ACE Basin (ACE) National Estuarine Research Reserve Water Quality Metadata
January-December 2009 Report
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I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

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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

Long-term water quality monitoring in the ACE Basin provides a unique opportunity to increase understanding of how various environmental factors influence estuarine processes. The Reserve research staff has elected to compare water quality conditions in shallow creeks along a salinity gradient and at different levels of development. Based on discussions with local Coastal Zone Management (CZM) personnel and ACE Basin NERR staff knowledge of land use within the Reserve, the South Edisto River drainage basin was selected because it is well suited for studying contrasting hydrographic conditions and land use patterns. Two tributaries, St. Pierre Creek and Fishing Creek, are in areas where boat traffic is light and development is sparse, and they are designated as "control" sites. In contrast, the two "treatment" sites are in Big Bay Creek and Mosquito Creek where boat traffic is moderate to heavy and residential and commercial development is medium to dense. The four sites also are located along the salinity gradient in the South Edisto River watershed: Big Bay Creek and St. Pierre Creek are in the polyhaline zone (18-30 ppt), Mosquito Creek is in the mesohaline zone (5-18 ppt), and Fishing Creek is in the oligohaline zone. See *Section 5 - Site Location and Character* for detailed descriptions of the sites.

The water quality monitoring program began on March 3, 1995 at Big Bay Creek and St. Pierre Creek; in October 2002, a monitoring station was established in Fishing Creek and in Mosquito Creek. Initially, YSI electronic data loggers were deployed to monitor the water temperature, specific conductance, dissolved oxygen, water level, and pH conditions, approximately 0.5 meters above the creek bottom, at 15-minute intervals; on August 11, 1995, the sampling interval was changed to 30 minutes, and turbidity monitoring was added to the program on April 11, 1996. On December 12, 2007, the sampling interval was changed to 15 minutes.

4) Research methods

One data logger is deployed at each permanent monitoring station (Big Bay, St. Pierre, Fishing Creek, and Mosquito Creek). The data logger is attached to a deployment mount at each station to ensure that the sensor is positioned approximately 0.5 m from the creek bottom during a deployment. At each monitoring station, the deployment mount consists of a PVC pipe that is attached vertically to a galvanized pole, which is driven approximately 1 m into the sediment. To facilitate water flow across the sensors, approximately two-inch diameter holes are drilled into the PVC pipes. On April 14, 2006 at 10:30:00 the St. Pierre deployment mount was replaced with a new PVC pipe. On August 06, 2007, a new Mosquito Creek deployment mount was installed 0.5 meters away from the old mount.

A Sutron Sat-Link2 transmitter was installed at the Saint Pierre station on 06/28/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3b02f20a. (Where 3b02f20a is the GOES ID for that particular station.) 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.

To minimize fouling (i.e. settlement of barnacles and sponges) of data loggers, new sensors and sensor guards are wrapped in nonconductive copper tape. A plastic mesh is wrapped around the sensor guard to keep out large animals (i.e. crabs, fish); the mesh is coated with anti-fouling paint. In addition, fouling organisms are removed from the PVC deployment mounts during monthly inspections.

The YSI data loggers are deployed for one to two weeks during the summer months, and the sampling period is extended up to one month during the cooler months. A data logger is retrieved and replaced with a newly calibrated data logger prior to a 15-minute reading to prevent interruption of data collection. Swap data is collected by taking readings at the same time with the retrieved and newly deployed data logger to determine how much drift occurred during the previous deployment. A secondary field reading is taken from time to time with in-situ measurements to serve as a secondary check. After deploying the calibrated data logger, a water sample is collected from same depth as the sensor to measure several water quality parameters (water temperature, salinity, pH, dissolved oxygen [mg/l]). Water temperature, salinity, and pH are measured directly with a thermometer, refractometer and hand-held pH meter, respectively, dissolved oxygen, expressed at mg/l, is determined with a field Winkler titration kit. Water depth and meteorological conditions (i.e. precipitation and wind speed and direction) also are recorded. This in-situ measurements are used to determine if the sensor readings drifted significantly during deployment and to evaluate anomalous readings (<28% air saturation).

When the data loggers are retrieved, they are taken to the laboratory for cleaning, post-deployment calibration checks and servicing, in accordance with guidelines set by YSI Operating and Service Manual. Upon returning to the laboratory, the data are downloaded, and the dataset is reviewed to determine if any equipment malfunctions occurred during deployment that need immediate attention. Post-deployment calibration checks of all the parameters except turbidity are done before cleaning the data loggers. Turbidity checks are performed after cleaning the data loggers to prevent contamination of the standard. Sensors are immersed in the appropriate standard solutions (i.e. pH) and readings are recorded. A DO membrane integrity test also is conducted to determine if the membrane was damaged during deployment.

A series of diagnostic values, including dissolved oxygen charge, dissolved oxygen gain, and pH millivolt value at pH 7 and at pH 10, are recorded during calibration and post-deployment calibration checks of data loggers. These diagnostic values are strong indicators of the individual sensor performance, and they are used to determine the accuracy of the data.

Before the data loggers are deployed dissolved oxygen (DO) membranes are changed and allowed to stretch for 24 hours, and the voltage of the batteries are checked. Next, the pH, conductivity, and turbidity sensors are calibrated, using the following standards: pH 7 and 10, 50 mS/cm potassium chloride solution, and 0 and 123 NTU solutions, respectively. The water level sensor is zeroed in air, and the barometric pressure in the laboratory is recorded. Before leaving the laboratory the following day, the DO sensor is calibrated in air-saturated water. In addition to the procedures outlined in the CDMO manual, we conduct a DO membrane integrity test prior to deployment to determine if the membrane was installed properly or was damaged during calibration.

5) Site location and character –

ACE Basin National Estuarine Research Reserve is one of the largest undeveloped estuaries on the East Coast. The study area encompasses the Ashepoo, Combahee and South Edisto River basins, which empty into St. Helena Sound. The NERR consists of approximately 150,000 acres of diverse estuarine wetlands providing preserved habitats for fish and wildlife.

Three monitoring stations are tributaries of the South Edisto River and one is in a tributary of both the S. Edisto and Ashepoo rivers, contributing to freshwater input to each site. The average tidal range at all stations is approximately 2.0 m (6.5 feet), with a maximum of 2.36 m (7.8 feet) and a minimum of 1.39 m (4.6 feet). The bottom habitat at each of the four sites consists of mud intermixed with dead shell hash. The descriptions of the sites are as follow:

Big Bay - GPS coordinates: 32.4941N and -80.3241W

This monitoring station is in Big Bay Creek proper, approximately 2 km (1.24 mi) from the mouth of the creek, and is located about 5 m (16.41 ft) from the southern bank of the creek. In 2009, the mean depth at the station was 2.81 m (9.22 ft), and the mean salinity was 30.7 parts per thousand (ppt). A deeper mean depth was influenced by the installation of a new deployment tube approximately 0.3 meters deeper than the one preceding it on 1/21/2009 – 11:00.

The Big Bay monitoring station is designated as a "treatment" site because it is subject to nonpoint source pollution and has a high density of development. The southern bank of the creek is bordered by residential and commercial development, with little setback from the bordering *Spartina* marsh. For instance, there are over forty private docks, two commercial seafood docks and a marina with 75 slips, three paved boat ramps, and two fueling areas along the southern bank. Docks and bulkheads are constructed of concrete, or creosote, CCA-treated or Wolmanized material. Boat traffic is heavy, especially during the warmer months, and the creek is closed to shellfish harvesting because of the surrounding human activities. The major sources of nonpoint source pollution are surface runoff from lawns, golf courses, and paved ramps that contain fertilizers, pesticides, herbicides and PAHs. All of the high ground along the southern bank is developed (i.e. residential homes, condominiums and restaurants); and maritime plant communities have been replaced by golf courses, lawns and ornamental gardens. Small patches of a few maritime species (i.e. live oak (*Quercus virginiana*), cabbage palmetto (*Sabal palmetto*), and Southern red cedar (*Juniperus silicicola*)) are found along the roads. In contrast, the northern bank is bordered by a wide expanse of *Spartina alterniflora* marsh, and no high ground is present. American oyster (*Crassostrea virginica*) forms a reef along the creek banks, especially the northern side, and on intertidal mud flats within the creek.

Fishing Creek – GPS coordinates: 32.6358 N and -80.3655W

This monitoring station is in a tributary of Fishing Creek, approximately 1.79 km (1.11 mi) from the mouth of the creek, and is located approximately 5 m (16.41 ft) from the northern bank of the creek. The tributary flows through the eastern half of Jehossee Island, a protected USFWS, and Fishing Creek forms the northeast border of the island. The station is surrounded by extensive *Spartina cynosuroides* marsh and vast mud flats. The upland area is characterized by slash pine, live oak, and cabbage palmetto. In 2009, the mean depth at the station was 2.38 m (7.81 ft), and the mean salinity was 8.81 parts per thousand (ppt). A deeper mean depth was influenced by the installation of a new deployment tube approximately 0.2 meters deeper than the one preceding it on 05/05/2009 – 12:45.

Fishing Creek monitoring station is designated as a “control” site because there is no development in the immediate area, and boat traffic is relatively light in the creek. The Wildlife Management Area contains impoundments (formerly rice fields) that are managed as wildlife habitat for endangered fauna and migratory waterfowl. No pesticides or herbicides are applied to the managed wetlands. Water level in the managed wetland is regulated by rice trunks that control the flow of water between the impoundment and the South Edisto River.

Mosquito Creek – GPS coordinates: 32.5558 N and -80.4380W

This monitoring station is in Mosquito Creek proper (a tributary of both the South Edisto and Ashepoo rivers), approximately 2.51 km (1.56 mi) from the Ashepoo River and 12 km (7.46 mi) from the South Edisto River, and it is about 5 m (16.41 ft) from the southern bank of the creek. In 2009, the mean depth at the station was 4.32 m (14.17 ft), and the mean salinity was 19.35 parts per thousand (ppt). Mean depth data for Mosquito Creek was compromised with two separate adjustments to depth from the construction of two separate deployment mounts, one on 12/18/2008 - 13:15, resulting in a depth reading approximately 0.2 meters shallower and the other on 08/04/2009 – 1400, resulting in a depth reading approximately 0.2 meters deeper than the previous mount provided. The depth readings for 2009 after the 08/04/2009 mount installation should be very similar to those taken prior to the 12/18/2008 mount installation.

Mosquito Creek station is designated as a "treatment" site because of the land use practices in the surrounding area. Agriculture fields and impounded wetlands are found upstream of the monitoring station. Ten docks constructed of creosote, concrete and Wolmanized pilings; a public boat landing; a commercial seafood business with three commercial shrimp boats and a fueling area are located about 0.8 km (0.5 mi) downstream of the monitoring station. The major source of nonpoint source pollution to the monitoring station is surface runoff from the impoundments and agricultural lands that contain high levels of nutrients and, at times, herbicides and pesticides. Impoundment trunks open and drain into the creek increasing the nutrient load and possibly introducing herbicides and pesticides. Vegetation in the area includes salt marsh dominated by *Spartina alterniflora* and *Juncus roemerianus*. Upland fringe areas consist of cabbage palmetto, live oaks and pine trees.

As of August 4, 2009, the Mosquito Creek station was moved approximately 20-feet from its historical location after a new concrete bridge was constructed adjacent to the historic site. The old wooden bridge, on which our station was attached to, was demolished. The new Mosquito Creek station is now located on the newly constructed concrete bridge.

St. Pierre - GPS coordinates: 32.5233N and -80.3568W

This monitoring station is in a small tributary of St. Pierre Creek, approximately 0.25 km (0.16 mi) from the mouth of the creek, and it is about 5 m (16.41 ft) from the northern bank of the creek. The tributary flows through the southern portion of Bailey Island, and creek forms the eastern border of the island. The monitoring station is surrounded by a wide expanse of *Spartina alterniflora* marsh. Extensive mud flats and oyster reefs fringe the banks. Maritime forest communities comprised of species such as wax myrtles, live oaks, and palmettos dominate the upland areas. In 2009, the mean depth at the station was 2.65 m (8.69 ft), and the mean salinity was 29.5 parts per thousand (ppt). The change in mean depth was influenced by the installation of a new deployment tube approximately 0.06 meters deeper than the one preceding it on 06/17/2009 – 10:00. However there seems to be a net decrease in depth of about 0.11 meters from 2008 – 2009.

The St. Pierre station is designated as a "control" site because development in the immediate area was sparse when the station was established on March 3, 1995, and the tributary is subject to relatively light boat traffic. In 1996, the 695-acre island was sold, and the owners partnered with The Nature Conservancy to design a conservation-based development. Four hundred and three acres in the center of Bailey Island were set aside as a nature preserve that is managed by The Nature Conservancy, and number of residential lots on the remaining 292 acres is limited to 67. Access to the island is limited to one bridge and all roads on the island are single lane and made of crushed seashells. In addition, a conservation manual was developed for the property owners that provide specific lot designs and construction guidelines as well as landscaping guidelines to protect the maritime and estuarine habitats.

6) Data collection period –

BEGAN	ENDED
Big Bay Site	
12/12/2008 – 10:45	01/07/2009 – 07:30
01/07/2009 – 08:00	02/05/2009 – 07:15
New deployment tube installed on 01/21/2009 – 11:20. Deployed 0.3 meters deeper.	
02/05/2009 – 07:45	03/11/2009 – 11:45
No simultaneous swap data gathered	
03/11/2009 – 12:00	04/08/2009 – 13:00
04/08/2009 – 13:15	05/05/2009 – 09:45
05/05/2009 – 10:00	05/21/2009 – 07:45
Temperature probe failed on previous deployment. No swap data gathered	
05/21/2009 – 08:15	06/03/2009 – 08:00
06/03/2009 – 08:15	06/17/2009 – 08:15
06/17/2009 – 08:45	07/06/2009 – 10:00
07/06/2009 – 10:30	08/04/2009 – 09:15
08/04/2009 – 09:45	08/17/2009 – 10:15
08/17/2009 – 10:45	09/02/2009 – 10:15
09/02/2009 – 10:45	09/15/2009 – 07:15
09/15/2009 – 07:45	10/13/2009 – 10:30
10/13/2009 – 11:00	11/12/2009 – 07:15
No simultaneous swap data gathered	
11/12/2009 – 07:30	12/14/2009 – 10:00
12/14/2009 – 10:30	01/12/2010 – 09:30
Fishing Creek	
12/12/2008 – 12:15	01/07/2009 – 09:00
01/07/2009 – 09:15	02/05/2009 – 08:45
02/05/2009 – 09:15	03/11/2009 – 13:15
03/11/2009 – 13:15	04/08/2009 – 12:00
04/08/2009 – 12:15	05/05/2009 – 11:45
Swap data recorded from 11:45 through 12:15 during tube installation	
New deployment tube installed on 05/05/2009 – 12:45. Deployed 0.2 meters deeper	

05/05/2009 – 12:00 05/21/2009 – 10:15
05/21/2009 – 10:45 06/03/2009 – 09:15
06/03/2009 – 09:45 06/17/2009 – 10:45
06/17/2009 – 11:15 07/06/2009 – 12:15
07/06/2009 – 12:45 08/04/2009 – 11:00

No simultaneous swap data gathered

08/04/2009 – 11:15 08/17/2009 – 11:15
08/17/2009 – 11:45 09/02/2009 – 11:30
09/02/2009 – 12:00 09/15/2009 – 09:45
09/15/2009 – 10:15 10/13/2009 – 08:30
********** **********

End of data collection for 2009. Water quality station destroyed and data logger lost.

Mosquito Creek

12/18/2008 – 11:00 01/07/2009 – 10:15

Old Fishing Creek sonde deployed on accident in place of new Mosquito Creek Sonde

01/07/2009 – 10:15 01/08/2009 – 12:45

No simultaneous swap data available when new Mosquito Creek Sonde deployed to replace accidentally deployed old Fishing Creek sonde

01/08/2009 – 13:00 02/05/2009 – 09:45
02/05/2009 – 10:15 03/11/2009 – 14:15
03/11/2009 – 14:45 04/08/2009 – 11:00
04/08/2009 – 11:30 05/05/2009 – 08:45

No simultaneous swap data gathered

05/05/2009 – 09:15 05/21/2009 – 12:30
05/21/2009 – 13:00 06/03/2009 – 12:00

No simultaneous swap data gathered

06/03/2009 – 12:15 06/17/2009 – 11:45

No simultaneous swap data gathered

Sonde not deployed due to construction of new bridge and demolition of old bridge and our old water quality station. New water quality station attached to new bridge approximately 21 meters from old site on 08/04/2009 – 1400. Deployed 0.2 meters deeper.

08/04/2009 – 14:00 08/17/2009 – 12:00
08/17/2009 – 12:30 09/02/2009 – 08:30
09/02/2009 – 09:00 09/15/2009 – 10:45
09/15/2009 – 11:15 10/13/2009 – 07:30

No simultaneous swap data gathered

10/13/2009 – 08:00 11/12/2009 – 10:30

No simultaneous swap data gathered

Timestamp for 11/12/2009 deployment was off by 5min. 29sec. because the start time was incorrect. Timestamp post corrected. Sonde's first reading was actually taken at 10:50:29

11/12/2009 – 10:45 12/14/2009 – 12:30

No swap data gathered due to timestamp issue with past deployment

12/14/2009 – 13:45 01/12/2010 – 11:00

St. Pierre Site

12/12/2008 – 11:15	01/07/2009 – 08:15
No simultaneous swap data gathered	
01/07/2009 – 08:30	02/05/2009 – 07:45
02/05/2009 – 08:15	03/11/2009 – 12:15
03/11/2009 – 12:45	04/08/2009 – 13:30
Swap data available from 13:45 through 14:30	
04/08/2009 – 14:45	05/05/2009 – 10:30
05/05/2009 – 10:45	05/21/2009 – 08:30
05/21/2009 – 08:45	06/03/2009 – 07:15
06/03/2009 – 07:45	06/17/2009 – 10:00
Swap data available from 09:15 through 10:00 during deployment tube installation. New deployment tube installed on 06/17/2009 – 10:00. Deployed 0.06 meters deeper.	
06/17/2009 – 10:15	07/06/2009 – 10:45
07/06/2009 – 11:15	08/04/2009 – 10:00
Swap data available from 10:15 through 10:30	
08/04/2009 – 10:30	08/17/2009 – 09:30
08/17/2009 – 10:00	09/02/2009 – 09:30
09/02/2009 – 10:00	09/15/2009 – 08:45
09/15/2009 – 09:15	10/13/2009 – 12:15
10/13/2009 – 12:45	11/12/2009 – 07:30
No swap data gathered. Missed reading at 07:45	
11/12/2009 – 08:00	12/14/2009 – 09:15
12/14/2009 – 09:45	**Sonde stopped logging 1/5/2009 – 01:15**
No swap data available	

7) Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program, is as follows.

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 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 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 (see *Section 1 - Principal Investigators and Contact Persons* for addresses), from the Data Manager at the Centralized Data Management Office (please see

personnel directory under 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, Microsoft Excel spreadsheet format and comma-delimited format.

8) Associated researchers and projects

Dr. Charles Wenner of SCDNR/Marine Resources Research Institute received funding through the National Marine Fisheries Service in January of 2001 to continue an ongoing survey of red drum (*Sciaenops ocellatus*) in the South Edisto and Combahee River basins, by electrofishing in tidal freshwater and low salinity brackish water. Although red drum is the target species, all species are identified to species, measured and weighed.

The ACE Basin NERR received funding from the U.S. Environmental Protection Agency to establish a National Atmospheric Deposition Program site in the Reserve. Sampling efforts began on January 1, 2002 and will continue for five years. Weekly precipitation samples are collected and analyzed for atmospheric pollutants. The precipitation collector is located on Bear Island, a Wildlife Management Area inside the NERR. This program was discontinued January 1, 2008.

In February 2006, the ACE Basin NERR installed a RASSL – Remote Access Satellite Sensor Link – transmitter unit to the deployment structure at the Mosquito Creek water quality sampling station, and in August 2006 installed an additional transmitter unit at the Big Bay station. North Star Science and Technology, funded by a CICEET grant, designed a compact and field rugged satellite communicator. The transmitter unit, compatible with YSI 6 series data sondes, communicates directly to the sonde and asks the sonde to take an additional reading once an hour. This additional reading is not stored by the data sonde and does not interfere with the scheduled SWMP data collection. The additional hourly reading is then transmitted via a satellite link. The provisional data are posted to a secure website provided and maintained by North Star Science and Technology. The RASSL project ended on January 2008 due to funding shortage.

On September 19, 2006 the Algal Ecology Lab began screening water samples from the ACE BASIN. Algal assemblages are being identified at these sites to monitor these areas and identify any harmful algal blooms. If a bloom is present, the fixed sample will be counted to determine algal density. These water samples are also being processed for HPLC (High Performance Liquid Chromatography), which will identify the pigments that are present in the water at that time, and can be later analyzed for estimates of algal community biomass. This project was discontinued October 2008.

As part of the System-wide Monitoring Program (SWMP), nutrient and weather data are gathered at the ACE NERR in conjunction with water quality data obtained by YSI 6600-EDS data loggers. Diehl nutrient samples are gathered once per month at the St. Pierre water quality monitoring station, and grab samples are obtained at each of the four sites once per month. The concentrations of the following parameters are measured and recorded for the nutrient monitoring program: ammonium (NH4), nitrite + nitrate (NO2 + NO3), ortho-phosphate (PO4), and chlorophyll-A (Chl-a). Real-time weather data is gathered 24/7 and is transmitted to the Centralized Data Management Office (CDMO). Historic water quality, nutrient, and weather data can be obtained at http://cdmo.baruch.sc.edu/QueryPages/viewstations.cfm?Site_ID=ace.

Information about other studies conducted in the ACE Basin may be obtained from the Research Coordinator.

II. Physical Structure Descriptors

9) Sensor specifications
YSI 6600EDS datalogger
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 auto-ranging
Model #: 6560
Range: 0-100 mS/cm
Accuracy: +/-0.5% of reading +0.001mS/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

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; 200-500% air saturation, +/-6% of the reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)
Units: milligrams per Liter (mg/L)
Sensor Type: Rapid Pulse – Clark type, polarographic
Model #: 6562
Range: 0 to 50mg/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: Non-Vented Level –Shallow (Depth)

Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1m)
Accuracy: +/- 0.06 ft (0.018m)
Resolution: 0.001ft (0.001 m)

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

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 ° scatter, with mechanical cleaning
Model #: 6136
Range: 0 to 1000 NTU
Accuracy: +/-5% reading or 2 NTU (whichever is greater)
Resolution: 0.1 NTU

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, 2002). Many reserves have upgraded to YSI 6600 EDS data sondes, which increase 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 non-EDS DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, ie. periodicity analysis. It should be noted that the amount of fouling is 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. **All data sondes used at ACE NERR in 2007 were EDS models.**

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.

Probe Identification:	**Standards for Calibration:**
Turbidity 6136 Probe	YSI 6073G Turbidity Standard 123 NTU
pH 116031 Probe	RICCA CHEMICAL COMPANY LLC. Buffer 7.00 and 10.00
pH 6561FG Probe	RICCA CHEMICAL COMPANY LLC. Buffer 7.00 and 10.00
Specific Conductivity 6030 Probe	YSI 3169 Conductivity Calibrator 50 mS/cm +/- 1%

10) Coded variable definitions

Sampling Station:	Sampling site code:	Station Code:
St. Pierre	SP	acespwq
Big Bay	BB	acebbwq
Fishing Creek	FC	acefcwq
Mosquito Creek	MC	acemcwq

11) QAQC flag definitions

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range
-4 Outside Low Sensor Range
-3 Data Rejected due to QAQC

-2 Missing Data
-1 Optional SWMP Supported Parameter
0 Data Passed Initial QAQC Checks
1 Suspect Data
2 *Open - reserved for later flag*
3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
4 Historical Data: Pre-Auto QAQC
5 Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction
GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
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 –

Site ID	Date	DO%Air	pH(7.00)	Depth(m)	Turbid 0 NTU	SpCond 50mS/cm
BB						
	01/07/2009	97.4	6.99	0.068	-2.0	50.28
	02/06/2009	96.2	7.41	0.135	2.0	49.66
	03/12/2009	102.2	7.11	0.061	0.0	50.52
	04/09/2009	98.8	6.97	-0.022	0.0	48.77
	05/06/2009	97.2	7.17	0.017	0.3	49.67
	05/21/2009	TEMP. PROBE FAILED NO POST CAL DATA AVAILABLE				
	06/04/2009	97.9	7.20	-0.022	-2.5	50.27

06/18/2009	102.4	7.12	-0.150	0.0	49.93
07/07/2009	96.8	7.29	-0.780	1.0	50.20
08/05/2009	101.8	7.02	-0.025	-0.9	51.10
08/18/2009	97.7	7.18	0.036	0.0	50.03
09/03/2009	100.6	6.87	-0.090	-0.8	50.79
09/17/2009	96.5	6.93	0.000	0.1	49.55
10/13/2009	96.1	7.05	0.019	3.5	50.59
11/13/2009	97.8	7.35	-0.102	0.2	49.88
12/15/2009	103.1	7.03	0.006	0.7	49.72
01/13/2010	98.4	6.96	0.115	-0.1	50.78

Site ID	Date	DO%Air	pH(7.00)	Depth(m)	Turbid 0 NTU	SpCond 50mS/cm
FC						
	01/08/2009	100.8	7.27	0.051	0.1	51.30
	02/06/2009	99.6	7.30	0.138	1.4	50.08
	03/12/2009	104.2	7.06	0.222	0.8	50.05
	04/09/2009	101.1	7.12	-0.017	0.2	49.33
	05/06/2009	97.8	7.10	0.013	0.8	49.99
	05/21/2009	100.3	7.10	0.026	0.1	49.37
	06/04/2009	100.8	7.02	-0.027	-1.4	50.04
	06/18/2009	105.2	7.13	-0.026	-2.2	50.28
	07/07/2009	94.3	7.17	-0.094	-0.2	49.88
	08/05/2009	96.8	6.94	-0.040	0.3	49.95
	08/18/2009	102.3	6.95	0.032	0.4	49.86
	09/03/2009	104.8	6.97	-0.009	4.1	49.40
	09/17/2009	98.9	6.95	-0.010	-1.5	50.22
	10/13/2009	98.1	6.90	0.010	3.4	49.36
	11/13/2009	NO POST CAL DATA AVAILABLE. SONDE WAS LOST DURING DEPLOYMENT. WATER QUALITY STATION MISSING. WAS NOT FIXED UNTIL JAN. 2010				

Site ID	Date	DO%Air	pH(7.00)	Depth(m)	Turbid 0 NTU	SpCond 50mS/cm
MC						
	01/08/2009	100.8	6.89	0.056	-1.1	49.64
	02/06/2009	102.2	7.14	0.491	-1.7	50.01
	03/12/2009	100.8	7.19	0.055	-0.2	50.26
	04/09/2009	100.1	7.06	-0.133	-0.2	47.89
	05/06/2009	100.9	7.17	0.014	-0.2	50.34
	05/21/2009	98.5	7.07	0.032	0.7	50.08
	06/04/2009	101.4	7.03	-0.026	0.4	50.02
	06/18/2009	99.3	***	-0.018	-3.1	50.26
	07/07/2009	NO DATA COLLECTED. STATION REMOVED DUE TO BRIDGE CONSTRUCTION				

08/05/2009 NO DATA COLLECTED. STATION REMOVED DUE TO BRIDGE CONSTRUCTION					
08/18/2009	99.2	7.04	0.034	-0.2	49.80
09/03/2009	102.8	7.10	-0.003	-0.7	51.10
09/17/2009	97.8	6.95	-0.003	-0.8	49.73
10/13/2009	100.7	7.04	0.020	1.9	49.35
11/13/2009	101.0	7.38	-0.102	0.1	48.02
12/15/2009	99.3	7.04	-0.007	-0.3	49.97
01/13/2010	99.2	7.02	0.123	0.3	49.78

Site ID	Date	DO%Air	pH(7.00)	Depth(m)	Turbid 0 NTU	SpCond 50mS/cm
SP						
	01/08/2009	104.3	7.09	0.054	-1.8	51.08
	02/06/2009	102.6	7.25	0.129	0.8	50.84
	03/12/2009	100.4	7.16	0.045	-0.5	50.99
	04/09/2009	100.7	7.26	-0.046	0.3	50.33
	05/06/2009	98.9	7.42	0.016	0.2	49.81
	05/21/2009	100.9	7.03	0.014	-0.6	49.86
	06/04/2009	101.1	7.17	-0.026	-2.6	50.83
	06/18/2009	100.7	6.77	-0.026	-1.8	49.89
	07/07/2009	96.9	6.93	-0.089	-0.2	50.72
	08/05/2009	103	6.74	-0.151	0.7	49.74
	08/18/2009	102	6.98	0.038	1.0	50.31
	09/03/2009	122	***	-0.047	1.1	49.32
	09/17/2009	97.7	6.84	0.001	-0.2	50.17
	10/13/2009	100.8	6.80	0.058	32.7	48.73
	11/13/2009	105.5	7.60	-0.099	-0.9	50.31
	12/15/2009	96.1	9.89	0.010	-0.3	50.06
	01/13/2010	98.0	***	0.130	0.5	50.87

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.

Blanket Statement(s)

Timestamp

Mosquito Creek timestamp was off by 5min 29 sec. due to the start time not being set at the correct time. The internal clock was set correctly. All data is good data. The deployment timestamp was corrected to the nearest 15 minute interval.

Salinity/SpCond
Unusually low salinity values were confirmed to be the result of rain events for all four water quality sites.

Depth
All four sites had work done that may have caused a slight difference in depth data vs. historic readings.

a) Big Bay 01/21/2009 – 11:30:
A new deployment mount was installed at Big Bay (BB). The deployment mount was installed 0.5 meters from river bottom as dictated by SWMP protocol manual, resulting in about a 0.3 meter deeper reading than historic records.

b) Fishing Creek 05/05/2009 – 12:45:
A new deployment tube was installed to replace the heavily biofouled one, resulting a depth change of about 0.2 meters deeper than historic readings. The site was established 0.5 meters from the bottom of the river as dictated by SWMP protocol manual.

c) Mosquito Creek 08/04/2009 – 14:00:
A new deployment mount was installed on a newly constructed concrete bridge after the old wooden bridge that the existing water quality site was located on was demolished. The location of the new site is approximately 21 meters from the historic location. The site was established 0.5 meters from the bottom of the river as dictated by SWMP protocol manual. The change in depth is approximately 0.2 meters deeper than historic readings provided.

d) St. Pierre 06/17/2009 – 10:00
The new deployment tube was installed on the piling directly next to the old site for added stability. The old tube was installed on a u-post. The tube was installed 0.5 meters from the bottom of the river as dictated by SWMP protocol manual. This caused the sonde to be deployed approximately 0.06 meters deeper than historically deployed.

pH
Several issues were experienced with our pH probes due to port contamination within our data sondes. St. Pierre (SP) experienced the brunt of these issues since much of the data is suspect due to poor calibrations from slow response flat glass pH probes or port contamination. The ACE NERR data loggers were sent into YSI for repairs due to these pH issues. It took YSI and ACE NERR a full year before the contamination issues were discovered and fixed. Many new pH probes were purchased to help alleviate our issues throughout the year after our data sondes were returned to us with "no problems found." It was not until January 2010 that the contamination issues were discovered behind the port connectors of the data sondes. Bulb style pH probes will be used in the future since they are less sensitive to port contamination and have been proven to provide quality pH data in such conditions. All sites show a decrease in pH values as temperatures rise. This decrease seems more exaggerated where data is rejected during the warming period. This is the case for St. Pierre.

Turbidity

Turbidity sensors for all sites provided unusually high values from the observed norm and have been marked as suspect data (Code: <1>). The cause of these irregular values above 300NTU is unknown (Code: CCU). However, these values could be attributed to low tide, max flood tide, and/or rain events.

Turbidity sensors for all sites provided values over 1000 NTU. These values are outside the sensor specifications and the cause is unknown (Code: CCU). Therefore, these anomalous data points have been marked as suspect (Code: <1>).

Big Bay

Missing Data (Code: <-2>)

None

Suspect Data (Code: <1>)

a) **All Data**:

For the following dates & times, the sonde was not at the proper deployment depth (Code: CWD). The sonde was removed from the deployment mount in order to check its final reading against the newly deployed sonde's first reading in order to gather comparison data between the two sondes.

01/07/2009 – 07:45
02/05/2009 – 07:30
04/08/2009 – 13:00
05/21/2009 – 08:00
06/03/2009 – 08:15
06/17/2009 – 08:30
07/06/2009 – 10:15
08/04/2009 – 09:30
08/17/2009 – 10:30
09/02/2009 – 10:30
09/15/2009 – 07:30
10/13/2009 – 10:45
12/14/2009 – 10:15

For the following dates and time, the sonde was not deployed at the proper depth within the sonde tube (Code: CWD).

06/03/2009 – 08:30 through 06/17/2009 – 08:15

b) **Temperature**:

The temperature probe experienced catastrophic failure [STF] at the end of the deployment ranging from 05/05/2009 – 08:00 through 05/21/2009 – 07:45. The following dates and times for the first half of the deployment were marked suspect <1> see metadata (CSM) since the temperature probe seemed to work correctly during this deployment period:

05/05/2009 – through 05/11/2009 – 02:45

c) **Salinity/SpCond**:

See **all data** in this section above

d) **DO**:
See **all data** in this section above

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

g) **Turbidity**:
See blanket statement
See **all data** in this section above

Rejected Data (Code: <-3>

a) **All Data**:
All data was rejected for the following dates and times due to a catastrophic temperature probe failure [STF]. All data were rejected because all parameters are temperature dependent.
05/11/2009 – 03:00 through 05/21/2009 – 07:45

b) **Temperature**:
See **all data** in this section above

c) **Salinity/SpCond**:
See **all data** in this section above

d) **DO**:
See **all data** in this section above

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

The data for the following dates and times were rejected due to sensor malfunction (SSM). PH readings were 1.3 units higher than provided by a newly calibrated replacement sonde. Post calibrations showed unacceptable readings of 7.41 and 10.33 in 7 and 10 standard solutions respectively.
01/07/2009 – 07:45 through 02/05/2009 – 07:15

The data for the following dates and times were rejected due to heavy sensor drift [SSD]. The sensor recorded an unusual increase in pH of about 0.7 throughout the duration of the deployment. However, post calibration provided good readings of 6.97 and 9.83 in 7 and 10 standard solutions respectively. This increase in pH was not matched with the newly

calibrated replacement sonde (8.5 vs 7.8). The replacement sonde following this deployment provided good post calibration as well.
03/11/2009 – 12:00 through 04/08/2009 – 12:45

The data for the following dates and times were rejected due to a sensor malfunction [SSM]. Poor calibration values due to the sensor malfunction and what looks like possible sensor drift are the reasons for rejecting this data. Post calibration values that determine if pH data is good or bad are usually 0.3 units higher than the calibration standard. Also, low slope values (>160), which indicate how trustworthy pH data is, help determine the quality of the data. Post calibration values did not pass QAQC for these dates and times.

06/17/2009 – 08:30 through 07/06/2009 – 10:00
08/04/2009 – 09:30 through 09/02/2009 – 10:15

g) **Turbidity**:
Turbidity for the following dates and times were rejected due to biofouling (CBF). Biofouling was caused by algae growth on the turbidity probe's optic sensor or heavy hydroid growth on the wiper assembly.
10/01/2009 – 10:15 through 10/13/2009 – 10:30
12/07/2009 – 07:45 through 12/14/2009 – 09:45

Fishing Creek

Missing Data (Code: <-2>)

a) **All Data**:
Data is missing for the following dates and times due to the water quality station being destroyed:
10/13/2009 – 08:45 through 12/31/2009 – 23:45

Suspect Data (Code: <1>)

a) **All Data**:
For the following dates & times, the sonde was not at the proper deployment depth (Code: CWD). The sonde was removed from the deployment mount in order to check its final reading against the newly deployed sonde's first reading in order to gather comparison data between the two sondes.

02/05/2009 – 09:00
03/11/2009 – 13:30
05/05/2009 – 12:15
05/21/2009 – 10:30
06/03/2009 – 09:30
06/17/2009 – 11:00
07/06/2009 – 12:30
08/04/2009 – 11:15
08/17/2009 – 11:30
09/02/2009 – 11:45
09/15/2009 – 10:00

The sonde was deployed at the wrong depth for the deployment spanning the following dates and times:

05/21/2009 – 08:15 through 06/17/2009 – 08:15

b) **Temperature**:
See **all data** in this section above

c) **Salinity/SpCond**:
See **all data** in this section above

d) **DO**:
See **all data** in this section above

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

g) **Turbidity**:
See blanket statement
See **all data** in this section above

Rejected Data (Code: <-3>)

a) **All Data**:
Data was rejected for the following dates and times during an out of water event when the sonde was removed from the water during site maintenance:
05/05/2009 – 12:30

b) **Temperature**:
See **all data** in this section above

c) **Salinity/SpCond**:
See **all data** in this section above

d) **DO**:
See **all data** in this section above

Data was rejected due to temporary sensor malfunctions (Code: SSM) for the following dates and times. Post calibrations were acceptable indicating the malfunctions were temporary.
03/11/2009 – 13:45 through 03/11/2009 – 14:30
03/11/2009 – 15:30 through 03/11/2009 – 16:45
03/11/2009 – 17:15 through 03/11/2009 – 18:00
03/11/2009 – 18:30
03/12/2009 – 14:30 through 03/12/2009 – 18:00
03/12/2009 – 18:45
03/29/2009 – 13:15 through 03/29/2009 – 13:45

03/29/2009 – 21:15 through 03/29/2009 – 21:30
03/30/2009 – 15:15 through 03/30/2009 – 20:30
04/03/2009 – 18:15 through 04/04/2009 – 02:15
04/04/2009 – 03:15

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

The pH data for the following dates and times were rejected due to a sensor malfunction [SSM]. Port contamination within the data logger caused the pH sensor to malfunction. This malfunction resulted in a poor calibration. The post calibration values of 7.30 in 7.00 standard and 10.38 in 10.00 standard were unacceptable as well. This data cannot be trusted due to there being too many issues with this flat glass pH probe and port contamination.
01/07/2009 – 09:15 through 02/05/2009 – 08:45

g) **Turbidity**:
See **all data** in this section above

Mosquito Creek

Missing Data (Code: <-2>)

a) **All Data**:
The sonde was removed from the deployment mount for protection while a new bridge was being constructed and while the old bridge and water quality station was being demolished. Upon completion of the new bridge, our water quality site was demolished when the old bridge was torn down. The new water quality station is located on the newly constructed bridge approximately 20 feet from the old location. All data are missing for the following dates and times due to the construction of a new bridge:
6/17/2009 – 12:00 through 08/04/2009 – 13:45

b) **pH**:
There was no sensor installed for the following dates and times because there were no spare sensors available for deployment.
06/03/2009 – 12:15 through 06/17/2009 – 11:45

Suspect Data (Code: <1>)

a) **All Data**:
For the following dates & times, the sonde was not at the proper deployment depth (CWD). The sonde was removed from the deployment mount in order to check its final reading against the newly deployed sonde's first reading in order to gather comparison data between the two sondes.

01/17/2009 – 10:15
02/05/2009 – 10:00
03/11/2009 – 14:30
04/08/2009 – 11:15
05/05/2009 – 09:00
05/21/2009 – 12:45
06/03/2009 – 11:15
08/17/2009 – 12:15
09/02/2009 – 08:45
09/15/2009 – 11:00
10/13/2009 – 07:45
12/14/2009 – 12:45
12/14/2009 – 13:00

b) **Temperature**:
See **all data** in this section above

c) **Salinity/SpCond**:
See **all data** in this section above

d) **DO**:
See **all data** in this section above

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

The pH probe calibration was off by approximately 0.3 units due to a slow response in the calibration standard. Pre-calibration reading was 6.74 in 7 standard and post-calibration reading was 7.38 in 7 standard. Calibration values indicate that this data may be post corrected by approximately 0.3 units to fit conditions. Data for the following dates and times were marked suspect for incorrect calibration [SIC].
10/13/2009 – 07:45 through 11/12/2009 – 10:30

g) **Turbidity**:
See blanket statement
See **all data** in this section above

Rejected Data (Code: <-3>)

a) All Data:
None

b) Temperature:
None

c) Salinity/Spcond:
None

d) DO:
None

e) pH:
The pH probe seemed to calibrate fine in lab, but field readings were approximately 0.5 units higher than adjoining deployments and diagnostics for this probe showed that it was close to failure with a slope of >160. The slope value should fall between 165 and 180. Data for the following dates and times were rejected due to a sensor malfunction [SSM]:
02/05/2009 – 10:00 through 03/11/2009 – 14:15

The pH probe experienced a sensor malfunction [SSM] that resulted in a poor calibration. This poor calibration resulted in field readings 0.5 units higher than the proceeding deployment recorded. Diagnostics from the failing probe showed that the sensor was close to failure with a slope value of 156, causing a poor calibration. The slope value should fall between 165 and 180. The proceeding deployment had a perfectly working probe and its data is trustworthy based on diagnostic and calibration values, therefore allowing us to conclude that the following data was of bad quality. Data for the following dates and times were rejected:
12/14/2009 – 13:00 through 01/12/2010 – 11:00

f) Turbidity:

Turbidity data for the following dates and times were rejected due to a sensor malfunction [SSM]. The sensor malfunction was identified when the turbidity probe recorded abnormally low values for the majority of the deployment (values around 2NTU), showing very little variation in readings. Post calibration checks showed that the wiper failed to rotate correctly, indicating a probe error. Also turbidity readings did not change when placed in 0NTU and 123NTU solution as it recorded values of 1.8NTU and 1.9NTU respectively. This also indicates that the probe is malfunctioning for the following dates and times:
09/15/2009 – 11:00 through 10/13/2009 – 07:30

Turbidity data for the following dates and times were rejected due to biofouling (CBF). Biofouling for this deployment was caused by excessive hydroid growth over the turbidity sensor optics and wiper assembly used to clean the turbidity optics:
11/02/2009 – 00:00 through 11/12/2009 – 10:30

St. Pierre

Missing Data (Code: <-2>)

a) **All Data**:
Data are missing due to the sonde being retrieved from the water before data was recorded while swapping data loggers. The newly deployed sonde was not in the water for its swap reading as well, resulting in no data being collected for the following dates and times:
11/12/2009 – 07:45

Suspect Data (Code: <1>)

a) **All Data**:
For the following dates & times, the sonde was not at the proper deployment depth (Code: CWD). The sonde was removed from the deployment mount in order to check its final reading against the newly deployed sonde's first reading in order to gather comparison data between the two sondes.

02/05/2009 – 08:00
03/11/2009 – 12:30
04/08/2009 – 13:45 through 14:30
05/05/2009 – 10:45
05/21/2009 – 08:45
06/03/2009 – 07:30
06/17/2009 – 10:00
07/06/2009 – 11:00
08/04/2009 – 10:15
08/17/2009 – 09:45
09/02/2009 – 09:45
09/15/2009 – 09:00
10/13/2009 – 12:30
12/14/2009 – 09:30

b) **Temperature**:
See **all data** in this section above

c) **Salinity/SpCond**:
See **all data** in this section above

d) **DO**:
See **all data** in this section above

e) **Depth**:
See **all data** in this section above

f) **pH**:
See **all data** in this section above

The pH values dropped significantly temporarily and rebounded to normal conditions. The cause for this drop in value is unknown (CCU). These low values could have been caused by an extremely low slope of 151. Slope values should be between 165 and 180. Slope values lower than this indicates that the probe is close to failure. Data for the following dates and times have been marked suspect:
01/07/2009 – 08:30 through 01/07/2009 – 12:30

The pH values were reporting values approximately 0.3 units lower than conditions provided due to a poor calibration [SIC] caused by a probe with a slow response. Calibration values indicate that this data can be post corrected by increasing recorded values by 0.2 – 0.3 units to fit conditions. Data for the following dates and times have been marked suspect:
06/03/2009 – 07:30 through 06/17/2009 – 09:45

The pH values were marked suspect due to a poor calibration [SIC] caused by a probe with a slow response. The probe did not read well in calibration standard for the pre or post calibration procedures and the slope was low at 158.4. Slope values should be between 165 and 180. Slope values lower than this indicates that the probe is close to failure. The probe did provide readings close to what adjoining deployments reported. Therefore, data for the following dates and times have been marked suspect.
07/06/2009 – 11:00 through 08/04/2009 – 10:00

g) **Turbidity**:
See blanket statement

Rejected Data (Code: <-3>)

a) **All Data**:
None

b) **Temperature**:
None

c) **Salinity/SpCond**:
None

d) **DO**:
The probe did not calibrate well and was reporting 15% more oxygen than conditions provided. Pre-calibration readings were 78.4%, and post calibrations were at 122%, indicating that the probe's readings were off. In-situ tests confirmed poor readings. Data for the following dates and times were rejected due to a bad calibration [SIC]:
08/17/2009 – 09:45 through 09/02/2009 – 09:30

e) **Depth**:
None

f) **pH**:
QAQC checks found that post cal data was out of range [SPC], suggesting a pH sensor error. This sensor error caused the probe to provide values 0.5 units higher than the newly deployed sonde with a good working pH probe. The post calibration values of 7.42 and 10.49 in 7.00 and 10.00 solutions respectively and a low slope value of 144.3 indicate a sensor that has failed or is very close to failure. Slope values should be between 165 and 180. It appears that the early portion of the deployment may provide good data due to the continuity of data between the swapped data loggers on 04/08/2009 and based on the decent pre calibration values. However, it is unknown when the probe's slope dropped dramatically, causing unusually high pH readings in the field. Therefore all values for the following dates and times were rejected:
04/08/2009 – 14:30 through 05/05/2009 – 10:30

The pH port/sensor was not functioning correctly [SSM], causing poor pH readings. An error message was received while conducting calibrations. There were no replacement

probes or working data loggers to deploy. Data for the following dates and times were rejected:
08/17/2009 – 09:45 through 09/02/2009 – 09:30

The pH port/sensor was not functioning correctly [SSM], causing poor pH readings. Post calibration reading in 7 standard was unacceptable at 7.60 units and the slope value was 158.1. Slope values should be between 165 and 180. Slope values lower than this indicates that the probe is close to failure or has already failed. Data for the following dates and times were rejected:
10/13/2009 – 12:30 through 11/12/2009 – 07:30

The pH port/sensor malfunctioned during deployment [SSM]. The probe calibrated okay with a low slope 158, but the post calibration values were horrible 9.89 and 11.17 in 7.00 and 10.00 standards respectively. Also, the slope value dropped to 71.0 Slope values should be between 165 and 180. Slope values lower than this indicates that the probe is close to failure. This probe failed. Data for the following dates and times were rejected:
11/12/2009 – 08:00 through 12/14/2009 – 09:15

The pH port/sensor was not functioning [SSM]. The pH probe was not able to be calibrated. All data for the following dates and times were rejected:
12/14/2009 – 09:30 through 1/5/2009 – 01:15

g) **Turbidity**:
Data for the following dates and times were rejected due to biofouling (CBF). Biofouling for these dates and times were caused by excessive algae growth on the turbidity optic sensor, hydroid growth on the sensor and wiper brush assembly used to keep the sensor clean, and from aquatic animals such as fish and crabs that get trapped in the sonde guard, which causes erroneous turbidity readings as well.
06/29/2009 – 18:15 through 07/06/2009 – 10:45
07/20/2009 – 15:15 through 08/04/2009 – 10:00
08/13/2009 – 16:00 through 08/17/2009 – 09:30
08/30/2009 – 08:30 through 09/02/2009 – 09:30
09/11/2009 – 13:00 through 09/15/2009 – 08:45
09/23/2009 – 09:15 through 10/13/2009 – 12:15
11/10/2009 – 11:15 through 11/12/2009 – 07:30
11/27/2009 – 07:30 through 12/14/2009 – 09:15

Rain Data: Bennetts Point Weather Station

Date	Total Precipitation (mm)
01/04/2009	0.3
01/07/2009	1.3
01/11/2009	2.9
01/24/2009	1.3

01/25/2009	1.3
01/28/2009	0.8
01/29/2009	0.9
02/19/2009	25.5
02/24/2009	0.5
02/28/2009	8.9
03/01/2009	27.6
03/16/2009	6.5
03/17/2009	1.2
03/28/2009	22.2
03/29/2009	1.8
03/31/2009	3.7
04/01/2009	9.2
04/02/2009	107.2
04/03/2009	0.6
04/05/2009	4.5
04/06/2009	0.8
04/20/2009	2.2
05/05/2009	3.5
05/10/2009	0.3
05/11/2009	0.5
05/12/2009	0.3
05/13/2009	1.3
05/17/2009	14.9
05/18/2009	0.3
05/21/2009	2.3
05/23/2009	1.5
05/24/2009	3.9
05/27/2009	0.3
05/29/2009	4.8
06/04/2009	10.5
06/05/2009	1.2
06/06/2009	3.1
06/07/2009	2.4
06/08/2009	19.9
06/09/2009	1.1
06/11/2009	0.5
06/14/2009	48.6
06/16/2009	37.2
06/18/2009	7.2
06/26/2009	0.6
06/28/2009	0.3
06/29/2009	13.7
07/06/2009	12.2
07/07/2009	17.2
07/08/2009	27.4

07/09/2009	2.0
07/13/2009	20.3
07/17/2009	0.6
07/24/2009	10.4
07/27/2009	1.5
07/29/2009	10.5
07/30/2009	15.1
07/31/2009	5.5
08/02/2009	9.9
08/12/2009	36.5
08/13/2009	122
08/14/2009	0.8
08/15/2009	11.2
08/20/2009	1.0
08/26/2009	1.3
08/27/2009	2.3
08/28/2009	33.6
08/31/2009	8.8
09/01/2009	0.5
09/22/2009	1.6
09/27/2009	33.5
10/05/2009	21.4
10/06/2009	0.3
10/10/2009	7.6
10/11/2009	0.3
10/12/2009	13.3
10/14/2009	23.4
10/15/2009	0.6
10/16/2009	8.0
10/22/2009	0.3
10/23/2009	2.3
10/24/2009	0.9
10/27/2009	13.9
10/30/2009	0.3
11/09/2009	3.3
11/10/2009	3.3
11/11/2009	20.8
11/22/2009	0.9
11/24/2009	0.3
11/25/2009	5.9
12/02/2009	62.7
12/04/2009	0.9
12/08/2009	1.1
12/09/2009	4.8
12/10/2009	1.9
12/13/2009	30.3

12/14/2009	10.7
12/15/2009	2.4
12/18/2009	13.4
12/25/2009	5.9