

Old Woman Creek (OWC) NERR Site Water Quality Metadata

March through December, 2009

Latest Update: August 8, 2014

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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. The files are archived at OWC. Dr. David Klarer was responsible for both data logger deployment and data management at Old Woman Creek NERR during the 2009 deployment.

3. Research Objectives:

Measurements are taken every 15 minutes over two or three-week periods at four sites within the Old Woman Creek- three in the estuary proper- one in the upper reaches at Darrow Road (DR), one near the mouth, just south of State Route 6 (WM), and the third site upstream from the WM site (OL). The final site (BR) is just upstream of the first riffle zone above the estuary in Old Woman Creek proper. The purpose of this monitoring program is to document the role of this Great Lakes estuary in the Lake Erie ecosystem, particularly the estuary's role in mitigating storm flow that passes through it. The role of the OL site is to document the degree of

intrusion by lake water during northerly winds and subsequent seiche events.

4. Research methods:

The YSI monitoring program began on 16 March, 2009 at sites BR, DR, and WM. Due to storm damage to the trap, sampling for OL began on 18 March, 2009. The sampling at all sites ended for the year on December, 2009. Prior to deployment of the data loggers, a 4-inch diameter PVC pipe was bolted to an 8-foot long metal post that had been driven into the sediment. The logger trap at site DR was not bolted to an 8-foot metal post, but rather was suspended from the north side of the road bridge by metal chain. Each pipe had 4 vertical slits $\frac{3}{4}$ " wide drilled into it spanning the area of the probe guard on the data logger to insure that the probes would have direct contact with the surrounding waters. Additional field readings for dissolved oxygen, pH, temperature, turbidity, and specific conductance are taken when the instrument is changed at each site (see the Other Remarks Section). The data loggers are replaced in the field after a two or three-week deployment, depending on temperature and degree of fouling of the data loggers. All data loggers were the extended deployment loggers. The data was retrieved from each data logger and each data logger was recalibrated (according to the directions in the YSI Operations Manual) before being returned to the field. Conductivity, turbidity (2 point calibration using distilled water for zero turbidity and a YSI standard for the other turbidity point), and pH (2 point calibration) are calibrated using commercial standards. These standards were prepared prior to each deployment. The data loggers at site WM has a vented water level sensors while the loggers at sites BR, DR, and OL have non-vented depth sensors. At sites WM, BR, and OL the ROX optical dissolved oxygen probe was used. The calibration logs provide sensor information. A Sutron Sat-Link2 transmitter was installed at Site OL during October 2006. This system transmits data to the NOAA Goes satellite, NESDIS ID# 3B02849A. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at <http://cdmo.baruch.sc.edu>.

5. Site Location and Character:

Old Woman Creek National Estuarine Research Reserve is located on the southern shore of Lake Erie, slightly east of the city of Huron, Ohio (Latitude 41° 23'N; Longitude 82° 33'W). Land use in the Old Woman Creek (OWC) watershed is primarily row crop agriculture. Other than the non-point source pollutants coming into the estuary from these agricultural practices and from the town of Berlin Heights, there are no other major pollution sources in the estuary. Salinity in Old Woman Creek is normally 1 ppt. or less, although it will rise, on occasion, to nearly 2 ppt. The tidal range in Lake Erie (and therefore in the estuary) is on the order of 4 cm or less. Water levels in the estuary and in the creek are extremely variable, with changes occurring daily, seasonally and annually due to changing lake levels, seiches on the lake, storm runoff, and the mouth closing and opening through the year.

The data logger at the State Route 6 (WM) site (Latitude 41° 22' 57" N, Longitude 82° 30'54" W) is very close to the mouth of Old Woman Creek. In this portion of the Reserve, the creek is very shallow but extends over a large surface area. This site frequently experiences influx of Lake Erie waters. The bottom sediments at this site are silty clay. At the beginning of the deployment for 2009, there was no rooted aquatic vegetation directly adjacent to the site,

although there was both emergent and submerged vegetation within 3 meters of the site. The data logger is about .18 meters above the bottom sediments. Raised the trap 15 cm on 4/26/2009 (09:15-09:30).

The data logger at site OL (Latitude 41° 22' 55" N, Longitude 82° 30' 51" W) is in the lower reaches of the estuary. This site is not in direct sight of the mouth, so northerly winds and resulting seiche activities should be less noticeable at this site. The bottom sediments are silty clay. This site is located about 5 meters north of a *Nelumbo lutea* bed, but, there were no plants immediately adjacent to the data logger. The base of data logger is about 31 cm above the sediment. In March 2009, a temporary logger site was established 5 meters north of the original site due to damage of the original logger trap by a winter storm. At this temporary site, the base of logger is 26 cm above the sediment. In 2010, this temporary site became the permanent OL site. There are one or two leaves of *N. lutea* adjacent to this temporary logger site. This is the site that is telemetered to the GOES satellite, but the temporary site is not telemetered.

The data logger at site BR (Latitude 41° 20' 54" N, Longitude 82° 30' 30" W) is located in the lower portion of the creek proper. Just upstream from the data logger, Berlin Road crosses Old Woman Creek. Site BR is just upstream of the first riffle above the estuary. Unlike the other three sites, Lake Erie water levels have no impact on this site. The bottom of the creek at this site is a combination of rocks interspersed with some clay-silt that has been washed in from upstream. There are no aquatic macrophytes at or near this site. The trap is 18 cm above the bottom at this site. The trap was raised 5 cm on 5/17/2009 (08:00-08:15). Short guards were used on all loggers at this site through the year. Wire mesh fencing around trap has been installed to diminish debris build-up around the logger. The trap was lowered 5 cm on 9/20/2009 at 08:15 when the loggers were switched out. The trap was raised 5 cm on 10/11/2009 at 08:15 when the loggers were switched out.

The data logger at site DR (Latitude 41° 21' 54" N, Longitude 82° 30' 17" W) is at the southern boundary of the reserve. The logger trap is suspended from western most of the two center guard rail supports on the north side of the Darrow Road bridge near the deepest part of the creek channel. At this site the creek is relatively narrow. Although water direction and flow is influenced at this site by changes in Lake Erie water levels, this site doesn't have direct contact with Lake Erie waters. The bottom sediments at his site are silty clay. There is no rooted aquatic vegetation near or upstream from this site. The data logger is about .40 meters above the bottom at this site. Short guards were used on all loggers at this site through the year.

6. Data collection periods:

Sampling at WM began on March 16 2009 at 07:30. The logger was pulled for the year on January 19, 2010 at 10:15. I was unable to pull the logger any earlier due to the presence of both ice and very high water levels. Sampling at OL began on March 18, 2009 at 09:30, and ceased on January 20, 2010 at 13:15. I was unable to pull the logger earlier due to high water levels and ice cover in the estuary. Sampling at BR began on March 16, 2009 at 08:30 and ceased on December 9, 2009 at 15:45. Sampling at DR began on March 16, 2009 at 08:45. The logger was pulled for the year on December 9, 2009 at 09:30. Specific deployment dates are listed below.

Site	Deployed	Pulled
WM	3/16/2009 (07:30)	3/20/2009 (12:00)
	3/20/2009 (12:30)	4/5/2009 (08:45)
	4/7/2009 (17:30)	4/26/2009 (09:30)
	4/26/2009 (10:00)	5/17/2009 (09:00)
	5/17/2009 (09:15)	06/07/2009 (10:00)

06/07/2009 (10:15)	06/28/2009 (09:00)
06/28/2009 (09:15)	07/19/2009 (08:45)
07/19/2009 (09:00)	07/29/2009 (15:00)
07/29/2009 (15:30)	08/09/2009 (08:45)
08/09/2009 (09:00)	08/30/2009 (09:15)
08/30/2009 (09:30)	09/20/2009 (09:15)
09/20/2009 (09:30)	10/11/2009 (09:15)
10/11/2009 (09:45)	11/1/2009 (10:15)
11/1/2009 (10:45)	11/22/2009 (10:15)
11/22/2009 (10:30)	01/19/2010 (10:15)

OL

3/18/2009 (09:30)	4/5/2009 (08:30)
4/5/2009 (08:45)	4/26/2009 (09:30)
4/26/2009 (09:45)	5/17/2009 (09:00)
5/17/2009 (09:15)	06/07/2009 (09:45)
06/07/2009 (10:00)	06/28/2009 (08:45)
06/28/2009 (09:00)	07/19/2009 (09:00)
07/19/2009 (09:15)	08/09/2009 (08:30)
08/09/2009 (08:45)	08/30/2009 (09:00)
08/30/2009 (09:15)	09/20/2009 (09:00)
09/20/2009 (09:15)	10/11/2009 (09:15)
10/11/2009 (09:30)	11/1/2009 (10:15)
11/1/2009 (10:30)	11/22/2009 (10:15)
11/22/2009 (10:30)	01/20/2010 (13:15)

BR

3/16/2009 (08:30)	4/5/2009 (09:45)
4/5/2009 (10:00)	4/26/2009 (08:15)
4/26/2009 (08:45)	5/17/2009 (08:00)
5/17/2009 (08:15)	06/07/2009 (09:00)
06/07/2009 (09:15)	06/28/2009 (07:45)
06/28/2009 (08:00)	07/19/2009 (08:00)
07/19/2009 (08:15)	08/09/2009 (07:30)
08/09/2009 (07:45)	08/30/2009 (08:15)
08/30/2009 (08:30)	09/20/2009 (08:00)
09/20/2009 (08:15)	10/11/2009 (08:15)
10/11/2009 (08:30)	11/1/2009 (09:30)
11/1/2009 (09:45)	11/22/2009 (09:15)
11/22/2009 (09:30)	12/09/2009 (15:45)

DR

3/16/2009 (08:45)	4/5/2009 (09:30)
4/5/2009 (09:45)	4/26/2009 (08:00)
4/26/2009 (08:15)	5/17/2009 (07:45)
5/17/2009 (08:00)	06/07/2009 (08:45)
06/07/2009 (09:00)	06/28/2009 (07:15)
06/28/2009 (07:30)	07/19/2009 (07:45)
07/19/2009 (08:00)	08/09/2009 (07:15)
08/09/2009 (07:30)	08/30/2009 (08:00)

08/30/2009 (08:15)	09/20/2009 (07:45)
09/20/2009 (08:00)	10/11/2009 (08:15)
10/11/2009 (08:30)	11/1/2009 (09:15)
11/1/2009 (09:30)	11/22/2009 (09:00)
11/22/2009 (09:15)	12/09/2009 (09:30)

7. Distribution

NOAA/ERD retains the right to analyze, synthesize, and publish summaries of the NERRS System-wide Monitoring Program data. The OWC Research Coordinator (RC) retains the right to be fully credited for having collected and processed the data. Following academic courtesy standard, the RC and the NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration.

The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined in the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government and the State of Ohio do not assume liability to the Recipient or third persons, nor will the Federal government or the State of Ohio 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 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 projects:

Replicate samples for chemical analysis of the water are collected at each site every time the data loggers are changed. Samples for phytoplankton determination are collected at the same time at sites near two of the data logger deployment sites (DR and WM). Additionally, a 26 hour sampling regime (samples are collected at 2 hour intervals over the 26 hours) is conducted at the WM site once during each month.

As part of SWMP, in addition to this Water Quality monitoring dataset, OWC NERR also monitors Meteorological and Nutrient data. These data are available from the Research Coordinator or online at <http://cdmo.baruch.sc.edu/>

II. Physical Structure and Descriptors:

9. Sensor specifications:

YSI 6600EDS and YSI 6600 V2 dataloggers

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model #: 6560
Range: -5 to 45 °C
Accuracy: +/-0.15 °C
Resolution: 0.01 °C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model #: 6560
Range: 0 to 100 mS/cm
Accuracy: +/-0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependent)

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

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Rapid Pulse – Clark type, polarographic (YSI 6600 EDS loggers only)
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 (YSI 6600 EDS loggers only)
Model #: 6562
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 % saturation
Units: percent air saturation (%)
Sensor Type: Optical probe with mechanical cleaning
Model #: 6150 ROX (YSI 6600 V2 loggers only)

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation- +/- 1% of the reading or 1% air saturation, whichever is greater
200-500% air saturation- +/- 15% 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: Optical probe with mechanical cleaning

Model #: 6150 ROX (YSI 6600 V2 loggers only)

Range: 0-50 mg/L

Accuracy: 0-20 mg/L- +/- 2% of the reading or 0.2 mg/L, whichever is greater
20-50 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 (9.1 m)

Accuracy: +/- 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

Parameter: Vented Level – Shallow (Depth)

Units: feet or meters (ft or m)

Sensor Type: Stainless steel strain gauge

Range: 0 to 30 ft (9.1 m)

Accuracy 0-10 ft: +/- 0.01 ft (0.003 m)

Accuracy 10-30 ft: +/- 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

Parameter: pH (EDS probe)

Units: units

Sensor Type: Glass combination electrode

Model #: 6561

Range: 0 to 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

Non-vented sondes are used at the BR, OL and DR sites. A vented sonde is used at the WM site.

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

The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Research Coordinator at the specific NERR site regarding site and seasonal variation in fouling of the DO sensor.

ROX sensors are used at WM, BR, and OL sites, rapid pulse probes are used at the DR site.

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.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the

same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

The Research Coordinator at the specific NERR site should be contacted in order to obtain information regarding atmospheric pressure data availability. At OWC NERR in 2009, site WM employed water level sensors, and sites BR, OL, and DR employed non-vented depth sensors.

10. Coded variable definitions:

Sampling Station	Sampling site code	Station code
State Route 6	WM	owcwmwq
Lower Estuary	OL	owcolwq
Berlin Road	BR	owcbrwq
Darrow Road	DR	owcdrwq

11. QAQC flag

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
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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:

End of Deployment Post-calibration Readings in Standard Solutions: Dissolved oxygen standard is in parentheses following the DO reading. Depth is always 0.0 meters for the vented loggers. For the unvented loggers, the depth reading in parentheses after the first depth reading is the expected depth reading when correcting for changes in barometric pressure. The specific conductivity standard is 1.413 mS/cm, except 8/9/2009 when it was measured at 1.510 mS/cm. If the conductivity ports were inhabited by Chironomid larvae, the sp cond reading after clearing the ports is in parentheses after the initial Sp. Cond reading. The pH standards are 7.00 and 10.00 (both are corrected for temperature). The primary turbidity standard is zero, and the second standard is in parentheses if it differs from 122. An asterisk after the DO% reading signifies that the DO membrane was punctured at time of retrieval. Complete post deployment data are in the calibration sheets

Site	Date	Sp. Cond.	DO(%)	pH	Turb	Depth
WM	3/20/2009	1.420	98.2 (98.6)	6.99/10.02	-.1/116.4 (122)	-.005
	4/5/2009	1.457	91.0 (97.0)	6.99/9.99	1.6/122.6	-.002
	4/26/2009	.736 (1.438)*	97.2 (98.6)	7.00/10.02	0.2/122.0	.001
	5/17/2009	1.423	98.8 (99.1)	6.97/10.05	2.7/123.5	-.003
	6/07/2009	1.284	95.5 (97.6)	7.03/10.07	1.8/124.1	-.001
	6/28/2009	.721(1.269)*	95.9 (96.7)	7.03/10.01	2.7/124.2	-.003
	7/19/2009	1.144 (1.407)*	100.4 (98.6)	6.98/9.83	0.6/122.4 (121)	.001
	7/29/2009	1.434	99.0 (97.6)	6.94/9.98	0.4/121 (121)	-.002
	8/9/2009	1.467 (1.510)	96.8 (98.3)	6.98/9.95	0/121.6 (121)	-.002
	8/30/2009	1.215 (1.377)*	96.4 (98.5)	7.00/9.98	1.1/122.8	-.001
	9/20/2009	1.417	89.6 (98.7)	7.06/10.04	0.6/120.8	-.003
	10/11/2009	1.386	98.4 (99.2)	7.01/10.09	0.5/121.8	-.004

11/1/2009	1.422	98.5 (98.5)	7.05/10.09	5.6/120.4 (123)	-0.005
11/22/2009	1.438	99.1 (98.9)	7.03/10.12	0.3/124.7 (123)	-0.003
1/19/2010	1.392	108.3 (97.7)	7.10/10.14	0.3/123.9 (123)	-0.007

Site	Date	Sp. Cond.	DO(%)	pH	Turb	Depth
OL	4/5/2009	1.387	94.1 (97.0)	7.10/10.05	2.0/126.9 (122)	-.298(-.294)
	4/26/2009	1.559	96.8 (98.9)	7.04/10.02	0.5/123.9	-.147 (-.128)
	5/17/2009	1.000 (1.446)*	98.8 (99.1)	7.00/10.00	2.4/124.1	-.087 (-.097)
	6/07/2009	1.386	94.5 (97.6)	7.02/10.04	0.3/123.1	-.223 (-.241)
	6/28/2009	.505 (1.194)*	94.4 (96.8)	6.91/10.00	1.9/123.6	-.319 (-.321)
	7/19/2009	1.415	98.2 (98.8)	7.07/9.93	1.2/123.3 (121)	-.145 (-.137)
	8/9/2009	1.519 (1.510)	99.7 (98/0)	7.01/9.98	0.7/121.9 (121)	-.190 (-.196)
	8/30/2009	1.229 (1.376)*	95.7 (98.6)	7.11/10.12	0.7/123	-.151 (-.154)
	9/20/2009	1.422	97.2 (98.5)	7.04/10.02	1.0/126.3	-.146 (-.147)
	10/11/2009	1.397	98.1 (99.0)	7.05/10.12	0.8/121.8	-.079 (-.086)
	11/1/2009	1.400	97.9 (98.7)	7.07/10.10	0.2/120.6 (123)	-.123 (-.117)
	11/22/2009	1.435	99.1 (98.9)	7.04/10.07	0.9/121.3 (123)	-.115 (-.118)
	1/20/2010	1.408	118.6 (97.8)	7.08/10.10	.5/124.8 (123)	-.160 (-.196)

Site	Date	Sp. Cond.	DO(%)	pH	Turb	Depth
BR	4/5/2009	1.443	90.8 (97.5)	7.07/10.00	0.5/122.6 (122)	-.275 (-.261)
	4/26/2009	1.441	95.1(98.9)	6.98/9.97	0.0/124.2	-.129 (-.118)
	5/17/2009	1.443	91.3 (98.9)	6.97/10.04	0.3/123.1	-.088 (-.091)
	6/07/2009	1.396	94.1 (97.7)	7.12/10.05	0.4/125.4	-.223 (-.231)
	6/28/2009	1.444	94.6 (97.0)	7.11/10.12	0.5/119.1	-.314 (-.309)
	7/19/2009	1.394	98.0 (98.6)	7.04/9.92	-.5/120.5 (121)	-.138 (-.135)
	8/9/2009	1.497 (1.510)	97.2 (98.0)	7.06/9.91	1.1/116.8 (121)	-.199 (-.197)
	8/30/2009	1.389	98.9 (98.2)	7.11/10.07	-0.6/ 121	-.173 (-.173)
	9/20/2009	1.420	94.8 (98.8)	7.10/10.14	0/118.4	-.131 (-.139)
	10/11/2009	1.413	96.6 (99.2)	7.15/10.18	0.2/120	-.076 (-.084)
	11/1/2009	1.396	94.4 (98.8)	7.10/10.15	0.5/122.8 (123)	-.125 (-.124)
	11/22/2009	1.426	98.0 (98.7)	7.06/10.09	0.1/122.9 (123)	-.129 (-.122)
	12/09/2009	1.436	99.4 (99.7)	7.01/10.00	0.5/123.4 (123)	-.026 (-.037)

Site	Date	Sp. Cond.	DO(%)	pH	Turb	Depth
DR	4/5/2009	1.451	103.7 (97.4)	7.09/10.06	1.3/122.8	-.279 (-.269)
	4/26/2009	1/379	128.4 (99.0)	7.07/10.08	-0.1/121.9	-.155 (-.122)
	5/17/2009	1.468	103.7 (97.1)	7.07/10.04	3.5/124.0	-.095 (-.095)
	6/07/2009	1.352	98.1 (97.7)	7.10/10.24	0.5/124.9	-.221 (-.221)
	6/28/2009	1.444	113.6 (97.0)	7.01/10.03	0.7/123.8	-.314 (-.313)
	7/19/2009	1.395	124.4 (98.7)	7.16/10.09	0.5/122.5 (121)	-.144 (-.135)
	8/9/2009	1.519 (1.510)	121.7 (98.3)	7.02/10.06	1.8/123.2	-.185 (-.178)
	8/30/2009	1.318 (1.387)*	101.9 (98.5)	6.97/9.94	1.0/122.1	-.163 (-.164)
	9/20/2009	1.404	103.0 (98.6)	7.03/9.97	-0.4/110.2	-.141 (-.141)
	10/11/2009	1.419	99.9 (99.1)	probe failed	0.3/120.1	-.084 (-.088)
	11/1/2009	1.387	96.9 (98.8)	6.99/10.12	-0.1/121.1 (123)	-.125 (-.120)

11/22/2009	1.428	97.5 (98.9)	7.13/10.08	0.1/120.9 (123)	-.113 (-.121)
12/09/2009	1.427	119.5 (99.7)	6.96/10.21	0.3/123.7 (123)	-.030 (-.035)

* after cleaning

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.

Field data collected at time of data logger swap is reported below. Specific conductivity was taken in the laboratory immediately after returning from the field. Temperature is reported in Degrees C, specific conductivity in millimhos, and oxygen in milligrams/liter.

Site	Date	Temp	Sp. Cond.	DO(mg/l)	pH
WM	3/16/2009	4.6	.482	11.49	7.88
	3/20/2009	8.0	.488	10.07	8.03
	4/5/2009	7.9	.317	11.32	8.12
	4/26/2009	19.7	.433	8.64	7.82
	5/17/2009	14.6	.356	9.64	8.34
	6/07/2009	22.8	.492	11.74	8.27
	6/28/2009	24.3	.577	5.30	7.48
	7/19/2009	22.2	.595	4.39	7.49
	7/29/2009	26.0	.592	6.15	7.33
	8/9/2009	24.7	.599	4.83	7.50
	8/30/2009	20.0	.565	3.58	7.34
	9/20/2009	19.6	.555	5.37	7.51
	10/11/2009	11.8	.532	8.09	7.80
	11/1/2009	12.4	.539	7.29	7.76
	11/22/2009	9.4	.636	8.82	7.78
	1/19/2010	1.4	.777	11.30	7.10

Site	Date	Temp	Sp. Cond.	DO(mg/l)	pH
OL	3/18/2009	10.5	.410	10.35	7.93
	4/5/2009	7.8	.333	11.15	8.10
	4/26/2009	20.2	.447	8.7	7.82
	5/17/2009	14.2	.427	8.85	8.18
	6/07/2009	23.2	.502	12.42	8.28
	6/28/2009	24.2	.576	5.66	7.46
	7/19/2009	21.9	.596	4.90	7.52
	8/9/2009	25.3	.598	4.89	7.37
	8/30/2009	19.7	.562	4.41	7.36

9/20/2009	19.6	.556	5.64	7.50
10/11/2009	11.8	.533	7.87	7.80
11/1/2009	12.2	.539	7.18	7.78
11/22/2009	9.4	.638	9.35	7.83
1/20/2010	1.1	.768	11.05	7.42

Site	Date	Temp	Sp. Cond.	DO(mg/l)	pH
BR	3/16/2009	3.7	.564	11.82	7.98
	4/5/2009	8.8	.584	10.68	8.00
	4/26/2009	18.0	.588	8.59	7.90
	5/17/2009	13.2	.644	8.82	7.88
	6/07/2009	18.3	.686	7.83	7.76
	6/28/2009	21.4	.725	6.98	7.71
	7/19/2009	18.6	.683	7.18	7.70
	8/9/2009	21.2	.872	5.52	7.44
	8/30/2009	17.8	.835	7.22	7.61
	9/20/2009	16.1	1.009	5.92	7.38
	10/11/2009	9.7	.861	9.60	7.58
	11/1/2009	9.6	.855	7.86	7.74
	11/22/2009	7.4	.958	8.10	7.64
	12/8/2009	3.0	1.042	11.42	7.81

Site	Date	Temp	Sp. Cond.	DO(mg/l)	pH
DR	3/16/2009	4.4	.556	11.20	7.92
	4/5/2009	9.2	.581	9.70	7.95
	4/26/2009	19.0	.564	6.68	8.02
	5/17/2009	15.0	.643	6.96	7.59
	6/07/2009	17.7	.679	7.24	7.52
	6/28/2009	22.9	.672	5.34	7.53
	7/19/2009	20.4	.683	4.08	7.54
	8/9/2009	21.8	.632	5.11	7.27
	8/30/2009	19.6	.645	3.74	7.52
	9/20/2009	16.8	.670	3.90	7.25
	10/11/2009	11.1	.865	2.87	7.27
	11/1/2009	11.6	.987	1.85	7.66
	11/22/2009	8.0	.854	3.48	7.40
	12/9/2009	4.9	.818	11.45	7.78

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