Sapelo Island NERR Water Quality Metadata
January – December 2016
Latest Update: February 21, 2018

I. Data Set and Research Descriptors

1)
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2) 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), EcoWatch Lite in a comma separated file (CSV) or KOR Software in an Excel File (.XLS) and uploaded to the CDMO where they undergo automated primary QAQC; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12. Patrick Hagan is primarily responsible for all data acquisition and management with consultations and assistance from Dorset Hurley.

3) Research objectives – Hydrological studies (Ragotskie and Bryson, 1955: Imberger et al., 1983) have shown that there are three tidal excursions along the length of the Duplin River, resulting in three distinct water masses. The two monitoring sites in the Duplin River, called the Lower Duplin site and the Hunt Dock site, are
located within the lower and upper water masses, respectively. Water passing the Lower Duplin site during flood **tide has come from Doboy Sound, which receives input from the Altamaha River via the Intra-Coastal Waterway and from the Atlantic Ocean. The water in the lower water mass is pushed further up the Duplin or up smaller tidal** creeks and some is pushed onto the marsh surface by the flood tide and recedes into the main channel during ebb tide. The water in the upper water mass, which passes the Hunt Camp station, is pushed up small creek channels and onto the marsh at each high tide. Thus the two stations monitor conditions in two hydrological separate water masses, one of which is heavily

influenced by exchanges with Doboy Sound and the other, which is influenced by its twice-daily contact with the marsh surface.

4) Research methods –A Sutron Sat-Link2 transmitter was installed at the Lower Duplin station on 03/18/2007 and transmits data to the NOAA GOES satellite, NESDIS ID # 01 00 51 DE. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at http://cdmo.baruch.sc.edu.

Before each YSI 6600 data logger is deployed, calibration and maintenance is performed following the manufacturer's instructions manufacturer's instructions and NERRS SWMP standard operating procedures. Calibration standards are only required for pH, conductivity, and turbidity, all other parameters are done as described in the manual. The conductivity, pH, and turbidity calibrations use a YSI produced traceable solution.

When deployed, the weather conditions and tidal stage are recorded in the field observation log. The datalogger is placed inside a length of PVC pipe attached to the dock. The data logger is attached to a non-floating dock by a steel cable and run down a PVC pipe to rest 0.5m above the surface bottom. Because of the large tidal range, water is continually flushed through 2" holes in the PVC pipes at the sonde location, thus eliminating the problem of creating a stagnant column of water with in the pipe with data logger. Every 15 minutes during the sampling period measurements are taken for temperature, specific conductance, salinity, pH, dissolved oxygen concentration, percent saturation, depth and turbidity. At the end of the sample period the data logger is retrieved and immediately replaced by another calibrated data logger. The data logger is then taken to the lab and runs QA/QC standards for pH, and conductivity, and dissolved oxygen, the data are uploaded, and the sonde is cleaned. Data are rejected if the post calibration standards fail or if technical problems are noted. All data rejected is noted in the metadata.

5) Site location and character –

The Lower Duplin (LD) monitoring site (31 deg 25' 4" N, 81 deg 17' 46" W) is located on the Marsh Landing Dock in the Duplin River on Sapelo Island and consists of a muddy bottom habitat. Water passing the dock during flood tide originates from the Doboy Sound. The Doboy Sound receives input from the Atlantic Ocean, and the freshwater Altamaha River via the Intra-Coastal Waterway. The water is pushed up the river or up smaller tidal creeks and some is pushed onto the marsh surface by the flood tide and recedes into the main channel during ebb tide. Primary freshwater input consists of rainwater runoff. The Marsh Landing dock is used as the main dock to the island where the ferry makes several daily runs, with several small boats that are docked there. The surrounding area vegetation is dominated by salt marsh with Spartina being the predominate flora. Normal tidal range for the site is 3meters and the salinity range is 5-35 ppt. The depth at this sampling station ranges from 2.5 meters to 6.0 meters depending on tide.

The Hunt Dock (HD) monitoring site (31 deg 28' 43", 81 deg 16' 23" W) is located on the Duplin River, off of Moses Hammock, which is separated from Sapelo Island by a small tidal channel. The primary runoff at the site is from tidal creeks flowing through Spartina marsh and through the mud. Bottom habitat at this site includes soft mud and some oyster bed building along the shoreline with an average tidal range of 3meters and a salinity range of 5-35 ppt. Primary freshwater input consists of rainwater runoff. There is little human traffic this far up the Duplin and it is north of the people living on Sapelo. During the fall, the Hunt dock and Moses Hammock is the camping and docking site for deer hunters traveling to the island.

These are controlled hunts and dates are available from the SAP NERR office if needed. The maximum depth at the Hunt Dock site is 4.27 meters.

Dean Creek (DC), (N 31 23 22.5W 81 16 44.2) is located on a small wooden bridge spanning Dean Creek, in close proximity to the adjacent Nannygoat Beach causeway. Dean Creek is a small tidal basin fed from the waters of Doboy Sound, which is located on Sapelo Island's south end. The creeks' salinity normally ranges between 5 and 30 ppt. Primary freshwater input consists of rainwater runoff. The benthic community consists of a sandy-mud substrate with occasional, small, intertidal oyster reef community and mean tidal amplitude of approximately 3meters. The small creek feeds approximately 150 acres of Spartina alterniflora dominated salt marsh, which is interspersed with small 0.5-1 acre hammocks and saltpans. Fringe community components range from Loblolly pine forests with a sub-canopy of Yaupon holly to Wax myrtle and Sable Palm.

The Cabretta Creek (CA) site coordinates are N 31 26 37.3W 81 14 23.7. The station is located on a small (one-lane), wooden, roadway bridge spanning Cabretta creek located on the island's extreme eastern side, bordering the Atlantic Ocean. The creek is fed directly from waters of the Atlantic Ocean. Cabretta experiences an average tidal range of approximately 3 meters. Salinity ranges with exception to major, long-term precipitation events, varies from 15-36 ppt., seasonally. Primary freshwater input consists of rainwater runoff. The benthos is composed primarily of sand substrate with small, intertidal oyster reef conglomerate communities. Adjacent to the site is extensive, intertidal, bank stabilization (armoring) in the form of woven rip-rap fencing and granite rocks. This manipulation is slowly becoming stabilized via oyster reef community colonization. The adjacent marshes are dominated by Spartina alterniflora with occasional Juncus romerianus in the nearby fringe community habitat. The creek has very little adjacent uplands due to: 1) the low elevational gradient and 2) the areas geologically recent accretion genesis (Holocene) resulting in sandy soils; of which neither conditions allow for extensive floral colonization or stabilization.

There are no current studies on pollutants in this area. Sapelo Island is typically considered a pristine environment, with minimal pollutant input.

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
sapcawq	P	Cabretta Creek	31° 26' 37.32 N, 81° 14' 23.64 W	08/01/2004 00:00 - current	NA	NA
sapdcwq	P	Dean Creek	31° 23' 22.56 N, 81° 16' 44.04 W	05/01/2004 00:00 - current	NA	NA
saphdwq	P	Hunt Dock	31° 28' 42.96 N, 81° 16' 23.16 W	07/01/1999 00:00 - current	NA	NA
sapldwq	P	Lower Duplin	31° 25' 4.59 N, 81° 17' 45.77 W	01/01/1999 00:00 - current	NA	NA
sapbcwq	P	Barn Creek	31° 26' 21.12 N, 81° 16'	05/01/1995 00:00 - 12/01/1997	unknown	unknown

			42.96 W	00:00		
sapfdwq	P	Flume Dock	31° 28' 58.08 N, 81° 16' 3.00 W	06/01/2002 00:00 - 08/01/2004 00:00	Unknown	unknown
sapmlwq	P	Marsh Landing	31° 25' 3.72 N, 81° 17' 45.96 W	06/01/2002 00:00 - 05/01/2004 00:00	Site character	near surface deployment and the fouling with such a setup was too severe to harvest reliable data

6) Data collection period –

Cabretta

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/21/2015	11:45	1/6/2016	14:15
1/6/2016	14:45	1/22/2016	12:15
1/22/2016	12:30	2/10/2016	14:15
2/10/2016	14:30	3/3/2016	12:15
3/3/2016	12:30	3/18/2016	11:15
3/18/2016	11:30	3/30/2016	13:30
3/30/2016	13:45	4/13/2016	13:15
4/13/2016	13:30	4/28/2016	13:00
4/28/2016	13:15	5/10/2016	9:45
5/10/2016	10:00	5/25/2016	13:15
5/25/2016	13:30	6/10/2016	10:45
6/10/2016	11:00	6/23/2016	11:45
6/23/2016	12:00	7/7/2016	10:30
7/7/2016	10:45	7/20/2016	12:30
7/20/2016	13:00	8/12/2016	13:00
8/12/2016	13:45	9/1/2016	14:00
9/1/2016	14:30	9/22/2016	14:00
9/22/2016	14:15	10/4/2016	12:30
10/4/2016	13:00	10/21/2016	12:30
10/21/2016	12:45	11/4/2016	9:00
11/4/2016	9:15	11/16/2016	11:45
11/16/2016	12:00	12/1/2016	11:30
12/1/2016	12:00	12/14/2016	11:30
12/14/2016	11:45	12/29/2016	12:15
12/29/2016	12:30	1/13/2017	12:00

Dean creek

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/22/2015	16:30	1/7/2016	12:45

1/7/2016	13:00	1/26/2016	14:15
1/26/2016	14:30	2/11/2016	13:00
2/11/2016	13:15	3/3/2016	11:45
3/3/2016	12:00	3/18/2016	12:15
3/18/2016	12:30	3/30/2016	13:00
3/30/2016	13:15	4/13/2016	13:00
4/13/2016	13:15	4/28/2016	11:30
4/28/2016	11:45	5/10/2016	9:15
5/10/2016	9:30	5/25/2016	12:45
5/25/2016	13:00	6/10/2016	10:15
6/10/2016	10:30	6/24/2016	13:30
6/24/2016	13:45	7/7/2016	10:00
7/6/2016	10:15	7/20/2016	12:15
7/20/2016	12:30	8/11/2016	13:45
8/11/2016	14:00	9/1/2016	10:45
9/1/2016	11:00	9/15/2016	13:15
9/22/2016	12:45	10/4/2016	13:15
10/4/2016	13:45	10/21/2016	11:00
10/21/2016	11:15	11/2/2016	14:00
11/2/2016	14:30	11/15/2016	15:15
11/15/2016	15:30	12/2/2016	13:15
12/2/2016	13:45	12/14/2016	10:45
12/14/2016	11:00	12/29/2016	11:00
12/29/2016	11:15	1/3/2017	11:30

Hunt Dock

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/21/2015	13:45	1/6/2016	14:45
1/6/2016	15:00	1/22/2016	12:45
1/22/2016	13:00	2/10/2016	14:30
2/10/2016	14:45	3/3/2016	13:30
3/3/2016	13:45	3/18/2016	11:45
3/18/2016	12:00	3/30/2016	13:45
3/30/2016	14:00	4/13/2016	13:45
4/13/2016	14:00	4/29/2016	13:15
4/29/2016	13:30	5/10/2016	10:00
5/10/2016	10:15	5/25/2016	13:30
5/25/2016	13:45	6/10/2016	11:00
6/10/2016	11:15	6/23/2016	12:15
6/23/2016	12:30	7/7/2016	10:45
7/7/2016	11:00	7/20/2016	13:00
7/20/2016	13:15	8/10/2016	11:00
8/10/2016	11:00	9/1/2016	13:45
9/1/2016	14:15	9/20/2016	8:30

Lower Duplin

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
12/21/2015	15:00	1/7/2016	14:45
1/7/2016	15:00	1/27/2016	10:45
1/27/2016	11:00	2/11/2016	15:00
2/11/2016	15:15	3/3/2016	14:00
3/3/2016	14:15	3/18/2016	12:00
3/18/2016	12:15	3/30/2016	14:00
3/30/2016	14:30	4/13/2016	14:30
4/13/2016	14:45	4/29/2016	11:15
4/29/2016	11:30	5/10/2016	9:30
5/10/2016	9:45	5/25/2016	13:00
5/25/2016	13:15	6/10/2016	10:45
6/10/2016	10:45	6/24/2016	13:45
6/24/2016	14:15	7/7/2016	11:15
7/7/2016	11:30	7/20/2016	13:30
7/20/2016	13:45	8/9/2016	13:30
8/9/2016	13:45	9/1/2016	13:30
9/1/2016	13:45	9/22/2016	11:15
9/22/2016	11:15	10/4/2016	13:00
10/4/2016	13:15	10/19/2014	14:15
10/19/2016	14:45	11/4/2016	9:45
11/4/2016	10:00	11/16/2016	13:00
11/16/2016	13:15	12/2/2016	9:45
12/2/2016	10:00	12/14/2016	11:00
12/14/2016	11:15	12/29/2016	12:30
12/29/2016	12:45	1/13/2016	13:30

7) Distribution –

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should 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. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; *accessed* 12 October 2012.

Also include the following excerpt in the metadata which will address how and where the data can be obtained.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page www.nerrsdata.org. Data are available in comma delimited format.

8) Associated researchers and projects –

The SWMP program in place on Sapelo also includes meteorological and nutrient datasets collected along with this water quality data. Furthermore Sapelo Island has a long history of maintaining research. In 1953, the University of Georgia Marine Institute (UGAMI) was formed and the island became a working laboratory for many. The research continues today with SAP NERR and UGAMI creating a unique partnership with much of the current research being done facilitated by SAP NERR and UGAMI together. Given UGAMI's long history on Sapelo, a bibliographic list of over 800 articles of current and previous research can be found on the UGAMI website: http://www.uga.edu/ugami and on the Sapelo Island NERR site: http://www.sapelonerr.org .

II. Physical Structure Descriptors

9) Sensor specifications

Sapelo NERR deployed YSI 6600 EDS data sondes at the Hunt Dock site for the entire year and at Cabretta until 10/04. EXO data sondes replaced the 6600 EDS sondes at Cabretta from 10/04 onward and were deployed the entire year at the Dean Creek and Lower Duplin sites.

YSI 6600EDS data sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 50 C
Accuracy: +/- 0.15
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 dependant)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Rapid Pulse - Clark type, polargraphic
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 to 500% air saturation: +/- 6% of the reading
Resolution: 0.1% air saturation

or

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

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Rapid Pulse - Clark type, polargraphic
Model#: 6562
Range: 0 to 50 mg/L
Accuracy: 0-20 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

or

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 – bulb probe or EDS flat glass probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561 or 6561FG
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)

Sensor Type: Optical, 90 degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence
Units: micrograms/Liter
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6025
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: CT2 Probe, Thermistor
Model#: 599870
Range: -5 to 50 C
Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: CT2 Probe, 4-electrode cell with autoranging
Model#: 599870
Range: 0 to 200 mS/cm
Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Sensor Type: CT2 probe, Calculated from conductivity and temperature
Range: 0 to 70 psu
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 psu

OR

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Wiped probe; Thermistor
Model#: 599827
Range: -5 to 50 C
Accuracy: ±0.2 C
Resolution: 0.001 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: Wiped probe; 4-electrode cell with autoranging
Model#: 599827

Range: 0 to 100 mS/cm
Accuracy: ±1% of the reading or 0.002 mS/cm, whichever is greater
Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Model#: 599827
Sensor Type: Wiped probe; Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: ±2% of the reading or 0.2 ppt, whichever is greater
Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
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: +/- 5% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
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: +/- 5% 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 33 ft (10 m)
Accuracy: +/- 0.013 ft (0.004 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701(guarded) or 599702(wiped)
Range: 0 to 14 units
Accuracy: +/- 0.1 units within +/- 10° of calibration temperature, +/- 0.2 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90 degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading
Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Parameter: Chlorophyll

Units: micrograms/Liter
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

Dissolved Oxygen Qualifier (Rapid Pulse / Clark type sensor):

The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor 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). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Research Coordinator at the specific NERR site regarding site and seasonal variation in fouling of the DO sensor.

Depth Qualifier:
The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.02 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

NOTE: older depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method. The following equation is used for corrected depth/level data provided by the CDMO beginning in 2010:
((1013-BP)*0.0102)+Depth/Level = cDepth/cLevel.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System 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.

Chlorophyll Fluorescence Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements

10) Coded variable definitions – List the sampling station, sampling site code, and station code used in the data.

Sampling station:	Sampling site code:	Station code:
Cabretta Creek	CA	sapcawq
Dean Creek	DC	sapdcwq
Hunt Dock	HD	saphdwq
Lower Duplin	LD	sapldwq

11) 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

12) 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

13) Post deployment information

Cabretta

Deploy Date	Sonde Nickname	SpCond	ROXDO1	pH7	pH10	Turb	Turb
1/6/2016	10/DC1	50.3(50.0)	98.4	7.1	9.91	-0.06(0.0)	125.9(126.0)
1/22/2016	12/CA1	48.95(50.0)	95.4	7.03	9.97	-0.8(0.0)	126.3(126.0)
2/10/2016	10/DC1	49.45(50.0)	101	7.09	10.02	-0.1(0.0)	126.1(126.0)
3/3/2016	14/LD2	49.78(50.0)	101.1	7.1	9.99	-2.5(0.0)	135.5(126.0)
3/18/2016	10/DC1	49.03(50.0)	97.7	7.58	9.44	14.5(0.0)	141.2(126.0)
3/30/2016	2/CA2	30.91(50.0)	94.3	7.5	8.77	2.4(0.0)	120.6(126.0)
4/13/2016	1A/HD2	48.97(50.0)	99.9	7.14	9.89	-3.4(0.0)	141.5(126.0)
4/28/2016	2/CA2	50.44(50.0)	98.6	7.05	10.02	-0.4(0.0)	130.7(126.0)
5/10/2016	1A/HD2	49.44(50.0)	100.1	7.29	9.9	0.0(0.0)	119.9(126.0)
5/25/2016	2/CA2	50.09(50.0)	100.6	7.07	9.79	-2.98(0.0)	124.3(126.0)
6/10/2016	1A/HD2	49.35(50.0)	100	7.13	10.26	0.5(0.0)	113.0(126.0)
6/23/2016	12/CA1	50.31(50.0)	100.3	7.39	8.89	1475.0(0.0)	1589.0(126.0)
7/7/2016	10/DC1	52.3(50.0)	101.5	7.23	10.13	-1.2(0.0)	129.8(126.0)
7/20/2016	12/CA1	49.26(50.0)	99.5	7.59	10.73	0.8(0.0)	135.2(126.0)
8/12/2016	10/DC1	48.54(50.0)	99	7.28	10.01	7.2(0.0)	124.6(126.0)
9/1/2016	14/LD2	49.87(50.0)	97.6	7.55	9.69	2.2(0.0)	121.8(126.0)
9/22/2016	12/CA1	49.15(50.0)	99.6	7.05	10.06	1.2(0.0)	122.9(126.0)
10/4/2016	Amelia	49.56(50.0)	102.1	6.98	9.97	3.56(0.0)	125.9(124.0)
10/21/2016	Catherine	49.903(50.0)	99.7	7.03	9.97	1.73(0.0)	130.7(124.0)
11/4/2016	july	49.853(50.0)	99.3	7.21	10.18	1.26(0.0)	126.9(124.0)
11/16/2016	Cumberland	49.95(50.0)	101.3	7.12	10.32	1.8(0.0)	122.9(124.0)
12/1/2016	july	49.55(50.0)	100.7	7.12	10.06	0.55(0.0)	129.8(124.0)
12/14/2016	Catherine	50.053(50.0)	100.8	6.97	9.96	1.24(0.0)	125.86(124.0)
12/29/2016	july	50.587(50.0)	101.2	7.03	10.01	-0.03(0.0)	123.12(124.0)

Dean Creek

Deploy Date	Sonde Nickname	SpCond	ROXDO1	pH7	pH10	Turb	Turb
1/7/2016	Amelia	50.21(50.0)	100.1	7.15	10	0.63(0.0)	122.02(124.0)
1/26/2016	july	49.08(50.0)	100.2	6.99	10.05	-0.5(0.0)	131.2(126.0)
2/11/2016	Sapelo	49.18(50.0)	99.8	7.15	10.07	0.24(0.0)	122.46(124.0)
3/3/2016	july	49.45(50.0)	101.8	7.06	9.99	0.197(0.0)	192.5(124.0)
3/18/2016	Sapelo	49.64(50.0)	97.9	7.08	10.05	1.56(0.0)	125.63(124.0)
3/30/2016	Amelia	49.37(50.0)	99.7	7.13	9.82	0.81(0.0)	60.35(124.0)
4/13/2016	Catherine	50.28(50.0)	99.7	7.03	9.96	-1.13(0.0)	130.4(124.0)
4/28/2016	Amelia	49.84(50.0)	99.1	7.02	10.04	3.77(0.0)	128.75(124.0)
5/10/2016	Catherine	50.124(50.0)	99.3	7.05	10.08	-0.79(0.0)	124.1(124.0)
5/25/2016	Amelia	49.06(50.0)	98.8	7.06	10.01	1.02(0.0)	126.9(124.0)
6/10/2016	Catherine	49.1(50.0)	99.5	7.13	10.06	0.38(0.0)	115.77(124.0)
6/24/2016	Amelia	49.96(50.0)	100.3	7.06	10.01	-0.22(0.0)	121.96(124.0)
7/6/2016	Catherine	50.59(50.0)	100.3	7.18	10.18	0.79(0.0)	125.9(124.0)
7/20/2016	Amelia	48.42(50.0)	99.1	7.09	10.07	3.5(0.0)	303.2(124.0)
8/11/2016	Catherine	43.302(50.0)	99.9	7.14	10.17	0.92(0.0)	128.33(124.0)

9/1/2016	Amelia	48.54(50.0)	98.1	7.2	10.01		
9/22/2016	Catherine	47.435(50.0)	100.4	7.11	10.07	0.63(0.0)	131.66(124.0)
10/4/2016	july	50.32(50.0)	101.6	6.55	9.85	1.23(0.0)	122.9(124.0)
10/21/2016	Cumberland	49.865(50.0)	98.7	7.14	10.04	3.97(0.0)	129.25(126.0)
11/2/2016	Amelia	33.19(50.0)	99.9	7.15	10.18	-6.97(0.0)	122.5(124.0)
11/15/2016	Catherine	49.96(50.0)	100.9	6.23	9.15	0.59(0.0)	126.9(124.0)
12/2/2016	Amelia	50.852(50.0)	103.2	7.08	9.96	0.29(0.0)	120.43(126.0)
12/14/2016	Cumberland	49.63(50.0)	101.1	7.06	10.04	1.35(0.0)	123.23(124.0)
12/29/2016	Amelia	49.585(50.0)	100.5	7.1	10.1	0.82(0.0)	123.7(126.0)

Hunt Dock

Deploy Date	Sonde Nickname	SpCond	ROXDO1	pH7	pH10	Turb	Turb
1/6/2016	1A/HD2	51.38(50.0)	100.2	7.1	10.13	0.2(0.0)	126.9(126.0)
1/22/2016	14/LD2	49.59(50.0)	100.1	7.02	9.95	-2.2(0.0)	-129.3(126.0)
2/10/2016	1A/HD2	48.99(50.0)	101.2	7.02	10.06	-1.0(0.0)	130.1(126.0)
3/3/2016	2/CA2	50.84(50.0)	101.4	7.05	9.98	0.6(0.0)	139.5(126.0)
3/18/2016	1A/HD2	50.63(50.0)	100.5	7.07	10.02	2.7(0.0)	125.2(126.0)
3/30/2016	16/LD1	49.98(50.0)	100.1	7.1	9.67	0.6(0.0)	110.7(126.0)
4/13/2016	10/DC1	48.15(50.0)	105.1	7.01	9.99	-2.3(0.0)	132.5(124.0)
4/29/2016	14/LD2	49.81(50.0)	98.9	7	9.99	2.7(0.0)	117.0(126.0)
5/10/2016	10/DC1	49.92(50.0)	100.1	7.04	10.04	0.2(0.0)	118.6(126.0)
5/25/2016	14/LD2	48.89(50.0)	99.1	6.99	9.96	1.2(0.0)	128.9(126.0)
6/10/2016	10/DC1	50.43(50.0)	100	7.19	10.25	52.7(0.0)	169.1(126.0)
6/23/2016	14/LD2	50.0(50.0)	100.6	7.02	10	0.7(0.0)	128.2(126.0)
7/7/2016	1A/HD2	50.33(50.0)	101.8	6.99	10.06	0.1(0.0)	117.1(126.0)
7/20/2016	14/LD2	48.65(50.0)	100.8	7.06	9.96	1.6(0.0)	141.1(126.0)
8/10/2016	1A/HD2	49.14(50.0)	99.3	7.02	9.21	0.4(0.0)	125.8(126.0)
9/1/2016	12/CA1	49.94(50.0)	97.7	7.16	9.31	2.9(0.0)	134.8(126.0)

Lower Duplin

Deploy Date	Sonde Nickname	SpCond	ROXDO1	pH7	pH10	Turb	Turb
1/7/2016	Sapelo	50.8(50.0)	101.7	7.11	9.94	0.03(0.0)	123.27(124.0)
1/27/2016	Amelia	49.65(50.0)	100.6	7.1	9.98	0.02(0.0)	129.5(124.0)
2/11/2016	Catherine	49.49(50.0)	100.9	7.21	10.11	0.56(0.0)	124.37(124.0)
3/3/2016	Amelia	49.17(50.0)	100	7	9.97	0.58(0.0)	147.5(124.0)
3/18/2016	Catherine	49.86(50.0)	99.7	7.25	10.03	2.06(0.0)	126.48(124.0)
3/30/2016	july	49.67(50.0)	99.3	7.07	10.05	0.29(0.0)	80.43(124.0)
4/13/2016	Sapelo	49.97(50.0)	97.2	7.08	10.02	-0.082(0.0)	128.24(126.0)
4/29/2016	july	49.2(50.0)	96.6	7	9.95	3.78(0.0)	131.65(124.0)
5/10/2016	Sapelo	50.93(50.0)	100.3	7.17	9.9	0.2(0.0)	123.04(124.0)
5/25/2016	july	47.95(50.0)	99.8	7.54	9.61	6.98(0.0)	135.8(124.0)

6/10/2016	Sapelo	48.91(50.0)	99.7	7.35	9.75	-2.68(0.0)	116.99(124.0)
6/24/2016	july	50.55(50.0)	101.1	6.95	10.17	1.26(0.0)	120.8(124.0)
7/7/2016	Sapelo	49.87(50.0)	100.5	6.98		2.89(0.0)	119.9(124.0)
7/20/2016	july	42.8(50.0)	99.5	6.99	9.91	3.99(0.0)	255.3(124.0)
8/9/2016	Sapelo	47.64(50.0)	98	7.05	9.88	-5.18(0.0)	732.82(124.0)
9/1/2016	july	47.04(50.0)	97.3	7.78	9.02	7.49(0.0)	262.5(124.0)
9/22/2016	Sapelo	49.85(50.0)	100	7.08	10	1.07(0.0)	130.86(126.0)
10/4/2016	Blackbeard						
10/19/2016	Sapelo	52.7515(50.0)	100.5	7.22	10.18	-2.22(0.0)	123.29(124.0)
11/4/2016	Blackbeard	49.602(50.0)	100.2	7.16	10.14	1.9(0.0)	126.4(124.0)
11/16/2016	Sapelo	51.01(50.0)	102.1	7.02	10.12	1.12(0.0)	124.9(124.0)
12/2/2016	Blackbeard	50.306(50.0)	101.7	7.02	10.02	0.98(0.0)	117.87(124.0)
12/14/2016	Sapelo	50.04(50.0)	101.3	7.1	10.06	1.37(0.0)	125.02(124.0)
12/29/2016	Blackbeard	49.592(50.0)	100	7.1	10.09	0.35(0.0)	122.39(124.0)

14) Other remarks/notes –

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 Research Coordinator at the reserve submitting the data.

Originally DC and LD files for the following deployments were collected in UTC time. These files have been corrected to EST time by subtracting five hours from the UTC date/time stamps.. The BIN files will not match the RAW CSV files due to this.
DC
12/22/2015
1/7/2016

LD
12/21/2015
1/7/2016
1/27/2016
2/11/2016
3/3/2016

From 9/22 14:15-9/23 6:45 at the Cabretta site all data is marked 1 CWD at the beginning of a deployment. This site tends to foul quickly so the sonde may have been hung upon deployment and then settled to the correct depth.

Data at Hunt Dock is missing after 9/20. At that point the dock was removed to be rebuilt. At that point Hurricane Matthew made a mess. Once the dock was completed it wasn't possible to re-deploy in the same way so we were delayed by altering the site and building a custom deployment structure.

Data at Lower Duplin at 7/29 13:15 and 8/23 9:45 was out of the water. More than likely this was because of someone tampering with the sonde while it was deployed.

Lower Duplin and Cabretta deployments were removed on 10/6 before the arrival of hurricane Matthew on 10/7 and replaced on 10/11. Dean creek was left in place due to the sheltered location of the deployment site.

Turbidity on the Cabretta 12/01 to 12/14 deployment had lots of large spikes but no biofouling, I suspect some debris or a small fish was trapped in the sonde guard.