St. Martins Marsh and Big Bend Seagrasses Aquatic Preserves (SMMAP & BBSAP)

**Water Quality Metadata Report**

January – December 2016  
Latest Update: 04/09/2019

Note: This is a provisional metadata document; it has not been authenticated as of its download date. Contents of this document are subject to change throughout the QAQC process and it should not be considered a final record of data documentation until that process is complete. Contact the Florida Coastal Office ([Timothy.W.Jones@dep.state.fl.us](mailto:Timothy.W.Jones@dep.state.fl.us)) or the Aquatic Preserve office with any additional questions.

**I. Data Set and Research Descriptors**

1. **Principal investigator & contact persons:**

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1. **Entry verification:**

Data from each deployment are uploaded from the YSI data sonde to a PC, and graphs are produced using EcoWatch software Version 3.18. These graphs are examined for suspect data that, for example, might derive from probe failure. Notes are made of any abnormal data, and sensors are reconditioned as necessary. The files are subsequently exported from EcoWatch in a comma-delimited format (.csv) and opened in Microsoft Excel for processing. Two copies of this file are saved in the .csv format; one file is used to archive the raw data, while the second file is edited to adjust all records to Eastern Standard Time (as needed), to adjust the time as needed to read exactly at the top or bottom of the hour (e.g., 00:00:00), to remove headers and footers, and to delete data at the beginning and end of each deployment when the sondes were out of the water. These latter data are identified by field notes that document the times in and out of the water, together with depth and conductivity values near zero.

Using the edited .csv files, monthly data are compiled and processed by various macros created by the National Estuarine Research Reserve’s Central Data Management Office (CDMO). These macros are designed to: 1) check data files for missing data points, 2) fill all cells that do not contain data with periods (.), 3) convert the data columns to appropriate formats for time, date and numeric variables, 4) find all data that are out of acceptable range for the sensors, 5) save the files as Excel worksheets (\*.xls), and 6) generate single parameter monthly graphs.

Anomalous data are evaluated to determine if the suspect data should be rejected. Data are flagged if the values are: 1) outside the range expected for the site, or 2) outside the range of measurements established for the sensors (see Table 1). Data outside the "normal" range of water quality parameters for a particular site were investigated for validity based on field observations, QC checks, PC6000 printouts, and instrument diagnostics. Data are rejected if the anomalies are attributed to sensor malfunction. In addition to observations of any physical damage (e.g., a torn DO probe membrane), sensor malfunctions are detected if the voltage reading of the probe is outside the range established for the sensor or the sensor will not calibrate. Jonathan Brucker and Jamie Letendre are responsible for these tasks.

Beginning in July 2018, data underwent a two-step (primary and secondary) Quality Assurance/Quality Control (QA/QC) procedure as outlined in the NERRS CDMO Data Management Manual Version 6.6 (<http://cdmo.baruch.sc.edu/request-manuals/>).

The primary QA/QC process was performed by the CDMO and involved inserting flag columns into the data files for each water quality parameter, creating a flag record column, and creating an automated process that applied standardized flags to data if the values were outside sensor specifications as determined by YSI, the instrument manufacturer. Yearly data files that completed the primary QA/QC process were returned to FCO staff for secondary QA/QC. Data were evaluated, and standardized flags and codes were applied to individual data points by insertion into the flag columns using the CDMO’s NERRQAQC Excel macro to provide further documentation of the data. Data files were then returned to the CDMO for ingestion into the Florida Aquatic Preserves database as provisional data. For more information on QA/QC flags and codes, see Sections 11 and 12.

1. **Research objectives:**

Water quality monitoring using YSI dataloggers began within the SMMAP and BBSAP in early 2004. Currently, four stations exist where YSI 6600 EDS data sondes have been deployed to continuously monitor selected abiotic parameters at 15-min intervals. In addition to these four sites, four stations equipped with YSI 600 OMS data sondes are also monitoring selected abiotic parameters at 15-min intervals. Historically, all data was recorded at 30-min intervals. The positions of these stations allow for comparisons between relatively pristine versus more urbanized drainage basins as well as higher versus lower salinity regions of the estuary (see “Station Descriptions” under “Site Location and Character”). The objective of this effort is to quantify the spatial/temporal variability and trends, both seasonally and as a function of tidal forcing, of selected abiotic parameters (e.g. establish baseline data) within the Preserves.

1. **Research methods:**

YSI 600 OMS data sondes have been continuously operated (data collection interval: 30 minutes) at the Crystal River site since January 2004, at the Bennett Creek, Kings Bay, and Homosassa River monitoring stations since February 2004, and at the Withlacoochee monitoring station since March 2004. YSI 6600 EDS data sondes were operated at Cat Island and Lone Cabbage Key beginning in March 2004, and at Seahorse Key and Gomez Rocks beginning in April 2004. These models incorporate a specially designed wiper apparatus attached to the turbidity probe that reduces the oxygen and pH sensor fouling and thereby improves the quality of data collected. At each site, the sonde is contained within a 10 cm (inside diameter) housing pipe mounted vertically on a piling. To facilitate water flow across the sensors, several 2 cm diameter holes were drilled into the submerged portion of the pipe. Hole density is greatest near the base where the sonde sensors are located. In early 2005, the Cat Island and Lone Cabbage Key sites were removed. During most of 2005 and early 2006, data was sporadically collected at all sites due to a lack of staff.

As of March 2006, all YSI 600 OMS sites were operational. In July 2006, the Gomez Rocks site was removed, and in August 2006, the Seahorse Key station became operational. In October 2006, the YSI 600 OMS was replaced with an YSI 6600 EDS sonde at the Kings Bay station. In March 2007, a 6600 EDS station was established in Dekle Beach. In early 2009, the data collection interval was changed to 15 minutes at all locations. In March 2009, an additional 6600 EDS station was installed at the mouth of the Suwannee River. In March 2010, the Kings Bay station was relocated due to the removal/replacement of the piling the sonde was previously located at. In February 2012, all four YSI 6600 EDS sondes were ungraded from rapid pulse dissolved oxygen probes, to ROX optical dissolved oxygen probes. At this time, additional 6600 sites are being determined and planned.

Data recorded on the 600’s are downloaded on-site at approximately two to four week intervals. The sondes are inspected for damage and fouling, and if no maintenance is required, the sondes are cleaned, reactivated, and returned to the water. The 600’s are retrieved and returned to the laboratory for cleaning, calibration, and any additional maintenance throughout the year as needed.

Sonde exchanges at the 6600 EDS sites are made at approximately two to four week intervals. At the end of a sampling period, sondes are returned to the laboratory where post-deployment readings and reconditioning take place in accordance with the methods outlined in the YSI Operating and Service Manual. The EDS turbidity wiper brush is removed and replaced with a clean wiper to avoid contamination of standards during post-deployment procedures. After a superficial rinse of the sonde in tap water, post deployment readings are recorded for pH (Fisher 7.00 buffer solution) and specific conductivity (Exaxol 50.00 mS/cm standard); a post-deployment turbidity reading in 0.0 NTU standard (DI water) is recorded after a more thorough rinse of the turbidity sensor. The results of these post-deployment readings are used to evaluate the validity of data (See Tables 3, 4, and 5).

1. **Site location and character:**

The St. Martins Marsh Aquatic Preserve (SMMAP) was established on October 21, 1969. SMMAP covers open water areas from the Crystal River to the Homosassa River in coastal Citrus County. It is composed of open water, several inlet bays, tidal rivers and creeks, salt marsh, and adjoins upland hammock islands. Nutrient exchange between the marshes and the Gulf of Mexico makes the salt marsh a significant area of primary production and a nursery ground for commercial and recreational fish species. St. Martins Marsh Aquatic Preserve’s freshwater tributaries includes two 1st magnitude spring fed rivers; the Homosassa River to the south and Crystal River to the north. Spring discharge does not fluctuate dramatically from season to season allowing a constant flow of freshwater into SMMSP’s productive and well-balanced estuary. The vast coastal salt marshes, mud flats, oyster bars, mangrove islands, and seagrass beds of the area are the southern terminus for migratory waterfowl of the Atlantic and Mississippi flyways. SMMAP provides stopover and wintering areas for many migratory species. The Springs Coast is characterized by unique limestone outcroppings and exposed karstic features. Habitats associated with these areas are hard-bottom sponge and coral communities, as well as Sargassum meadows.

The Big Bend Seagrasses Aquatic Preserve (BBSAP) was established in 1985. Its boundaries extend from the Withlacoochee River northward to the St. Marks River and extends out nine nautical miles. The preserve boundary encompasses all tidal lands, islands, seagrass beds, shallow banks, and submerged bottoms from the mean high water line to nine miles into the Gulf of Mexico. Landward, it includes all natural waterways tidally connected to the preserve to the extent of state jurisdiction. Spanning over 945,000 acres, BBSAP is the largest aquatic preserve and one of the most pristine places in Florida. The Big Bend Seagrasses Aquatic Preserve consists mainly of a large, remote, and undeveloped expanse of submerged seagrasses and nearshore marshlands located along some 150 miles of the northeast coast of the Gulf of Mexico where the Florida peninsula joins the panhandle. Numerous estuaries, which nurture a diverse flora and fauna, are formed at the confluence of the many rivers and streams that flow into the preserve. Open waters and submerged bay bottoms of these estuaries provide habitat to a wide variety of sea and shore birds, including a large nesting colony of frigate birds on Seahorse Key. This region supports a very important commercial shellfish industry including Cedar Key clams, scallops, oysters, pink shrimp, and blue crab; this area of Florida is a popular destination for the recreational scallop season. The Suwannee River region supports Essential Fish Habitat (EFH) and the most viable population of the threatened gulf sturgeon. Big Bend’s vast seagrass beds with mud and sand substrates are important marine habitats to this species.

Station Descriptions:

**Table 1: Station Descriptions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Site Name** | **Identification Code** | **Latitude and Longitude** | **Site Description** |
| Bennett Creek | BC | N29 01.078  W82 43.621 | Sand/rock bottom, near residential development |
| Crystal River | CR | N28 55.502 W82 41.227 | Sand/mud bottom, adjacent to oyster bars, near mouth of river |
| Homosassa River | HS | N28 46.224 W82 41.783 | Sand/mud/rock bottom, near mouth of river |
| Kings Bay | KB | N28 53.0  W82 35.986 | Sand/rock bottom, near residential developments, high tourism activity |
| Suwannee River | SW | N29 17.269  W83 09.965 | Mud bottom, at the mouth of the West Pass of the Suwannee River |
| Withlacoochee River | WT | N29 00.063 W82 45.422 | Sand/rock bottom, near mouth of river |

1. **Data collection period:**

Individual sonde deployment and retrieval dates and times for 2015 data are as follows:

BEGAN ENDED

Bennett Creek Site

12/17/15, 11:00:00 03/01/16, 09:00:00\*\*

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05/05/16, 11:00:00 05/25/16, 08:45:00

05/25/16, 09:00:00 06/24/16, 10:00:00\*

06/24/16, 10:30:00 07/22/16, 12:00:00\*\*\*

Crystal River Site

06/09/16, 10:45:00 06/23/16, 12:15:00

06/23/16, 12:30:00 07/11/16, 08:15:00

07/11/16, 08:30:00 08/15/16, 12:15:00\*\*\*

Homosassa River Site

04/05/16, 10:45:00 05/02/16, 13:00:00

05/02/16, 13:15:00 06/02/16, 12:00:00

06/02/16, 12:15:00 07/01/16, 08:00:00\*

07/01/16, 08:15:00 07/12/16, 08:45:00\*\*\*

Kings Bay Site

07/14/16, 11:30:00 07/22/16, 08:15:00\*\*\*

Suwannee River Site

02/18/16, 13:30:00 04/20/16, 10:00:00\*

04/20/16, 10:15:00 05/26/16, 09:30:00\*

05/26/16, 10:00:00 06/27/16, 09:45:00\*

06/27/16, 10:15:00 07/27/16, 13:15:00\*\*\*

Withlacoochee Site

05/25/16, 08:30:00 06/24/16, 09:45:00\*\*

\* indicates short term loss of data due to battery failure, out of water for maintenance, weather related causes, and/or other internal problems that occurred during deployment.

\*\* indicates long term loss of data due to sonde removal from field for long term repairs.

\*\*\*Site decommissioned.

1. **Distribution:**

The Principle Investigator (PI) retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and Aquatic Preserve (AP) site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. Water quality data and metadata can be obtained from the PI (see section 1).

1. **Associated researchers and projects:**

The SMMAP and BBSAP have formed partnerships with other agencies and organizations actively involved in resource protection in the preserves’ watershed. Cooperating managers of lands within the AP’s include the: 1) National Park Service (NPS), 2) Suwannee River Water Management District (SRWMD), 3) Southwest Florida Water Management District (SWFWMD), 4) Department of Environmental Protection (DEP) Division of Recreation and Parks/Florida Park Service (FPS), 5) United States Fish and Wildlife Service (USFWS), 6) DEP Aquatic Preserve Program, 7) Florida Fish and Wildlife Conservation Commission (FWC), 8) Florida Forest Service (FFS), and 9) Citrus, Taylor, Jefferson, Dixie, Levy, and Wakulla Counties.

Other water quality research and monitoring initiatives within the Aquatic Preserves include: 1) Project COAST in conjunction with the laboratory of Dr. Thomas Frazer at the University of Florida [This work includes water quality, light penetration (PAR), and nutrient analyses.] 2) Nutrient sampling partnership with Division of Environmental Assessment and Restoration (DEAR) in BBSAP.

**II. Physical Structure Descriptors**

1. **Sensor specifications**:

### Table 2. YSI 6600 EDS data sonde

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Thermistor

Model #: 6560

Range: -5 to 45 °C

Accuracy: +/-0.15 °C

Resolution: 0.01 °C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: 4-electrode cell with autoranging

Model #: 6560

Range: 0 to 100 mS/cm

Accuracy: +/-0.5% of reading + 0.001 mS/cm

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependent)

Parameter: Salinity

Units: parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: +/- 1.0% of reading or 0.1 ppt, whichever is greater

Resolution: 0.01 ppt

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 6150 ROX

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading

Resolution: 0.1% air saturation

Units: milligrams/Liter (mg/L)

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 6150 ROX

Range: 0 to 50 mg/L

Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater

20 to 50 mg/L: +/- 15% of the reading

Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (Depth)

Units: feet or meters (ft or m)

Sensor Type: Stainless steel strain gauge

Range: 0 to 30 ft (9.1 m)

Accuracy: +/- 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

Parameter: pH (specify whether EDS probe or not)

Units: units

Sensor Type: Glass combination electrode

Model #: 6561

Range: 0 to 14 units

Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity

Units: nephelometric turbidity units (NTU)

Sensor Type: Optical, 90 ° scatter, with mechanical cleaning

Model #: 6136

Range: 0 to 1000 NTU

Accuracy: +/- 5 % reading or 2 NTU (whichever is greater)

Resolution: 0.1 NTU

Dissolved Oxygen Qualifier: The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Many Aquatic Preserves have upgraded to YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data (e.g., periodicity analysis). It should be noted that the amount of fouling is site specific and that not all data are affected. The Principal Investigator at should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

Depth Qualifier: The water quality monitoring program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. Standard calibration protocols for the non-vented sensor use the atmosphere pressure at the time of calibration. Therefore, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1millibar change in atmospheric pressure. This error is eliminated for level sensors because they are vented to the atmosphere throughout the deployment time interval. If proper atmospheric pressure data is available, non-vented sensor depth measurements can be corrected for deployments between calibrations. Readings for both vented and non-vented sensors are automatically compensated for water density changes due to variations in temperature and salinity. The Principal Investigator should be contacted in order to obtain information regarding atmospheric pressure data availability. All data sondes used at all 6600 sites in 2006 were non-vented models.

Salinity Units Qualifier: 6600 series sondes report salinity in parts per thousand (ppt) units and the EXO sondes report in practical salinity units (psu). These units are essentially the same and for the AP water quality program purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the AP program will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier: 6600 series sondes report turbidity in nephelometric turbidity units (NTU) and the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for AP water quality program purposes they will be considered equivalent. Moving forward, the AP program will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

1. **Coded variable definitions:**

BC = Bennett Creek; CR = Crystal River; HS = Homosassa River; KB = Kings Bay; SW = Suwannee River; WT = Withlacoochee.

1. **QAQC flag definitions:**

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter’s associated flag column (header preceded by an F\_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range

-4 Outside Low Sensor Range

-3 Data Rejected due to QAQC

-2 Missing Data

-1 Optional SWMP Supported Parameter

0 Data Passed Initial QAQC Checks

1 Suspect Data

2 *Open - reserved for later flag*

3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure

4 Historical Data: Pre-Auto QAQC

5 Corrected Data

1. **QAQC code definitions:**

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an \* below) can be applied to the entire record in the F\_Record column.

General Errors

GIC No instrument deployed due to ice

GIM Instrument malfunction

GIT Instrument recording error; recovered telemetry data

GMC No instrument deployed due to maintenance/calibration

GNF Deployment tube clogged / no flow

GOW Out of water event

GPF Power failure / low battery

GQR Data rejected due to QA/QC checks

GSM See metadata

Corrected Depth/Level Data Codes

GCC Calculated with data that were corrected during QA/QC

GCM Calculated value could not be determined due to missing data

GCR Calculated value could not be determined due to rejected data

GCS Calculated value suspect due to questionable data

GCU Calculated value could not be determined due to unavailable data

Sensor Errors

SBO Blocked optic

SCF Conductivity sensor failure

SCS Chlorophyll spike

SDF Depth port frozen

SDG Suspect due to sensor diagnostics

SDO DO suspect

SDP DO membrane puncture

SIC Incorrect calibration / contaminated standard

SNV Negative value

SOW Sensor out of water

SPC Post calibration out of range

SQR Data rejected due to QAQC checks

SSD Sensor drift

SSM Sensor malfunction

SSR Sensor removed / not deployed

STF Catastrophic temperature sensor failure

STS Turbidity spike

SWM Wiper malfunction / loss

Comments

CAB\* Algal bloom

CAF Acceptable calibration/accuracy error of sensor

CAP Depth sensor in water, affected by atmospheric pressure

CBF Biofouling

CCU Cause unknown

CDA\* DO hypoxia (<3 mg/L)

CDB\* Disturbed bottom

CDF Data appear to fit conditions

CFK\* Fish kill

CIP\* Surface ice present at sample station

CLT\* Low tide

CMC\* In field maintenance/cleaning

CMD\* Mud in probe guard

CND New deployment begins

CRE\* Significant rain event

CSM\* See metadata

CTS Turbidity spike

CVT\* Possible vandalism/tampering

CWD\* Data collected at wrong depth

CWE\* Significant weather event

1. **Post deployment information:**

Post-deployment calibration values for 2016 are as follows:

**Table 2. Post-deployment readings of 6600 EDS sondes deployed at the Crystal River site** **during 2016.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **pH** | **SpCond (mS/cm)** | **DO %** | **Turbidity (NTU)** | **Depth (m)** |
| **Date/Std.** | **7.00** | **50.00** | **100.0** | **0.0** | **n/a** |
| 06/09/2016 | 6.82 | 49.20 | 100.6, 100.8 | -0.9 | 0.085 |
| 06/23/2016 | 7.19 | 48.36 | 100.2, 103.1 | 0.4 | 0.082 |
| 07/11/2016 | N/A | N/A | 100.0, 100.2 | N/A | N/A |
| 08/04/2016 | N/A | N/A | N/A | N/A | N/A |

**Table 3. Post-deployment readings of 6600 EDS sondes deployed at the Homosassa site**

**during 2016.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **pH** | **SpCond (mS/cm)** | **DO %** | **Turbidity (NTU)** | **Depth (m)** |
| **Date/Std.** | **7.00** | **50.00** | **100.0** | **0.0** | **n/a** |
| 04/05/2016 | 7.15 | 49.58 | 97.7, 97.8 | 0.8 | 0.090 |
| 05/02/2016 | 7.16 | 49.11 | 100.9, 100.9 | 2.2 | 0.043 |
| 06/02/2016 | 8.59 | 48.71 | 101.9, 100.4 | -1.2 | 0.105 |
| 07/01/2016 | 6.83 | 51.31 | 98.8, 98.4 | -0.3 | 0.085 |
| 07/12/2016 | 7.02 | 50.56 | N/A | -0.9 | 0.103 |
| 08/10/2016 | N/A | N/A | N/A | N/A | N/A |
| 11/03/2016 | 6.99 | 50.68 | N/A | -0.2 | 0.075 |
| 11/17/2016 | 7.05 | 48.72 | N/A | 0.2 | 0.053 |
| 12/15/2016 | 6.90 | 50.81 | N/A | 0.2 | 0.128 |

**Table 4. Post-deployment readings of 6600 EDS sondes deployed at the Suwannee River site** **during 2016.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **pH** | **SpCond (mS/cm)** | **DO %** | **Turbidity (NTU)** | **Depth (m)** |
| **Date/Std.** | **7.00** | **50.00** | **100.0** | **0.0** | **n/a** |
| 02/18/2016 | 7.19 | 49.87 | 86.3, 86.1 | 0.1 | 0.101 |
| 04/20/2016 | 7.13 | 49.26 | 103.6, 101.3 | N/A | 0.064 |
| 05/26/2016 | 6.98 | 50.77 | 101.3, 101.1 | 1.1 | N/A |
| 06/27/2016 | 7.06 | 50.45 | 99.7, 99.9 | -0.4 | 0.076 |
| 07/27/2016 | 6.94 | 50.94 | N/A | -1.0 | 0.273 |
| 09/21/2016 | 6.57 | 49.96 | N/A | -0.1 | 0.141 |
| 10/26/2016 | N/A | N/A | N/A | N/A | N/A |

Note: N/A indicates values are unavailable.

1. **Other remarks/notes:**
2. Calibration of DO was performed on the day of deployment. Two DO values are   
   recorded during the post-calibration process.
3. This style of metadata was modeled after the National Estuarine Research Reserve   
   program; more specifically, reports created at the Guana Tolomato Matanzas National   
   Estuarine Research Reserve.
4. Copies of calibration/deployment logs can be obtained through the Principal Investigator

**Missing Data**

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Principal Investigator.

**January 1-31, 2016**

**CR**

1. No data. Site not active.

**HS**

1. No data. Site not active.

**KB**

1. No data. Site not active.

**SW**

1. No data. Site not active.

**February 1-28, 2016**

**BC**

1. Missing data 02/26/16 21:00:00 – 02/28/16 23:45:00; battery failure.

**CR**

1. No data. Site not active.

**HS**

1. No data. Site not active.

**KB**

1. No data. Site not active.

**SW**

1. Missing data 02/01/16 00:00:00 – 02/18/16 13:15:00; site not active due to insufficient staff. Site reestablished 02/18/16 13:30:00.

**March 1-31, 2016**

**BC**

1. Site decommissioned 03/01/16; insufficient staff.

**CR**

1. No data. Site not active.

**HS**

1. No data. Site not active.

**KB**

1. No data. Site not active.

**WT**

1. Missing data 03/25/16 04:30:00 – 04:45:00, 5:15:00 – 14:15:00, 14:45:00 – 03/31/16 23:45:00; battery failure.

**April 1-30, 2016**

**BC**

1. No data. Site not active.

**CR**

1. No data. Site not active.

**HS**

1. Missing data 04/01/16 00:00:00 – 04/05/16 10:30:00; site not active due to insufficient staff. Site reestablished 04/05/16 10:45:00.

**KB**

1. No data. Site not active.

**SW**

1. Missing data 04/03/16 22:45:00 – 04/20/16 07:00:00; battery failure.

**WT**

1. Site decommissioned 04/01/16; insufficient staff.

**May 1-31, 2016**

**BC**

1. Missing data 05/01/16 00:00:00 – 05/05/16 10:45:00; site not active due to insufficient staff. Site reestablished 05/05/16 11:00:00.

**CR**

1. No data. Site not active.

**KB**

1. No data. Site not active.

**SW**

1. Missing data 05/26/16 09:45:00; associated with sonde exchange.

**WT**

1. No data 05/01/16 00:00:00 – 05/25/16 08:15:00; site not active. Site reestablished 05/25/16 08:30:00.

**June 1-30, 2016**

**BC**

1. Missing data 06/24/16 10:15:00; associated with data download.

**CR**

1. No data 06/01/16 00:00:00 – 06/09/16 10:30:00; site not active. Site reestablished 06/09/16 10:45:00.

**HS**

1. Missing data 06/28/16 19:15:00 – 06/30/16 23:45:00; battery failure.

**KB**

1. No data. Site not active.

**SW**

1. Missing data 06/27/16 10:00:00; associated with sonde exchange.

**WT**

1. Missing data 06/24/16 09:45:00 – 06/30/16 23:45:00; site decommissioned permanently.

**July 1-31, 2016**

**BC**

1. Missing data 07/22/16 12:15:00 – 07/31/16 23:45:00; site decommissioned permanently.

**HS**

1. Missing data 07/01/16 00:00:00 – 08:00:00; battery failure.
2. Missing data 07/12/16 09:00:00 – 07/31/16 23:45:00; site decommissioned permanently.

**KB**

1. No data 07/01/16 00:00:00 – 07/14/16 08:30:00. Site not active.
2. Missing data 07/22/16 08:30:00 – 07/31/16 23:45:00; site decommissioned permanently.

**SW**

1. Missing data 07/27/16 13:30:00 – 07/31/16 23:45:00; site decommissioned permanently.

**WT**

1. No data. Site permanently removed.

**August 1-31, 2016**

**BC**

1. No data. Site permanently removed.

**CR**

1. Missing data 08/05/16 06:45:00 – 08/15/16 12:15:00; battery failure.
2. Missing data 08/15/16 12:15:00 – 08/31/16 23:45:00; site decommissioned permanently.

**HS**

1. No data. Site permanently removed.

**KB**

1. No data. Site permanently removed.

**SW**

1. No data. Site permanently removed.

**WT**

1. No data. Site permanently removed.

**September 1-30, 2016**

**BC**

1. No data. Site permanently removed.

**CR**

1. No data. Site permanently removed.

**HS**

1. No data. Site permanently removed.

**KB**

1. No data. Site permanently removed.

**SW**

1. No data. Site permanently removed.

**WT**

1. No data. Site permanently removed.

**October 1-31, 2016**

**BC**

1. No data. Site permanently removed.

**CR**

1. No data. Site permanently removed.

**HS**

1. No data. Site permanently removed.

**KB**

1. No data. Site permanently removed.

**SW**

1. No data. Site permanently removed.

**WT**

1. No data. Site permanently removed.

**November 1-30, 2016**

**BC**

1. No data. Site permanently removed.

**CR**

1. No data. Site permanently removed.

**HS**

1. No data. Site permanently removed.

**KB**

1. No data. Site permanently removed.

**SW**

1. No data. Site permanently removed.

**WT**

1. No data. Site permanently removed.

**December 1-31, 2016**

**BC**

1. No data. Site permanently removed.

**CR**

1. No data. Site permanently removed.

**HS**

1. No data. Site permanently removed.

**KB**

1. No data. Site permanently removed.

**SW**

1. No data. Site permanently removed.

**WT**

1. No data. Site permanently removed.

**See Metadata “CSM” “GSM” Notes/Comments from Data Files**

**Anomalous/Suspect data:**

**Note #1:** Slight shifts in data are sometimes correlated with sonde exchanges. These shifts are most noticeable in pH, specific conductivity, salinity, DO% and DO conc, and may be related to sensor drift (e.g., due to fouling) and/or calibration/performance differences between sondes.

**Note #2:** Turbidity “outliers” (i.e., values that are negative or greater than 1000 NTU for 6600 series sondes and 4000 NTU for EXO series sondes) were not deleted from the monthly records. Readings greater than 1000 NTU for 6600 series sondes and 4000 NTU for EXO series sondes are considered out of range and are rejected. They have been left in the database to provide users with a complete dataset and to allow true visual representation of the data in graphs. Negative turbidity values occur throughout the year at all four sites. Some of these negative values are within the accuracy range of the sensor (+/- 2.0 %) and, therefore, were not removed from the dataset. They were marked suspect with the CAF code.

**Note #3**: Turbidity data is subject to single and clusters of spikes that occur in the beginning and middle of deployments. Turbidity values that fall between 500 and 1000 are not specifically indicated as suspect data, but possibly could be interpreted as suspect. Turbidity spikes may be associated with wiper malfunction but mostly the reason is unknown. Data users should exercise caution when interpreting turbidity data that fall within this range.

**Note #4:** Time series profiles of the dissolved oxygen data at all monitoring stations sometimes exhibits brief “spikes” of reduced DO concentrations. These events appear to be coupled with the occurrence of slack tide conditions as well as the level of fouling associated with the sonde.

**Note #5:** All times in data files at all sites had to be adjusted post-deployment; more specifically, times were altered such that the readings occurred on the hour and half hour. It has been determined that this clock error is a software issue and has been resolved.

**May 1-31, 2016**

**HS**

1. Shift in specific conductivity, salinity, dissolved oxygen pH and turbidity 05/02/16 13:15:00 associated with sonde exchange (See Note #1).

**June 1-30, 2016**

**HS**

1. Suspect intermittent negative turbidity data 06/02/16 12:15:00 – 06/28/16 10:00:00; values out of range (See Note #2).

**July 1-31, 2016**

**HS**

1. Suspect intermittent negative turbidity data 07/02/16 01:45:00 – 07/11/16 22:00:00; values out of range (See Note #2).

**SW**

1. Suspect negative turbidity data 07/27/16 11:30:00; values out of range (See Note #2).

**Rejected Data:**

Obvious outliers, data associated with probe malfunction, and/or calibration (both pre and post) problems are rejected as specified below. For more details about rejected data, contact the Principal Investigator.

**July 1-31, 2016**

**CR**

1. Deleted turbidity data 07/29/16 06:15:00 – 07/31/16 23:45:00; values indicate probe malfunction.
2. Deleted dissolved oxygen data 07/29/16 14:00:00, 15:30:00, 16:45:00, 20:45:00, 22:30:00, 23:00; 07/30/16 00:30:00, 04:30:00, 08:45:00, 09:30:00, 10:00:00, 10:45:00, 11:15:00 – 12:45:00, 14:30:00 – 14:45:00, 15:15:00 – 16:00:00, 17:15:00 – 17:30:00, 18:00:00, 18:45:00, 19:45:00 – 20:00:00, 20:45:00, 22:00:00 – 22:30:00, 23:00:00, 23:30:00 – 23:45:00; 07/31/16 00:15:00, 00:45:00 – 01:30:00, 02:00:00, 02:30:00, 03:15:00 – 05:00:00, 06:00:00 – 06:30:00, 07:45:00, 08:15:00, 08:45:00 – 09:00:00, 10:00:00, 10:45:00 – 11:45:00, 13:15:00 – 13:30:00, 14:15:00, 16:15:00, 19:15:00 – 19:30:00, 20:00:00 – 20:15:00, 21:30:00, 23:00:00, 23:30:00; values indicate probe malfunction.

**August 1-31, 2016**

**CR**

1. Deleted turbidity data 08/01/16 00:00:00 – 08/05/16 06:30:00; values indicate probe malfunction.
2. Deleted dissolved oxygen data 08/01/16 00:00:00, 00:30:00, 02:00:00 – 02:15:00, 02:45:00, 03:30:00, 04:15:00, 04:45:00, 05:30:00 – 06:15:00, 07:30:00 – 08:00:00, 08:30:00, 09:30:00, 10:45:00, 11:15:00, 12:00:00, 12:45:00, 13:15:00 – 14:00:00, 14:30:00, 15:30:00, 16:00:00, 16:45:00 – 17:00:00, 17:45:00, 18:15:00 – 18:45:00, 19:15:00, 20:00:00 – 20:15:00, 20:45:00, 21:30:00, 22:15:00 – 22:30:00, 23:15:00 – 23:45:00; 08/02/16 02:15:00 – 02:30:00, 03:15:00, 03:45:00, 04:45:00, 06:30:00 – 08:00:00, 08:30:00 – 09:00:00, 09:30:00, 10:00:00, 11:15:00, 12:30:00, 13:00:00 – 14:00:00, 15:00:00, 15:30:00 – 15:45:00, 16:30:00 – 16:45:00, 18:00:00, 20:00:00 – 20:15:00, 20:45:00 – 21:45:00, 22:30:00 – 22:45:00, 23:15:00; 08/03/16 00:15:00 – 00:30:00, 01:15:00 – 01:45:00, 03:00:00, 04:15:00, 05:30:00 – 05:45:00, 06:15:00 – 07:00:00, 07:30:00 – 09:00:00, 09:30:00 – 09:45:00, 10:45:00, 11:15:00, 12:30:00, 13:00:00 – 13:15:00, 14:30:00, 15:15:00 – 15:30:00, 16:15:00, 16:45:00, 19:30:00 – 19:45:00, 20:30:00 – 20:45:00, 21:45:00, 22:15:00 – 22:30:00, 23:15:00 – 23:30:00; 08/04/16 00:15:00, 00:45:00, 01:15:00 – 01:30:00, 02:30:00: - 02:45:00, 03:30:00, 04:30:00 – 04:45:00, 05:15:00, 06:30:00, 07:00:00, 07:30:00, 08:00:00 – 08:15:00, 08:45:00, 09:15:00, 10:00:00, 11:00:00 – 11:30:00, 12:45:00 – 13:15:00, 13:45:00, 14:15:00, 14:45:00 – 15:00:00, 15:30:00 – 15:45:00, 16:30:00 – 18:00:00, 18:30:00 – 18:45:00, 19:30:00 – 20:00:00, 20:30:00 – 21:45:00, 23:30:00 – 23:45:00; 08/05/16 00:15:00, 00:45:00, 01:15:00 – 01:30:00, 02:00:00, 03:30:00 – 04:00:00, 04:45:00 – 05:15:00, 05:45:00, 06:15:00; values indicate probe malfunction.