

Reserve Name (NOC) NERR Water Quality Metadata
January – December 2007
Latest Update: 01/11/2011

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

Dr. John Fear, Research Coordinator
400 Commerce Ave.
Morehead City, NC 28557
Phone: (252) 808-2808 ext. 224
Fax: (252) 247-3330
Email: john.fear@ncmail.net

Heather Wells, Research Associate
5600 Marvin K. Moss Lane
Wilmington, NC 28409
Phone: (910) 962-2335
Fax: (910) 962-2410
Email: wellsh@uncw.edu

Byron Toothman, Research Associate
5600 Marvin K. Moss Lane
Wilmington, NC 28409
Phone: (910) 962-2334
Fax: (910) 962-2410
Email: wellsh@uncw.edu

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 and become part of the CDMO's online provisional database. Excessive pre- and post-deployment data are removed from the file prior to upload with up to 2 hours of pre- and post-deployment data retained to assist in data management. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve 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 graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove remaining pre- and post-deployment data, append files, and export the resulting data file to the CDMO for tertiary QAQC 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. Research Associates Byron Toothman and Heather Wells, were responsible for data management during 2007.

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 30 or 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 08/07/06) 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

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.

YSI 6600 EDS models were utilized for all deployments. Each sonde is equipped with a non-vented depth probe and identical sensor models (with the exception of the ROX dissolved oxygen probe use detailed below).

Deployment and Retrieval Dates for 2007:

Deployment**Retrieval**

Loosin Creek, Masonboro Island

12/5/2006 14:00	1/4/2007 14:30
1/4/2007 14:45	2/5/2007 15:45
02/05/07 16:00	03/06/07 14:00
03/06/07 14:15	04/02/07 13:15
04/02/07 13:30	05/02/07 14:15
05/02/07 14:30	05/24/07 10:45
05/24/07 11:00	06/13/07 8:00
06/13/07 8:15	07/05/07 8:15
07/05/07 8:30	07/24/07 14:00
07/24/07 14:15	08/13/07 14:15
08/13/07 14:30	09/05/07 10:00
09/05/07 10:15	09/26/07 12:45
09/26/07 13:00	10/15/07 14:30
10/15/07 14:45	11/12/07 14:45
11/12/07 15:00	12/12/07 12:45
12/12/07 13:00	01/08/08 12:15

Research Creek, Masonboro Island

12/05/06 14:18	01/04/08 17:45
01/04/07 18:00	01/05/07 16:30
01/05/07 16:45	02/05/07 15:00
02/05/07 15:15	03/06/07 13:30
03/06/07 14:00	04/02/07 12:45
04/02/07 13:00	05/02/07 15:45
05/02/07 16:00	05/24/07 11:00
05/24/07 11:30	06/13/07 08:30
06/13/07 08:45	07/05/07 08:30
07/05/07 08:45	07/24/07 14:30
07/24/07 14:45	08/13/07 13:30
08/14/07 10:15	09/05/07 10:15
09/05/07 10:45	09/26/07 14:15
09/26/07 14:30	10/15/07 14:00
10/15/07 14:30	11/12/07 14:15
11/12/07 14:45	12/12/07 12:00
12/12/07 12:15	01/09/08 10:05

East Cribbings, Zeke's Island

12/05/06 10:16	1/04/07 10:45
01/04/07 11:00	2/05/07 12:00
02/05/07 12:15	3/06/07 10:45
03/06/07 11:00	4/02/07 9:15
04/02/07 9:30	5/02/07 10:15
05/02/07 10:30	5/24/07 14:15
05/24/07 14:30	6/15/07 9:45
06/15/07 10:00	7/05/07 15:00
07/05/07 15:15	7/23/07 14:00
07/23/07 14:15	8/14/07 13:15
08/14/07 14:00	9/05/07 14:45

09/05/07 15:15	9/26/07 9:15
09/26/07 9:45	10/15/07 12:15*
10/15/07 12:30	11/12/07 11:15
11/12/07 11:30	12/12/07 10:15*
12/12/07 10:30	1/08/08 10:20

Zeke's Basin, Zeke's Island

12/05/06 10:16	1/04/07 11:00
01/04/07 11:15	2/05/07 12:30
02/05/07 12:45	3/06/07 11:15
03/06/07 11:30	4/02/07 09:30
04/02/07 09:45	5/02/07 10:45
05/02/07 11:15	5/24/07 14:45
05/24/07 15:15	6/15/07 10:15*
06/15/07 10:30	7/05/07 14:30
07/05/07 14:45	7/23/07 14:30*
07/23/07 14:45	8/14/07 14:00
08/14/07 14:15	9/05/07 14:15*
09/05/07 14:30	9/26/07 08:45
09/26/07 09:15	10/15/07 12:30*
10/15/07 12:45	11/12/07 11:30
11/12/07 11:45	12/12/07 10:30*
12/12/07 22:30	1/08/08 10:20

*Deployments marked with an asterisk utilized the ROX Dissolved oxygen probe, all others utilized the rapid-pulse probe (see sensor specifications for more information on each sensor).

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 long-term monitoring program, NOC NERR also monitors Meteorological and Nutrient data which may be correlated with the Water Quality dataset. These data are available from the Research Coordinator or online at <http://cdmo.baruch.sc.edu/>.

Additional 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

All sondes are YSI 6600 EDS data sondes. Probe specifications include:

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, polarographic

Model#: 6562

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: +/-2% of the reading or 2% air saturation, whichever is greater; 200 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: $\pm 1\%$ of the reading or 1% air saturation, whichever is greater 200-500% air saturation: $\pm 15\%$ 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, polarographic

Model#: 6562

Range: 0 to 50 mg/L

Accuracy: 0-20 mg/L: $\pm 2\%$ of the reading or 0.2 mg/L, whichever is greater

20 to 50 mg/L: $\pm 6\%$ 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: $\pm 15\%$ 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 - EDS flat probe

Units: pH units

Sensor Type: Glass combination electrode

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: $\pm 2\%$ of reading or 0.3 NTU (whichever is greater)

Resolution: 0.1 NTU

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. 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 level 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 site can be corrected. The Research Coordinator at the specific NERR site should be contacted in order to obtain information regarding atmospheric pressure data availability.

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

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 *Open - reserved for later flag*
- 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.

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

Sensor Errors

SBO	Blocked Optic
SCF	Conductivity Sensor Failure
SDF	Depth Port Frozen
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
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

13) Post deployment information –

Loosin Creek calibration

record	%DO	SpCond	pH 7	pH 10	Turb 0	Batt. Volts
LC120506	96.1*	49.11	6.99	9.87	0.1	11.7
LC010407	106.0	49.70	7.14	10.00	0.1	11.7
LC020507	96.5*	48.15	6.96	9.88	-0.1	11.3
LC030607	104.5*	47.84	7.23	10.32*	0.9	6.6
LC040207	5.4*	49.52	7.10	10.03	0.3	10.8
LC050207	102.2	48.90	7.07	10.10	0.2	12.3
LC052407	96.1*	49.39	7.05	10.10	0.1	11.2
LC061307	99.0	49.90	7.16	10.09	0.1	12.0
LC070507	97.3*	49.48	7.37	10.49*	0.5	10.0
LC072407	106.5*	50.44	7.07	10.02	0.0	11.5
LC081307	106.0*	48.00	6.97	10.02	0.1	8.3
LC090507	107.8*	49.10	7.06	10.08	0.0	11.1
LC092607	104.9*	50.00	6.93*	9.92*	0.2	12.3
LC101507	106.5*	51.18	7.05	9.95	0.5	9.8
LC111207	101.2	50.26	7.04	9.92	0.3	11.7
LC121207	100.9	51.51	7.01	9.99	-0.1	12.3

Research Creek calibration

record	DO (%)	SpCond	pH 7	pH 10	Turb 0	Batt. Volts
RC120506	92.6*	48.87	7.29	10.51*	1.6	10.8
RC010507	103.9*	0.01*	10.61*	not recorded*	-67.5*	12.2
RC020507	139.5*	-160*	6.68*	10.58*	-1.0	8.9
RC030607	85.6*	48.95	7.10	10.21	-1.1	10.9
RC040207	103.9*	49.90	7.18	10.08	0.3	12.0
RC050207	93.0*	49.10	6.96	10.13	-0.5	10.6
RC052407	89.4*	48.90	6.95	9.95	0.1	11.5
RC061307	105.5*	49.86	6.90	9.83	0.1	11.6
RC070507	102.7*	50.15	7.21	10.47*	0.3	11.1
RC072407	104.1*	43.13*	6.85	9.85	0.6	11.5
RC081307	84.2*	48.80	6.84	9.80	0.4	10.6
RC090507	107.9*	50.80	7.16	10.14	-0.9	11.0
RC092607	102.0	49.40	7.30*	10.20	0.3	9.3
RC101507	102.5*	50.09	6.97	9.85	0.8	10.3
RC111207	85.1*	50.86	6.93	9.97	-1.2	11.5
RC121207	102.5*	50.74	6.97	10.00	0.5	9.9

**East Cribbings
calibration**

record	DO (%)	SpCond	pH 7	pH 10	Turb 0	Batt. Volts
EC120506	108.6*	49.16	6.91	9.77	0.2	8.2
EC010407	100.4	49.50	7.13	10.28*	-0.1	10.3
EC020507	106.4*	49.95	7.04	9.98	0.2	11.5
EC030607	92.1*	49.74	7.09	10.21	2.5	12.1
EC040207	68.8*	49.20	7.30	10.16	0.2	11.1
EC050207	103.6*	46.00	7.10	10.17	-1.5	11.8
EC052407	2.6*	49.35	7.52	9.75	0.2	10.5
EC061507	99.5	50.20	6.84	9.87	-0.2	11.3
EC070507	500.0*	50.56	6.91	9.92	-0.1	9.3
EC072307	100.3	50.76	6.87	9.71	0.4	10.7
EC081407	500.0*	48.90	7.12	10.01	-0.1	12.0
EC090507	108.4*	49.50	7.11	10.13	0.1	10.9
EC092607	95.1*	49.50	7.10	10.08	0.2	11.1
EC101507	100.8	49.69	6.77	9.53	1.4	12.1
EC111207	100.2	51.50	6.93	9.99	0.5	9.5
EC121207	91.8*	56.23*	6.92	9.89	0.0	11.7

**Zeke's Basin
calibration**

record	DO (%)	SpCond	pH 7	pH 10	Turb 0	Batt. Volts
ZB120506	104.6*	48.78	7.29*	10.26*	0.2	12.0
ZB010407	209.1*	49.10	6.95	10.00	-0.1	9.6
ZB 020507	94.5*	49.08	6.69*	9.62*	0.1	11.0
ZB 030607	106.4*	48.26	7.30*	10.42*	0.9	11.3
ZB 040207	75.6*	51.70	7.11	9.98	0.2	10.7
ZB 050207	103.4*	52.00*	7.12	10.16*	0.2	10.9
ZB 052407	101.0	49.20	7.14	8.66*	-0.4	9.1
ZB 061507	27.2*	49.30	7.05	10.03	-9.8*	7.7
ZB 070507	100.4	62.70*	7.04	10.02	0.6	13.3
ZB 072307	108.1*	49.08	7.13*	9.94	0.9	11.5
ZB 081407	99.3	48.60	7.13	10.00	0.3	11.8
ZB 090507	89.7*	48.50	6.96	10.01	-0.9	9.6
ZB 092607	99.4	49.40	7.02	10.00	0.5	11.2
ZB 101507	99.7	39.97*	7.06*	9.91	1.3	10.4
ZB 111207	99.8	50.58	6.87	9.71	0.1	8.9
ZB 121207	62.7*	51.57	7.02	9.87	-0.5	9.9

*Values marked with an asterisk are not within the acceptable post calibration ranges.

14) Other remarks/notes

This section lists and explains all anomalous (and suspect) data that still remains in the data set. The data are generally extreme for the aquatic system being monitored. The cause of such anomalies may be a bad calibration, fouling of the sensors, boat traffic disturbances, malfunction of the instrument, or the measurements may be correct and outside the range of standard seasonal variability.

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.

In general, large positive turbidity spikes (>200 NTU, but < 1000) occurring for unknown reasons were retained and marked as suspect. The high value may reflect the turbid conditions that occur during heavy rainfall and high wind events, when the probe is covered by sediment, or may reflect fauna caught within the probe guard or fouling covering the optics. Turbidity values above 1000 NTU were rejected due to being outside the sensor range, and elevated values below 200 NTU were retained.

Dips in specific conductivity and salinity data that were generally due to fouling drift between deployments or periods of heavy rainfall were retained. Values were highly variable and were retained even if outside two or three standard deviations from seasonal norms.

Variability was noted for all parameters and was retained even if outside of two standard deviations from the seasonal norms.

Loosin Creek, Masonboro Island

General remarks

Out of water event during low tide

02/18/2007 01:45

02/18/2007 02:00

02/18/2007 02:15

02/18/2007 14:45

02/19/2007 02:45

02/20/2007 16:00

02/20/2007 16:15

02/20/2007 16:30

04/15/2007 23:15

04/15/2007 23:30

04/15/2007 23:45

04/16/2007 00:00

04/16/2007 00:15

04/16/2007 00:30

04/16/2007 00:45

04/16/2007 01:00

04/16/2007 01:15

04/16/2007 01:30

04/16/2007 01:45

04/16/2007 02:00

04/16/2007 02:15

04/16/2007 02:30

04/16/2007 11:30

04/16/2007 11:45

04/16/2007 12:00

04/16/2007 12:15

04/16/2007 12:30

04/16/2007 12:45

04/16/2007 13:00
04/16/2007 13:15
04/16/2007 13:30
04/16/2007 13:45
04/16/2007 14:00
04/16/2007 14:15
04/17/2007 01:15
04/17/2007 01:30
04/17/2007 01:45
04/17/2007 02:00
04/17/2007 02:15
06/10/2007 18:30

Battery failure during the following deployment records:
03/08/2007 05:15 - 04/02/2007 13:15

Sonde out of water. Likely due to being pulled out of the water by curious boaters.. All data rejected
10/10/2007 10:00
12/16/2007 19:15 - 12/16/2007 19:45

Dissolved Oxygen

DO (% and mg/L) values were anomalously and consistently low for no visibly apparent reason between the following records and were flagged as suspect or rejected.

02/05/2007 16:00 - 03/06/2007 14:00
04/05/2007 16:30 - 05/02/2007 14:15
05/24/2007 11:45 - 06/02/2007 19:30
07/05/2007 08:30 - 07/23/2007 12:30 - due to probe failure

pH

pH drift was identified between the following records:
01/09/2007 08:45 - 02/05/2007 15:45

pH records were above normal for the following records. Probably due to bad calibration. Regarded as suspect.
03/06/2007 14:15 - 03/08/2007 05:00

7/5/08 08:30– 7/24/05 14:00 - Calibration of pH probe appeared to be incorrect for deployment. Post cal data indicates pH was increased by roughly the same magnitude as pH values changed from pre-calibration to calibration for deployment. ie. Improper calibration or contaminated standards likely contributed to elevated pH data (by 0.2 – 0.3) throughout the deployment period. Trends during this time are probably legitimate but actual pH is probably a 0.2 – 0.3 lower than indicated.

Turbidity

Turbidity spikes between 7/2/07- and 7/5/08 are likely due to small crabs around the probe
Turb spikes likely due to small crabs/fauna/alga around the probe for the following data:

07/07/2007 05:00
07/16/2007 17:15
07/18/2007 16:00
08/04/2007 07:15
08/04/2007 08:30
08/04/2007 14:30
08/04/2007 14:45

08/04/2007 15:00
08/04/2007 17:00
08/05/2007 02:15
08/05/2007 03:30
08/05/2007 05:45
08/05/2007 06:00
08/05/2007 08:30
08/05/2007 09:00
08/17/2007 17:30

A large amount of unexplained turbidity noise reported. Possibly due to fouling. Reported as rejected and/or/suspect.

08/09/2007 08:30 - 08/11/2007 01:45

08/19/2007 14:30 - 08/20/2007 04:45

Data rejected due to excessive noise.

08/26/2007 18:45 - 09/05/2007 10:15

Research Creek

General Remarks

Several out of water events occurred during sonde swaps. Occasionally dissolved oxygen values were marked as suspect after a sonde swap due to equilibration delays. On 8/13/07, the deployment structure collapsed and resulted in missing data until 8/14/07. The sonde was moved and may have had some electrical trouble on 10/31/07. The sonde was exposed at low tides and data should be considered suspect from 10/31/07-11/12/07.

Mud filled the probe guard and all data was rejected for temperature, conductivity, salinity, dissolved oxygen and pH from 4/20/07 through the end of deployment. Data was considered suspect from 4/16/07 through 4/20/07.

Data was considered suspect after a cable installation for conductivity, depth and pH from 6/13/07-7/05/07.

Temperature

Temperature probe malfunctioned during the 01/04/07 deployment and all data was rejected through 2/05/07. Temperature probe failure occurred on 2/24/07 and all data was rejected through 03/06/07.

Dissolved Oxygen

DO data from 3/6/07 through 4/2/07 should be considered suspect, post calibration values unacceptable. From 5/02/07 through 5/24/07 dissolved oxygen data should be considered suspect, post calibration values unacceptable. Again the post calibration values were unacceptable and DO labeled as suspect or rejected for 5/24/07-6/13/07 and 6/13/07-7/05/08.

Specific Conductivity/Salinity

Specific Conductivity and salinity data are suspect for the 7/24 deployment due to sensor drift. Specific conductivity was high and should be considered suspect during the 9/5/07 deployment. Post calibration notes documented that this parameter steadily rose while in calibration solution. Suspect data from 9/26/07 – 10/10/07 for unknown reasons.

Depth

On 9/12 at 10:15 there was an anomalous depth reading, perhaps due to tampering – cause unknown.

pH

Data for pH was considered suspect from 7/05/07 through 7/24/07, with post calibration values outside of acceptable range. pH calibration and post calibration values were within acceptable range, but data for entire deployment from 11/12/07-12/12/07 was elevated and should be considered suspect.

East Cribbings, Zeke's Island

Temperature

A temperature malfunction occurred on 9/17/07 and all data should be considered suspect due to sensor drift through 9/18/07. From 9/18/07 through the end of deployment, data for all parameters was rejected due to jumpy readings and sensor malfunction.

Dissolved Oxygen

After 2/05/07 deployment, post calibration values were high for dissolved oxygen, data was retained and marked as "post cal out of range" [SPC]. Dissolved oxygen drift may have occurred during the 3/06/07 deployment as well, these data were rejected and marked as "post cal out of range" [SPC]. Dissolved oxygen data was labeled as suspect for the entire 4/02/07 deployment. During the 5/02/07 deployment, super saturated dissolved oxygen levels were recorded when total depth was shallow, data was retained. After the 5/24/07 deployment, calcium epiphyte build up was present on the dissolved oxygen probe and membrane. DO values were labeled as suspect from 6/08/07 through the end of the deployment. Dissolved oxygen dips during the 6/15/07 deployment were retained. Data was rejected during the 7/05/07 deployment from 7/10/07 through the end of the deployment due to sensor error. Elevated dissolved oxygen considered suspect beginning on 8/25/07 and then rejected through the end of deployment, due to sensor failure. Dissolved oxygen data should be considered suspect from 10/01/07 through the end of deployment due to possible sensor drift or fouling. An error occurred during the sonde data transfer and dissolved oxygen data was not uploaded for the 11/12/07 deployment.

Specific Conductivity/Salinity

On 1/21/07 the 0:30 and 7:15 readings had a drop in specific conductivity/salinity, not associated with an out of water event. Data was labeled as suspect, cause unknown. After the 5/2/07 deployment, specific conductivity was low during post calibration, data was retained and may have been due to algae/mud on probe. During the 5/24/07 deployment, abnormal trends were observed in data. Sonde was not out of the water, low values were rejected due to sensor malfunction, the cause unknown. Dips in conductivity were rejected and considered sensor error on 7/11, 7/13 and 7/22/07. On 8/14 and 8/15/07 there was a dip in specific conductivity and data was rejected due to sensor error.

Major dips in overall salinity were observed around 4/25/07 and 10/27/07, cause unknown, perhaps due to increased river discharge.

pH

There were elevated pH values during the 2/05/07 deployment, and though post calibration values were within acceptable range, data was retained and marked as suspect. pH values were high for post calibration for the 4/02/07 deployment, data was retained and labeled as suspect. Elevated pH levels were observed and retained during super saturated dissolved oxygen conditions during the 5/02/07 deployment. After the 5/24/07 deployment, the post calibration values were low, some calcium deposits present, and data labeled as suspect after 6/08/07. After the 7/23/07 deployment, pH values were low and data was labeled as suspect due to sensor drift. For the 10/15/07 deployment, pH post calibration values were low and entire deployment pH data considered suspect.

Turbidity

Negative turbidity values were flagged suspect on 10/16/07 and 11/12/07.

Missed readings due to sonde swap on 8/14/07, 9/5/07, 9/26/07

Zek's Basin, Zeke's Island

General Remarks / All Data

Data rejected due to temp/conductivity probe failure. Temperature and salinity data look too low, too variable, or both to be accurate.

01/22/2007 17:30 - 01/24/2007 17:45

01/25/2007 01:00 - 01/25/2007 03:15

01/25/2007 17:45 - 01/27/2007 15:00

01/27/2007 18:30 - 01/27/2007 21:15

01/28/2007 00:30 - 02/05/2007 12:30

Data flagged as suspect due to temp/conductivity probe failure. Temperature and salinity data look too low, too variable, or both to be accurate.

01/24/2007 18:00 - 01/25/2007 00:45

01/25/2007 03:30 - 01/25/2007 17:30

01/27/2007 15:15 - 01/27/2007 18:15

01/27/2007 21:30 - 01/28/2007 00:15

Data missing. Sonde mistakenly programmed to begin recording data approximately 1 day late.

02/05/2007 13:00 - 02/06/2007 03:15

Reading missed during sonde maint.

05/02/2007 11:00

Data Missing due to low voltage resulting in probe shutdown.

07/01/2007 11:45

07/01/2007 12:15

07/01/2007 13:45 - 07/02/2007 01:30

07/02/2007 08:15 - 07/02/2007 13:45

07/02/2007 14:15

07/03/2007 23:00 - 07/04/2007 06:45

07/04/2007 23:30 - 07/05/2007 14:30

Sonde out of water due to maint. Reading missed:

09/26/2007 09:00

Wiper detached from turb probe and sediment accumulated in and around the probes. This coincides with a period of strong sustained N – NNW winds and escalating turbidity readings prior to apparent malfunction. Probes all had acceptable post-cal. Turbidity and DO records rejected. Cond/Sal records flagged as suspect due to a slight but noticeable downward drift following the event.

11/06/07 11:15 to 11/12/07 11:30

Sonde incorrectly programmed to begin recording on the day after deployment. Records missing for the following time.

12/12/2007 10:45 to 12/12/2007 22:15

Specific Conductivity/Salinity

Salinity and conductivity for Zekes Basin can be greatly influenced by upland nonlocal upland precipitation as the Cape Fear River stage rises and falls. This can be responsible for seasonal and short term changes in salinity.

Sal probe malfunction occurred resulting in data rejection (all) the following records.

Cond, Sal for the 7/5/07 – 7/23/07 were rejected due to sensor malfunction and failure of post calibration. Calibration records indicate some difficulty with initial calibration and the PostCal data was 12.7 mS/cm over the 50.0 std. There also seems to be some drift upwards during the deployment and the last record is significantly higher than the YSI field check and the next record by the newly deployed sonde.

08/05/2007 13:30 - 08/06/2007 23:45

A sudden drop in conductivity and salinity occurred and the values slowly rebounded over the next day. This could not be definitively explained, though high sustained winds may have disturbed benthic sediments basin-wide causing suspended sediments to temporarily settle on the probe.

Spcond and affected parameters were rejected for 11/2 – 11/12 due to extensive sensor drift.

Dissolved Oxygen

Winter algal blooms regularly cause DO super saturation. These are marked very high DO concentrations (occasionally >15mg/l and >200%) and pH values >9.0. These are regular events in this basin.

-There was some DO drift noticed at the end of the 2/5/07 – 3/6/07 deployment. DO post cal was a little low as well.

-DO drift noticed during the 3/6/07 – 4/2/07 deployment. DO post cal was high as well.

-Abrupt decline in DO can occur following heavy rain due to the formation of an unmixed freshwater lens on the surface of the heavier salinity seawater.

DO probe malfunction – occurred sporadically and then sustained malfunction for the remaining duration of the deployment. These records are flagged as suspect or rejected.

REJECTED

06/29/2007 22:15

06/30/2007 18:15

07/01/2007 02:45

07/01/2007 03:15 - 07/01/2007 06:15

07/01/2007 07:00

07/01/2007 07:45

07/01/2007 09:00

07/01/2007 09:30

07/02/2007 01:45 - 07/02/2007 08:00

07/02/2007 14:00

07/02/2007 14:30 - 07/03/2007 22:45

07/04/2007 07:00 - 07/04/2007 23:15

SUSPECT

06/29/2007 22:30

06/29/2007 22:45

07/01/2007 02:15

07/01/2007 06:45

07/01/2007 08:00

Data not collected for DO during the 11/12/2007 11:45 to 12/12/2007 10:30 deployment due to data upload error.

pH

Winter algal blooms regularly cause DO super saturation. These are marked very high DO concentrations (occasionally >12mg/l and as high as 14+ mg/l) and pH values as high as 9.0+. These are regular events in this basin.

pH data were rejected from 6/1/07 18:00 through 6/15/07 10:15. During post cal slope was out of range and out of range with the 10 standard.

Depth

Data (all) for depth missing from deployment for 5/24/07 - 6/15-07. The raw data is missing from the raw file.

Turbidity

Due to the uniformly shallow nature of the basin and silty bottom composition turbidity can be greatly influenced by the wind/wave action. Occasional surges in turbidity were checked against weather data to confirm that they were due in part to windy conditions.

Data for Turb was rejected or considered suspect due to a crack in the probe that resulted in bad data or substantial amounts of negative data.

06/15/2007 11:30 - 07/04/2007 23:15

Data rejected due to negative values and values above sensor range for the for the following records. Possible optical blockage by macro alga but could not be sure.

07/23/2007 14:45
07/23/2007 15:15
07/23/2007 15:30
07/23/2007 15:45
07/23/2007 16:00
07/23/2007 16:15
07/23/2007 16:30
07/23/2007 16:45
07/23/2007 17:00
07/23/2007 17:15
07/23/2007 17:30
07/23/2007 17:45
07/23/2007 18:00
07/23/2007 18:15
07/23/2007 18:30
07/23/2007 18:45
07/23/2007 19:00
07/23/2007 19:15
07/23/2007 19:30
07/23/2007 19:45
07/23/2007 20:00
07/23/2007 20:15
07/23/2007 20:30
07/23/2007 20:45
07/23/2007 21:00
07/23/2007 21:15

07/23/2007 21:30
07/23/2007 21:45
07/23/2007 22:00
07/23/2007 22:15
07/23/2007 22:30
07/23/2007 22:45
07/23/2007 23:00
07/23/2007 23:15
07/23/2007 23:30
07/23/2007 23:45
07/24/2007 00:00
07/24/2007 00:15
07/24/2007 00:30

Series of turbidity spikes recorded towards the end of this deployment for the following records. The wiper was parked incorrectly. Additionally the sonde was covered in macroalga and inhabited by a small crab inside the guard. These spikes are considered suspect; they were rejected if they were out of sensor range (>1000).

09/23/2007 09:15
09/23/2007 09:30
09/23/2007 09:45
09/23/2007 10:00
09/23/2007 10:15
09/23/2007 10:30
09/23/2007 10:45
09/23/2007 11:00
09/23/2007 11:15
09/23/2007 11:30
09/23/2007 11:45
09/23/2007 12:00
09/23/2007 12:15
09/23/2007 12:30
09/23/2007 12:45
09/23/2007 13:00
09/24/2007 03:00
09/24/2007 03:15
09/24/2007 03:30
09/24/2007 03:45
09/24/2007 04:00
09/24/2007 04:15
09/24/2007 04:30
09/24/2007 04:45
09/24/2007 05:00
09/24/2007 05:15
09/24/2007 05:30
09/24/2007 05:45
09/24/2007 06:00
09/24/2007 06:15
09/24/2007 06:30
09/24/2007 06:45
09/24/2007 07:00
09/24/2007 07:15

09/24/2007 07:30
09/24/2007 07:45
09/24/2007 08:00
09/24/2007 08:15
09/24/2007 08:30
09/24/2007 11:30
09/24/2007 11:45
09/24/2007 12:00
09/24/2007 12:15
09/24/2007 12:30
09/24/2007 12:45
09/24/2007 13:00
09/24/2007 13:15
09/24/2007 13:30
09/24/2007 13:45
09/24/2007 14:00
09/24/2007 14:15
09/24/2007 14:30
09/24/2007 14:45
09/24/2007 15:00
09/24/2007 15:15
09/24/2007 15:30
09/24/2007 15:45
09/24/2007 16:00
09/24/2007 16:15
09/24/2007 16:30
09/24/2007 16:45
09/24/2007 17:00
09/24/2007 17:15
09/24/2007 17:30
09/24/2007 17:45
09/24/2007 18:00
09/24/2007 18:15
09/24/2007 18:30
09/24/2007 18:45
09/24/2007 19:00
09/24/2007 19:15
09/24/2007 19:30
09/24/2007 19:45
09/24/2007 20:00
09/24/2007 20:15
09/24/2007 20:30
09/24/2007 20:45
09/24/2007 21:00
09/24/2007 21:15
09/24/2007 21:30
09/24/2007 21:45
09/24/2007 22:00
09/24/2007 22:15
09/24/2007 22:30
09/24/2007 22:45
09/24/2007 23:00

09/24/2007 23:15
09/24/2007 23:30
09/24/2007 23:45
09/25/2007 00:00
09/25/2007 00:15
09/25/2007 00:30
09/25/2007 00:45
09/25/2007 02:45
09/25/2007 03:00
09/25/2007 03:15
09/25/2007 03:30
09/25/2007 03:45
09/25/2007 04:00
09/25/2007 04:15
09/25/2007 04:30
09/25/2007 04:45
09/25/2007 05:00
09/25/2007 05:15
09/25/2007 05:30
09/25/2007 05:45
09/25/2007 06:00
09/25/2007 06:15
09/25/2007 06:30
09/25/2007 06:45
09/25/2007 07:00
09/25/2007 07:15
09/25/2007 07:30
09/25/2007 07:45
09/25/2007 08:00
09/25/2007 08:15
09/25/2007 08:30
09/25/2007 08:45
09/25/2007 09:00
09/25/2007 09:15
09/25/2007 09:30
09/25/2007 09:45
09/25/2007 10:00
09/25/2007 10:15
09/25/2007 10:30
09/25/2007 10:45
09/25/2007 11:00
09/25/2007 11:15
09/25/2007 11:30
09/25/2007 11:45
09/25/2007 12:00
09/25/2007 12:15
09/25/2007 12:30
09/25/2007 12:45
09/25/2007 13:00
09/25/2007 13:15
09/25/2007 13:30
09/25/2007 13:45

09/25/2007 21:00
09/25/2007 21:15
09/25/2007 21:30
09/25/2007 21:45
09/25/2007 22:00
09/25/2007 22:15
09/25/2007 22:30
09/25/2007 22:45
09/25/2007 23:00
09/25/2007 23:15
09/25/2007 23:30
09/25/2007 23:45
09/26/2007 00:00
09/26/2007 00:15
09/26/2007 00:30
09/26/2007 00:45
09/26/2007 01:00
09/26/2007 01:15
09/26/2007 01:30
09/26/2007 01:45
09/26/2007 02:00
09/26/2007 02:15
09/26/2007 04:00
09/26/2007 04:15
09/26/2007 04:30
09/26/2007 04:45
09/26/2007 05:00
09/26/2007 05:15
09/26/2007 05:30
09/26/2007 05:45
09/26/2007 06:00
09/26/2007 06:45
09/26/2007 08:45