

North Inlet-Winyah Bay (NIW) NERR Water Quality Metadata
January - December 2006
Latest Update: 10/01/19

I. Data Set & Research Descriptors

1) Principal investigator(s) & contact persons

Address: North Inlet-Winyah Bay NERR
PO Box 1630
Georgetown, SC 29440
phone: (843)-546-3623
fax: (843)-546-1632

Contact Persons:

Dr. Erik Smith, Research Coordinator
email: erik@belle.baruch.sc.edu; (843)-546-3623 ext. 235
Tracy Buck, Research Specialist
email: tracy@belle.baruch.sc.edu; (843)-546-3623 ext. 259

2) Entry verification

Deployment data are uploaded from the YSI 6600-EDS data logger to a Personal Computer (IBM compatible). Data plots are produced and examined and erroneous data are detected using the PC6000 or EcoWatch software from YSI. Notes are made of any unusual data during that deployment. Files are exported from EcoWatch in a comma-delimited format (.CSV) and opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a corrected time column and allow the technician to remove any pre- and post-deployment data from the file. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is accepted as being the most accurate. The pre-processed file is then ready to be copied into the EQWin water.eqi file where the data are QA/QC checked and archived in a database. EQWin queries, reports and graphs are used to discover data set outliers (values which fall outside the range that the instrument is designed to measure) and large changes in the data. If the data were determined to be bad, they were deleted from the final edited .txt file and then documented in the metadata. If it could not be determined whether or not suspect data were bad (as was often the case with turbidity) the data were left in the final edited .txt file and noted in the metadata as anomalous. The dissolved oxygen (DO) and Turbidity (Turb) probes were the most problematic. In instances where data values increased or decreased in an exponential fashion and or intermittently went outside the accepted range for that instrument and never returned to normal, the data were considered suspect, noted in the metadata, and removed from the final edited data file. EQWin is also used to generate statistics, view graphs, create customized queries and reports of the data, cross query the water, weather and nutrient data and finally export the data to the CDMO. Research Specialist, Tracy Buck edited and archived the 2006 data for Thousand Acre, Debidue Creek, Oyster Landing, and Clambank Creek.

3) Research Objectives

The principal objective of this study is to record long-term water quality data for North Inlet/Winyah Bay in order to observe any physical changes or trends in water quality over time. Four sites were chosen; two to represent pristine sites and two to represent impacted sites. The Oyster Landing site is located near the center of the Reserve and is considered pristine. The Clambank site is

located on a waterway that receives run-off from the undeveloped area of the reserve and is considered a pristine site. Debidue Creek and Thousand Acre are both located in waterways that receive run-off from heavily developed areas, and are therefore considered our impacted sites. Measurements were taken every 30 minutes (15-minutes beginning 5/29/06) over roughly two week collecting periods at the Oyster Landing, Debidue Creek, Clambank and Thousand Acre sites.

4) Research methods

YSI 6600-EDS (Extended Deployment System) sondes are currently mounted in a 4" diameter PVC pipe which is strapped to a treated 2" X 6" board; and then attached via stainless steel bands to a piling at the Thousand Acre, Debidue Creek, Clambank, and Oyster Landing sites. The PVC pipe that houses the data loggers has two 4x8" holes cut adjacent to the sonde probes to allow for unimpeded tidal water flow over the probes. In October 2006, pipes with 4x8" openings were replaced with pipes in which a 1' section of 1" holes were drilled approximately 0.5cm apart. A stop bolt placed through the PVC pipe below these holes keeps the sonde exactly one foot (30 cm) above the creek bottom. Every 30 minutes measurements of specific conductivity, salinity, percent saturation, dissolved oxygen, water temperature, pH, turbidity, and water level are recorded. This interval was switched to 15 minutes in late May of 2006. The two-week sampling interval has been selected due to biofouling of the individual probes and expected battery life. Prior to deployment, the sondes were calibrated according to the procedures in the YSI Service Manual and the Standard Operating Procedures V5.1 provided by the NERR CDMO. Calibrations conducted prior to deployment of the instruments include a pH calibration using a two-point method with 7 and 10 unit standards. The turbidity calibration also used a two-point method using 0 and 123 NTU standards. Specific Conductivity was calibrated using a one-point method with a 10 mS/cm standard that was purchased through YSI, Inc. Depth and dissolved oxygen are calibrated according to the barometric pressure at the time of calibration. The turbidity wiper and DO membrane were changed before each deployment. At the end of each sampling interval, the sondes were brought back to the laboratory to be downloaded and cleaned. Before the instruments were cleaned, a post calibration reading was taken from each instrument in fresh standard to see if any of the instruments exhibited drift (see Section II-14). Two sondes are assigned to each of the four monitoring stations to allow the sondes to be switched out the same day, and minimize data loss.

5) Site location and character

The North Inlet-Winyah Bay National Estuarine Research Reserve is located on the Southeastern Atlantic coast of the United States in two tidal estuaries, North Inlet and Winyah Bay, near Georgetown, South Carolina. The North Inlet estuary, located approximately 10 km east of Georgetown, is a bar-built Class C type estuary (Pritchard, 1955). The North Inlet estuary is composed of numerous winding tidal creeks, and is considered a pristine tidal estuary due to minimal anthropogenic impacts. The watershed drains a 24.8 km² area of mostly pine forest and a moderately developed residential watershed to the north. The Winyah Bay estuary, classified as a Class B type estuary by Pritchard (1955), which originates in the Blue Ridge Mountains of North Carolina, is one of the largest river-estuary ecosystems on the Eastern Seaboard. It is located 14.4 km south of North Inlet. Winyah Bay drains the sub-basins of 6 major rivers, which are heavily impacted by agriculture, mining, and industry. The rivers drain approximately 46,736 km² of uplands and marshes. Descriptions of the four sampling stations are as follows:

A) Debidue Creek (DC) - (lat 33:21:37, long 79:10:03). The Debidue Creek monitoring site is considered an impacted site that is located

approximately 1 km south of the Debidue Colony. The Colony is a large development built on man-made canals that directly drain into the northern portion of Debidue Creek. The DC site is also located in an ocean-dominated *Spartina* marsh that was formerly surrounded by pine-dominated uplands. Salinity can range from 0 to full strength seawater and an average tidal range of approximately 2 m. The approximate depth and width at MHW at the site is 2.2 and 70 m respectively. The bottom is comprised mostly of oyster shell hash with some fine sediment and detritus.

B) Oyster Landing (OL) - (lat. 33:20:58, long. 79:11:20). The Oyster Landing monitoring site is considered a fairly pristine and undisturbed area located at the end of the Oyster Landing pier, which is also where the NI-WB Bay NERR weather station site is located. The pier stretches into the upper reaches of Crabhaul Creek in the mid western portion of North Inlet. The sampling site is located approximately 2.8 km from the headwaters of Crabhaul Creek. The creek directly drains pine-forested uplands and wetlands. Salinity can range from 0-32 ppt. and average tidal range is approximately 1.44 m. The creek has an average depth of 2 m MHW and average width of 150 m MHW. The bottom is comprised mostly of oyster shell hash with some fine sediment and detritus.

C) Thousand Acre (TA) - (lat. 33:17:57, long. 79:15:22) The Thousand Acre monitoring site is located in Thousand Acre marsh tidal creek and is on the NW corner of the west bridge of Thousand Acre marsh (this site was relocated 07-19-99 to the current location due to heavy siltation and degrading data quality). The present site is about 15 m from the mouth of the creek. At the sampling site, creek depth is approximately 2 m MHW and creek width is approximately 10 m. The creek empties into the northeastern side of the mid portion of Winyah Bay and directly drains pine forested upland and wetlands. Salinity ranges from 0 to 15 ppt. and tidal range is approximately 1m. The bottom is composed mostly of fine sediments and detritus. Georgetown, 5 km upstream from the Thousand Acre site and on the southern side of Winyah Bay, is the homeport for a number of heavy industries including a steel plant, paper mill, chemical plant, and a coal fired power plant. A public sewage treatment plant, which discharges into the bay, is also located in Georgetown.

D) Clambank Creek (CB) - (lat 33:20:02, long 79:11:35). The Clambank Creek monitoring site is located roughly in the center of the reserve property. This site is surrounded by a *Spartina* marsh and drains associated uplands. Salinity can range from near fresh water concentrations following large rainfall events, to full strength seawater during most of the year. The creek width and depth at MHW at the sampling site are 40 m and 2.4 m respectively. The average depth of the creek at MHW is 2.0 m with an average tidal range of approximately 1.4 meters. The bottom is comprised mostly of oyster shell hash and some fine sediment. This site is considered a pristine site and is influenced by its close proximity to North Inlet.

6) Data collection period

Thousand Acre data collection began January 1, 1995. Debidue Creek sampling began March 5, 1998. Oyster Landing data collection began in 1995; however, it was not considered a SWMP site until 1996 when the collection site was switched from Caledonia to Oyster Landing. Clambank sampling began in February 1981

through June 1995; however, it was not considered a SWMP site until sampling resumed on August 17, 2001. All sampling is ongoing.

Deployment dates and times (in Eastern Standard Time) for 2006 follow:

Site: Debidue Creek

Deploy Date	Time	Retrieve Date	Time
12/20/05	10:00	01/04/06	10:30
01/04/06	11:00	01/19/06	10:00
01/19/06	10:30	02/02/06	10:00
02/02/06	10:30	02/16/06	10:30
02/16/06	11:00	03/03/06	10:30
03/03/06	11:00	03/17/06	09:30
03/17/06	10:00	03/31/06	10:00
03/31/06	10:30	04/14/06	08:00
04/14/06	08:30	04/28/06	08:00
04/28/06	08:30	05/12/06	07:00
05/12/06	07:30	05/29/06	09:00
05/29/06	09:15	06/13/06	10:00
06/13/06	10:15	06/27/06	08:15
06/27/06	08:30	07/13/06	08:30
07/13/06	08:45	07/28/06	09:00
07/28/06	09:15	08/10/06	08:15
08/10/06	08:30	08/15/06	12:15
08/15/06	12:30	08/25/06	07:45
08/25/06	08:00	08/28/06	12:15
08/28/06	12:30	09/08/06	08:15
09/08/06	08:30	09/25/06	08:45
09/25/06	09:00	10/09/06	08:45
10/09/06	09:00	10/10/06	10:30
10/10/06	10:45	10/24/06	09:00
10/24/06	09:15	11/09/06	10:15
11/09/06	10:45	11/22/06	09:15
11/22/06	09:30	12/07/06	09:15
12/07/06	09:30	12/20/06	09:00
12/20/06	09:15	01/05/07	11:00

Site: Oyster Landing

Deploy Date	Time	Retrieve Date	Time
12/20/05	11:00	01/04/06	12:00
01/04/06	12:30	01/19/06	11:00
01/19/06	11:30	02/02/06	11:30
02/02/06	12:00	02/16/06	11:00
02/16/06	11:30	03/03/06	11:30
03/03/06	12:00	03/17/06	10:30
03/17/06	11:00	03/31/06	11:00
03/31/06	11:30	04/14/06	09:00
04/14/06	09:30	04/28/06	09:00
04/28/06	09:30	05/12/06	09:00
05/12/06	09:30	05/29/06	10:30
05/29/06	10:45	06/13/06	10:45
06/13/06	11:00	06/27/06	09:15
06/27/06	09:30	07/07/06	09:30
07/07/06	10:00	07/13/06	09:15
07/13/06	09:30	07/27/06	10:30

07/27/06	10:45	08/10/06	09:45
08/10/06	10:00	08/25/06	09:00
08/25/06	09:15	09/08/06	09:45
09/08/06	10:00	09/25/06	10:15
09/25/06	10:30	10/10/06	11:00
10/10/06	11:15	10/24/06	11:00
10/24/06	11:15	11/09/06	12:15
11/09/06	12:30	11/11/06	15:15
11/11/06	15:30	11/22/06	10:30
11/22/06	11:00	12/08/06	11:45
12/08/06	12:00	12/18/06	09:30
12/18/06	09:45	01/05/07	11:15

Site: Thousand Acre

Deploy Date	Time	Retrieve Date	Time
12/20/05	12:00	01/04/06	11:30
01/04/06	12:00	01/19/06	11:00
01/19/06	11:30	02/02/06	10:30
02/02/06	11:00	02/16/06	09:30
02/16/06	10:00	03/02/06	10:00
03/02/06	10:30	03/22/06	10:30
03/22/06	11:00	04/03/06	08:30
04/03/06	09:00	04/17/06	09:30
04/17/06	10:00	05/02/06	09:00
05/02/06	09:30	05/12/06	08:30
05/12/06	09:00	05/29/06	10:00
05/29/06	10:15	06/13/06	12:30
06/13/06	12:45	06/27/06	10:15
06/27/06	10:30	07/13/06	14:00
07/13/06	14:15	07/27/06	09:45
07/27/06	10:00	08/10/06	09:00
08/10/06	09:15	08/25/06	08:30
08/25/06	08:45	09/08/06	09:00
09/08/06	09:30	09/25/06	09:45
09/25/06	10:00	10/11/06	09:45
10/11/06	10:00	10/24/06	09:45
10/24/06	10:00	11/09/06	11:30
11/09/06	11:45	11/22/06	09:45
11/22/06	10:00	12/07/06	11:00
12/07/06	11:15	12/18/06	10:45
12/18/06	11:00	01/05/07	15:00

Site: Clambank Creek

Deploy Date	Time	Retrieve Date	Time
12/20/05	10:30	01/04/06	11:00
01/04/06	11:30	01/19/06	10:30
01/19/06	11:00	02/02/06	10:00
02/02/06	10:30	02/17/06	09:30
02/17/06	10:00	03/03/06	09:30
03/03/06	10:00	03/17/06	10:00
03/17/06	10:30	03/31/06	10:30
03/31/06	11:00	04/14/06	08:30
04/14/06	09:00	04/28/06	08:30
04/28/06	09:00	05/12/06	07:30
05/12/06	08:00	05/29/06	09:30

05/29/06	09:45	06/13/06	10:30
06/13/06	10:45	06/27/06	08:45
06/27/06	09:00	07/13/06	08:45
07/13/06	09:00	07/27/06	09:00
07/27/06	09:15	08/10/06	08:30
08/10/06	09:00	08/25/06	08:00
08/25/06	08:15	09/08/06	08:30
09/08/06	09:00	09/25/06	09:15
09/25/06	09:30	10/09/06	09:15
10/09/06	09:30	10/24/06	10:30
10/24/06	10:45	11/09/06	11:00
11/09/06	11:15	11/22/06	10:15
11/22/06	10:30	12/07/06	10:00
12/07/06	10:15	12/18/06	10:00
12/18/06	10:15	01/05/07	10:45

7) Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program, 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 the 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/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 of 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 section 1. 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 CDMO homepage) and online at the CDMO homepage <http://cdmo.baruch.sc.edu>. Data are available in text tab-delimited format.

8) Associated researchers and projects

A water chemistry program is associated with the NIW core-monitoring program. Variables sampled include: chlorophyll, dissolved organic carbon, nitrate-nitrite, orthophosphate, and ammonia. (See documentation on the NIW WWW home page <http://www.northinlet.sc.edu/> for further details). Thousand Acre is our permanent monitoring station for the NERR monitoring program, but Oyster Landing and Debidue Creek were also sampled beginning in 1998. Clambank Landing was added as a sampling station in August of 2001. These stations are also included in our NIW core-monitoring program. Ben Lakish (Research Specialist) is responsible for the collection and management of this data.

A long-term fish survey is also done at the Oyster Landing site bi-weekly. Species present, total weight, individual weights and standard lengths of fish that utilize the marsh at high tide are recorded. In the winter months (November through February), this sampling is done only once monthly. Dr. Dennis Allen (Director, Baruch Marine Lab) is the Principal Investigator on this project.

The NERR weather station is also located at the Oyster Landing site. Air temperature and humidity, barometric pressure, solar radiation (total and PAR), wind speed and direction, and precipitation are measured. Amy Willman (Research Specialist) is responsible for the collection and management of this data.

II. Physical Structure Descriptors

9) Sensor Specifications

YSI 6600 EDS-S Multi-parameter Water Quality Logger

Parameter: Non-vented Level-Shallow (Depth)
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: Temperature
Model #: 6560
Sensor Type: Thermistor
Range: -5 to 45 °C
Accuracy: +/- 0.15 °C
Resolution: 0.01 °C

Parameter: Dissolved Oxygen, Percent Saturation
Model #: 6562
Sensor Type: Rapid Pulse - Clark type, polarographic
Range: 0 to 500 % air saturation
Accuracy: 0-200 % air saturation, +/- 2% of the reading or 2 % air saturation, whichever is greater, 200-500 % air saturation, +/- 6% of reading
Resolution: 0.1 % air saturation

Parameter: Dissolved Oxygen, mg/L (calculated from % air saturation, temperature & salinity)
Model #: 6562
Sensor Type: Rapid Pulse - Clark type, polarographic
Range: 0 to 50 mg/L
Accuracy: 0 to 20 mg/L, +/- 2% of the reading or 0.2 mg/L, whichever is greater, 20 to 50 mg/L, +/- 6% of the reading
Resolution: 0.01 mg/L

Parameter: Dissolved Oxygen
Model #: 6150
Sensor Type: optical, self-cleaning
Range: 0 to 500 % air-saturation; 0 to 50 mg/L
Accuracy: 0 to 200 % air-saturation, +/- 1 % of the reading or +/- 1 % air-saturation, whichever is greater; 200 to 500 % air-saturation, +/- 15 % of the reading

0 to 20 mg/L, +/- 1 % of the reading or +/- 0.1 mg/L, whichever is greater; 20 to 50 mg/L, +/- 15 % of the reading
Resolution: 0.1 % air-saturation; 0.01 mg/L

Parameter: Conductivity
Model #: 6560
Sensor Type: 4 electrode cell with autoranging
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
Model #: 6560
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading or 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: pH
Model #: 6561 or 6561FG (flat glass)
Sensor Type: Glass combination electrode
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Model #: 6136
Sensor Type: Optical, 90o scatter, with mechanical cleaning
Range: 0 to 1000 NTU
Accuracy: +/- 5% reading or 2 NTU (whichever is greater), relative to calibration standards
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. In 2006 NIW NERR only deployed 6600 EDS data sondes.

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

Site definitions:

DC = Debidue Creek,
OL = Oyster Landing;
TA = Thousand Acre,
CB = Clambank Creek

Station code definitions:

niwdcwq = North Inlet-Winyah Bay NERR Debidue Creek water quality data
niwolwq = North Inlet-Winyah Bay NERR Oyster Landing water quality data
niwtawq = North Inlet-Winyah Bay NERR Thousand Acre water quality data
niwcbwq = North Inlet-Winyah Bay NERR Clambank Creek water quality data

Data code definitions:

Time = raw time stamp recorded by sonde in Eastern Standard Time (EST)
cTime = corrected time stamp generated by Excel macro to correct anomalous offsets reported by sonde (EST)
Temp = temperature measured in degrees Celsius (°C)
SpCond = specific conductivity measured in milli-Siemens per centimeter (mS/cm)
Sal = salinity measured in parts per thousand (ppt)
DO_pct = percent dissolved oxygen (%)
DO_mgl = oxygen concentration measured in milligrams per liter (mg/l)
Depth = depth measured in meters (m)
pH = hydrogen ion concentration (standard units)
Turb = turbidity measured in Nephelometric Turbidity Units (NTU)

11) Anomalous/Suspect Data

DEBIDUE CREEK

- a) For the following date & time, the sonde recorded data at the surface due to someone tampering with the instrument during its deployment. See Section 14 for further information.

02/25/06 10:30

- b) For the following dates and times turbidity data were >1000 NTU. Suspect something passed in front of optics during sampling. Data were retained but should be considered suspect.

04/01/06 15:00

04/06/06 05:00
06/26/06 15:00
07/05/06 19:30
08/18/06 19:15 - 20:00
09/26/06 16:15
12/13/06 13:30
12/16/06 16:00
12/18/06 04:00, 04:15, 16:15, 17:15
12/20/06 05:00, 05:15

- c) For the following dates and times turbidity data were abnormally high or >1000 NTU. Suspect mud obscured optics during a heavy sedimentation event. Data were retained but should be considered suspect.

06/24/06 02:15 - 06/27/06 08:15

- d) For the following dates, turbidity data were elevated. Suspect that fouling on the wiper elevated readings during this period. Data should be considered suspect.

07/24/06 - 07/28/06
10/05/06 - 10/09/06

- e) For the following dates and times, dissolved oxygen data (% saturation & mg/L) were deleted due to a tear in the membrane during deployment. An optical DO probe was in place during this period, so that data has been substituted for this period (see Section 14 Item e.).

07/28/06 19:30 - 08/10/06 08:15

- f) For the following dates and times, turbidity data >1000 NTU were deleted due to fouling (see Section 12). All other data were retained, but should be considered suspect.

08/04/06 13:15 - 08/10/06 08:15

- g) For the following dates and times, the sonde was deployed at a more shallow depth than normal due to excessive fouling in the sonde PVC housing. All out of water events have been deleted during these periods. See Section 12 for comments on dissolved oxygen data during this period.

08/15/06 12:30 - 08/25/06 07:45
08/28/06 12:30 - 09/08/06 08:15

- h) For the following dates and times, all dissolved oxygen data were deleted due to improper deployment of the YSI due to excessive fouling within the PVC housing. This caused improper flow over the Clark Cell Rapid Pulse probe which recorded lower than normal dissolved oxygen values during this period. A ROX optical dissolved oxygen probe was deployed during this period, which was not affected by this improper deployment. These data were substituted for the rapid pulse DO data.

08/15/06 12:30 - 08/25/06 07:45
08/28/06 12:30 - 09/08/06 08:15

- i) For the following dates and times, dissolved oxygen (% saturation and mg/l) should be considered suspect. The dissolved oxygen membrane was found to be ripped when retrieved; however, the vexar mesh covering the sonde guard was ripped off during retrieval which may have, in turn, ripped the membrane.

08/28/06 12:30 - 09/08/06 08:15

OYSTER LANDING

- a) For the following dates and times, depth data were negative. The remaining parameters indicate the sonde was not out of the water during these periods, so suspect slight calibration error &/or extreme shallow depth. Data were retained.

01/01/06 02:30

03/02/06 17:00

06/14/06 16:30 - 16:45

- b) pH data for the 2/2/2006 12:00 - 2/16/2006 11:00 deployment are suspect. The pH probe on Unit (sonde) S was problematic and possibly beginning to go bad in February. The probe was replaced with a new probe in March. Readings from this probe during this period are elevated.
- c) pH data for the 3/17/2006 11:00 - 3/31/2006 11:00 deployment are suspect. The pH probe on Unit (sonde) S was new (had been replaced), but there were exposed threads at the base of the probe. The probe was later replaced again as this one continued to record some questionable readings.
- d) For the following dates and times turbidity data were >1000 NTU. Suspect something passed in front of optics during sampling. Data were retained but should be considered suspect.

04/22/06 19:00

- e) For the following dates and times, all data should be considered suspect due to the PVC tube which houses the sonde pulling loose from the piling. The tube remained tethered to the dock via the telemetry cable, but the sonde tube was slightly buoyant which affected the depth of the deployment during this period.

06/09/06 21:45 - 06/12/06 09:30

- f) For the following dates and times, depth data were affected by the sonde not settling properly after the PVC sonde housing was changed.

11/30/06 15:00 - 20:45

THOUSAND ACRE

- a) For the following dates and times turbidity data were >1000 NTU. Suspect something passed in front of optics during sampling. Data were retained but should be considered suspect.

01/12/06 16:30

04/03/06 14:00
04/22/06 12:30
05/26/06 17:30, 18:00
07/12/06 02:45
07/13/06 08:15
07/17/06 03:45
07/21/06 18:30
08/05/06 01:30, 01:45
08/07/06 22:15
08/08/06 01:30
08/21/06 23:15
10/01/06 15:15
11/05/06 02:00
11/17/06 16:15

- b) For the following dates and times, the sonde was at a more shallow depth than normal due to someone tampering with the unit during deployment.

10/02/06 16:15 - 10/11/06 09:45

- c) For the following dates and times, the sonde was at a more shallow depth than normal while the PVC sonde housing was being changed.

11/29/06 10:30 - 11:00

CLAMBANK CREEK

- a) pH data for the 2/17/2006 10:00 - 3/3/2006 09:30 deployment are suspect. The pH probe on Unit (sonde) S was problematic and possibly beginning to go bad in February. The probe was replaced with a new probe in March. Readings from this probe during this period are elevated.
- b) pH data for the 3/3/2006 10:00 - 3/17/2006 10:00 deployment are suspect. These readings are markedly lower than the previous and following deployments and are likely due to a calibration error.
- c) For the following dates and times turbidity data were >1000 NTU. Suspect something passed in front of optics during sampling. Data were retained but should be considered suspect.

07/24/06 07:15
07/27/06 06:30, 07:00
08/05/06 03:00
09/25/06 02:15
10/09/06 03:45 - 04:00
10/11/06 07:45

- d) For the following dates and times, turbidity data >1000 NTU were deleted due to fouling (see Section 12). All other data were retained, but should be considered suspect.

08/07/06 19:30 - 08/10/06 08:30
08/21/06 15:30 - 08/25/06 08:00

12) Deleted Data

DEBIDUE CREEK

- a) For the following dates and times, turbidity data were deleted due to probable obstruction of the optics from fouling &/or fish/crabs.

08/04/06 13:15, 16:15, 17:00, 21:00, 21:45, 23:30
08/05/06 00:45, 02:00, 03:15, 04:30, 05:45, 07:00, 08:15, 09:30, 10:45,
12:45, 14:00, 15:15, 16:30, 17:45, 18:00, 18:15, 19:00, 23:00,
23:15
08/06/06 00:15, 01:30, 02:45, 04:00, 05:15, 06:30, 07:45, 09:15, 09:30,
10:30, 10:45, 11:45, 12:00, 13:00, 13:15, 14:15, 15:30, 18:00,
20:45
08/07/06 00:15, 01:30, 02:45, 04:00, 10:30, 11:45, 13:00, 14:15, 15:30,
16:45, 19:15, 20:45, 22:00, 23:45
08/08/06 00:30, 00:45, 02:45, 05:15, 08:45, 10:15, 11:30, 11:45, 12:30,
13:00, 14:45, 15:00, 16:00, 16:45, 18:15, 18:30, 19:30,
21:00, 21:15, 21:45, 22:15
08/09/06 01:30, 02:00, 02:15, 02:45, 03:15, 03:30, 04:00, 05:15, 05:45,
06:00, 06:45, 07:00, 07:45, 09:00, 09:15, 10:15, 10:30, 11:15,
11:30, 11:45, 12:00, 12:15, 12:30, 13:15, 14:30, 15:00, 15:15,
15:45, 17:00, 17:15, 18:00, 18:30, 18:45, 19:30, 20:30, 20:45,
21:45, 22:00, 22:45, 23:45
08/10/06 00:15, 02:30, 04:00, 06:30, 06:45, 07:45, 08:00

- b) For the following dates and times, all data were deleted due to out of water events.

08/16/06 06:45 - 08:30
08/19/06 10:30
08/20/06 10:45 - 12:15
08/21/06 00:00 - 01:15, 11:00 - 13:45
08/22/06 00:30 - 02:00, 12:00 - 14:15
08/23/06 01:30 - 02:30, 13:15 - 14:30
08/24/06 14:30
09/08/06 16:00
11/30/06 11:00

OYSTER LANDING

- a) For the following dates and times, turbidity data were deleted due to probable obstruction of the optics from fouling &/or fish/crabs.

07/11/06 13:00, 20:45
07/12/06 07:00, 13:45, 14:15, 14:45, 15:30, 18:15, 19:00, 19:30, 20:00,
20:30, 21:00, 22:00, 22:45
07/13/06 00:30, 01:15, 03:15, 04:15, 05:00, 05:30, 06:00, 07:15, 07:45,
08:15, 08:45, 09:15

- b) For the following dates and times, all dissolved oxygen data (% saturation & mg/l) were deleted due to an apparent tear in the membrane before deployment.

08/25/06 09:15 - 09/08/06 09:45

- c) For the following dates and times, all data were deleted due to out of water events.

11/10/06 16:45

THOUSAND ACRE

- a) For the following dates and times, all water quality parameters were deleted due to a malfunction of the temperature probe.

05/24/06 11:00 - 05/25/06 13:00

CLAMBANK CREEK

- a) For the following dates and times, conductivity, salinity, depth, and dissolved oxygen concentration data were deleted. The sonde bulkhead cracked during the deployment, which allowed salt water to seep into the conductivity probe connector.

01/27/06 06:00 - 02/02/06 10:00

- b) For the following dates and times, turbidity data were deleted due to probable obstruction of the optics from fouling &/or fish/crabs.

07/11/06 07:45, 11:45, 12:15, 15:45, 19:45, 22:00, 22:30

07/12/06 00:00, 01:30, 02:15, 09:00, 11:15, 13:15, 14:00, 14:30, 16:45, 17:30, 17:45, 19:30, 20:30, 21:15, 22:00, 22:30, 23:15

07/13/06 00:00, 01:15, 02:00, 04:15, 06:30, 07:15, 08:00, 08:45

08/07/06 19:30

08/08/06 00:45, 10:30, 10:45, 11:00, 12:00, 12:30, 13:30, 13:45, 14:15, 14:30, 15:15, 15:30, 16:00, 16:15, 17:45, 18:45, 19:00, 19:45, 20:00, 20:45, 21:00, 23:30

08/09/06 00:15, 00:30, 01:00, 01:15, 02:00, 02:15, 03:45, 05:30, 05:45, 06:15, 06:30, 07:15, 08:15, 08:30, 09:00, 09:15, 10:00, 10:30, 10:45, 11:15, 11:30, 12:15, 12:30, 13:00, 13:15, 13:30, 14:45, 15:00, 15:30, 15:45, 16:15, 16:30, 18:30, 20:00, 20:15, 20:30, 21:00, 21:15, 23:00, 23:15,

08/10/06 00:00, 00:45, 01:00, 01:30, 01:45, 02:00, 02:45, 03:30, 03:45, 04:00, 04:30, 04:45, 05:15, 05:30, 07:00, 07:30, 07:45

08/23/06 01:15

08/24/06 04:30, 05:45, 09:00, 09:45, 12:45, 13:30, 23:15

08/25/06 02:30

13) Missing Data

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. For more details on deleted data, see the Deleted Data Section (12.). If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

DEBIDUE CREEK

- a) For the following dates and times, data are missing due to sonde maintenance.

09/27/06 10:30, 12:30
10/05/06 08:15
11/09/06 10:30

OYSTER LANDING

- b) For the following dates and times, data are missing due to sonde maintenance.

07/07/06 09:45
11/22/06 10:45

THOUSAND ACRE

- a) For the following dates and times, data are missing due to sonde maintenance.

02/02/06 11:00
05/02/06 09:30
09/08/06 09:15

CLAMBANK CREEK

- b) For the following dates and times data are missing due to sonde maintenance.

02/02/06 10:30
08/10/06 08:45
09/08/06 08:45

14) Post Deployment Information

End of Deployment Post-calibration Readings in Standard Solutions:
NA = no data available for that particular standard

Debidue Creek

Date	Sp. Cond. (0 mS/cm)	Salinity (0 ppt)	DO % (% air sat.)	pH (7.0)	Depth (air sat.)	Turbidity (0 NTU)
01/04/06	0.021	0.01	100.5	7.08	-0.079	-0.2
01/19/06	0.055	0.02	99.5	7.00	0.107	0.2
02/02/06	0.025	0.01	99.5	7.10	-0.040	-0.2
02/16/06	0.031	0.01	101.0	6.95	0.135	1.0
03/03/06	0.036	0.02	100.1	6.99	0.016	0.6
03/17/06	0.015	0.01	100.3	6.86	0.012	1.1
03/31/06	0.018	0.01	100.4	7.04	0.112	0.1
04/14/06	0.029	0.01	99.7	6.72	0.014	0.2
04/28/06	0.050	0.02	98.8	7.06	0.061	0.2
05/12/06	0.027	0.01	99.1	7.02	-0.044	0.1
05/29/06	0.012	0.00	107.6	7.11	0.064	0.0
06/13/06	0.007	0.00	103.5	7.04	0.021	0.2

06/27/06	0.031	0.01	106.1	7.08	0.007	0.5
07/13/06	0.217	0.10	103.5	7.04	0.164	0.1
07/28/06	0.064	0.03	103.5	7.10	0.119	-0.3
08/10/06	0.056	0.02	na*	6.93	-0.028	0.3
08/15/06	0.031	0.01	101.5	7.05	0.033	0.7
08/25/06	0.024	0.01	100.8	7.12	0.021	-0.1
08/28/06	0.097	0.04	109.2	7.07	0.013	0.7
09/08/06	0.028	0.01	100.3	7.05	0.041	0.1
09/25/06	0.040	0.02	98.6	6.93	-0.005	-0.2
10/09/06	0.100	0.05	100.3	6.93	0.032	0.5
10/10/06	0.034	0.01	100.4	7.01	-0.006	-0.5
10/24/06	0.011	0.00	99.8	6.97	0.036	0.2
11/09/06	0.104	0.05	100.9	7.05	-0.068	0.4
11/22/06	0.049	0.02	101.7	7.20	-0.040	0.6
12/07/06	0.233	0.11	104.4	6.98	0.025	0.5
12/20/06	0.031	0.01	103.2	7.12	0.146	-0.2
01/05/07	0.030	na	89.4	6.86	0.014	0.1

*tear in membrane

Oyster Landing

Date	Sp. Cond. (0 mS/cm)	Salinity (0 ppt)	DO % (% air sat.)	pH (7.0)	Depth (air sat.)	Turbidity (0 NTU)
01/04/06	0.085	0.04	96.4	6.82	-0.090	0.6
01/19/06	0.090	0.04	103.7	6.91	0.202	1.4
02/02/06	0.011	0.00	100.1	6.99	-0.043	0.3
02/16/06	0.020	0.01	97.1	7.26	0.141	0.1
03/03/06	0.026	0.01	100.3	6.83	0.014	0.1
03/17/06	0.068	0.03	104.9	7.06	0.017	0.6
03/31/06	0.040	0.02	100.7	7.08	0.108	0.2
04/14/06	0.026	0.01	100.5	7.03	0.001	0.5
04/28/06	0.023	0.01	100.7	7.17	0.053	-0.2
05/12/06	0.041	0.02	102.2	6.95	-0.051	0.4
05/29/06	0.012	0.00	105.5	6.80	0.060	-3.6
06/13/06	0.030	0.01	103.1	6.99	0.020	-0.2
06/27/06	0.057	0.03	101.0	6.82	0.006	0.1
07/13/06	0.076	0.03	105.7	7.06	0.080	-0.1
07/27/06	0.085	0.04	102.8	7.06	0.047	0.2
08/10/06	0.026	0.01	107.0	6.90	-0.012	0.0
08/25/06	0.102	0.05	101.4	6.88	0.022	1.0
09/08/06	0.058	0.03	99.5	7.12	0.041	0.6
09/25/06	*na	na	100.0	na	-0.010	na
10/10/06	0.016	0.01	100.8	7.13	-0.006	0.1
10/24/06	0.029	0.01	101.9	7.04	0.031	1.7
11/09/06	0.067	0.03	99.4	7.13	-0.066	0.1
11/11/06	0.032	0.01	96.6	6.79	0.034	0.1
11/22/06	0.021	0.01	102.1	7.07	-0.047	0.3
12/08/06	0.025	0.01	102.1	7.12	0.187	0.1
12/18/06	0.047	0.02	100.6	6.90	0.106	0.1
01/05/07	0.007	na	101.2	6.77	0.016	-0.3

*sonde became unresponsive during post-calibration procedures and had to be sent back to YSI for repair

Thousand Acre

Date	Sp. Cond. (0 mS/cm)	Salinity (0 ppt)	DO % (% air sat.)	pH (7.0)	Depth (air sat.)	Turbidity (0 NTU)
01/04/06	0.041	0.02	102.6	7.12	0.041	1.0
01/19/06	0.036	0.02	100.0	7.27	0.182	0.7

02/02/06	0.016	0.01	101.3	7.02	-0.038	-0.6
02/16/06	0.012	0.00	102.7	7.07	0.123	0.3
03/02/06	0.005	0.00	99.7	7.11	-0.046	0.4
03/22/06	0.005	0.00	103.2	7.05	0.044	0.0
04/03/06	0.014	0.00	99.1	6.95	-0.007	-0.4
04/17/06	0.007	0.00	97.7	6.85	-0.105	0.1
05/02/06	0.029	0.01	105.5	7.13	0.069	0.2
05/12/06	0.025	0.01	105.7	7.03	-0.045	0.3
05/29/06	0.019	0.01	100.0	7.08	0.062	0.2
06/13/06	0.054	0.02	100.7	7.04	0.011	0.1
06/27/06	0.004	0.00	105.0	6.88	0.008	-0.1
07/13/06	0.113	0.05	99.5	6.94	0.067	0.2
07/27/06	0.074	0.03	106.2	6.84	0.050	0.3
08/10/06	0.038	0.02	100.0	7.00	-0.021	1.4
08/25/06	0.076	0.03	100.8	6.99	0.022	0.1
09/08/06	0.050	0.02	105.2	6.80	0.041	0.1
09/25/06	0.019	0.01	101.2	7.04	-0.008	1.2
10/11/06	0.029	0.01	102.7	7.00	-0.056	0.0
10/24/06	0.022	0.01	104.8	7.00	0.036	0.4
11/09/06	0.024	0.01	103.9	6.87	-0.071	0.5
11/22/06	0.032	0.01	101.6	7.16	-0.034	0.5
12/07/06	0.015	0.01	100.0	7.02	0.015	0.1
12/18/06	0.013	0.00	102.8	7.00	0.013	0.0
01/05/07	0.001	na	100.5	6.84	0.009	-0.3

Clambank Creek

Date	Sp. Cond. (0 mS/cm)	Salinity (0 ppt)	DO % (% air sat.)	pH (7.0)	Depth (air sat.)	Turbidity (0 NTU)
01/04/06	0.348	0.17	102.4	7.04	0.348	-0.3
01/19/06	0.070	0.03	101.3	7.04	0.200	0.3
02/02/06	0.084	0.04	101.3	na	-0.033	-1.6
02/17/06	0.026	0.01	101.5	7.18	0.083	-0.2
03/03/06	0.024	0.01	99.4	7.17	0.018	0.4
03/17/06	0.050	0.02	100.2	6.78	0.010	0.1
03/31/06	0.008	0.00	103.2	6.92	0.114	0.1
04/14/06	0.015	0.01	101.1	7.05	0.034	0.1
04/28/06	0.050	0.02	99.9	7.21	0.047	0.2
05/12/06	0.027	0.01	102.0	7.07	-0.048	0.5
05/29/06	0.037	0.02	101.6	7.00	0.066	0.9
06/13/06	0.048	0.02	104.0	7.04	0.021	0.2
06/27/06	0.060	0.03	100.8	6.94	0.010	0.7
07/13/06	0.050	0.02	102.4	7.01	0.083	-0.1
07/27/06	0.057	0.03	105.8	7.04	0.058	0.0
08/10/06	0.033	0.01	102.0	6.96	-0.018	0.2
08/25/06	0.098	0.05	101.5	6.95	0.016	-0.4
09/08/06	0.030	0.01	105.0	6.99	0.043	0.6
09/25/06	0.049	0.02	98.4	6.97	-0.008	1.3
10/09/06	0.101	0.05	100.1	6.98	0.022	1.5
10/24/06	0.034	0.01	100.8	7.21	0.023	0.2
11/09/06	0.020	0.01	99.6	7.02	-0.074	0.6
11/22/06	0.037	0.02	100.5	7.10	-0.038	1.1
12/07/06	0.024	0.01	102.1	6.90	0.018	0.0
12/18/06	0.022	0.01	95.6	6.92	0.105	-0.6
01/05/07	0.023	na	100.0	6.90	0.010	1.1

14) Other Remarks/Notes

On 10/01/2019 this dataset was updated to include embedded QAQC flags for anomalous/suspect data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2006, rejected data were deleted from the dataset so they are unavailable to be used at all, but suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

- a) The following are daily rainfall totals > 2.54 mm for the year of 2005 recorded at the NIWB-NERR weather station at Oyster Landing. Note that significant rainfall amounts can affect all measured parameters, most noticeably salinity, turbidity and pH. Please note that Tropical events are associated with heavy winds that may also affect tidal depth.

DATE	PRECIPITATION (mm)	
01/14/2006	05.6	
02/11/2006	03.3	
02/25/2006	26.7	
02/26/2006	16.0	
03/21/2006	31.0	
04/08/2006	17.3	
04/17/2006	07.9	
04/22/2006	55.1	
04/26/2006	19.1	
04/27/2006	02.8	
05/07/2006	06.9	
05/14/2006	15.5	
05/18/2006	02.8	
05/19/2006	03.3	
05/20/2006	11.4	
06/03/2006	18.0	
06/05/2006	02.8	
06/08/2006	05.3	
06/13/2006	26.4	Tropical Depression Alberto
06/15/2006	05.3	
06/26/2006	07.4	
06/27/2006	12.4	
06/28/2006	02.5	
06/29/2006	06.4	
07/06/2006	82.2	
07/15/2006	16.1	
07/23/2006	46.1	
07/28/2006	14.3	

07/29/2006	03.2
08/10/2006	20.9
08/11/2006	09.1
08/12/2006	06.1
08/17/2006	08.0
08/22/2006	25.5
08/24/2006	03.2
08/31/2006	102.3 Tropical Storm Ernesto
09/05/2006	24.3
09/06/2006	08.9
09/14/2006	13.0
09/25/2006	15.0
09/29/2006	03.6
10/08/2006	11.3
10/09/2006	18.9
10/18/2006	10.3
10/22/2006	11.9
10/27/2006	41.9
11/07/2006	58.5
11/12/2006	03.3
11/16/2006	29.3
11/21/2006	30.7
11/28/2006	02.7
12/03/2006	07.6
12/22/2006	31.5
12/25/2006	10.4
12/26/2006	05.4
12/31/2006	06.4

- b) A tide gauge was installed directly adjacent to the Debidue sonde tube on 02/25/06 without the permission/knowledge of NIWB. The gauge was discovered on 03/03/06 and the persons responsible were asked to move the gauge. The gauge was moved to ~90° from the YSI tube on the afternoon of 03/03/06.
- c) The interval of data collection was changed from 30 minutes to 15 minutes at all four water quality monitoring stations beginning with deployments on 05/29/06.
- d) On 07/07/06 the Oyster Landing sonde was moved to a new location approximately 3 meters from its previous location, where it is deployed at a slightly greater depth (approx. 0.5 meters deeper). At this time, a Sutron Sat-Link2 transmitter was installed at this station and began transmitting data to the NOAA GOES satellite, NESDIS ID # 3B031302. The transmissions are scheduled hourly and contain (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data is "Provisional" data and not the "Authentic" dataset used for long term monitoring and study. This data can be viewed by going to <http://cdmo.baruch.sc.edu>.
- e) Beginning 07/20/06, we began testing a new YSI 6150 Optical Dissolved Oxygen Sensor at Debidue Creek. This site was chosen due to its

propensity for biofouling. There are periods in which optical dissolved oxygen data have been substituted for the Rapid-Pulse Clark Cell dissolved oxygen data, due to loss of data from a ripped membrane on the rapid-pulse probe. These periods have been documented in Section 11) Anomalous/Suspect Data. The 6150 Optical Dissolved Oxygen Sensor specifications can be found in Section 9.

- f) On 09/27/06 a test of the optical DO sensor was conducted which required 3 minute data intervals between 10:45 and 12:15. Readings nearest the quarter hour were used in the final dataset. Please note that these data were collected at normal depth, but outside of the PVC sonde housing.
- g) On 10/05/06 a test of the optical DO sensor was conducted which required 2 minute data intervals between 08:30 and 09:45. Readings nearest the quarter hour were used in the final dataset. Please note that these data were collected at normal depth, but outside of the PVC sonde housing.
- h) On the following dates and times, the PVC sonde housing was changed at each site. The new sonde housing was painted inside and out with anti-fouling paint and the opening for water flow over the sonde probes was changed from 2 large openings to a 1 foot section with multiple 1 inch holes drilled as close as possible around the circumference of the pipe. This was done to allow better flow over the probes and hopefully reduce the effects of biofouling.

Debidue Creek	11/30/06	11:12
Oyster Landing	11/30/06	12:12
Thousand Acre	11/29/06	11:00
Clambank Landing	12/04/06	13:09