

Florida Department of Environmental Protection



Office of Communications

The System-Wide Monitoring Program (SWMP) in the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)

Water Quality Component

Katie Petrinec

Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)

June 13, 2012





Overview

- What is SWMP? Goal?
- GTMNERR SWMP Stations
- Deployment Set-up
- Calibration/Post-Deployment Methods
- GTMNERR Data Management
- QAQC Tools



What is SWMP?

- Long-term standardized monitoring program
- Established by NOAA conducted by each NERR
- Three monitoring components:
 - Water quality and weather
 - Biological monitoring
 - Land Use/Land Change

National Estuarine Research Reserves

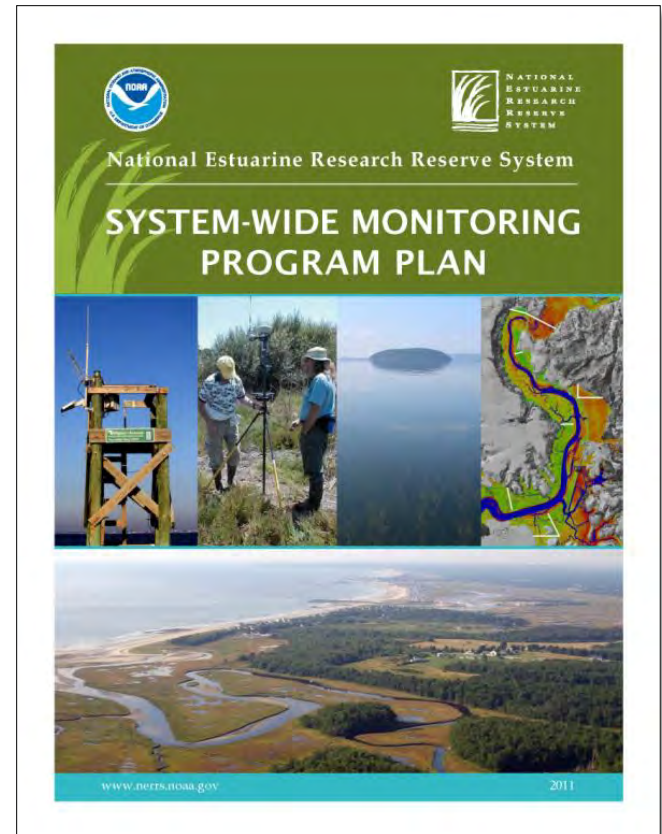
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SWMP Goal

- Establish a system-wide monitoring program that measures short-term variability and long-term change in estuaries
- Provide researchers, resource managers, educators, and other coastal decision makers with information on Reserve conditions
- Gain a better understanding of how human activities and natural events can change coastal ecosystems



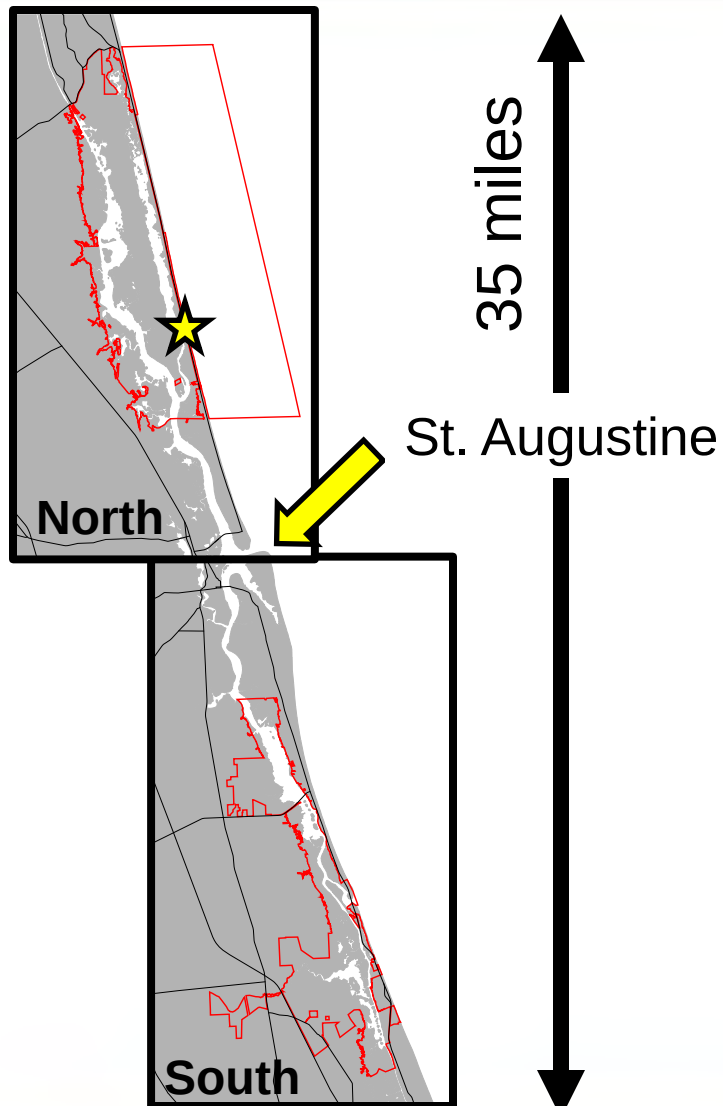


SWMP Element

- Core element
 - Required to be implemented at all Reserves; standardized national protocols
- Elective element
 - May be implemented by a single or a subset of Reserves to address local, regional or national issues



GTMNERR Core Element



- Combination of core and elective elements within the Reserve
- Wide variety of research programs; broadly categorized into terrestrial and aquatic

GTMNERR Core Element

SWMP Stations

- 4 Water Quality (including Nutrients)
- 1 Weather Station





SWMP Water Quality Stations

Pine Island

- Established in 2001
- Tolomato River
- Low Impact
- Northern most site





SWMP Water Quality Stations

San Sebastian

- Established in 2002
- Confluence of San Sebastian and Matanzas Rivers
- High Impact
- Near St. Augustine Inlet





SWMP Water Quality Stations

Fort Matanzas

- Established in 2001
- Matanzas River
- Medium Impact
- Near Matanzas Inlet





SWMP Water Quality Stations

Pellicer Creek

- Established in 2002
- Pellicer Creek
- Low Impact
- Satellite Telemetry (near real-time data)



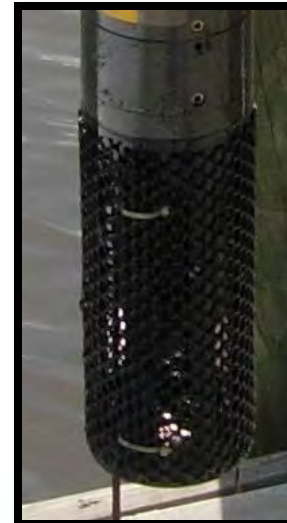
SWMP Water Quality Equipment

- YSI 6600 EDS Datasondes
- Parameters Monitored
 - Temperature
 - Salinity
 - Dissolved Oxygen
 - pH
 - Depth
 - Turbidity
- Vexar mesh over guard
- Anti-fouling tape
- Ram Rod cleaning

Photo Credit : YSI, Inc.



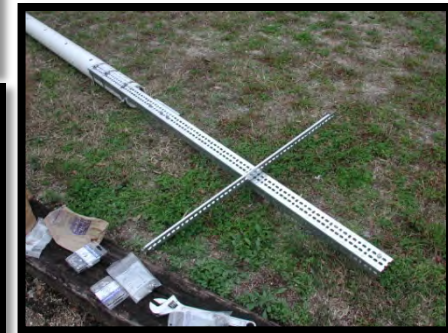
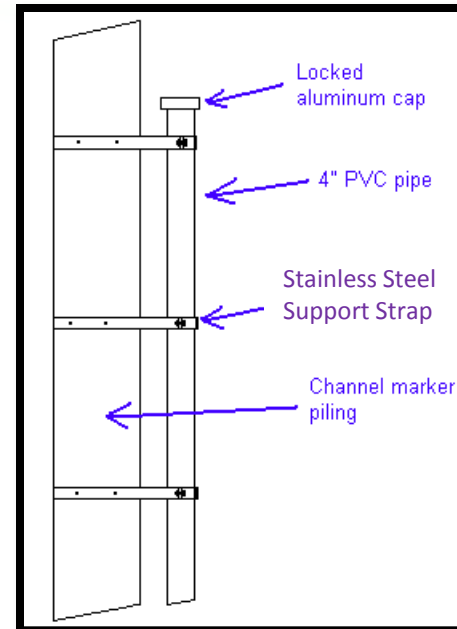
Photo Credit : YSI, Inc.



SWMP Water Quality Equipment

Deployment Tube

- 4 inch, Schedule 40 PVC
- Attached to pilings
- Custom hangers
- Positioned 1 meter from bottom





SWMP Calibration Log

■ NERRS Calibration Log (partial)

Date of Calibration: 12/20/2011 mm/dd/yyyy		Technician(s): Katie Petrinec																																																																																																									
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Pre/Post Deployment Calibration: (turn on pH mV in Report menu)																																																																																																											
<table border="1"> <thead> <tr> <th colspan="4">Pre-Deployment</th> <th colspan="2">Post-Deployment</th> <th colspan="2">Sensor Diagnostics</th> </tr> <tr> <th>Standards</th> <th>Before Cal</th> <th>Calibrated</th> <th>Error</th> <th colspan="2"></th> <th colspan="2">Pre-Deployment</th> </tr> </thead> <tbody> <tr> <td>Optical %DO @ 100% sat</td> <td>97.0 %</td> <td>100.5 %</td> <td>No</td> <td>104.9</td> <td>104.6 %</td> <td>Optical DO gain</td> <td>1.028</td> </tr> <tr> <td>BP @ cal (Optical)</td> <td>765.0 mm Hg</td> <td></td> <td></td> <td>767.8</td> <td>mm Hg</td> <td>Cell const (4.6-5.45)</td> <td>5.10</td> </tr> <tr> <td>Baro. Pres. (Depth Calib)</td> <td>765.0 mm Hg (760.0 for vented sondes)</td> <td></td> <td></td> <td>767.2</td> <td>mm Hg (760.0 for vented)</td> <td>pH 7 (0 +/- 50 mV)</td> <td>-8.2</td> </tr> <tr> <td>Depth 0.068 offset</td> <td>0.070 m</td> <td>0.068 m</td> <td>No</td> <td>0.090 m</td> <td>0.097 offset</td> <td>pH 10 (-180 +/- 50 mV)</td> <td>-185.4</td> </tr> <tr> <td>SpCond 50.00 mS/cm</td> <td>49.57 mS/cm</td> <td>50.00 mS/cm</td> <td>No</td> <td>49.69 mS/cm</td> <td></td> <td>pH 4 (+180 +/- 50 mV)</td> <td>166.4</td> </tr> <tr> <td>pH 7 7.00</td> <td>7.02</td> <td>7.00</td> <td>No</td> <td>7.06</td> <td></td> <td>Calculated pH slope</td> <td>177.2</td> </tr> <tr> <td>pH 10 10.00</td> <td>10.02</td> <td>10.00</td> <td>No</td> <td>9.96</td> <td></td> <td colspan="2">Post-Deployment</td> </tr> <tr> <td>pH 4 4.00</td> <td>4.04</td> <td>4.01</td> <td>No</td> <td></td> <td></td> <td>pH 7 (0 +/- 50 mV)</td> <td>-12.3</td> </tr> <tr> <td>Turb 0.0 NTU</td> <td>0.2 NTU</td> <td>0.0 NTU</td> <td>No</td> <td>2.6 NTU</td> <td></td> <td>pH 10 (-180 +/- 50 mV)</td> <td>-182.1</td> </tr> <tr> <td>Turb 126.0 NTU</td> <td>122.5 NTU</td> <td>126.0 NTU</td> <td>No</td> <td></td> <td></td> <td>pH 4 (+180 +/- 50 mV)</td> <td></td> </tr> <tr> <td>Battery voltage 12.8 V (remove ext. power -650, 6038)</td> <td></td> <td></td> <td></td> <td>11.6 V (remove ext. power)</td> <td></td> <td>Calculated pH slope</td> <td>169.8</td> </tr> </tbody> </table>				Pre-Deployment				Post-Deployment		Sensor Diagnostics		Standards	Before Cal	Calibrated	Error			Pre-Deployment		Optical %DO @ 100% sat	97.0 %	100.5 %	No	104.9	104.6 %	Optical DO gain	1.028	BP @ cal (Optical)	765.0 mm Hg			767.8	mm Hg	Cell const (4.6-5.45)	5.10	Baro. Pres. (Depth Calib)	765.0 mm Hg (760.0 for vented sondes)			767.2	mm Hg (760.0 for vented)	pH 7 (0 +/- 50 mV)	-8.2	Depth 0.068 offset	0.070 m	0.068 m	No	0.090 m	0.097 offset	pH 10 (-180 +/- 50 mV)	-185.4	SpCond 50.00 mS/cm	49.57 mS/cm	50.00 mS/cm	No	49.69 mS/cm		pH 4 (+180 +/- 50 mV)	166.4	pH 7 7.00	7.02	7.00	No	7.06		Calculated pH slope	177.2	pH 10 10.00	10.02	10.00	No	9.96		Post-Deployment		pH 4 4.00	4.04	4.01	No			pH 7 (0 +/- 50 mV)	-12.3	Turb 0.0 NTU	0.2 NTU	0.0 NTU	No	2.6 NTU		pH 10 (-180 +/- 50 mV)	-182.1	Turb 126.0 NTU	122.5 NTU	126.0 NTU	No			pH 4 (+180 +/- 50 mV)		Battery voltage 12.8 V (remove ext. power -650, 6038)				11.6 V (remove ext. power)		Calculated pH slope	169.8
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Interval	15 min	Start date	12/20/2011 mm/dd/yyyy	Start time (std.time)	4:59:30 hh:mm:ss																																																																																																						
Duration	365 days	Data file name	PI122111	Battery life	117 days																																																																																																						
Free memory	80 days	Set clock (status)	Yes Y or N	Free bytes (status)	169728 K																																																																																																						
Parameters recorded: Date, Time, Temp°C, SpCon, Sal, DO%, DO mg/L, Depth, pH, Turb, Batt																																																																																																											



SWMP Calibration Log

■ NERRS Field Log (partial)

Date Deployed:	12/21/2011	mm/dd/yyyy	Time:	9:36	hh:mm (24hr)	White Towel:	Yes
Technician(s):	Katie Petrinec				Sonde ID #:	Turtle	
Field Data:							
Water Temp	17.46	°C	DO Percent	86.8	%		
Sp Cond	44.461	mS/cm	DO Conc.	6.99	mg/L		
Salinity	28.78	ppt	Other				
Comments <u>Winds WSW 15-20 mph, falling tide, rolling seas.</u>							
<u>Infield Maintenance</u> (note any changes to site during deployment, sonde tube maintenance, biofouling removal, etc.)							
Date:	12/21/2011		Duration:	1 min.	Maintenance:	Ram Rod of Tube	
Comments <u>Tube felt clear</u>							
<u>Retrieval Information</u>							
Date Retrieved:	1/5/2012	mm/dd/yyyy	Time:	10:21	hh:mm (24hr)	White Towel:	Yes
Technician(s):	Katie Petrinec				Sonde ID #:	Turtle	
Field Data:							
Water Temp	11.57	°C	DO Percent	96	%		
Sp Cond	43.288	mS/cm	DO Conc.	8.76	mg/L		
Salinity	27.81	ppt	Other				
<u>Fouling Presence:</u> Type: A=algae, B=barnacles, C=crabs, E=eggs, F=fish, H=hydroids, S=sponges, T=tunicates, O=other, N=none Amount: H=heavy, M=moderate, L=light (e.g. A/H, B/L)							
Sonde/Guard	N		External Screen	N			
Temp/Cond	N		Dissolved Oxygen	N			
pH	N		Turbidity	N			
Comments <u>cold, clear, light fouling on sonde, wind W 5-7 mph, falling tide.</u>							
<u>Light mud fouling on sensor shafts, sensor surfaces clean.</u>							



SWMP Water Quality Calibration

- Temperature – Check with Thermometer
- Specific Conductivity – 50 mS/cm
- pH – 3-point calibration
 - 7.00, 10.00, and 4.00
- Depth – Barometric Pressure and Offset
- Turbidity – 2-point calibration
 - 0.0 NTU and 126.0 NTU
- Dissolved Oxygen – Aerated bucket



SWMP Water Quality Deployments

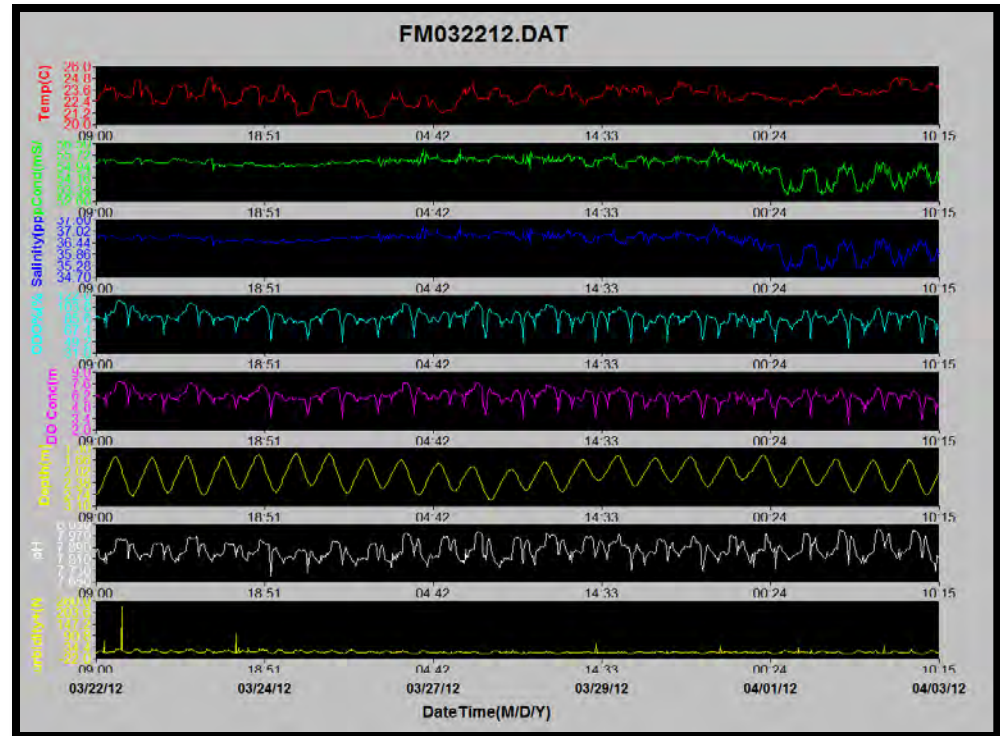
- Calibration/Post-Deployment performed in laboratory
- Bi-weekly Exchanges
- Ram-rod Tube Cleaning





SWMP Water Quality Data

- Download data from datasonde using Ecowatch
 - Print Graph
 - Export as .csv





SWMP Data Management

- Centralized Data Management Office (CDMO)
 - Funded through NOAA
 - Information Management Team
 - Provide QAQC Tools
 - Provide Technical Support
 - Host Annual SWMP Technician Training Workshop
 - Manage and Host NERRS Data Website (www.nerrsdata.org)
 - Perform tertiary QAQC
 - Data Management Committee
 - Comprised of NERR Managers, Research Coordinators, Education Coordinators, SWMP Technicians, NOAA, and State CZM Programs
 - Creates SWMP and QAQC Protocols and Deadlines



SWMP Data Management

- CDMO Data submission requirements
 - One Week deadline after retrieval for raw .csv file submission
 - File is verified
 - Undergoes an automated primary QAQC
 - Ingested into CDMO database
 - Available for download via website (considered provisional)
 - Returns a primary QAQC'd file to the Reserve



SWMP Data Management

The screenshot shows the homepage of the National Estuarine Research Reserve System's Centralized Data Management Office. The header includes the NERRS logo and the text "NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM Centralized Data Management Office". A navigation bar contains links: Home, About CDMO, About Data, Get Data, Web Services, and Contact CDMO. Below the navigation bar is a large image of a white egret standing in a marshy area. The main content area is titled "Data Upload Service" and contains a login form with fields for Username, Password, and a Remember Me checkbox, followed by a "Log into data uploads" button. The footer includes a list of partner organizations: Department of Commerce, NOAA, National Ocean Service, Ocean and Coastal Resource Management, NERRS, and Webmaster, along with the text "Site hosted by NOAA National Estuarine Research Reserve, Centralized Data Management Office." and the NOAA logo.

 **NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM**
Centralized Data Management Office

Home About CDMO About Data Get Data Web Services Contact CDMO



Data Upload Service

Please enter your username and password to log into the CDMO website to upload files. If you have reached this page in error, please return to the [CDMO home page](#).

Username:

Password:

Remember Me? ☐

Department of Commerce | NOAA | National Ocean Service | Ocean and Coastal Resource Management | NERRS | Webmaster
Site hosted by NOAA National Estuarine Research Reserve, Centralized Data Management Office. 



SWMP Data Management

Data Upload

Please select the data type and stage of QC for the file you are uploading. Make sure to enter a valid email address so that the confirmation email and primary QAQC'd data file (for raw uploads) can be emailed to you. See below for additional upload types. Please download the CDMO Manual to see step-by-step documentation for this process.

NERR Site:

GTM ▼

Data Type:

☒ WQ ☐ MET ☐ NUT

Raw or QAQC Data File:

☒ RAW ☐ QAQC

Email Address:

Continue

Additional Uploads

- [To upload raw WQ DAT files or raw/process NUT files, please click here.](#)
- [To upload your provisional metadata, please click here.](#)
- [To upload your calibration, field or met logs, please click here.](#)

Tools

- [Correct historical depth, you may do so by clicking here.](#)



SWMP Data QAQC

- SWMP Secondary QAQC Process
 - Quarterly
 - Combine primary QAQC'd data files into quarterly files
 - Analyze the data
 - Create graphs
 - Code and Flag data
 - Create quarterly metadata report
 - Annual
 - Append the quarterly files
 - Review data
 - Create annual metadata report
 - Submit all raw files
 - Submit all Calibration and Field Logs

Quarterly Data Due Dates

Jan. – Mar.	May 1 st
April – June	August 1 st
July – Sept.	Nov. 1 st
Oct. – Dec.	Feb. 1 st

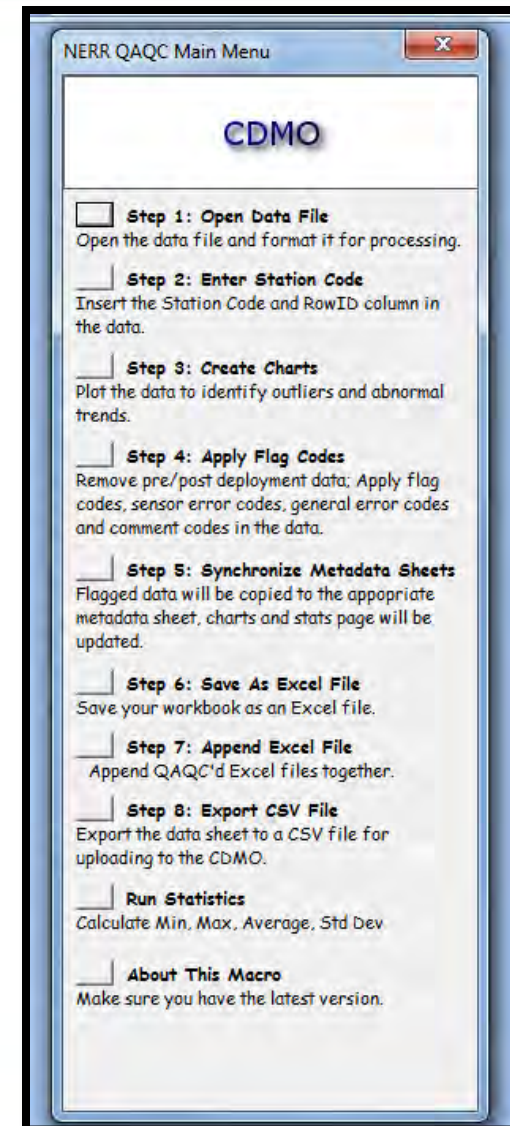
Annual Data Due Date

March 15th



SWMP Data Management Tools

- Excel Macros used for data QAQC
- Create Graphs
- Apply Flag Codes
 - General Errors
 - Sensor Errors
 - Comments





SWMP QAQC Flag Codes

■ QAQC Codes

- <-3> Rejected data
- <-2> Missing data
- <0> Good data
- <1> Suspect data
- <5> Corrected data

■ QAQC Flags

- GPF – Power Failure
- GIM – Inst. Malfunction
- SSM – Sensor Malfunction
- STS – Turb. Spike
- CSM – See Metadata
- CBF – Biofouling



SWMP Excel Macro Flag Codes

Flags and Codes

1	A	B	C	D	H	I	J	K	L	M	N	O	P	Q	R	S	T
	RowID	Station Code	DateTimeStamp	F_Record	F_SpCond	Sal	F_Sal	DO_pct	F_DO_pct	DO_mgl	F_DO_mgl	Depth	F_Depth	pH	F_pH	Turb	F_Turb
32472	32472	gtmpiwq	12/05/2011 05:30		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]
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32479	32479	gtmpiwq	12/05/2011 07:15		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]
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32483	32483	gtmpiwq	12/05/2011 08:15		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]		<-2> [GIM]
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32485	32485	gtmpiwq	12/05/2011 08:45		<0> (CND)	35.3	<0> (CND)	89.8	<0> (CND)	6.9	<0> (CND)	3.47	<0> (CND)	7.7	<0> (CND)	6	<0> (CND)

32507	32507	gtmpiwq	12/05/2011 14:15		0	34.8	0	90.7	0	7.0	0	3.07	0	7.8	0	7	0
32508	32508	gtmpiwq	12/05/2011 14:30		0	34.8	0	90.9	0	7.0	0	3.14	0	7.8	0	7	0

Data Outside Sensor Range Hi <-5> Outside Sensor Range Lo <-4> Rejected Data <-3> Missing Data <-2>

Data Tabs



SWMP Checklist

- CDMO checklist
 - Assist with quarterly and annual data submission

	Submission of Water Quality Data Elements	Y/N
1	<u>Raw data submission:</u> Were at least 80% of the raw files uploaded to the CDMO ODIS within one week of the deployment end time?	Y
2	<u>Raw data submission:</u> Is the naming convention correct for raw files uploaded to the CDMO and were they in .DAT or .CSV format? ex: acebbwq011511	Y
3	<u>Raw data submission:</u> Were all pre- and post deployment data removed from each raw file prior to initial upload?	Y
4	<u>Raw data submission:</u> Were raw .DAT files (unchanged - include all pre- and post-deployment data, may use any naming convention) also archived with the CDMO?	Y
5	<u>Quarterly data submission:</u> Were the quarterly Secondary QAQC'd files, including the quarterly metadata (beginning in 2012), uploaded to the CDMO by each quarter's deadline?	Y
6	<u>Quarterly data submission:</u> Is the quarterly file naming convention correct for data and metadata files? ex: acebbwq2011Q1 and acewq01-03.12m.prov	Y
7	<u>Quarterly data submission:</u> (Beginning in 2012) Is the quarterly metadata complete? Does it contain all required components from the template and explanations for all CSM codes applied to the quarterly data files?	Y
8	<u>Quarterly data submission:</u> For the quarterly Secondary QAQC'd files submitted to the CDMO, were all pre- and post-, overlapping deployment and data from the previous/following year removed? Were all -4 and -5 flags addressed? Do all data with -3, 1, or 5 flags also have QAQC codes?	Y
9	<u>Final yearly submission:</u> Is the metadata naming convention correct (ex: ace01-12.11m.prov), in .DOC format, and was it uploaded as provisional metadata?	Y
10	<u>Final yearly submission:</u> Is the yearly Secondary QAQC'd data file naming convention correct (acebbwq2011) and in .CSV format?	Y
11	<u>Final yearly submission:</u> Were both digital and field calibration logs submitted for each station? Were they named and organized following the proper conventions?	Y
	Metadata Completeness Section - Is all the following information included?	
12	Heading: Reserve name, months and year the document covers, and date the last updates were made	Y
13	Section 1: Contact persons	Y
14	Section 2: Entry verifications (how data were QA/QC'd, person responsible for data management, justification or QC of ChlFluor parameter if reported) Include 2010 canned statement.	Y
15	Section 3: Research objectives	Y
16	Section 4: Methods (describe deployments, calibrations, types of standards used, QA/QC of instruments (detailed for ChlFluor if reported), and data intervals - include GOES statement)	Y
17	Section 5: Site location and character (lat/long, tidal range, salinity range, type and amount of freshwater	Y



SWMP Data Management



NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM
Centralized Data Management Office

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Data Upload Service

Please enter your username and password to log into the CDMO website to upload files. If you have reached this page in error, please return to the [CDMO home page](#).

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Data Upload

Please select the data type and stage of QC for the file you are uploading. Make sure to enter a valid email address so that the confirmation email and primary QAQC'd data file (for raw uploads) can be emailed to you. See below for additional upload types. Please download the CDMO Manual to see step-by-step documentation for this process.

NERR Site:

Data Type: ☒ WQ ☐ MET ☐ NUT

Raw or QAQC Data File: ☐ RAW ☒ QAQC

Email Address:

Additional Uploads

- [To upload raw WQ DAT files or raw/process NUT files, please click here.](#)
- [To upload your provisional metadata, please click here.](#)
- [To upload your calibration, field or met logs, please click here.](#)

Tools

- [Correct historical depth, you may do so by clicking here.](#)



SWMP Data Management

Tertiary QAQC

- CDMO performs final data review in conjunction with NERR
 - Authenticates data for data download
 - Grades NERR
 - Mistakes?
 - Unexcused missing data?
 - Timely submission
 - Creates a final report



SWMP Data Management

NOAA/NERRS System-Wide Monitoring Program Reserve SWMP Compliance

Reserve: **Guana Tolomato Matanzas**

Background: The SWMP Oversight Committee (OC) was formed by Research Coordinators in 1999 to ensure that all the Reserves receiving funding for any/all aspects of the System-Wide Monitoring Program follow the Standard Operating Procedures (SOP), uphold the quality of the data collected, and maximize the amount of data collected. The OC consists of at least three Research Coordinators and at a minimum the Chair of the OC is a member of the Data Management Committee (DMC), the other members of the OC may or may not be members of the DMC.

The OC is tasked with determining if a Reserve is meeting the goals and fulfilling its SWMP obligations. If a Reserve is not meeting these requirements it could face sanctions from ERD. A Reserve's compliance status is based on a rolling three year point system for each of the categories of SWMP (Water Quality, Nutrients and Meteorological). A total of 5 points in a single category over a rolling 3 year period will be considered non-compliant, and invoke mandatory OC involvement and possibly other actions. Resolution of the issue will not immediately alter the point total.

Points are allotted by the following method:

If data are submitted late for any reason	1 pt
If CDMO checklist grade is fair (75 to 89%)	1 pt
If CDMO checklist grade is poor (74% or fewer)	2 pt
If more than 15% of data are unexcused missing	3 pt

Data submission dates are as follows and submission will not be considered complete without all raw data files, edited files, metadata, calibration sheets for WQ, monthly log sheets for MET and lab SOP for NUT: WQ = March 15, MET = April 15, NUT = May 15. If a satisfactory reply to a request for missing information is not made within three weeks this will invoke mandatory OC involvement and possibly other actions.

Data will be considered excused and will not subject the Reserve to penalties if the missing data are due to **vandalism, ice, theft, catastrophic natural events or unplanned office closures**. The Chair of the OC must be notified of the data gaps within one month of occurrence and the oversight committee must approve the reason for it to be considered excused.

SWMP Compliance for GTM:

Nutrients 2006

Data were submitted early or on time (5/15/07)	0 pt
CDMO checklist grade was good (100%)	0 pt
Less than 15% of data were unexcused missing (0%)	0 pt

Where can I get data?



The screenshot shows the homepage of the National Estuarine Research Reserve System Centralized Data Management Office. The header includes the NERRS logo and the text "NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM Centralized Data Management Office". A navigation bar contains links: Home, About CDMO, About Data, Get Data, Web Services, and Contact CDMO. Below the navigation bar is a large image of a white egret standing in a marsh. The main content area is divided into three columns. The left column, titled "View / Download Data", features a map of the United States with the text "View / Download Data" overlaid. The middle column, titled "Real Time Monitoring Data", includes a dropdown menu labeled "Choose Reserve..." with "Guana Tolomato Matanzas 06/10/12 06:45" selected. Below this is a small image of a monitoring station and the following data: "Air Temperature: 22.5 °C (73 °F)", "Water Temperature: 28.8 °C (84 °F)", and "Wind Speed: 2.3 m/Sec (05 mph)". The right column, titled "CDMO News", contains two paragraphs of text with links: "We have launched our new Real Time Application for displaying near real time data. To view real time data, gauges, and graphs [click here.](#)" and "The CDMO's **Advanced Query System** specializes in delivering large amounts of data and complex queries in a single download. To use this new system [click here.](#)" followed by "Want to easily export or graph data? If so, check out our [Data Export System!](#)".

All SWMP data are available for download at
www.nerrsdata.org



Contact Information

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Data Download

www.nerrsdata.org