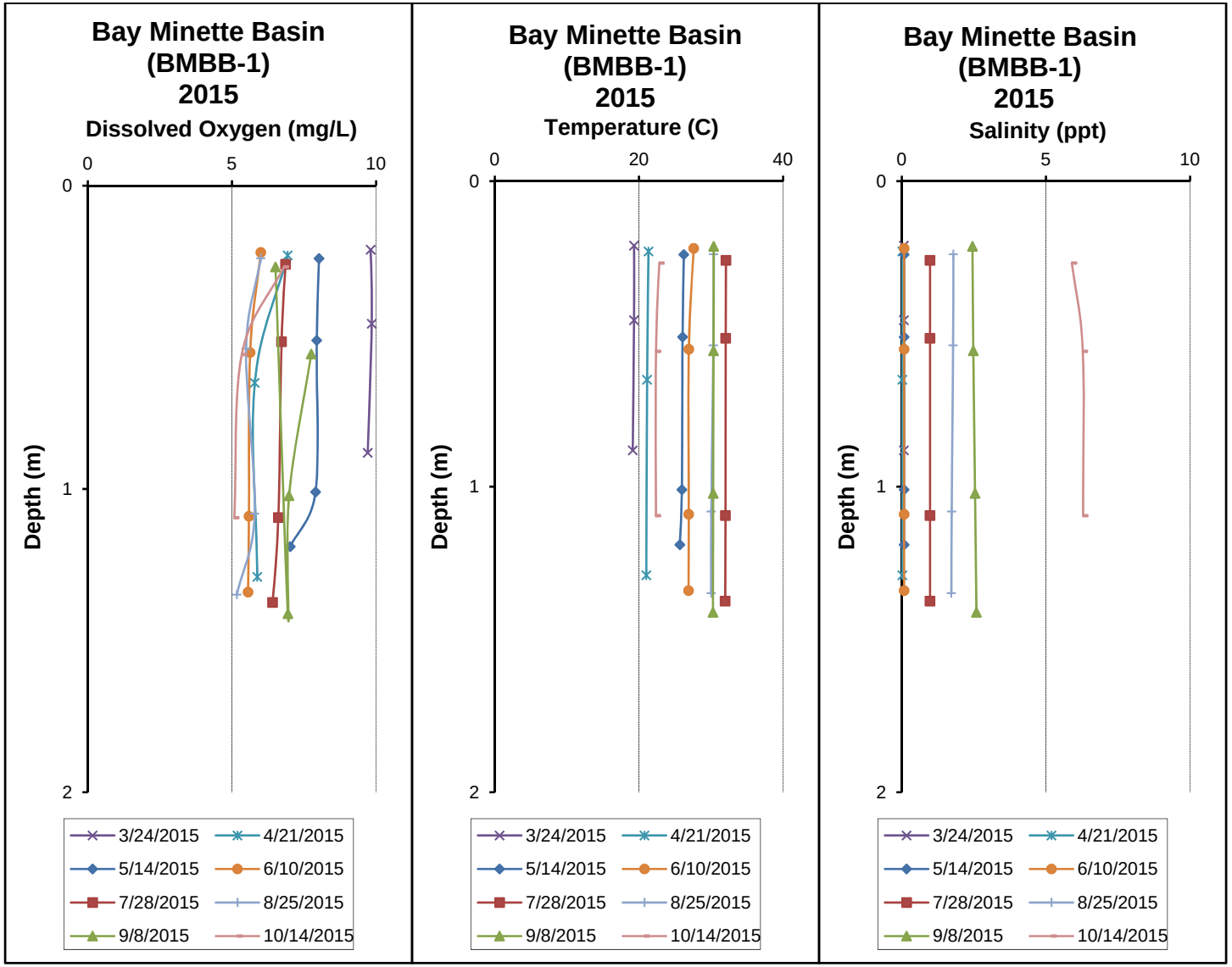


Figure 11. (continued)

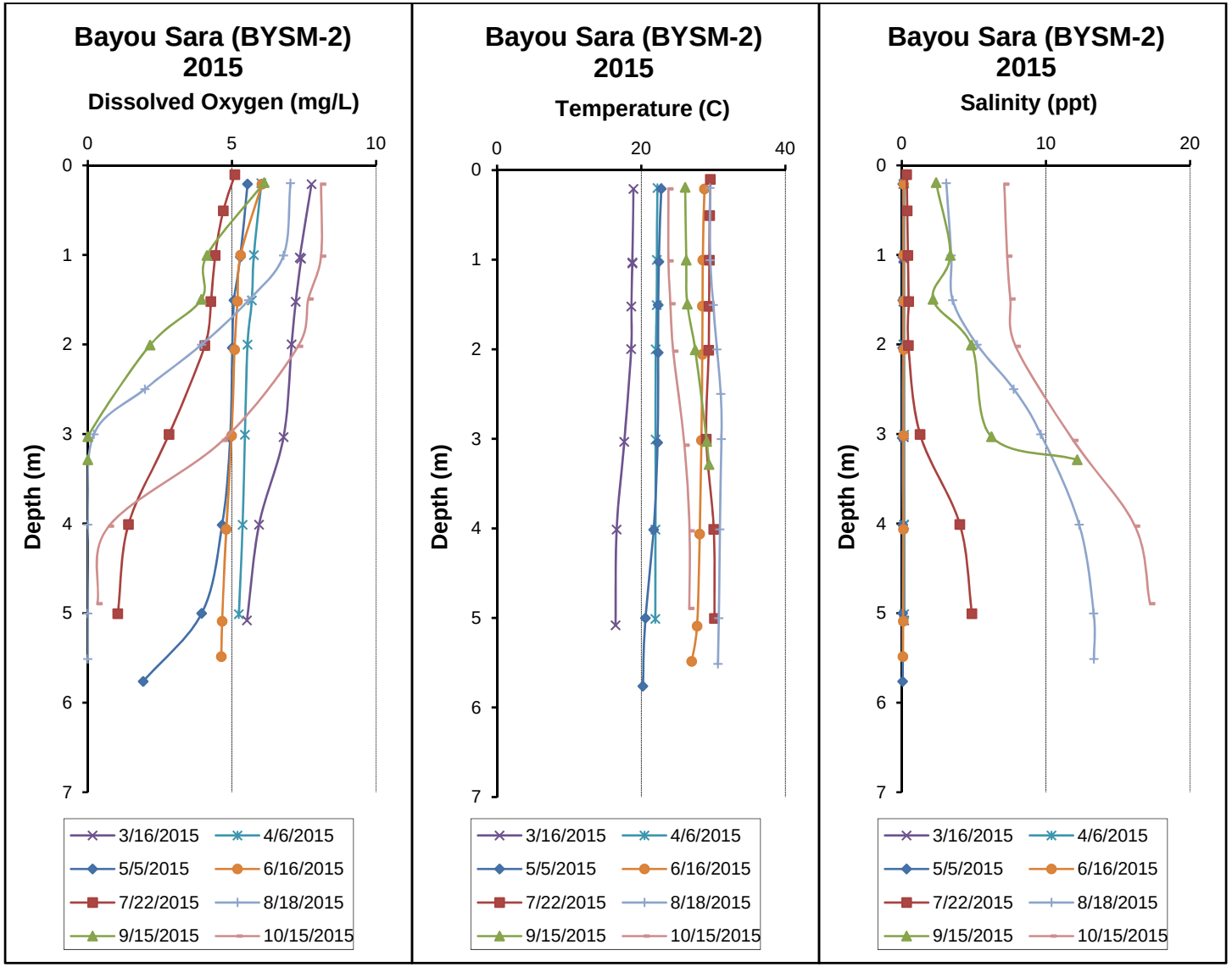


Figure 11. (continued)

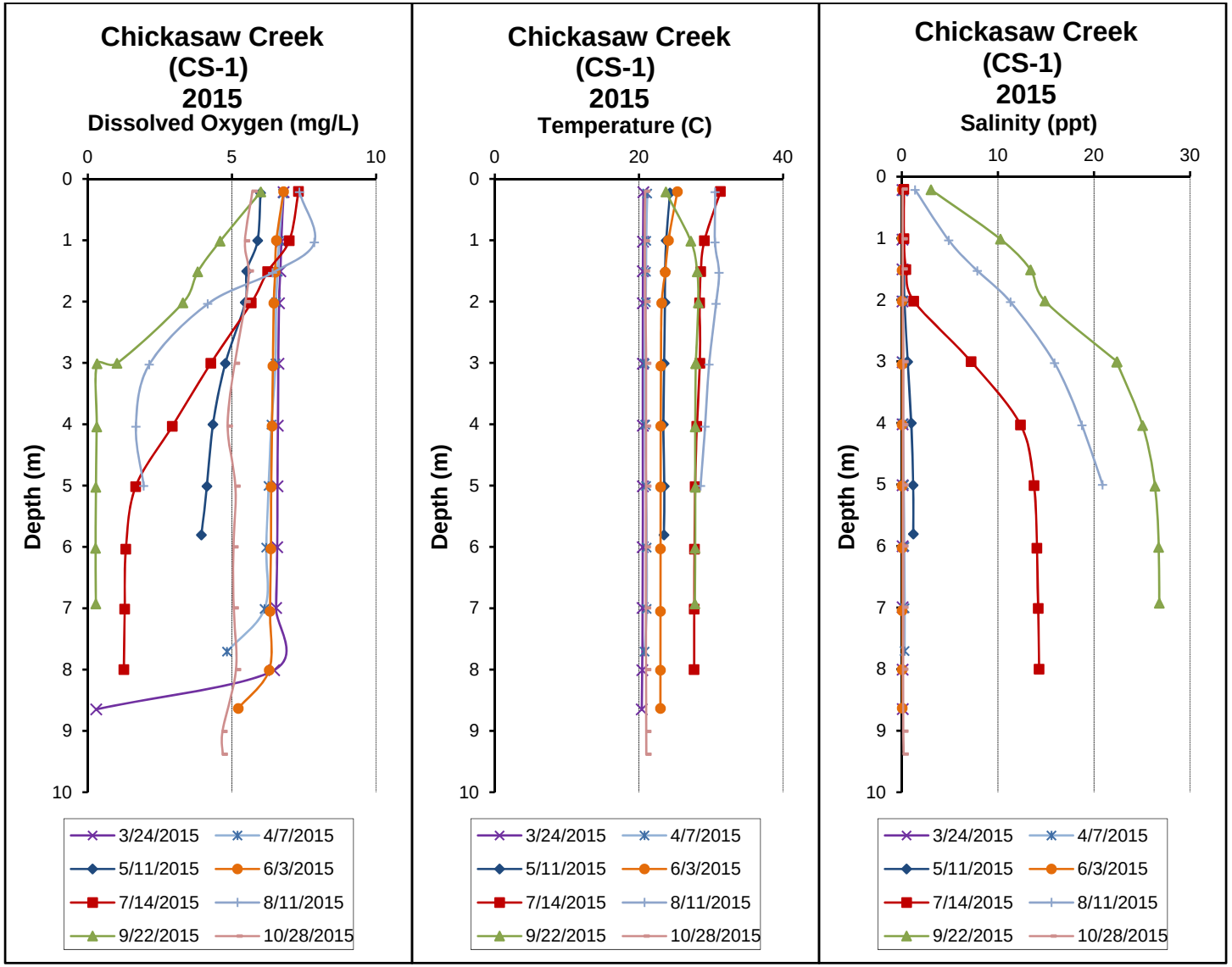


Figure 11. (continued)

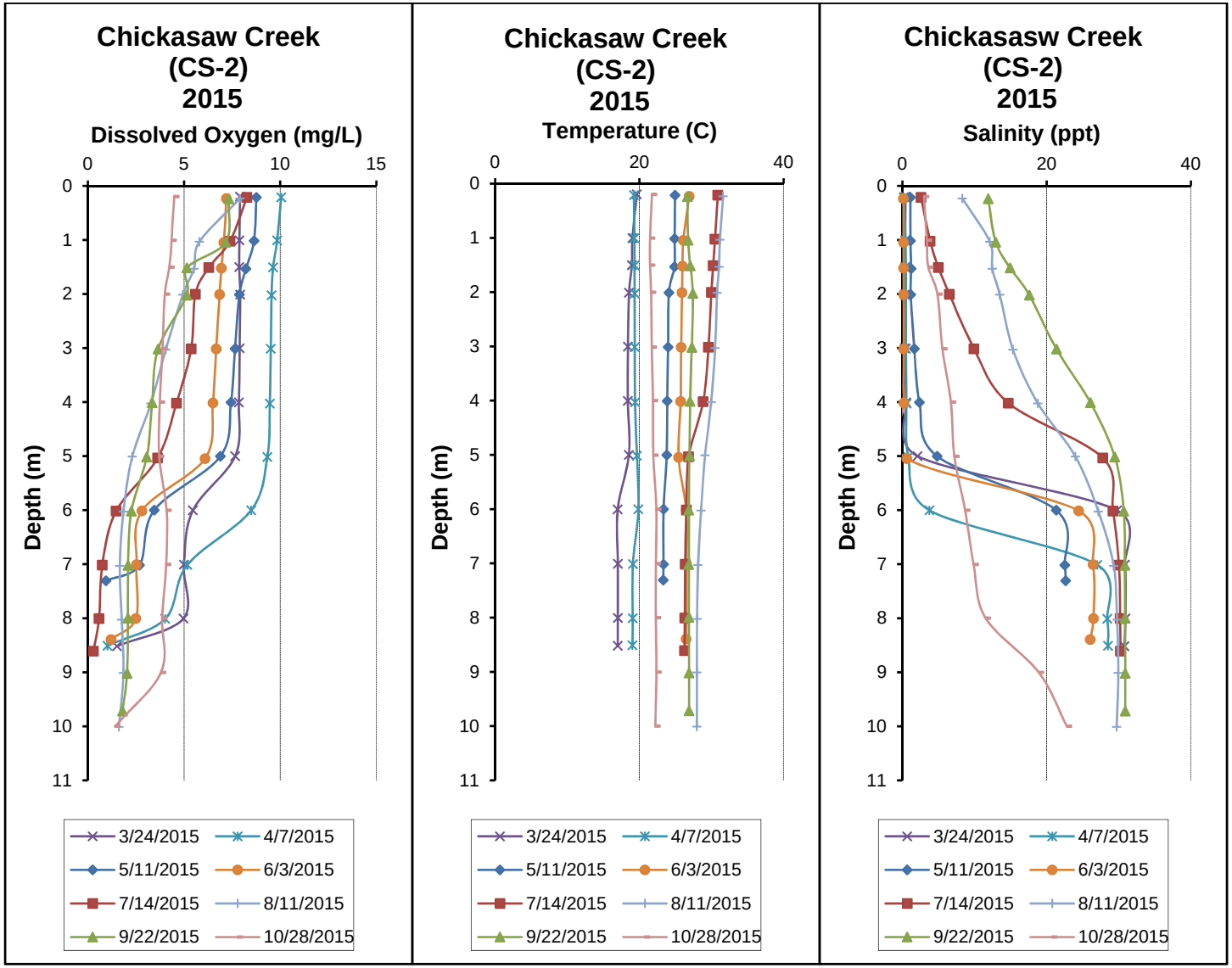
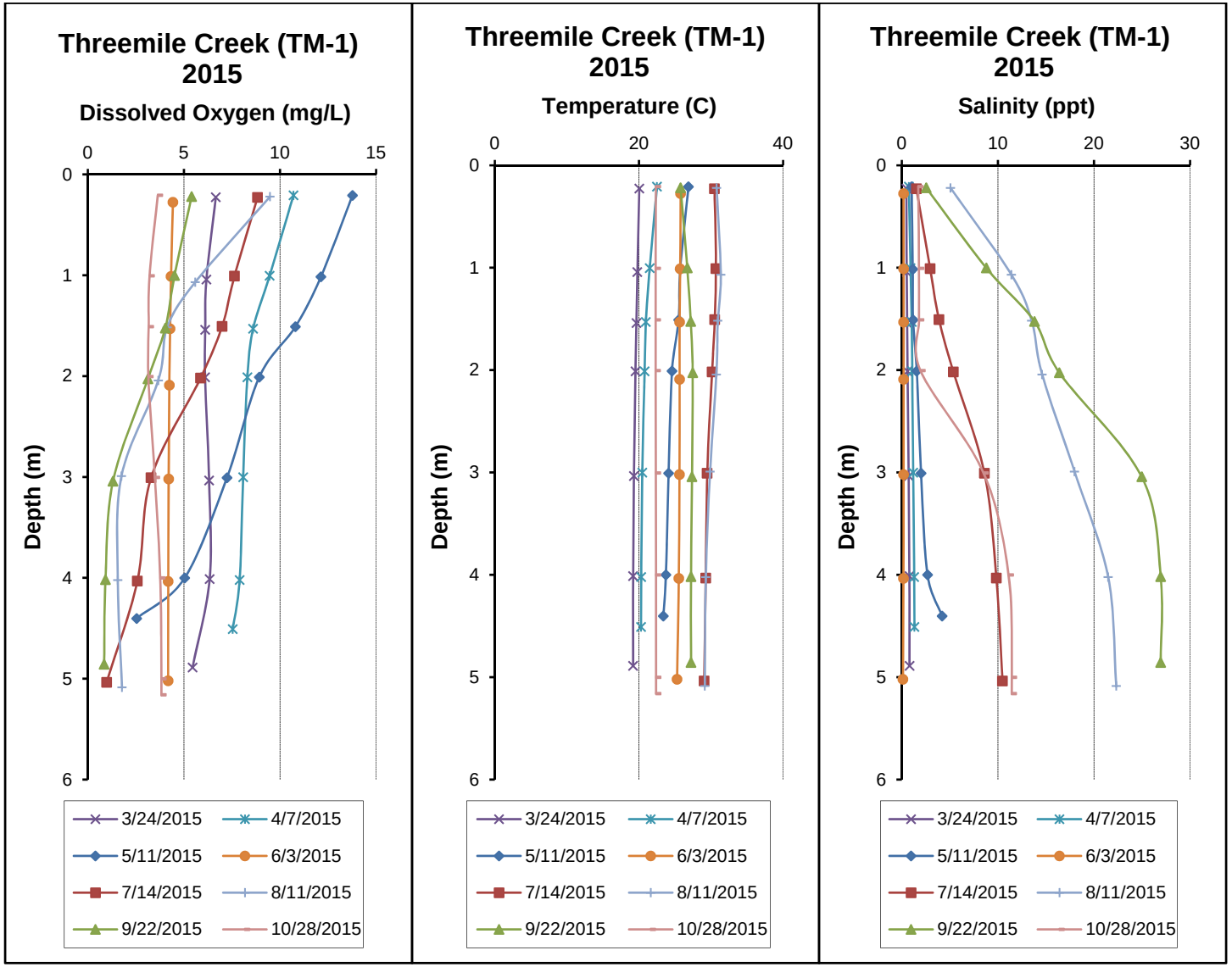


Figure 11. (continued)



## REFERENCES

ADEM. 2012. Quality Management Plan (QMP) For the Alabama Department of Environmental Management, Alabama Department of Environmental Management (ADEM), Montgomery AL. 58 pp.

ADEM. 2015. Quality Assurance Project Plan (QAPP) for Surface Water Quality Monitoring in Alabama. Alabama Department of Environmental Management (ADEM), Montgomery, AL. 78 pp.

ADEM. 2014. Alabama's Water Quality Assessment and Listing Methodology, Alabama Department of Environmental Management (ADEM), Montgomery, AL. pp 7-11

ADEM. 2015 (as amended). Standard Operating Procedures #2041 In Situ Surface Water Quality Field Measurements-Temperature, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2015 (as amended). Standard Operating Procedures #2044 In Situ Surface Water Quality Field Measurements–Turbidity, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2015 (as amended). Standard Operating Procedures #2046 Photic Zone Measurement and Visibility Determination, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2015 (as amended). Standard Operating Procedures #2047 In Situ Surface Water Quality Field Measurements–By Datasonde, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2015 (as amended). Standard Operating Procedures #2061 General Surface Water Sample Collection, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2015 (as amended). Standard Operating Procedures #2062 Dissolved Reactive Phosphorus (DRP) Surface Water Sample Collection and Field Processing, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM 2015 (as amended). Standard Operating Procedures #2063 Water Column Chlorophyll a Sample Collection and Field Processing, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM. 2012 (as amended). State of Alabama Water Quality Monitoring Strategy. Alabama Department of Environmental Management (ADEM), Montgomery, AL.

Alabama Department of Environmental Management Water Division (ADEM Admin. Code R. 335-6-10-.09). 2012. Specific Water Quality Criteria. Water Quality Program. Chapter 10. Volume 1. Division 335-6.

American Public Health Association, American Water Works Association and Water Pollution Control Federation. 1998. Standard methods for the examination of water and wastewater. 20th edition. APHA, Washington, D.C.

# APPENDIX

Appendix Table 1. Summary of Mobile Delta Sub-Watershed water quality data collected March-October, 2015. Minimum (min) and maximum (max) values calculated using minimum detection limits when results were less than this value. Median (med), mean, and standard deviation (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

| Station | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| BMBB-1 | **Physical** | | | | | | | |
| | Temperature (°C) | 3 | 21.1 | 26.0 | 22.4 | 23.2 | 2.6 | |
| | Turbidity (NTU) | 8 | 12.8 | 24.6 | 17.4 | 17.8 | 3.7 | |
| | Total Dissolved Solids (mg/L) | 8 | 64.0 | 6630.0 | 612.5 | 1573.0 | 2256.2 | |
| | Total Suspended Solids (mg/L) | 8 | 8.0 | 20.0 | 12.5 | 12.5 | 4.0 | |
| | Specific Conductance (µmhos/cm) | 3 | 39.0 | 11042.4 | 173.0 | 3751.5 | 6314.5 | |
| | Hardness (mg/L) | 1 | | | | 51.0 | | |
| J | Alkalinity (mg/L) | 8 | 3.2 | 72.0 | 60.0 | 53.9 | 22.5 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 3 | 5.3 | 7.9 | 5.8 | 6.4 | 1.4 | |
| | pH (SU) | 3 | 5.6 C | 7.3 | 7.1 | 6.7 | 0.9 | 1 |
| J | Ammonia Nitrogen (mg/L) | 8 | < 0.024 | 0.070 | 0.029 | 0.032 | 0.022 | |
| J | Nitrate+Nitrite Nitrogen (mg/L) | 8 | < 0.006 | 0.190 | 0.016 | 0.049 | 0.066 | |
| J | Total Kjeldahl Nitrogen (mg/L) | 8 | 0.580 | 2.300 | 0.755 | 1.001 | 0.588 | |
| J | Total Nitrogen (mg/L) | 8 | < 0.583 | < 2.303 | 0.848 | 1.051 | 0.571 | |
| J | Dis Reactive Phosphorus (mg/L) | 8 | < 0.003 | 0.011 | 0.006 | 0.006 | 0.004 | |
| | Total Phosphorus (mg/L) | 8 | 0.035 | 0.071 | 0.056 | 0.052 | 0.012 | |
| J | CBOD-5 (mg/L) | 8 | < 2.0 | < 2.0 | 1.0 | 1.1 | 0.4 | |
| J | Chlorides (mg/L) | 8 | 6.3 | 3700.0 | 279.5 | 830.4 | 1272.2 | |
| | **Total Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 1.370 | | |
| | Iron (mg/L) | 1 | | | | 1.330 | | |
| J | Manganese (mg/L) | 1 | | | | 0.067 | | |
| | **Dissolved Metals** | | | | | | | |
| J | Aluminum (mg/L) | 1 | | | | 0.146 | | |
| | Iron (mg/L) | 1 | | | | 0.334 | | |
| | Manganese (mg/L) | 1 | | | < | 0.004 | | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 | < 1.00 | 3.60 | 1.85 | 1.69 | 1.12 | |
| J | Enterococci (MPN/DL) | 8 | 10 | 10 | 5 | 6 | 2 | |

C=*S,F&W* criterion violated; E=# samples that exceeded criteria; J= estimate N=# samples

| | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| BMCB-1 | **Physical** | | | | | | | |
| | Temperature (°C) | 8 | 20.7 | 30.1 C | 25.9 | 25.9 | 3.6 | 1 |
| | Turbidity (NTU) | 8 | 8.6 | 18.2 | 10.1 | 11.4 | 3.2 | |
| | Total Dissolved Solids (mg/L) | 8 | 47.0 | 5160.0 | 102.0 | 995.6 | 1762.3 | |
| J | Total Suspended Solids (mg/L) | 8 | 4.0 | 9.0 | 5.5 | 5.8 | 1.7 | |
| | Specific Conductance (µmhos/cm) | 8 | 39.0 | 9842.9 | 178.8 | 1836.8 | 3363.3 | |
| | Hardness (mg/L) | 1 | | | | 21.4 | | |
| J | Alkalinity (mg/L) | 8 | 2.5 | 42.0 | 20.0 | 24.2 | 14.8 | |
| | Monthly Stream Flow (cfs) | 6 | -593.8 | 652.1 | -106.7 | -14.9 | 458.4 | |
| | Measured Stream Flow (cfs) | 6 | -593.8 | 652.1 | -106.7 | -14.9 | 458.4 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 4.9 C | 6.8 | 6.5 | 6.2 | 0.6 | 1 |
| | pH (SU) | 8 | 5.3 C | 7.4 | 6.8 | 6.7 | 0.7 | 1 |
| J | Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.070 | 0.015 | 0.024 | 0.020 | |
| J | Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.006 | < 0.037 | 0.007 | 0.010 | 0.006 | |
| J | Total Kjeldahl Nitrogen (mg/L) | 8 | 0.420 | 2.500 | 0.775 | 0.978 | 0.704 | |
| J | Total Nitrogen (mg/L) | 8 < | 0.438 | < 2.503 | 0.782 | 0.987 | 0.700 | |
| J | Dis Reactive Phosphorus (mg/L) | 8 < | 0.005 | 0.027 | 0.002 | 0.007 | 0.009 | |
| | Total Phosphorus (mg/L) | 8 | 0.022 | 0.035 | 0.026 | 0.028 | 0.005 | |
| J | CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | |
| J | Chlorides (mg/L) | 8 | 5.9 | 2800.0 | 30.0 | 525.2 | 964.8 | |
| | **Total Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.316 | | |
| | Iron (mg/L) | 1 | | | | 1.080 | | |
| J | Manganese (mg/L) | 1 | | | | 0.015 | | |
| | **Dissolved Metals** | | | | | | | |
| J | Aluminum (mg/L) | 1 | | | | 0.151 | | |
| | Iron (mg/L) | 1 | | | | 0.696 | | |
| | Manganese (mg/L) | 1 | | | < | 0.004 | | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 3.60 | 1.15 | 1.55 | 1.07 | |
| J | Enterococci (MPN/DL) | 8 | 10 | 10 | 5 | 6 | 2 | |

C=*S,F&W* criterion violated; E=# samples that exceeded criteria;
J= estimate; N=# samples

| | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| BMCB-3 | **Physical** | | | | | | | |
| | Temperature (°C) | 6 | 17.8 | 24.2 | 22.2 | 21.8 | 2.3 | |
| | Turbidity (NTU) | 8 | 4.6 | 9.5 | 6.7 | 7.0 | 1.9 | |
| | Total Dissolved Solids (mg/L) | 8 | 30.0 | 42.0 | 34.5 | 35.9 | 4.2 | |
| J | Total Suspended Solids (mg/L) | 8 | 1.0 | 5.0 | 2.0 | 2.5 | 1.4 | |
| | Specific Conductance (µmhos/cm) | 6 | 25.0 | 40.9 | 26.3 | 28.5 | 6.1 | |
| | Hardness (mg/L) | 1 | | | | 5.2 | | |
| J | Alkalinity (mg/L) | 8 < | 1.0 | 41.0 | 2.7 | 8.1 | 13.7 | |
| | Monthly Stream Flow (cfs) | 6 | 29.0 | 91.4 | 51.0 | 52.9 | 21.3 | |
| | Measured Stream Flow (cfs) | 6 | 29.0 | 91.4 | 51.0 | 52.9 | 21.3 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 6 | 6.6 | 8.7 | 7.5 | 7.6 | 0.7 | |
| | pH (SU) | 6 | 5.4 C | 7.3 | 6.4 | 6.3 | 0.7 | 2 |
| J | Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.060 | 0.012 | 0.024 | 0.018 | |
| | Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.025 | 0.076 | 0.052 | 0.049 | 0.017 | |
| J | Total Kjeldahl Nitrogen (mg/L) | 8 | 0.160 | 0.980 | 0.285 | 0.398 | 0.289 | |
| J | Total Nitrogen (mg/L) | 8 | 0.236 | 1.005 | 0.334 | 0.447 | 0.275 | |
| J | Dis Reactive Phosphorus (mg/L) | 8 < | 0.005 | 0.007 | 0.002 | 0.004 | 0.002 | |
| J | Total Phosphorus (mg/L) | 8 | 0.008 | 0.014 | 0.010 | 0.011 | 0.002 | |
| J | CBOD-5 (mg/L) | 8 < | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | |
| J | Chlorides (mg/L) | 8 | 3.5 | 68.0 | 4.0 | 11.9 | 22.6 | |
| | **Total Metals** | | | | | | | |
| J | Aluminum (mg/L) | 1 | | | | 0.154 | | |
| | Iron (mg/L) | 1 | | | | 1.080 | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | |
| | **Dissolved Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | |
| | Iron (mg/L) | 1 | | | | 0.581 | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m$^3$) | 8 < | 1.00 | 1.60 | 0.50 | 0.84 | 0.50 | |
| J | Enterococci (MPN/DL) | 8 | 10 | 90 | 30 | 33 | 29 | |

C=*S,F&W* criterion violated; E=# samples that exceeded criteria;
J= estimate; N=# samples

| | Parameter | N | Min | Max | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|
| BYSM-2 | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 18.6 | 30.0 | 25.2 | 25.2 | 4.0 | | |
| | Turbidity (NTU) | 8 | 3.1 | 9.6 | 6.1 | 6.1 | 2.6 | | |
| | Total Dissolved Solids (mg/L) | 8 | 121.0 | 8550.0 | 280.0 | 2600.1 | 3455.2 | | |
| | J Total Suspended Solids (mg/L) | 8 | 3.0 | 10.0 | 5.5 | 5.6 | 2.4 | | |
| | Specific Conductance (µmhos/cm) | 8 | 159.9 | 13086.8 | 661.4 | 3212.8 | 4617.5 | | |
| | Hardness (mg/L) | 1 | | | | 63.4 | | | |
| | J Alkalinity (mg/L) | 8 | 11.0 | 52.0 | 19.0 | 26.1 | 16.5 | | |
| | Monthly Stream Flow (cfs) | 5 | -1272.7 | 783.9 | -674.6 | -481.7 | 808.0 | | |
| | Measured Stream Flow (cfs) | 5 | -1272.7 | 783.9 | -674.6 | -481.7 | 808.0 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 3.9 C | 7.6 | 5.4 | 5.6 | 1.3 | 2 | |
| | pH (SU) | 8 | 6.1 | 6.8 | 6.4 | 6.4 | 0.2 | | |
| | J Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.090 | 0.034 | 0.040 | 0.030 | | |
| | J Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.006 | 0.056 | 0.021 | 0.025 | 0.022 | | |
| | J Total Kjeldahl Nitrogen (mg/L) | 8 | 0.370 | 1.800 | 0.840 | 0.926 | 0.532 | | |
| | J Total Nitrogen (mg/L) | 8 < | 0.373 | 1.807 | 0.854 | 0.952 | 0.531 | | |
| | J Dis Reactive Phosphorus (mg/L) | 8 < | 0.003 | 0.020 | 0.008 | 0.009 | 0.006 | | |
| | J Total Phosphorus (mg/L) | 8 | 0.032 | 0.077 | 0.044 | 0.048 | 0.015 | | |
| | J CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | | |
| | J Chlorides (mg/L) | 8 | 32.0 | 5000.0 | 128.0 | 1426.0 | 1967.5 | | |
| | **Total Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.209 | | | |
| | Iron (mg/L) | 1 | | | | 0.580 | | | |
| | J Manganese (mg/L) | 1 | | | | 0.039 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | < | 0.106 | | | |
| | J Antimony (µg/L) | 1 | | | | 0.049 | | | |
| | J Arsenic (µg/L) | 1 | | | | 0.838 A | | | 1 |
| | Cadmium (µg/L) | 1 | | | < | 0.097 | | | |
| | J Chromium (µg/L) | 1 | | | | 0.817 | | | |
| | J Copper (µg/L) | 1 | | | | 1.500 | | | |
| | Iron (mg/L) | 1 | | | | 0.386 | | | |
| | J Lead (µg/L) | 1 | | | | 0.443 | | | |
| | Manganese (mg/L) | 1 | | | | 0.031 | | | |
| | J Nickel (µg/L) | 1 | | | | 0.549 | | | |
| | Selenium (µg/L) | 1 | | | < | 0.151 | | | |
| | Silver (µg/L) | 1 | | | < | 1.742 | | | |
| | Thallium (µg/L) | 1 | | | < | 0.025 | | | |
| | Zinc (µg/L) | 1 | | | | 10.900 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 1.70 | 0.50 | 0.82 | 0.48 | | |
| | J Enterococci (MPN/DL) | 8 | 10 | 60 | 10 | 19 | 20 | | |

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

| | Parameter | N | Min | | Max | | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CS-1 | **Physical** | | | | | | | | | | |
| | Temperature (°C) | 8 | 20.5 | | 31.1 | C | 23.6 | 24.7 | 4.1 | 1 | |
| | Turbidity (NTU) | 8 | 2.8 | | 15.6 | | 4.6 | 6.8 | 4.9 | | |
| | Total Dissolved Solids (mg/L) | 8 | 84.0 | | 12700.0 | | 194.5 | 2781.4 | 4816.8 | | |
| | Total Suspended Solids (mg/L) | 8 | 1.0 | | 17.0 | | 5.0 | 6.2 | 5.3 | | |
| | Specific Conductance (µmhos/cm) | 8 | 71.1 | | 22342.9 | | 332.3 | 4757.1 | 8522.4 | | |
| | Hardness (mg/L) | 2 | 16.9 | | 2000.0 | | 1008.4 | 1008.4 | 1402.3 | | |
| | Alkalinity (mg/L) | 8 | 3.0 | | 63.0 | | 14.5 | 24.5 | 21.2 | | |
| | Monthly Stream Flow (cfs) | 6 | -362.9 | | 2914.4 | | 222.0 | 592.7 | 1254.6 | | |
| | Measured Stream Flow (cfs) | 6 | -362.9 | | 2914.4 | | 222.0 | 592.7 | 1254.6 | | |
| | **Chemical** | | | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 3.8 | C | 6.7 | | 6.3 | 5.9 | 1.0 | 1 | |
| | pH (SU) | 8 | 5.5 | C | 7.1 | | 6.0 | 6.2 | 0.6 | 2 | |
| | J Ammonia Nitrogen (mg/L) | 8 | < 0.024 | | 0.100 | | 0.050 | 0.049 | 0.033 | | |
| | J Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.015 | | 0.136 | | 0.072 | 0.075 | 0.038 | | |
| | J Total Kjeldahl Nitrogen (mg/L) | 8 | 0.190 | | 0.880 | | 0.670 | 0.610 | 0.224 | | |
| | J Total Nitrogen (mg/L) | 8 | 0.326 | | 0.895 | | 0.731 | 0.685 | 0.201 | | |
| | J Dis Reactive Phosphorus (mg/L) | 8 | < 0.003 | | 0.016 | | 0.005 | 0.006 | 0.005 | | |
| | Total Phosphorus (mg/L) | 8 | 0.032 | | 0.064 | | 0.042 | 0.042 | 0.010 | | |
| | J CBOD-5 (mg/L) | 8 | < 2.0 | < | 2.0 | | 1.0 | 1.0 | 0.0 | | |
| | J Chlorides (mg/L) | 8 | 21.0 | | 6400.0 | | 74.0 | 1471.6 | 2537.5 | | |
| | **Total Metals** | | | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | | | 0.250 | | | |
| | Iron (mg/L) | 1 | | | | | | 0.354 | | | |
| | J Manganese (mg/L) | 1 | | | | | | 0.109 | | | |
| | **Dissolved Metals** | | | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | | | < 0.106 | | | |
| | J Antimony (µg/L) | 2 | < 0.342 | | 0.388 | | 0.280 | 0.280 | 0.153 | | |
| | J Arsenic (µg/L) | 2 | 0.500 | | 4.430 | A | 2.465 | 2.465 | 2.779 | 1 | 1 |
| | J Cadmium (µg/L) | 2 | < 0.311 | < | 0.388 | | 0.175 | 0.175 | 0.027 | | |
| | J Chromium (µg/L) | 2 | 1.034 | | 1.360 | | 1.197 | 1.197 | 0.230 | | |
| | J Copper (µg/L) | 2 | 1.088 | | 29.700 | | 15.394 | 15.394 | 20.232 | | |
| | Iron (mg/L) | 1 | | | | | | 0.271 | | | |
| | J Lead (µg/L) | 2 | 0.426 | | 0.607 | S | 0.516 | 0.516 | 0.128 | 1 | |
| | J Manganese (mg/L) | 1 | | | | | | 0.108 | | | |
| | J Nickel (µg/L) | 2 | 0.837 | | 1.840 | | 1.338 | 1.338 | 0.709 | | |
| | J Selenium (µg/L) | 2 | < 0.395 | | 24.100 | A | 12.149 | 12.149 | 16.902 | 1 | |
| | Silver (µg/L) | 2 | < 0.365 | < | 6.970 | | 1.834 | 1.834 | 2.335 | | |
| | J Thallium (µg/L) | 2 | < 0.100 | < | 0.514 | | 0.154 | 0.154 | 0.146 | | |
| | J Zinc (µg/L) | 2 | 6.757 | | 48.200 | | 27.478 | 27.478 | 29.305 | | |
| | **Biological** | | | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 | < 1.00 | | 6.90 | | 0.50 | 1.48 | 2.25 | | |
| | J,L Enterococci (MPN/DL) | 8 | 10 | | 410 | | 18 | 109 | 177 | | |

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;
S= SF&W aquatic life use criterion exceeded.

| | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| CS-2 | **Physical** | | | | | | | |
| | Temperature (°C) | 8 | 19.0 | 31.0 C | 25.4 | 24.9 | 4.6 | 2 |
| | Turbidity (NTU) | 8 | 3.1 | 46.1 | 10.2 | 14.0 | 13.7 | |
| | Total Dissolved Solids (mg/L) | 8 | 191.0 | 17800.0 | 2200.0 | 5103.6 | 6669.4 | |
| | J Total Suspended Solids (mg/L) | 8 | 3.0 | 25.0 | 11.0 | 10.9 | 6.6 | |
| | Specific Conductance (µmhos/cm) | 8 | 347.1 | 24639.1 | 4443.6 | 8189.8 | 9571.9 | |
| | Hardness (mg/L) | 2 | 65.8 | 3050.0 | 1557.9 | 1557.9 | 2110.1 | |
| | Alkalinity (mg/L) | 8 | 12.0 | 87.0 | 50.5 | 52.0 | 26.6 | |
| | Monthly Stream Flow (cfs) | 7 | -2962.6 | 3760.6 | -28.9 | 210.8 | 2087.9 | |
| | Measured Stream Flow (cfs) | 7 | -2962.6 | 3760.6 | -28.9 | 210.8 | 2087.9 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 4.2 C | 9.6 | 6.6 | 6.7 | 1.8 | 1 |
| | pH (SU) | 8 | 6.3 | 7.5 | 7.1 | 7.1 | 0.4 | |
| | J Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.080 | 0.045 | 0.049 | 0.022 | |
| | J Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.023 | 0.389 | 0.072 | 0.118 | 0.117 | |
| | J Total Kjeldahl Nitrogen (mg/L) | 8 | 0.550 | 2.000 | 0.740 | 0.965 | 0.490 | |
| | J Total Nitrogen (mg/L) | 8 | 0.623 | 2.111 | 0.906 | 1.083 | 0.491 | |
| | J Dis Reactive Phosphorus (mg/L) | 8 < | 0.005 | 0.031 | 0.012 | 0.015 | 0.010 | |
| | J Total Phosphorus (mg/L) | 8 | 0.043 | 0.098 | 0.054 | 0.060 | 0.017 | |
| | J CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | |
| | Chlorides (mg/L) | 8 | 51.0 | 9700.0 | 1265.0 | 2783.9 | 3651.1 | |
| | **Total Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.202 | | |
| | J Iron (mg/L) | 1 | | | | 0.163 | | |
| | J Manganese (mg/L) | 1 | | | | 0.074 | | |
| | **Dissolved Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | |
| | J Antimony (µg/L) | 2 < | 0.342 | 0.410 | 0.290 | 0.290 | 0.169 | |
| | J Arsenic (µg/L) | 2 | 0.485 | 6.030 A | 3.258 | 3.258 | 3.921 | 2 |
| | J Cadmium (µg/L) | 2 < | 0.311 | < 0.388 | 0.175 | 0.175 | 0.027 | |
| | J Chromium (µg/L) | 2 | 0.790 | 1.971 | 1.380 | 1.380 | 0.835 | |
| | J Copper (µg/L) | 2 | 1.317 | 42.100 | 21.708 | 21.708 | 28.838 | |
| | J Iron (mg/L) | 1 | | | | 0.086 | | |
| | J Lead (µg/L) | 2 < | 0.428 | < 1.190 | 0.404 | 0.404 | 0.269 | |
| | J Manganese (mg/L) | 1 | | | | 0.073 | | |
| | J Nickel (µg/L) | 2 | 0.781 | 3.800 | 2.290 | 2.290 | 2.135 | |
| | J Selenium (µg/L) | 2 < | 0.395 | 31.400 A | 15.799 | 15.799 | 22.064 | 1 |
| | Silver (µg/L) | 2 < | 0.365 | < 6.970 | 1.834 | 1.834 | 2.335 | |
| | J Thallium (µg/L) | 2 < | 0.100 | < 0.514 | 0.154 | 0.154 | 0.146 | |
| | J Zinc (µg/L) | 2 | 4.588 | 50.800 | 27.694 | 27.694 | 32.677 | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 8.40 | 2.50 | 2.60 | 2.60 | |
| | J,L Enterococci (MPN/DL) | 8 | 10 | 60 | 5 | 13 | 19 | |

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

| | Parameter | N | Min | Max | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|
| MO-1A | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 13.8 | 32.8 C | 27.2 | 25.4 | 6.6 | 2 | |
| | Turbidity (NTU) | 8 | 8.5 | 72.6 | 14.6 | 22.2 | 21.2 | | |
| | Total Dissolved Solids (mg/L) | 8 | 103.0 | 3970.0 | 363.5 | 1256.6 | 1525.6 | | |
| | Total Suspended Solids (mg/L) | 8 | 8.0 | 86.0 | 10.0 | 22.8 | 26.6 | | |
| | Specific Conductance (µmhos/cm) | 8 | 74.4 | 4521.6 | 772.1 | 1660.4 | 1853.2 | | |
| | Hardness (mg/L) | 1 | | | | 56.4 | | | |
| J | Alkalinity (mg/L) | 8 | 41.0 | 76.0 | 50.0 | 55.5 | 13.3 | | |
| | Monthly Stream Flow (cfs) | 6 | 1447.7 | 43085.9 | 13077.9 | 16837.4 | 14281.0 | | |
| | Measured Stream Flow (cfs) | 6 | 1447.7 | 43085.9 | 13077.9 | 16837.4 | 14281.0 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 5.1 | 10.2 | 7.9 | 7.9 | 2.0 | | |
| | pH (SU) | 8 | 6.7 | 7.2 | 7.0 | 7.0 | 0.1 | | |
| J | Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.130 | 0.095 | 0.083 | 0.045 | | |
| J | Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.037 | 0.245 | 0.173 | 0.150 | 0.075 | | |
| J | Total Kjeldahl Nitrogen (mg/L) | 8 | 0.350 | 1.300 | 0.585 | 0.688 | 0.336 | | |
| J | Total Nitrogen (mg/L) | 8 < | 0.529 | 1.510 | 0.670 | 0.838 | 0.357 | | |
| J | Dis Reactive Phosphorus (mg/L) | 8 | 0.006 | 0.020 | 0.015 | 0.013 | 0.006 | | |
| J | Total Phosphorus (mg/L) | 8 | 0.049 | 0.158 | 0.062 | 0.073 | 0.036 | | |
| J | CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | | |
| | Chlorides (mg/L) | 8 | 6.8 | 2400.0 | 143.0 | 676.2 | 915.4 | | |
| | **Total Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.965 | | | |
| | Iron (mg/L) | 1 | | | | 0.922 | | | |
| J | Manganese (mg/L) | 1 | | | | 0.031 | | | |
| | **Dissolved Metals** | | | | | | | | |
| J | Aluminum (mg/L) | 1 | | | | 0.144 | | | |
| J | Antimony (µg/L) | 1 | | | | 0.079 | | | |
| J | Arsenic (µg/L) | 1 | | | | 0.637 A | | | 1 |
| | Cadmium (µg/L) | 1 | | | < | 0.097 | | | |
| J | Chromium (µg/L) | 1 | | | | 0.674 | | | |
| J | Copper (µg/L) | 1 | | | | 1.760 | | | |
| | Iron (mg/L) | 1 | | | | 0.257 | | | |
| | Lead (µg/L) | 1 | | | < | 0.297 | | | |
| | Manganese (mg/L) | 1 | | | < | 0.004 | | | |
| J | Nickel (µg/L) | 1 | | | | 0.744 | | | |
| | Selenium (µg/L) | 1 | | | < | 0.151 | | | |
| | Silver (µg/L) | 1 | | | < | 1.742 | | | |
| | Thallium (µg/L) | 1 | | | < | 0.025 | | | |
| J | Zinc (µg/L) | 1 | | | | 9.440 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 3.50 | 1.85 | 1.88 | 0.92 | | |
| J | Enterococci (MPN/DL) | 8 | 10 | 20 | 5 | 7 | 5 | | |

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

| Station | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| MO-2 | **Physical** | | | | | | | |
| | Temperature (°C) | 8 | 18.0 | 30.4 [C] | 26.3 | 25.6 | 4.4 | 1 |
| | Turbidity (NTU) | 8 | 4.5 | 44.1 | 10.2 | 13.5 | 13.0 | |
| | Total Dissolved Solids (mg/L) | 8 | 504.0 | 62700.0 | 14400.0 | 16306.8 | 20016.6 | |
| | Total Suspended Solids (mg/L) | 8 | 6.0 | 25.0 | 10.5 | 11.8 | 6.0 | |
| | Specific Conductance (µmhos/cm) | 8 | 896.8 | 28350.7 | 15974.1 | 14875.8 | 10261.4 | |
| | Hardness (mg/L) | 1 | | | | 568.0 | | |
| | Alkalinity (mg/L) | 8 | 26.0 | 97.0 | 70.5 | 68.8 | 26.5 | |
| | Monthly Stream Flow (cfs) | 7 | -24403.3 | 28838.8 | -5741.8 | 407.9 | 18373.0 | |
| | Measured Stream Flow (cfs) | 7 | -24403.3 | 28838.8 | -5741.8 | 407.9 | 18373.0 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 4.6 [C] | 8.0 | 6.4 | 6.1 | 1.3 | 1 |
| | pH (SU) | 8 | 6.9 | 7.8 | 7.5 | 7.4 | 0.3 | |
| | [J] Ammonia Nitrogen (mg/L) | 8 | 0.060 | 0.150 | 0.095 | 0.096 | 0.035 | |
| | [J] Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.030 | 0.196 | 0.090 | 0.110 | 0.066 | |
| | [J] Total Kjeldahl Nitrogen (mg/L) | 8 | 0.520 | 1.300 | 0.710 | 0.801 | 0.315 | |
| | [J] Total Nitrogen (mg/L) | 8 | 0.550 | 1.489 | 0.846 | 0.911 | 0.351 | |
| | [J] Dis Reactive Phosphorus (mg/L) | 8 | 0.009 | 0.034 | 0.024 | 0.021 | 0.009 | |
| | Total Phosphorus (mg/L) | 8 | 0.044 | 0.093 | 0.054 | 0.058 | 0.015 | |
| | [J] CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | |
| | Chlorides (mg/L) | 8 | 170.0 | 10000.0 | 5650.0 | 5361.2 | 4287.5 | |
| | **Total Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.813 | | |
| | Iron (mg/L) | 1 | | | | 0.848 | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.108 | | |
| | **Dissolved Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | |
| | [J] Antimony (µg/L) | 1 | | | | 0.185 | | |
| | [J] Arsenic (µg/L) | 1 | | | | 1.700 [A] | | 1 |
| | Cadmium (µg/L) | 1 | | | | < 0.097 | | |
| | [J] Chromium (µg/L) | 1 | | | | 0.777 | | |
| | Copper (µg/L) | 1 | | | | 5.900 | | |
| | [J] Iron (mg/L) | 1 | | | | 0.159 | | |
| | [J] Lead (µg/L) | 1 | | | | 0.376 | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.054 | | |
| | [J] Nickel (µg/L) | 1 | | | | 1.430 | | |
| | Selenium (µg/L) | 1 | | | | 6.240 [A] | | 1 |
| | Silver (µg/L) | 1 | | | | < 1.742 | | |
| | Thallium (µg/L) | 1 | | | | < 0.025 | | |
| | [J] Zinc (µg/L) | 1 | | | | 13.800 | | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 1.90 | 0.50 | 0.68 | 0.50 | |
| | [J] Enterococci (MPN/DL) | 8 | 10 | 30 | 5 | 11 | 9 | |

A=*S,F&W* aquatic life use criterion exceeded; C=*S,F&W* criterion violated;
E=# samples that exceeded criteria; J= estimate; N=# samples

| Station | Parameter | N | Min | Max | Med | Avg | SD | E |
|---|---|---|---|---|---|---|---|---|
| MOBM-1 | **Physical** | | | | | | | |
| | Temperature (°C) | 12 | 9.1 | 32.5 C | 21.8 | 21.3 | 7.9 | 2 |
| | Turbidity (NTU) | 12 | 10.2 | 51.1 | 18.3 | 24.9 | 15.0 | |
| | Total Dissolved Solids (mg/L) | 12 | 88.0 | 180.0 | 118.5 | 127.8 | 29.0 | |
| | Total Suspended Solids (mg/L) | 12 | 11.0 | 51.0 | 14.5 | 21.7 | 13.4 | |
| | Specific Conductance (µmhos/cm) | 12 | 56.3 | 329.9 | 166.4 | 189.3 | 83.3 | |
| | Hardness (mg/L) | 1 | | | | 53.1 | | |
| | J Alkalinity (mg/L) | 12 | 32.0 | 70.0 | 49.0 | 52.1 | 12.1 | |
| | Monthly Stream Flow (cfs) | 12 | -533.0 | 54100.0 | 23300.0 | 22269.8 | 16319.9 | |
| | Measured Stream Flow (cfs) | 12 | -533.0 | 54100.0 | 23300.0 | 22269.8 | 16319.9 | |
| | **Chemical** | | | | | | | |
| | Dissolved Oxygen (mg/L) | 12 | 5.7 | 12.1 | 7.9 | 8.4 | 1.8 | |
| | pH (SU) | 12 | 6.5 | 7.6 | 7.1 | 7.1 | 0.4 | |
| | J Ammonia Nitrogen (mg/L) | 12 | < 0.024 | 0.320 | 0.030 | 0.057 | 0.085 | |
| | J Nitrate+Nitrite Nitrogen (mg/L) | 12 | 0.044 | 0.291 | 0.152 | 0.153 | 0.075 | |
| | J Total Kjeldahl Nitrogen (mg/L) | 12 | 0.410 | 1.400 | 0.510 | 0.723 | 0.355 | |
| | J Total Nitrogen (mg/L) | 12 | 0.454 | 1.691 | 0.675 | 0.877 | 0.398 | |
| | J Dis Reactive Phosphorus (mg/L) | 11 | < 0.003 | 0.027 | 0.008 | 0.009 | 0.007 | |
| | J Total Phosphorus (mg/L) | 12 | 0.047 | 0.120 | 0.067 | 0.071 | 0.024 | |
| | J CBOD-5 (mg/L) | 12 | < 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | |
| | J Chlorides (mg/L) | 12 | 5.9 | 29.0 | 9.6 | 12.0 | 6.8 | |
| | **Total Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 1.200 | | |
| | Iron (mg/L) | 1 | | | | 1.300 | | |
| | J Manganese (mg/L) | 1 | | | | 0.045 | | |
| | **Dissolved Metals** | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.203 | | |
| | Iron (mg/L) | 1 | | | | 0.304 | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | |
| | **Biological** | | | | | | | |
| | Chlorophyll a (mg/m³) | 12 | < 1.00 | 3.50 | 1.35 | 1.49 | 1.07 | |
| | J,L Enterococci (MPN/DL) | 12 | 10 | 10 | 5 | 7 | 2 | |

C=*S,F&W* criterion violated; E=# samples that exceeded criteria;
J= estimate; L= estimate; N=# samples

| | Parameter | N | Min | Max | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|
| MOBM-6 | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 15.5 | 32.4 [C] | 26.0 | 24.9 | 6.3 | 2 | |
| | Turbidity (NTU) | 8 | 8.9 | 42.1 | 16.1 | 18.5 | 10.4 | | |
| | Total Dissolved Solids (mg/L) | 8 | 98.0 | 182.0 | 123.5 | 128.5 | 30.3 | | |
| | Total Suspended Solids (mg/L) | 8 | 9.0 | 35.0 | 16.0 | 17.1 | 8.3 | | |
| | Specific Conductance (µmhos/cm) | 8 | 132.8 | 311.6 | 201.0 | 206.5 | 68.1 | | |
| | Hardness (mg/L) | 1 | | | | 58.5 | | | |
| | [J] Alkalinity (mg/L) | 8 | 40.0 | 72.0 | 56.5 | 57.4 | 11.4 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 7.2 | 11.7 | 8.0 | 8.5 | 1.4 | | |
| | pH (SU) | 8 | 6.7 | 7.8 | 7.3 | 7.3 | 0.4 | | |
| | [J] Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.080 | 0.024 | 0.029 | 0.022 | | |
| | [J] Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.037 | 0.263 | 0.151 | 0.148 | 0.073 | | |
| | [J] Total Kjeldahl Nitrogen (mg/L) | 8 | 0.450 | 1.400 | 0.600 | 0.800 | 0.399 | | |
| | [J] Total Nitrogen (mg/L) | 8 < | 0.468 | 1.544 | 0.798 | 0.948 | 0.412 | | |
| | [J] Dis Reactive Phosphorus (mg/L) | 8 < | 0.003 | 0.019 | 0.002 | 0.006 | 0.007 | | |
| | [J] Total Phosphorus (mg/L) | 8 | 0.048 | 0.103 | 0.059 | 0.063 | 0.018 | | |
| | [J] CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | | |
| | [J] Chlorides (mg/L) | 8 | 5.9 | 19.0 | 10.0 | 10.8 | 5.0 | | |
| | **Total Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.537 | | | |
| | Iron (mg/L) | 1 | | | | 0.640 | | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.050 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | | |
| | [J] Antimony (µg/L) | 1 | | | | 0.091 | | | |
| | [J] Arsenic (µg/L) | 1 | | | | 0.820 [A] | | | 1 |
| | [J] Cadmium (µg/L) | 1 | | | | 0.121 | | | |
| | [J] Chromium (µg/L) | 1 | | | | 0.825 | | | |
| | [J] Copper (µg/L) | 1 | | | | 1.320 | | | |
| | [J] Iron (mg/L) | 1 | | | | 0.121 | | | |
| | [J] Lead (µg/L) | 1 | | | | 0.147 | | | |
| | Manganese (mg/L) | 1 | | | | 0.004 | | | |
| | [J] Nickel (µg/L) | 1 | | | | 0.746 | | | |
| | [J] Selenium (µg/L) | 1 | | | | 0.134 | | | |
| | [J] Silver (µg/L) | 1 | | | | 0.032 | | | |
| | Thallium (µg/L) | 1 | | | | < 0.025 | | | |
| | [J] Zinc (µg/L) | 1 | | | | 2.121 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 3.60 | 2.25 | 2.04 | 1.17 | | |
| | [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; J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedances

| | Parameter | N | Min | Max | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|
| TE-1 | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 17.7 | 32.7 [C] | 26.3 | 26.1 | 5.2 | 3 | |
| | Turbidity (NTU) | 8 | 10.1 | 53.3 | 16.5 | 19.9 | 14.1 | | |
| | Total Dissolved Solids (mg/L) | 8 | 91.0 | 1290.0 | 145.5 | 286.0 | 408.2 | | |
| | [J] Total Suspended Solids (mg/L) | 8 | 4.0 | 56.0 | 10.5 | 15.4 | 16.6 | | |
| | Specific Conductance (µmhos/cm) | 8 | 133.6 | 2313.0 | 200.6 | 464.7 | 756.6 | | |
| | Hardness (mg/L) | 1 | | | | 61.5 | | | |
| | Alkalinity (mg/L) | 8 | 44.0 | 82.0 | 56.5 | 59.0 | 13.4 | | |
| | Monthly Stream Flow (cfs) | 4 | -7974.6 | 75857.9 | 5072.0 | 19507.1 | 38677.9 | | |
| | Measured Stream Flow (cfs) | 4 | -7974.6 | 75857.9 | 5072.0 | 19507.1 | 38677.9 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 6.3 | 10.2 | 7.7 | 8.0 | 1.2 | | |
| | pH (SU) | 8 | 7.1 | 7.9 | 7.6 | 7.5 | 0.3 | | |
| | [J] Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.050 | 0.029 | 0.030 | 0.016 | | |
| | Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.006 | 0.191 | 0.094 | 0.094 | 0.080 | | |
| | [J] Total Kjeldahl Nitrogen (mg/L) | 8 | 0.360 | 1.400 | 0.665 | 0.728 | 0.346 | | |
| | [J] Total Nitrogen (mg/L) | 8 < | 0.393 | 1.586 | 0.802 | 0.822 | 0.391 | | |
| | [J] Dis Reactive Phosphorus (mg/L) | 8 < | 0.003 | 0.014 | 0.006 | 0.006 | 0.004 | | |
| | Total Phosphorus (mg/L) | 8 | 0.036 | 0.117 | 0.057 | 0.062 | 0.025 | | |
| | [J] CBOD-5 (mg/L) | 8 < | 2.0 | 2.3 | 1.0 | 1.2 | 0.5 | | |
| | [J] Chlorides (mg/L) | 8 | 5.7 | 670.0 | 17.4 | 102.1 | 230.1 | | |
| | **Total Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 0.472 | | | |
| | Iron (mg/L) | 1 | | | | 0.561 | | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.066 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | | |
| | [J] Antimony (µg/L) | 1 | | | | 0.097 | | | |
| | [J] Arsenic (µg/L) | 1 | | | | 0.888 [A] | | | 1 |
| | [J] Cadmium (µg/L) | 1 | | | | 0.122 | | | |
| | [J] Chromium (µg/L) | 1 | | | | 0.696 | | | |
| | [J] Copper (µg/L) | 1 | | | | 1.570 | | | |
| | Iron (mg/L) | 1 | | | | < 0.063 | | | |
| | Lead (µg/L) | 1 | | | | < 0.297 | | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | | |
| | [J] Nickel (µg/L) | 1 | | | | 0.683 | | | |
| | Selenium (µg/L) | 1 | | | | < 0.151 | | | |
| | Silver (µg/L) | 1 | | | | < 1.742 | | | |
| | Thallium (µg/L) | 1 | | | | < 0.025 | | | |
| | Zinc (µg/L) | 1 | | | | < 2.111 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 4.80 | 1.30 | 1.96 | 1.75 | | |
| | [J,L] Enterococci (MPN/DL) | 8 | 10 | 30 | 5 | 8 | 9 | | |

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 |
|---|---|---|---|---|---|---|---|---|---|
| TENB-2 | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 17.9 | 31.9 C | 26.2 | 25.9 | 5.0 | 2 | |
| | Turbidity (NTU) | 8 | 9.6 | 39.5 | 12.2 | 15.8 | 10.2 | | |
| | Total Dissolved Solids (mg/L) | 8 | 91.0 | 28700.0 | 459.5 | 3976.5 | 9997.4 | | |
| | Total Suspended Solids (mg/L) | 8 | 5.0 | 34.0 | 9.0 | 11.9 | 9.3 | | |
| | Specific Conductance (µmhos/cm) | 8 | 139.9 | 4379.9 | 684.8 | 1204.8 | 1462.2 | | |
| | Hardness (mg/L) | 1 | | | | 72.8 | | | |
| | Alkalinity (mg/L) | 8 | 43.0 | 70.0 | 56.0 | 56.2 | 9.9 | | |
| | Monthly Stream Flow (cfs) | 6 | -8442.1 | 74611.9 | 3139.0 | 16115.6 | 32330.2 | | |
| | Measured Stream Flow (cfs) | 6 | -8442.1 | 74611.9 | 3139.0 | 16115.6 | 32330.2 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 5.8 | 9.4 | 7.1 | 7.4 | 1.2 | | |
| | pH (SU) | 8 | 6.9 | 7.8 | 7.6 | 7.5 | 0.3 | | |
| | J Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.060 | 0.040 | 0.039 | 0.016 | | |
| | Nitrate+Nitrite Nitrogen (mg/L) | 8 < | 0.006 | 0.217 | 0.085 | 0.093 | 0.083 | | |
| | J Total Kjeldahl Nitrogen (mg/L) | 8 | 0.420 | 1.600 | 0.530 | 0.736 | 0.403 | | |
| | J Total Nitrogen (mg/L) | 8 < | 0.503 | 1.780 | 0.629 | 0.830 | 0.432 | | |
| | J Dis Reactive Phosphorus (mg/L) | 8 < | 0.005 | 0.014 | 0.008 | 0.008 | 0.004 | | |
| | Total Phosphorus (mg/L) | 8 | 0.034 | 0.099 | 0.052 | 0.057 | 0.020 | | |
| | J CBOD-5 (mg/L) | 8 < | 2.0 | < 2.0 | 1.0 | 1.0 | 0.0 | | |
| | Chlorides (mg/L) | 8 | 6.0 | 1500.0 | 150.0 | 336.7 | 508.2 | | |
| | **Total Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | 1.320 | | | |
| | Iron (mg/L) | 1 | | | | 1.270 | | | |
| | J Manganese (mg/L) | 1 | | | | 0.083 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | J Aluminum (mg/L) | 1 | | | | 0.178 | | | |
| | J Antimony (µg/L) | 1 | | | | 0.074 | | | |
| | J Arsenic (µg/L) | 1 | | | | 0.735 A | | | 1 |
| | Cadmium (µg/L) | 1 | | | | < 0.097 | | | |
| | J Chromium (µg/L) | 1 | | | | 0.628 | | | |
| | J Copper (µg/L) | 1 | | | | 1.800 | | | |
| | Iron (mg/L) | 1 | | | | 0.312 | | | |
| | J Lead (µg/L) | 1 | | | | 0.365 | | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | | |
| | J Nickel (µg/L) | 1 | | | | 0.889 | | | |
| | Selenium (µg/L) | 1 | | | | < 0.151 | | | |
| | Silver (µg/L) | 1 | | | | < 1.742 | | | |
| | Thallium (µg/L) | 1 | | | | < 0.025 | | | |
| | J Zinc (µg/L) | 1 | | | | 8.950 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 6.00 | 1.80 | 2.49 | 1.96 | | |
| | 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;
J= estimate; L= estimate; N=# samples; Q=number of samples that have uncertain exceedance

| | Parameter | N | Min | Max | Med | Avg | SD | E | Q |
|---|---|---|---|---|---|---|---|---|---|
| TENM-1 | **Physical** | | | | | | | | |
| | Temperature (°C) | 9 | 15.4 | 32.5 C | 23.6 | 24.4 | 6.0 | 2 | |
| | Turbidity (NTU) | 8 | 8.8 | 48.1 | 18.7 | 21.5 | 12.4 | | |
| | Total Dissolved Solids (mg/L) | 8 | 100.0 | 163.0 | 122.0 | 127.4 | 25.5 | | |
| | Total Suspended Solids (mg/L) | 8 | 11.0 | 44.0 | 16.5 | 20.9 | 11.6 | | |
| | Specific Conductance (µmhos/cm) | 9 | 129.0 | 276.9 | 174.4 | 199.0 | 65.1 | | |
| | Hardness (mg/L) | 1 | | | | 58.7 | | | |
| | J Alkalinity (mg/L) | 8 | 39.0 | 73.0 | 57.0 | 57.5 | 11.7 | | |
| | Monthly Stream Flow (cfs) | 7 | 3283.6 | 51670.5 | 10268.5 | 18201.3 | 16815.8 | | |
| | Measured Stream Flow (cfs) | 7 | 3283.6 | 51670.5 | 10268.5 | 18201.3 | 16815.8 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 9 | 6.4 | 10.7 | 8.2 | 8.2 | 1.3 | | |
| | pH (SU) | 9 | 6.6 | 7.7 | 7.1 | 7.2 | 0.4 | | |
| | J Ammonia Nitrogen (mg/L) | 8 < | 0.024 | 0.080 | 0.024 | 0.031 | 0.023 | | |
| | J Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.042 | 0.273 | 0.148 | 0.143 | 0.075 | | |
| | J Total Kjeldahl Nitrogen (mg/L) | 8 | 0.380 | 1.300 | 0.570 | 0.741 | 0.363 | | |
| | J Total Nitrogen (mg/L) | 8 | 0.492 | 1.448 | 0.730 | 0.884 | 0.376 | | |
| | J Dis Reactive Phosphorus (mg/L) | 8 < | 0.003 | 0.017 | 0.008 | 0.008 | 0.006 | | |
| | J Total Phosphorus (mg/L) | 8 | 0.045 | 0.111 | 0.062 | 0.068 | 0.022 | | |
| | J CBOD-5 (mg/L) | 8 < | 2.0 | 2.0 | 1.0 | 1.0 | 0.0 | | |
| | J Chlorides (mg/L) | 8 | 5.7 | 14.0 | 10.4 | 10.0 | 3.4 | | |
| | **Total Metals** | | | | | | | | |
| | J Aluminum (mg/L) | 1 | | | | 0.153 | | | |
| | Iron (mg/L) | 1 | | | | 0.362 | | | |
| | J Manganese (mg/L) | 1 | | | | 0.049 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | Aluminum (mg/L) | 1 | | | | < 0.106 | | | |
| | J Antimony (µg/L) | 1 | | | | 0.089 | | | |
| | J Arsenic (µg/L) | 1 | | | | 0.825 A | | | 1 |
| | J Cadmium (µg/L) | 1 | | | | 0.117 | | | |
| | J Chromium (µg/L) | 1 | | | | 0.696 | | | |
| | J Copper (µg/L) | 1 | | | | 1.370 | | | |
| | J Iron (mg/L) | 1 | | | | 0.106 | | | |
| | J Lead (µg/L) | 1 | | | | 0.175 | | | |
| | Manganese (mg/L) | 1 | | | | < 0.004 | | | |
| | J Nickel (µg/L) | 1 | | | | 0.753 | | | |
| | J Selenium (µg/L) | 1 | | | | 0.274 | | | |
| | Silver (µg/L) | 1 | | | | < 1.742 | | | |
| | J Thallium (µg/L) | 1 | | | | 0.025 | | | |
| | J Zinc (µg/L) | 1 | | | | 0.649 | | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 7 < | 1.00 | 2.10 | 1.60 | 1.26 | 0.73 | | |
| | J,L Enterococci (MPN/DL) | 8 | 10 | 10 | 5 | 6 | 2 | | |

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 |
|---|---|---|---|---|---|---|---|---|---|
| TM-1 | **Physical** | | | | | | | | |
| | Temperature (°C) | 8 | 19.7 | 31.0 [C] | 25.6 | 25.3 | 4.2 | 2 | |
| | Turbidity (NTU) | 8 | 4.7 | 20.5 | 6.9 | 8.4 | 5.1 | | |
| | Total Dissolved Solids (mg/L) | 8 | 230.0 | 11400.0 | 1580.0 | 3692.1 | 4429.8 | | |
| | [J] Total Suspended Solids (mg/L) | 8 | 4.0 | 17.0 | 8.5 | 9.1 | 3.9 | | |
| | Specific Conductance (µmhos/cm) | 8 | 375.9 | 22947.8 | 2842.2 | 7729.5 | 9499.2 | | |
| | Hardness (mg/L) | 2 | 75.9 | 1805.0 | 940.4 | 940.4 | 1222.6 | | |
| | Alkalinity (mg/L) | 8 | 36.0 | 84.0 | 58.0 | 58.5 | 16.4 | | |
| | Monthly Stream Flow (cfs) | 7 | -282.2 | 371.4 | 15.5 | 39.4 | 246.7 | | |
| | Measured Stream Flow (cfs) | 7 | -282.2 | 371.4 | 15.5 | 39.4 | 246.7 | | |
| | **Chemical** | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 8 | 3.2 | 10.8 | 5.2 | 6.0 | 2.6 | | |
| | pH (SU) | 8 | 6.4 | 7.5 | 6.8 | 7.0 | 0.4 | | |
| | [J] Ammonia Nitrogen (mg/L) | 8 | 0.060 | 1.200 | 0.270 | 0.345 | 0.363 | | |
| | [J] Nitrate+Nitrite Nitrogen (mg/L) | 8 | 0.521 | 2.100 | 1.335 | 1.315 | 0.534 | | |
| | Total Kjeldahl Nitrogen (mg/L) | 8 | 0.930 | 2.100 | 1.250 | 1.379 | 0.398 | | |
| | [J] Total Nitrogen (mg/L) | 8 | 1.782 | 4.200 | 2.485 | 2.694 | 0.834 | | |
| | Dis Reactive Phosphorus (mg/L) | 8 | 0.120 | 0.383 | 0.220 | 0.232 | 0.087 | | |
| | Total Phosphorus (mg/L) | 8 | 0.193 | 0.500 | 0.336 | 0.347 | 0.109 | | |
| | [J] CBOD-5 (mg/L) | 8 < | 2.0 | 3.9 | 1.0 | 1.8 | 1.2 | | |
| | Chlorides (mg/L) | 8 | 77.0 | 6300.0 | 855.0 | 2023.4 | 2512.5 | | |
| | **Total Metals** | | | | | | | | |
| | [J] Aluminum (mg/L) | 1 | | | | 0.270 | | | |
| | Iron (mg/L) | 1 | | | | 0.327 | | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.112 | | | |
| | **Dissolved Metals** | | | | | | | | |
| | [J] Aluminum (mg/L) | 1 | | | | 0.158 | | | |
| | [J] Antimony (µg/L) | 2 | 0.126 | 0.352 | 0.239 | 0.239 | 0.160 | | |
| | [J] Arsenic (µg/L) | 2 | 1.588 | 3.210 [A] | 2.399 | 2.399 | 1.147 | | 2 |
| | [J] Cadmium (µg/L) | 2 < | 0.311 | < 0.388 | 0.175 | 0.175 | 0.027 | | |
| | [J] Chromium (µg/L) | 2 | 0.886 | 1.210 | 1.048 | 1.048 | 0.229 | | |
| | [J] Copper (µg/L) | 2 | 1.988 | 26.800 | 14.394 | 14.394 | 17.545 | | |
| | Iron (mg/L) | 1 | | | | 0.247 | | | |
| | [J] Lead (µg/L) | 2 < | 1.037 | 1.190 | 0.816 | 0.816 | 0.312 | | |
| | [J] Manganese (mg/L) | 1 | | | | 0.112 | | | |
| | [J] Nickel (µg/L) | 2 | 0.991 | 3.080 | 2.036 | 2.036 | 1.477 | | |
| | [J] Selenium (µg/L) | 2 < | 0.395 | 15.300 [A] | 7.749 | 7.749 | 10.679 | | 1 |
| | Silver (µg/L) | 2 < | 0.365 | < 6.970 | 1.834 | 1.834 | 2.335 | | |
| | [J] Thallium (µg/L) | 2 < | 0.100 | < 0.514 | 0.154 | 0.154 | 0.146 | | |
| | [J] Zinc (µg/L) | 2 | 9.602 | 57.200 | 33.401 | 33.401 | 33.657 | | |
| | **Biological** | | | | | | | | |
| | Chlorophyll a (mg/m³) | 8 < | 1.00 | 11.00 | 2.40 | 4.21 | 4.32 | | |
| | [J,L] Enterococci (MPN/DL) | 8 | 10 | 1200 | 55 | 209 | 408 | | |

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