**Northwest Florida Aquatic Preserves (NWFLAP)   
Water Quality Metadata Report**

January - December 2017  
Latest Update: 09/29/2020

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 Aquatic Preserve Office ([Beth.L.Fugate@dep.state.fl.us](mailto:Beth.L.Fugate@dep.state.fl.us)) with any additional questions.

**I. Data Set and Research Descriptors**

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

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1. **Entry verification:**

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF or .CSV).

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:**

The goal of this research is to provide long term monitoring for the location within the watershed. Water quality monitoring using YSI dataloggers began within YRMAP concurrently in 2015. Currently, one station exists where YSI 6600 EDS monitors parameters at 15-min intervals. YSI data sondes are continuously measuring the parameters of turbidity, conductivity, salinity, temperature, dissolved oxygen, and pH. The position of this station allows for comparisons between existing monitoring from other organizations stations and gets an overall reading in the estuary from the output from the Yellow River and saline fluctuations from East Bay. 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 Preserve.

Improving degraded water quality is the main objective for the project and improving the water quality in the Pensacola Bay Watershed (PBW) is a main priority for Escambia and Santa Rosa counties. Much of the decline in habitat throughout, including seagrass, can be attributed to a reduction in water quality from decreased light penetration. Researchers are considering seagrass for a proposed indicator of estuarine change (Biber, Paerl, Gallegos, & Kenworthy, 2004). Currently nutrient sampling is not being conducted as part of this monitoring effort, however management will look to address if needed. The degradation in water quality can be attributed to several factors including point and non-point pollution sources impacting Blackwater and East bays. Several wastewater facilities discharge treated effluent into the system north of YRMAP. Additionally, the degraded septic tanks in nearby towns and within YRMAP vicinity ultimately affect the water quality. With an estimated 20 percent of the population utilizing septic systems, rising to 50 percent in rural areas (U.S. Environmental Protection Agency [EPA], 2008), it is likely that the YRMAP region is closer to the higher percentage. It is estimated that 10-20 percent of these septic systems fail each year and repairs are not always addressed in a timely manner (EPA, n.d.). Stormwater runoff is another factor currently being addressed by local agencies and has recently been elevated to an issue of high importance. Severe flooding events in Escambia, Santa Rosa, and Okaloosa counties on April 29, 2014 overloaded current facilities and infrastructure. All of these practices discharge potential excess nitrogen and phosphorus into the estuarine system decreasing primary productivity. The EPA suggests a guideline of 10:1 ratio of concentrations of nitrogen to phosphorus, of which are often higher in the bayous of the PBW (EPA, 2005).

1. **Research Methods:**

YSI 6600 EDS data sondes have been continuously operated (data collection interval: 15 minutes) at the Yellow River Marsh site since January 2015. This model incorporates 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. The sonde is contained within a 10 cm (inside diameter) housing pipe mounted horizontally on a cement base elevated off the seafloor. To facilitate water flow across the sensors, multiple 2 cm diameter holes were drilled, and density is greatest near the base where the sonde sensors are located.

Data recorded on the 6600’s is downloaded in site laboratory at approximately three to four-week intervals. The housing station is inspected for damage and fouling, and if no maintenance is required, the station is cleaned and returned to the water. The sondes are swapped out and the recovered sonde is taken to lab for verification, calibration, cleaning and data recovery. Reconditioning takes place in accordance with the methods outlined in the YSI Operating and Service Manual. Maintenance is assessed on sondes as needed and sent in for annual maintenance. The EDS turbidity wiper brush is removed and replaced with a clean wiper to avoid contamination of standards during post-deployment procedures. After ambient temperature acclimation, post deployment readings are recorded for pH (Fisher 7.00 and 10.00 buffer solutions) and specific conductivity (YSI 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. Calibration log documents all calibrations, verifications, standards and lot numbers used in process.

1. **Site location and character:**

The Yellow River Marsh Aquatic Preserve is located in south-central Santa Rosa County in the western Florida Panhandle (Map 2). The aquatic preserve is part of the PBW and includes parts of Blackwater and East Bays, as well as the western portion of Yellow River. The aquatic preserve’s boundary extends from Highway 87, west on the Yellow River and west to Bay Point on Blackwater Bay. From Bay Point, the aquatic preserve boundary stretches southward to White Point on East Bay, and then extends eastward to Escribano Point to the mouth of Blackwater Bay. From Escribano Point, the aquatic preserve boundary follows the shoreline north to Grassy Point and then extends inland to Highway 87 south of the Yellow River (Phillips & McKenzie, 1993).

Located northwest of YRMAP are the two closest population centers: the city of Milton, with a 2010 population of 8,826, and the village of Bagdad, with a 2010 population of 3,761 (U.S. Census Bureau, 2010). Milton is also the county seat of Santa Rosa County. There are several significant transportation routes in proximity of the aquatic preserve. Interstate 10 is located northwest of the aquatic preserve and is the only major interstate in the western Florida Panhandle. State Highway 87 is an important road for north and south travel in Santa Rosa County. The Highway 87 Bridge over the Yellow River was built in 1984 and has daily use of approximately 7,500 cars (The Ledger, 2013). State Road 281 (Avalon 12 Boulevard) runs north and south on the Garcon Point peninsula, eventually connecting Garcon Point to the city of Gulf Breeze via the Garcon Point Toll Bridge. Completed in 1999, the bridge offers passage over East Bay. County roads include County Road 191 (Garcon Point Road) and County Road 191C on Garcon Point peninsula, County Road 89 (Ward Basin Road), and County Road 184. Access points to the aquatic preserve include the Highway 87 Bridge, Ward Basin Road, and various community roads on Garcon Point peninsula.

The year-round climate of northwest Florida and YRMAP is typical of the Northern Hemisphere’s humid subtropical climate zone, with long, hot, humid summers, and relatively mild, short, wet winters. Humidity is relatively high (averaging 60 percent in the mornings and 85 percent in the afternoons), and winds are normally from the north/northwest in fall and winter and the south/southwest in spring and summer (NOAA, 2014). The average maximum temperature is 76.6°F and the average minimum temperature is 59.2°F. On average, the hottest months are June, July and August and the coolest months are December, January and February (NOAA, 2014). Typically, there are two wet seasons in northwest Florida in which summer precipitation is driven by convection and winter precipitation is driven by fronts (Winsberg, 2003). Average annual total precipitation 16 is 65.27 inches and is comprised almost entirely of rainfall. Snow is uncommon, with an average annual rate of 0.1 inches (NOAA, 2014). The months with the highest average precipitation are June, July, August and September. The occurrence of an El Niño Southern Oscillation or La Niña event may have a significant impact on precipitation and temperature in northwest Florida: El Niño may result in 30-40 percent more precipitation and relatively cooler temperatures than the annual average for the winter season, and La Niña may result in a much drier spring and winter than the average. Additionally, the occurrence of an El Niño event suppresses damaging winter freezes and lessens the severity of the hurricane season (Winsberg, 2003).

**Station description:**

Station description information is currently unavailable

**Station timeline:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Station Code** | **Station Name** | **Location** | **Active Dates** | **Reason Decommissioned** | **Notes** |
| YRMAP1 | YRMAP1 | 30°N, -87°W | 1/2015 - Present | N/A | N/A |

1. **Data collection period:**

See Calibration log and field logs for dates.

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:**

Salt marsh and oyster restoration were implemented off of the YRMAP shoreline in 2001. The marsh restoration area has done well, while the oyster restoration areas had flattened due to high wave energy at the site. Further monitoring is necessary. Additionally, in 2013 ecodiscs were installed along approximately 1,000 feet of shoreline at the same location. The ecodisc assemblage is approximately six feet tall and imbedded with shell material. A combination of approximately 4,000 smooth cordgrass and saltmeadow cordgrass were installed. Northwest Florida Aquatic Preserves (NWFLAP) staff will continue the monitoring for the project.

**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

Parameter: Dissolved Oxygen % saturation

Units: percent air saturation (%)

Sensor Type: Rapid Pulse – Clark type, polarographic

Model #: 6562

Range: 0 to 500 % air saturation

Accuracy: 0-200 % air saturation, +/- 2 % of the reading or 2 % air saturation, whichever is greater; 200-500 % air saturation, +/- 6 % of the reading

Resolution: 0.1 % air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)

Units: milligrams per Liter (mg/L)

Sensor Type: Rapid Pulse – Clark type, polarographic

Model #: 6562

Range: 0 to 50 mg/L

Accuracy: 0 to 20 mg/L, +/- 2 % of the reading or 0.2 mg/L, whichever is greater; 20 to 50 mg/L, +/- 6 % 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.

1. **Coded variable definitions:**

**Site definitions:**

|  |  |  |
| --- | --- | --- |
| **Sampling Station:** | **Sampling Site Code:** | **Station Code:** |
| YRMAP1 | YRMAP1 | YRMAP1 |

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:**

See Calibration log and field logs for more information.

1. **Other remarks/notes:**

**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.

**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.

**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.

**Acknowledgement:** The data included with this document were collected by the staff of the Florida Department of Environmental Protection. Any products derived from these data should clearly acknowledge this source (please use the attached logos below). This recognition is important for ensuring that these long-term monitoring programs continue to receive the necessary political and financial support.

