

North Carolina (NOC) National Estuarine Research Reserve Water Quality Metadata
January 1 – December 31, 2009
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I. Data Set & Research Descriptors

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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) 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.

3) Research Objectives:

Four long-term water quality monitoring stations have been established within the estuaries bordering Masonboro and Zeke's Islands of North Carolina's National Estuarine Research Reserve. Instruments are anchored to the bottom of the selected sites and measurements are taken at 15-minute intervals for approximately two to four week periods continuously throughout the year. Parameters measured include Depth, Temperature, Salinity, Specific Conductivity, pH, Dissolved Oxygen, and Turbidity. The goal is to assess short-term variability and long-term changes (i.e., localized impacts of seasonal storm events, inter-annual differences from rainfall, magnitude of climatic influence from El Nino/La Nina events, etc.) in estuarine water parameters within relatively pristine sites.

4) Research Methods:

The Estuarine Water Quality Monitoring Program began on 2 March 1992 at the Research Creek site of the Masonboro Island component. A second Masonboro Island site (Loosin Creek) was added on 26 February 2002. Data collection started on 19 May 1994 at the Zeke's Island component (East Cribbings) and an additional site (Zeke's Basin) was added 1 March 2002. The procedures described below were instituted in June 1995 and thus do not cover data recorded previously.

Two data loggers are assigned to each of the four permanent monitoring stations and are generally not interchanged among sites. Before each YSI 6600EDS is deployed, calibration and maintenance is performed following the manufacturer's instructions. Calibration standards are required for pH, turbidity and salinity; all other parameter calibrations are performed as described in the manual. Buffer solutions for a two-point pH calibration (pH 7 and 10) are purchased pre-made from a scientific supply house. The conductivity and turbidity standards are obtained from YSI. The dissolved oxygen membranes are replaced and allowed to settle at least 24 hrs prior to deployment unless deploying the optical dissolved oxygen probes, which require membrane changes yearly.

Data sondes are wrapped in a wet, white towel and placed in a cooler for transport to the site. Monitoring stations are accessed using a small boat equipped with an outboard motor. During deployment the weather conditions and tide stage are recorded in the field observation log. The water quality instrument is placed inside a locked steel cage and anchored horizontally approximately 15cm off the bottom. Every 15 minutes measurements are taken for Temperature, Specific Conductance, Salinity, Dissolved oxygen saturation, Dissolved oxygen concentration, Depth, pH, and Turbidity. All data are recorded in Eastern Standard Time.

At the end of the sample period the water quality instrument is exchanged with a freshly calibrated instrument and transported back to the laboratory wrapped in a wet, white towel. The weather and water quality measurements are again noted in the field observation log. The calibration drift and the effect of biofouling on the water quality instrument are documented by post-calibration protocols. The water quality data are then uploaded, and sent to CDMO for primary QAQC, and the instrument is cleaned and calibrated as noted previously.

A Sutron Sat-Link2 transmitter was installed at the Research Creek station on mm/dd/yy) and transmits data to the NOAA GOES satellite, NESDIS ID #3B032698. 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>.

5) Site Location and Character:

The components of North Carolina's National Estuarine Research Reserve (from north to south) are: Currituck Banks, Rachel Carson, Masonboro Island, and Zeke's Island. They are located along the southeast Atlantic coast of the United States. Currently, only data from Masonboro Island and Zeke's Island components are transferred to the CDMO. The four monitoring sites are:

A. Research Creek, Masonboro Island

The first Masonboro Island site (formerly called Masonboro Island (MS)) is 0.72 km north east from the mouth of Whiskey Creek, and east of the Intracoastal Waterway (ICW), in a small navigable channel called Research Creek at 34°09'21.7" latitude and 77° 50'59.9" longitude. The site typically has a salinity range of 20-35 ppt and a tidal range that averages around 1.2 meters. The sole source of freshwater is rain and salinity values as little as 10 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.2 to 2.6 m. *Spartina* spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site does experience minimal boat traffic.

B. Loosin Creek, Masonboro Island

The second Masonboro Island site (added in 2002) is 1.2 km east of the ICW, and 2.5 km south west of Masonboro Inlet, in a small navigable channel called Loosin Creek at 34° 10'20.0" latitude and 77° 49'58.1" longitude. The site generally has a salinity range of 22-35 ppt and a tidal range that averages 1.2 meters. The sole source of freshwater is rain and salinity values as little as 15 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.1 to 2.5 m. *Spartina* spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site does experience minimal boat traffic.

C. East Cribbings, Zeke's Island

The first Zeke's Island site (formerly called Zeke's Island (ZI)) is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33° 56'23.5" latitude and 77° 56'28.1" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site typically has a salinity range of 15-33 ppt, although values as little as 10 ppt have been recorded. Tidal range averages 1.2 meters. Depth varies, but usually can be found to range from 0.5 to 2.7 meters. Bottom type substratum consists of large rocks (the cribbings) with sand and detritus based sediment. There are no pollutants from land. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

D. Zeke's Basin, Zeke's Island

The second Zeke's Island site (added in 2002) is located 0.8 km south east of the Federal Point boat launch in a tidal basin estuary at 33° 57'17.0" latitude and 77° 56'6.0" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site has a characteristic salinity range of 12-30

ppt, but values below 10 ppt have been observed and are often associated with periods of heavy rainfall. Tidal range averages 1.2 meters. Depth varies, but typically it can be found to range from 0.1 to 1.8 meters. Bottom type substratum consists of sand and detritus based sediment with a layer of soft sulfuric mud. There are no pollutants from land. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

6) Data Collection Period:

Research Creek data collection began on 2 March 1992 while monitoring of Loosin Creek started on 26 February 2002. East Cribbing data collection commenced on 19 May 1994 and Zeke's Basin data collection began on 1 March 2002. All monitoring is considered long term.

Deployment Date and Time / Retrieval Date and Time for 2009

Research Creek, Masonboro Island:

12/18/2008	13:30	1/26/2009	10:30
1/26/2009	10:45	2/10/2009	9:30
2/10/2009	9:45	2/25/2009	17:15
3/11/2009	8:30	3/18/2009	14:30
3/18/2009	15:00	4/13/2009	11:00
4/13/2009	11:45	5/12/2009	10:15
5/12/2009	10:45	6/11/2009	09:45
6/11/2009	10:00	6/17/2009	14:00
6/17/2009	14:15	7/7/2009	10:00
7/7/2009	10:30	7/20/2009	8:00
7/20/2009	8:30	8/10/2009	22:00
8/11/2009	12:30	8/12/2009	13:30
8/12/2009	13:45	8/24/2009	12:15
8/24/2009	12:45	9/9/2009	11:30
9/9/2009	11:45	10/7/2009	12:15
10/7/2009	13:30	11/17/2009	11:00
11/17/2009	11:15	12/7/2009	13:00
12/7/2009	13:15	1/20/2010	12:05

Loosin Creek, Masonboro Island:

12/18/2008	13:30	1/26/2009	10:45
1/26/2009	11:15	2/9/2009	11:30
2/9/2009	11:45	3/18/2009	15:15
3/18/2009	15:30	4/13/2009	11:45
4/13/2009	12:00	5/11/2009	11:00
5/13/2009	00:00	6/11/2009	10:00
6/11/2009	10:15	7/7/2009	10:30
7/7/2009	10:45	7/20/2009	8:30
7/20/2009	8:35	7/20/2009	8:35
7/20/2009	9:00	8/11/2009	11:45
8/11/2009	12:00	8/24/2009	12:00
8/24/2009	12:15	9/9/2009	11:00
9/9/2009	11:15	10/7/2009	12:30
10/7/2009	12:45	11/17/2009	10:30
11/17/2009	10:45	12/7/2009	13:15
12/7/2009	13:30	1/20/2010	11:45

East Cribbings, Zeke's Island:

12/17/2008	13:00	1/12/2009	11:30
1/12/2009	11:45	2/9/2009	9:30
2/9/2009	9:45	3/18/2009	12:45
3/18/2009	13:00	4/13/2009	14:00
4/13/2009	14:30	5/11/2009	13:00
5/13/2009	00:00	6/11/2009	11:45
6/11/2009	12:00	7/7/2009	8:45
7/7/2009	9:00	7/21/2009	8:45
7/21/2009	9:00	8/11/2009	14:00
8/11/2009	14:15	8/24/2009	10:30
8/24/2009	11:00	9/9/2009	13:00
9/9/2009	13:15	10/12/2009	8:00
10/19/2009	9:45	11/19/2009	14:15
11/19/2009	14:30	12/7/2009	11:30
12/7/2009	11:45	1/7/2010	13:45

Zeke's Basin, Zeke's Island:

12/17/2008	13:15	1/12/2009	11:45
1/12/2009	12:00	2/7/2009	19:00
2/9/2009	10:15	3/18/2009	13:00
3/18/2009	13:15	4/13/2009	14:45
4/13/2009	15:00	5/11/2009	15:15
5/13/2009	00:00	6/11/2009	12:00
6/11/2009	12:15	7/7/2009	9:00
7/7/2009	9:15	7/21/2009	9:00
7/21/2009	9:15	7/26/2009	20:15
8/11/2009	14:45	8/24/2009	10:45
8/24/2009	11:00	9/9/2009	12:45
9/9/2009	13:00	10/19/2009	9:45
10/19/2009	10:00	11/18/2009	10:30
11/18/2009	11:00	12/7/2009	11:45
12/7/2009	12:00	1/7/2010	14:15

7) Distribution:

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR 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. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. 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.

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 <http://cdmo.baruch.sc.edu/>. Data are available in text tab-delimited format.

8) Associated Researchers and Projects:

As part of the SWMP core monitoring program, the North Carolina Reserve also collects weather data from a meteorological station located at the Research Creek monitoring site and water chemistry/nutrient data from all 4 of the water quality monitoring sites. These data may be correlated with the water quality data.

Additional research projects are ongoing and continually changing. Check with the Research Coordinator or other contact person for an updated list of research.

II. Physical Structure Descriptors

9) Sensor specifications:

YSI 6600 EDS models were utilized for all deployments. Each sonde is equipped with a non-vented depth probe. Rapid pulse dissolved oxygen sensors were deployed at Research Creek and Loosin Creek. Optical dissolved oxygen probes (ROX) were utilized every other deployment at the East Cribbings and Zeke's Basin sites.

YSI 6600 EDS data logger:

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
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

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

Units: units

Sensor Type: Glass combination electrode

Model #: 6561 EDS and 6561FG (flat glass)

Range: 0 to 14 units

Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity

Units: nephelometric turbidity units (NTU)

Sensor Type: Optical, 90°

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 reserves have upgraded to the YSI 6600 EDS data sondes, which increases 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, 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. The Research Coordinator at the specific NERR site 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 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 1.03 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.

10) Coded variable definitions:

Sampling station:	Sampling site code:	Station code:
Research Creek	RC	nocrcwq
Loosin Creek	LC	noclcwq
East Cribbings	EC	nocecwq
Zeke's Basin	ZB	noczbwq

11) QAQC flag definitions – This section details the automated and secondary 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 – This section details the secondary QAQC Code definitions used in combination with the flags above.

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
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:

Research Creek

Deployment start	Dissolved oxygen (%)	Specific Conductance	pH 7	pH 10	Turbidity	Battery voltage
12/18/2008 13:36	90.4*	49.73	7.09	10.04	0.3	10.2
1/26/2009 9:35	101.5	50.32	7.23*	10.16	-0.6	11.6
2/10/2009 9:35	97.7*	20.11*	6.93	9.84	0	6
3/11/2009 8:15	69.4*	49.94	7.03	10.6*	0.5	10.3
3/18/2009 14:30	100.9	49.41	7.13	10.18	0.2	12
4/13/2009 11:35	98.3	50.95	7.08	10.08	1	11.6
5/13/2009 10:44	98	50.31	7.03	9.98	0.7	11.3
6/11/2009 10:44	100.1	49.7	6.98	10.01	-0.4	11.5
6/17/2009 2:16	105.8	48.09*	7.07	10.05	0.9	10.5
7/7/2009 10:22	98.4	49.3	7.07	10.01	-0.2	11
7/20/2009 8:03	100.4	48.91*	6.85	9.73*	0	6.6
8/11/2009 11:14	99.2	50.04	7	10	1.1	10.9
8/12/2009 13:35	98.7	42.12*	6.84	9.83	0.4	12.3
8/24/2009 12:00	100.2	48.98*	6.8	9.82	1.6	Bat failure
9/9/2009 11:31	98.4	0.36*	6.99	9.65*	0.4	11.1
10/7/2009 12:18	100.2	24.53*	7.19	9.67*	1.1	11.3

11/17/2009 10:53	99.2	50.16	7.06	10.11	0.2	9.3
12/7/2009 13:08	100.4	56.13*	6.86	9.82*	-0.3	9.8

* = outside of acceptable range for post calibration

X= Unable to communicate with the sonde for post calibration procedures

(c)= conductivity hole was clogged

Loosin Creek

Deployment start	Dissolved oxygen (%)	Specific Conductance	pH 7	pH 10	Turbidity	Battery voltage
12/18/08 13:36	70.2	51.1	7.23	10.16	-0.4	10.7
1/26/09 10:53	102.5*	50.09	7.18	10.08	-0.05	12.5
2/9/09 11:35	70.9	50.11	7.04	9.99	0.4	11.5
3/18/09 14:30	101.7	49.26	7.4	10.42	-0.6	11.8
4/13/09 11:54	78.2*	27.63 (c)*	7.05	9.25	1.2	11.1
5/11/09 10:57	99.8	46.68*	7.02	10.06	1.5	11.3
6/11/09 10:08	100.8	48.8*	7.23*	10.11	0.9	10.9
7/7/09 10:31	105.8*	48.09*	7.07	10.05	0.9	10.5
7/20/09 8:35	104.6*	49.74	6.96	9.83	-4	10.7
7/20/09 8:35	101.4	50.55	7.06	10.09	0.3	10.7
8/11/09 11:48	98.7	49.42	6.95	9.89	1.6	9.4
8/24/09 12:05	95.9*	50	7.05	10.07	0.3	10.4
9/9/09 11:03	98.5	49.67	6.75*	9.67*	-0.5	11.3
10/7/09 12:42	74.8*	46.07*	7.37*	8.84*	-0.3	11.5
11/17/09 10:28	102.5*	52.29*	7.04	10.01	0.9	12.3
12/7/09 13:17	100.4	51.32*	7.16	10.1	0.3	10.6

* = outside of acceptable range for post calibration

X= Unable to communicate with the sonde for post calibration procedures

(c)= conductivity hole was clogged

East Cribbings

Deployment start	Dissolved oxygen (%)	Specific Conductance	pH 7	pH 10	Turbidity	Battery voltage
12/17/2008 13:04	100.8	50.63	7.05	10	-0.2	11.4
1/12/2009 11:35	99.6	6.0 (c)*	6.85	9.62*	4.5*	12
2/9/2009 9:40	100.8	50.71	6.82	9.81	0.8	10.4
3/18/2009 12:30	99.3	50.26	7.14	10.18	4	10.9
4/13/2009 14:08	100.3	48.25*	7.07	10	0.8	11.6
5/11/2009 13:04	99.2	18.63*(c)	7.04	9.98	-0.5	12.2
6/11/2009 11:47	98.9	49.89	7.1	9.98	0.4	11
7/7/2009 4:46	100.8	49.33	7.05	10.03	-0.3	11.5
7/21/2009 5:46	98.6	44.58*	6.78*	9.74*	0.5	10.2
8/11/2009 14:09	99	49.24	7.03	9.89	-0.4	11.3
8/24/2009 10:39	98.9	49.7	7.03	9.97	-0.9	10.7
9/9/2009 13:01	99.9	49.53	7.02	10.01	0.1	5.3
10/19/2009 9:32	97.9*	48.86*	7.08	10.03	3.7*	10.8

11/19/2009 14:20	100.4	49.39	6.97	9.87	0	11.7
12/7/2009 11:35	98.6	49.49	6.89	9.91	-0.6	9.6

* = outside of acceptable range for post calibration

X= Unable to communicate with the sonde for post calibration procedures

(c)= conductivity hole was clogged

Zeke's Basin

Deployment start	Dissolved oxygen (%)	Specific Conductance	pH 7	pH 10	Turbidity	Battery voltage
12/17/2008 13:18	99.9	49.41	6.95	9.99	1.3	11.7
1/12/2009 11:48	116*	50.39	6.94	9.82	-0.5	batteries died.
2/9/2009 10:05	100	48.48*	6.86	9.85	0.1	9.7
3/18/2009 13:05	100.8	50.61	7.03	10.13	-0.3	11
4/13/2009 14:48	99.7	47.12*	6.88	9.79*	0.1	11.9
5/11/2009 13:25	99.1	50.37	7.01	10.06	0.4	11.1
6/11/2009 12:06	99.5	49.89	7.39	10.24*	0.7	11.1
7/7/2009 9:02	100.7	48.91*	7.15	10.15	0	10.5
7/21/2009 9:03	98.5	49.43	6.74*	9.62*	0.3	6.2
8/11/2009 14:35	100.4	49.9	7.04	10	1	11.7
8/24/2009 10:50	99	48.85*	6.85	9.89	-31.6	12.3
9/9/2009 12:47	99.8	49.5	6.95	10	-0.5	10.5
10/19/2009 9:50	100.1	48.88*	6.83	9.73*	-3.4	11.2
11/18/2009 11:40	100.4	49.2	6.99	9.91	102*	8.3
12/7/2009 11:48	99.4	50.83	6.74*	9.67*	-0.1	7

* = outside of acceptable range for post calibration

X= Unable to communicate with the sonde for post calibration procedures

(c)= conductivity hole was clogged

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.

Stations RC and LC converted from rapid pulse dissolved oxygen sensors to ROX probes. Final conversion occurred on the following dates:

RC 6/11/09

LC 11/17/09

All sondes for NCNERR currently use ROX probes full time.

More than 6 inches of rain fell on 9/21/09-09/22/09, affecting temperature, salinity and specific conductance.

Research Creek.

General

RC sondes were deployed within newly vertical deployment structure 9/16/2009. The vertical deployment was not a large change. We minimized the horizontal movement of the sonde and potentially had less out of water events (if deployment structure was on a sand bar prior to vertical shift).

03/18/2009 14:45 - Reading missed during sonde exchange.
05/12/2009 10:30 - Reading missed during sonde exchange.
06/23/2009 08:45 - Reading missed during ISCO autosampler deployment.
07/07/2009 10:15 - Reading missed during sonde exchange.
07/20/2009 08:15 - Reading missed during ISCO autosampler deployment.
08/04/2009 02:15 - Reading missed during ISCO autosampler deployment
08/24/2009 12:30 - Reading missed during sonde exchange

10/07/2009 12:30 Sonde time set incorrectly. Data DateTimeStamp adjusted to reflect true time/date. Following 1 hour of data lost. Data flagged <-2> [GQR] (CSM)

12/10/2009 15:15 All data for this time rejected due to QAQC. Depth reads ~0 and salinity/SpCond drop to ~0 as well. This would indicate an out of water event. However, sonde is housed in locked housing and the reading occurred at high tide indicating that it could not have been exposed at low tide and was not likely to be tampered with. Sonde was not serviced at that time either.

Battery failure occurred on 2/25/09, missing data until 3/11/09. The sonde came back on from 13:15 to 17:15 on 2/25/09 and that data should be considered suspect due to the low battery voltage.

There were problems with the deployment structure on the March 11, 2009 deployment. The sonde was secured to the piling at Research Creek and not deployed on the cinder block structure used for previous data. The change in deployment regime may result in differences in depth and potentially other parameters until the sonde was swapped on March 18, 2009. Data was coded <0> (CSM).

Turbidity

Unexplained increases in turbidity from 05/10/2009 01:15 - 05/10/2009 05:30. Values were flagged as 0 CTS.

High turbidity due to rainfall. Spikes above 1000 were rejected, other spikes flagged as 0 CTS.

05/10/2009 13:15
05/10/2009 15:30
05/10/2009 15:45
05/10/2009 16:00
05/10/2009 16:15
05/26/2009 23:15
05/27/2009 03:45
05/27/2009 04:45
06/01/2009 09:00

Following 5/24/09 rainfall, sporadic high turbidity readings were recorded but did not occur tightly in conjunction with tidal exchange. Surges in turbidity were flagged <1> [STS] (CSM). After this period between the 06/05/2009 04:45 - 06/11/2009 09:45, values were rejected (>1000 or -1) or flagged as suspect. Turbidity post cal was acceptable and no heavy biofouling

was present. It is possible that some light algae on the wiper were confounding the optics. The anomalous readings ceased with the deployment of the next newly calibrated sonde.

A series of rain events likely increased turbidity around 6/4 and 6/5/2009. Settling sediments seem to have fouled the turbidity probe towards the end of the deployment.

There were occasional turbidity spikes that do not reflect the normal conditions for the site and should be considered suspect.

Turbidity malfunction occurred 06/05/2009 13:00 - 06/11/2009 09:45, with sporadic readings of -1 and abnormally high values. This time period coincides with a substantial regional rain event so high turbidity is expected. This does not explain the -1 values. All turbidity values were flagged suspect or rejected (-1) for this time period.

Turbidity values were high 06/27/2009 17:45 - 07/07/2009 10:00. Some values may have been elevated following a significant rain event, but it does not satisfactorily explain the constantly high turbidity values. Turbidity records flagged as suspect.

From 09/26/2009 19:00 - 10/07/2009 12:15, following rain event there were many turbidity spikes and values were clearly above what could normally be expected for the duration of the deployment.

Beginning November 6, 2009, elevated turbidity values were observed. Many of these values were rejected due to being outside of the sensor range. The values within range were marked as suspect for the remainder of the deployment. The probe was heavily fouled at the end of deployment, but functioned properly following a good cleaning.

Dissolved oxygen

During the December 18, 2008 deployment, dissolved oxygen drift may have occurred. DO saturation jumped 12% after a newly calibrated sonde was deployed suggesting that drift had occurred. The values for this data set should be considered suspect, due to the low post calibration values for dissolved oxygen. Data range for this submission was January 1, 2009 – January 26, 2009.

Dissolved oxygen was marked as suspect for the data from 3/11/2009- 3/18/2009. The post calibration value was below the acceptable range.

pH data from 7/1 7:30 to 7/7 10:00 pH was affected by increased algae fouling.

Hypoxia at low tide, at night. Probable algal bloom.

08/09/2009 03:30

08/09/2009 03:45

08/09/2009 04:00

08/06/2009 01:45

08/06/2009 02:15

08/06/2009 02:30

08/07/2009 02:00

08/07/2009 02:15

08/07/2009 02:30

08/07/2009 02:45

08/07/2009 03:00

08/07/2009 03:15

08/08/2009 03:00
08/08/2009 03:15
08/08/2009 03:30
08/10/2009 03:45
08/10/2009 04:00
08/10/2009 04:15
08/10/2009 04:30
08/10/2009 04:45
08/10/2009 05:00
08/10/2009 05:15

Temp/Salinity

Following the October 7, 2009 deployment, specific conductance/salinity did not have acceptable post calibration values. Heavy fouling was documented upon sonde retrieval. Since the drift may have been gradual, the entire deployment was marked as suspect for these parameters.

The same specific conductance probe was deployed again on December 7, 2009. Prior to deployment, it was noted that the conductivity constant was elevated, but the probe calibrated fine. However, the data values were considerably lower than those of the previous (and acceptable calibration/post calibration) sonde's deployment. The entire data set was marked as suspect for specific conductance and salinity from December 7, 2009 through the end of the year/deployment.

Following the October 7, 2009 deployment, specific conductance/salinity did not have acceptable post calibration values. Heavy fouling was documented upon sonde retrieval. Since the drift may have been gradual, the entire deployment was marked as suspect for these parameters.

pH

pH did not pass with acceptable post calibration values in the pH 10 solution following the October 7, 2009 deployment. Data was retained, but as sensor did not pass post calibration, was marked as suspect <1> [SPC] (CSM). The data seems to fit conditions and though outside of acceptable range, perhaps only higher pH scenarios would be affected.

Loosin Creek

LC sondes deployed within newly vertical deployment structure 9/30/2009. The vertical deployment was not a large change. We minimized the horizontal movement of the sonde and potentially had less out of water events (if deployment structure was on a sand bar prior to vertical shift).

During the December 18, 2008 deployment, dissolved oxygen drift may have occurred. The values for this data set should be considered suspect, due to the low post calibration values for dissolved oxygen. Data range for this submission is January 1, 2009 – January 26, 2009.

On January 26, 2009 the 11:00 reading was missed due to swapping sondes.

Beginning January 26, 2009, pH seems elevated for the duration of the deployment. The probe calibrated fine but the slope was low during post calibration. All pH data for this period should be considered suspect.

Beginning February 7, 2009, there were several out of water events for some probes. These were marked as rejected in the dataset.

Dissolved oxygen post calibration values were below the acceptable range after the February 9, 2009 deployment. Dissolved oxygen was marked as suspect for the entire deployment.

During the February 9, 2009 deployment, there were periods of elevated turbidity values. These may have been due to fauna within the guard and do not reflect normal conditions for the site. These elevated turbidity readings were marked as suspect unless outside the specifications for the sensor, in which case values were rejected.

There were out of water events on February 8-12, 2009 and March 8-9, 2009. Affected parameters were rejected.

During the March 18, 2009 deployment, the pH probe malfunctioned. This probe calibrated properly but failed the post calibration and showed elevated values throughout the deployment. The entire deployment was marked -3 SPC CSM..

During the March 18, 2009 deployment there was elevated turbidity values, marked as suspect unless outside the specifications for the sensor, in which case values are rejected.

For the April 13, 2009 deployment, several parameters had unacceptable post calibration values. Dissolved oxygen was low, specific conductance was low due to the probe being clogged with sand, and pH 10 was low and slope outside of acceptable range. Issues may have arisen after a couple of out of water events on April 22nd and April 25th. Unfortunately, the time of drift is not apparent in the data, so the entire dataset is marked as suspect for these parameters.

For the April 13, 2009 deployment, several parameters had unacceptable post calibration values. Dissolved oxygen was low, specific conductance was low due to the probe being clogged with sand, and pH 10 was low and slope outside of acceptable range. Issues may have arisen after a couple of out of water events on April 22nd and April 25th. Unfortunately, the time of drift is not apparent in the data, so the entire dataset is marked as suspect for these parameters.

Elevated turbidity values were recorded toward the end of the April 13, 2009 deployment, beginning around May 1, 2009. After an occasional turbidity spike, the readings were elevated above seasonal norms for a prolonged duration beginning May 7, 2009 and these were marked as suspect.

Data is missing from May 11, 2009 11:15 through May 13, 2009 23:45 due to an error in programming. The sonde was deployed on May 11th, but did not record data until May 13th.

For the May 13, 2009 deployment, specific conductivity did not meet the acceptable range for the post calibration. Drift occurred sometime within the deployment, but since the drift is not apparent in the data, specific conductivity and salinity were marked as suspect for the entire deployment.

Negative values were reported from May 17 - June 2, 2009 for turbidity. These were rejected and the cause is unknown. Some of the negative values occurred during turbidity spikes. Post calibration values for turbidity were within acceptable range.

07/07/09-07/20/09 – Turbidity post-cal unacceptable. Initial calibration performed with contaminated standard. All readings during this deployment likely under reported by 2-4 NTU.

Turbidity spikes were generally flagged 1 if greater than 400 or 0 depending on the surrounding data.

Between 9/26/09 – 9/30/09, and 10/5/09 there were several turbidity spikes. All > 1000 were rejected. All values between 400 and 999 were flagged <0> and coded as the result of a significant rain event (CRE).

11/05/2009 17:45 to 11/17/2009 10:30 Turbidity values were flagged as suspect <1> [SSM] (CBF) or rejected <-3> [SSM] (CBF) due to biofouling towards the end of the deployment.

11/05/2009 17:45 to 11/17/2009 10:30 were marked as suspect due to heavy biofouling on all probes with the exception of Temp and Depth.

East Cribbings.

Several out of water (OOW) readings occurred during the 01/12/09 deployment. Data were flagged as rejected.

Post Cal revealed that the conductivity probe was clogged causing low conductivity readings. Once sediment and debris was cleared out the probe performed fine. This likely occurred as a result of repeated out of water (OOW) events. All associated data was rejected due to conductivity failure from 01/20/2009 10:15 - 02/09/2009 09:30. Conductivity and salinity data prior to this but after initial OOWs was marked as suspect.

Turbidity failed post calibration and was marked as suspect for entire March 18, 2009 deployment. Turbidity spikes occurring on 04/01/2009 09:30 and 04/01/2009 11:15 were rejected.

A reading was missed due to a sonde swap on April 13, 2009 14:15.

Conductivity was below acceptable range during post calibration following the April 13, 2009 deployment. Beginning April 26, there was increased variability within the conductivity and salinity data. Data appears noisier than usual and should be considered suspect. Rain was not documented prior to these events and heavy fouling was not noted on the field sheet for this sonde recovery. Elevated turbidity readings were also observed during this period and retained. Fauna within the guard may have played a role in the erratic conductivity/salinity values as well as moderate turbidity spikes.

Data is missing from May 11, 2009 13:15 through May 13, 2009 23:45 due to an error in programming. The sonde was deployed on May 11th, but did not record data until May 13th.

There was heavy rain on May 17th, more than two inches reported locally. This weather event caused the temperature to drop from near twenty-five degrees Celsius to fifteen degrees Celsius. This data was retained and is not considered suspect.

Following the rain event on May 17th, the dissolved oxygen readings were highly variable with highs in excess of 140% and lows of less than 10%. This data was retained and though it may not reflect average conditions for the site, there did not seem to be probe malfunction at that time.

Following an additional storm event on May 29th, the dissolved oxygen and pH concentrations decreased rapidly. This may have been due to siltation or deposition around the deployment

structure. Mud clogged the conductivity sensor and was observed on other probes. All data after the storm event should be considered suspect through the end of the deployment.

During the June 11, 2009 deployment, there were elevated turbidity values from June 20-25, 2009. No rainfall was reported during this time and fauna within the guard is the most likely scenario. Data was flagged as suspect unless outside the sensor range, which was rejected. Turbidity passed the post calibration with acceptable values.

Turbidity failed post calibration following the July 7, 2009 deployment. All data was retained but marked as <1> [SPC] (CSM).

Several out of water events occurred where data was rejected from 7/15-7/21/09, 7/22/09, and 8/1/09.

Following the 7/21/09 deployment, several parameters did not meet post calibration ranges. Conductivity, salinity, pH and turbidity were affected. The recorded values did not seem to be off from the seasonal norms so data was retained and marked as <1> [SPC] (CSM).

From 8/11/09 through 8/18/09, there were lots of negative turbidity values. These were rejected. The cause was unknown and the turbidity probe post calibrated within acceptable range. All other turbidity data was retained and not marked as suspect.

More negative turbidity readings were reported and rejected on 9/09/09, 9/11/09, 9/17/09, 9/30/09, and 10/01/09. Elevated turbidity values were reported on 10/08/09 through 10/12/09. These were retained, some extremely high readings, marked as suspect and values above 1000 NTU were rejected. This probe had post calibration values within acceptable range but was replaced following this deployment because it did not calibrate properly.

On 8/24/09 the 10:45 reading was missed due to a sonde swap.

Batteries failed on October 12, 2009 at 8:15 and data was missing until the next deployment on October 19, 2009.

There were lots of out of water events throughout the October 19, 2009 deployment. All parameters except turbidity passed post calibration, so only out of water data was rejected. Though the turbidity probe did not pass post calibration, much of the data seems to fit conditions for the site.

Zeke's Basin

Turbidity spikes occurred throughout the deployments and were marked as suspect unless outside of the sensor upper limit, which were rejected. The spikes may have been caused by flora and/or fauna within the guard, low tide conditions and/or probe exposure.

An out of water event occurred on January 1, 2009 from 6:00-9:15.

Battery failure occurred at the end of a deployment and caused the sonde to power down. Data is missing from 02/07/2009 17:00 through 02/09/2009 10:00.

Out of water (OOW) events occurred at Zeke's Basin on April 23rd and 24th, 2009. These were coded as <-3> [GOW] (CLT) because they affected all sensors and occurred at low tide. Out of water (OOW) events also on April 27th and 28th, 2009 and were rejected with some shoulder data marked as <1> [GSM] (CLT) or <-3> [SOW] (CSM). The conductivity post calibration

value was not within the acceptable range following this deployment and since the time of drift was not apparent in the data, all conductivity and salinity data should be suspect following the OOWs through the end of the deployment.

Beginning around May 1, 2009 turbidity values were elevated periodically. These may have been due to fouling but are not representative of normal conditions and are marked as suspect. After sonde retrieval heavy fouling was documented on the turbidity wiper as well. Unfortunately no value was recorded for post calibration for turbidity.

Data is missing from May 11, 2009 15:30 through May 13, 2009 23:45 due to an error in programming. The sonde was deployed on May 11th, but did not record data until May 13th.

There was heavy rain on May 17th, more than two inches reported locally. This weather event caused the water temperature to drop from near twenty-five degrees Celsius to fifteen degrees Celsius. This data was retained and is not considered suspect.

During the May 13, 2009 deployment, turbidity data seemed noisy and was most likely due to fauna within the guard. Excessive spikes were marked as suspect, but much of the elevated data was retained.

The post calibration values for pH were not within the acceptable ranges following the June 11, 2009 deployment. The pH data for the entire deployment has been marked as suspect since the time of drift was not apparent from the data.

There were several turbidity readings of -1 during the June 11, 2009 deployment. These were rejected due to sensor drift. The turbidity values were within acceptable range for the post calibration, however this probe failed during a subsequent deployment and may have been inaccurate during the June 11th deployment. Negative values or values around zero should be considered suspect since average turbidity values for this site are near 40 NTU. There were many elevated turbidity values for this same deployment and values for the entire data set are marked as suspect due to the failure of the probe in a later deployment.

Batteries failed on 7/26/09, no data was recorded until 8/11/09.

Lots of out of water events were noted during low tides during the August 11, 2009 and August 24, 2009 deployments. This data was rejected for 8/13-8/19/09 and 8/25-8/31/09. Data was rejected if out of water, however some was marked suspect following the out of water events as well. Additional out of water events occurred during the September 9th deployment on 10/8/09 and 10/11/09.

Turbidity data was rejected for the August 24, 2009 deployment due to many negative readings, poor calibration/post calibration and probe failure. The probe also affected the suspect turbidity values during the June 11, 2009 deployment. A different turbidity probe also failed during the November 18, 2009 deployment. Data from the previous deployment, September 9, 2009, showed some elevated turbidity spikes which were rejected as well as several readings of 3800 (due to sensor error). This probe may have been beginning to malfunction during the September deployment though it passed post calibration.

Upon retrieval from the November 18, 2009 deployment, the wiper was misparking. During post calibration the probe was reading ~ 100 NTU in deionized water, the zero calibrant. Turbidity spikes were observed beginning November 26, 2009 and many values were outside the sensor range. Data prior to these events was retained and marked as sensor post calibration out

of range. During the elevated turbidity ranges, data was marked as suspect unless it was outside the sensor range and was rejected.

An out of water even occurred on October 8 and 11, 2009 and data was rejected.

Following the October 19, 2009 deployment, specific conductivity did not pass with acceptable post calibration values. Data for the deployment fits seasonal conditions for the majority of the deployment and was retained and marked as suspect [SPC] for sensor post calibration out of range for the entire deployment for specific conductivity and salinity. Toward the end of the deployment, around November 12, 2009 unusually low values for specific conductance/salinity were documented on the Cape Fear River. Heavy rains occurred inland and the lower salinity levels within Zeke's Basin were verified with a hand held YSI 85 on November 18th. Values that day were 24.7 mS/cm for specific conductance and 15 ppt for salinity at the surface.

Turbidity data for the same October 19, 2009 deployment was marked as suspect due to numerous negative values and post calibration values out of acceptable range. Data was marked as <1> [SPC] (CSM).

The November 18, 2009 10:45 reading was missed due to a sonde swap.

Following the November 18, 2009 deployment, dissolved oxygen post calibration values were outside of acceptable range. Dissolved oxygen saturation values near 200% were observed at low tide beginning on November 28, 2009 through December 1, 2009. It does not appear that there were prolonged out of water events. The data was marked as suspect due to post calibration values for November 18 through the end of the deployment <1> [SPC] (CSM).

Following the December 7, 2009 deployment, the pH post calibration was outside of acceptable range. Data was retained and marked as <1> [SPC] (CSM).

During the December 7, 2009 dataset, several turbidity spikes occurred. These were marked as suspect unless the values were outside the range of the sensor and data was rejected.