**Chesapeake Bay Maryland (CBM) NERR Water Quality Metadata**
**January – March 2020**
**Latest Update:** October 8, 2025

## I. Data Set and Research Descriptors

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### 2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF), EcoWatch Lite in a comma separated file (CSV) or KOR Software in an Excel File (.XLS) 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. A reserve may opt to include additional non-required data during primary upload, such as chlorophyll/fluorescence data. CBM NERR does collect and upload chlorophyll fluorescence data (see section 4 for additional chlorophyll methodology information). 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. CBM NERR applies codes to data that are out of water due to low water depth, data obtained from sensors that malfunctioned/broke/post-calibrated out of range, data skewed by heavy biofouling, and data that appear as anomalous "spikes." To objectify what qualifies as a spiked data point and decrease the inherent subjectivity of such determinations, a data point is coded as a blocked optic or turbidity/chlorophyll spike if it is at least three times greater than both its preceding and following values. Other anomalous data are coded with the appropriate code as well as a "see metadata" code to further explain their exclusion from the dataset. 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. John Zimmerelli is responsible for data management at CBM NERR.

**3) Research objectives**

One of the objectives of the monitoring program at CBM NERR is to conform to the NERR System Wide Monitoring Program (SWMP) where the overall goal is a long-term dataset providing baseline water quality information capable of tracking trends and identifying changes in water quality over temporal and spatial scales. In addition to the aforementioned NERR-wide research objectives, reserve-specific objectives include understanding how anthropogenic activities affect water quality and examining the effects of submerged macrophyte communities on water quality. To accomplish this, monitoring sites were selected that characterize the variety of habitat and water quality conditions existing at two of the three components that make up the CBM NERR, the Jug Bay and Otter Point Creek components. At the Jug Bay component, three sites were selected that span the range of conditions thought to be typical of this site. These sites include a reference site, an impaired site and a mainstem site; where the reference site is thought to have little anthropogenic-induced effect on water quality, an impaired site where anthropogenic activities strongly influence local water quality, and a mainstem site thought to be highly representative of mainstem water quality conditions at the Jug Bay component. The fourth and final site is located at the Otter Point Creek component, a much smaller component, and is thought to represent typical water quality conditions at this site. All four sites span the range of habitat conditions at these components to include varying abundances of submerged macrophyte communities as well as varying depth and energy regimes from shallow tidal creeks to proportionately deep tidal river systems to shallow open water embayments. Additional monitoring, outside the scope of this effort, is being done at all three components; Jug Bay, Otter Point Creek, and Monie Bay components. These efforts use comparable field sampling methods, with high spatial resolution, to better understand the spatial variability between and around the sites monitored in this effort.

**4) Research methods**

Water quality measurements were taken every 15 minutes from January through March 2020 at each station, weather permitting. One YSI6600V2 or YSI EXO2 data logger is deployed at each station. All data are recorded in Eastern Standard Time. When a datasonde is retrieved, another one is deployed at the same time to ensure a continuous dataset. During transport to and from the sampling sites, dataloggers are placed horizontally in a cooler with a damp towel. The cooler lid is kept slightly ajar, allowing the datalogger to be in equilibrium with the ambient barometric pressure.

Deployment apparatus' are constructed out of 4" diameter PVC pipe and suspended vertically in the water column. 2" diameter holes are cut into the PVC pipes at 2" intervals to guarantee free flow of water through the PVC pipe. The pipes are painted with Trinidad SR antifouling paint. The pipe is attached to a 2x4 using copper plated clevis hangers. The 2x4 is bolted to a piling with the bottom of the PVC pipe resting on the bottom of the river. A stop bolt was placed 0.25 meters from the bottom of the pipe to keep the YSI instrument at a constant depth above bottom.
Measurements for temperature, specific conductance, salinity, percent oxygen saturation, dissolved oxygen concentration, water depth, pH, turbidity, and chlorophyll fluorescence are recorded every 15 minutes. Deployments range from two to four weeks, depending on biofouling intensity (temperature dependent) and availability of field personnel. When a deployment concludes, dataloggers are replaced with newly serviced and calibrated instruments. At the time of replacement two (2) simultaneous overlapping readings are taken between the old and new YSI instruments, as well as an in situ reading with a series 4a Hydrolab sonde. All simultaneous overlapping readings are taken prior to the previously deployed sonde being disturbed in any way. Once retrieved, the sondes are placed in a cooler with a damp towel for transport back to the lab. The sondes are then placed in a bucket with 100% air-saturated water, continuing to log data every 15 minutes. DO post-calibration record is taken from this logged data the following morning, using the current barometric pressure reading from a mercury

barometer. Logging is then stopped, and YSI sondes are post calibrated using the same standards as used in the calibration.

Deployment data are collected and data are uploaded onto a PC, archived, and then visually examined. Efforts are made to relate sensor conditions to any apparent outliers or anomalies (eg. battery charge status, or normal DO data at the beginning of a deployment may be distinguished from erroneous data resulting from a known malfunction, such as an electrical short in an optical sensor). Data loggers and sensors are cleaned, serviced and calibrated according to the methods described in the YSI Operating Manual and SWMP Operating Procedures. Laboratory calibration procedures are carried out in accordance with the YSI Operating Manual methods. Standards for turbidity are purchased from YSI. Standards for pH and Chlorophyll are purchased from Fisher Scientific, a YSI approved vendor. Specific conductance standards are prepared in-house, from A.C.S. certified KCl. Data are reviewed and edited according to the YSI Data Review and Editing Protocol in Appendix B of the CDMO manual. The pH, specific conductance, depth, turbidity, and chlorophyll sensors are calibrated using the following methods: 2-point pH 7 and 10, specific conductance standard to the nearest concentration of river (with following standards 6.668 mS/cm and 24.82 mS/cm), pressure-dependant depth in the air, 2-point turbidity standards of 0 (deionized water) and 126 NTU's, 2-point chlorophyll standards of 0 (deinonized water) and temperature-dependent Rhodamine WT standard. The DO sensor is calibrated using the YSI recommended aerated water in a bucket method. As a quality assurance check, YSI datalogger records during sonde deployment and retrieval are compared to the series 4a Hydrolab instrument. Post-deployment measurements of all the parameters are recorded before cleaning the data loggers. Sensors are immersed in the appropriate standard solutions (e.g., pH) and readings recorded using discreet sampling.

Because chlorophyll fluorescence data is collected *in vivo* there is an inherent loss of accuracy due to lack of disruption of the cells and subsequent extraction of chlorophyll, possible interference from other fluorescent organisms, and the inverse effects of temperature and light. Chlorophyll data should be used only as estimates of chlorophyll activity, not as accurate quantitative measurements. These limitations are reduced by following calibration and Rhodamine WT standard protocol according to the YSI Operating Manual. Chlorophyll data are considered as accurate as possible when matchup readings correlate and post-calibration is within range of the temperature-dependent standard, suggesting there was no sensor drift in readings during the deployment. For more accurate chlorophyll measurements contact the Research Coordinator for the extractive analysis data obtained from field grab samples.

A Sutron Sat-Link2 transmitter was installed at the Railroad Bridge (RR) station on 11/18/05 and transmits data to the NOAA GOES satellite, NESDIS ID # 3B00629C. A Sutron Sat-Link2 transmitter was also installed at the Otter Point Creek (OC) station on 09/25/2006 and transmits data to the NOAA GOES satellite, NESDIS ID # 3B03D61C. The transmissions are scheduled hourly and contain four (4) datasets 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. At the end of 2018 both Sutron units stopped transmitting. Efforts are being made to update and troubleshoot these telemetry units to get them back online.

**5) Site location and character**

The Chesapeake Bay Maryland NERR is comprised of three components, Otter Point Creek, Jug Bay, and Monie Bay, which are scattered throughout the Maryland portion of the Chesapeake Bay. All three components are thought to represent the diverse semi-diurnal estuarine environments of the Maryland portion of the Chesapeake Bay.

Otter Point Creek is a shallow, open water embayment located in the tidal headwaters of the Bush River on the Upper Western Shore of the Chesapeake Bay. Otter Point Creek is the smallest and proportionately shallowest of the three components and consists of 672 acres of open water, tidal marshes, forested wetlands and upland hardwood forests surrounded by major highways, large residential communities, and heavy commercial and industrial development. The watershed draining into Otter Point Creek is rapidly being developed and urbanized. As a result, sediments are rapidly accreting into the marsh and are very fine and flocculent resulting in typically high turbidity when submerged macrophytes are not present. The non-native *Hydrilla verticillata* submerged macrophyte invaded the marsh in 2002 and has colonized most bottom substrates less than one half meter depth at low tide. There is one station (OC) located at the Otter Point Creek component.

Jug Bay is located in the upper tidal reaches of the Patuxent River and represents a river dominated by tidal freshwater marsh with expansive emergent vegetation communities. The Patuxent River is located on the western shore of the Chesapeake Bay and drains highly urbanized areas of the Washington Metropolitan area. Jug Bay is a 722-acre tidal estuary providing a narrow transition zone between brackish marshes and upland freshwater wetlands. The broad, shallow waters of Jug Bay support a profusion of freshwater plants and animals. Emergent and submerged vegetation crowd the river channel and form an interlaced pattern of tidal and nontidal marshes, swamps and forested wetlands surrounded by upland woods and fields. The component has deep water river dominated areas (>10m depth) as well as an extensive shallow water (<1m depth) network of tidal creeks and flooded mud flats. Submerged macrophytes are persistent along the shoreline of these creeks and are extensive within the flooded mud flats and the emergent marshes. There are three stations (MC, RR, IP) located at the Jug Bay Component.

Monie Bay is located on the lower Eastern Shore of the Chesapeake Bay at the mouth of the Wicomico River. The Monie Bay Component represents a mesohaline bay with primarily three tidal creeks representing a variety of agricultural input. The local area is largely undeveloped with varying agriculture and rural residential land use. The component is dominated by salt marshes with tidal fresh marshes in the upper tidal reaches of the tributaries. Shallow water habitats give way to fringing submerged macrophyte communities. One monitoring site (MB) is located within this component. MB is a secondary site, established effective January 1, 2020. Non SWMP compliant data had been collected starting 2006 but not submitted to the CDMO and may be obtained directly from the reserve.

The following is a list of the 5 sites as well as site characteristics

Mataponi Creek (MC)
38° 44.599'N, 76° 42.446'W (NAD83)
38.74331667, -76.70743333 (GIS format)

Site MC is located in a small tributary off the upper tidal headwaters of the Patuxent River, Maryland. MC is 2.4 km upstream of the mouth, midchannel in the creek, which is approximately 7m wide. The southern bank is steep and covered mainly with hardwood trees while the northern bank is tidal marsh. The sonde is deployed vertically in a perforated PVC pipe. Average depth at this site is roughly 0.7 meters with a mean tidal fluctuation of approximately 0.6 m. The YSI is deployed 0.25m off of the creek bottom. Salinities at this site rarely exceed 0.1 ppt. The bottom habitat is soft sediment, and SAV grassbeds are abundant during the summer months. Because this site is located along the main channel of Mataponi Creek, water quality is reflective of the general quality of water flowing along the main portion of the creek. The SAV community at this site is seasonally very dense and thus water quality is thought to be strongly influenced by the presence of SAV during the summer months. Freshwater inputs are not quantified. Any pollutants would most likely be due to agricultural runoff. No USGS gauge for streamflow is available.

Railroad Bridge (RR)
38° 46.877'N, 76° 42.822'W (NAD 83)
38.78128333, -76.7137 (GIS format)
Site RR is located in the mainstem of the upper tidal headwaters of the Patuxent River, Maryland. The site is slightly upstream (roughly 0.3km) from Jackson's Landing at the Patuxent River Park (previous PR site 2002). This section of the Patuxent River is approximately 70m wide and average depth at the site is 1.4m. The YSI is deployed 0.25 m off of the river bottom. Bottom habitat is soft sediment, and grassbeds are evident in the area during summer months. Mean tidal fluctuation is approximately 0.6 m. Salinities are typically less than 1 ppt at this site throughout the year. In 2003 this site was moved from 38° 46' 50.6" N, 76° 42' 29.1" W (Jug Bay) to its present location because of the shallow nature of the old site. The new site location (RR) is at the end of the old railroad bed and is deployed vertically in a perforated PVC pipe near midchannel of the Patuxent River. Because this site is located along the main channel of the Patuxent River, water quality is reflective of the general quality of water flowing along

the main portion of the river. The site is roughly 1km downstream of the confluence of the Western Branch tributary and the Patuxent River Mainstem, thus water quality is influenced by Western Branch. A large wastewater treatment plant (averaging 20 mgd ) discharges directly into the Western Branch tributary of the Patuxent River just upstream of IP. USGS streamflow for the closest gauge (Latitude 38°57'21.3"N, Longitude 76°41'37.3"W NAD83): yearly mean of approximately 350 – 430 cfs.

Iron Pot Landing (IP)
38° 47.760'N, 76° 43.248' W (NAD 83)
38.796, -76.7208 (GIS Format)

Site IP is located 2.09km from the mouth of Western Branch. IP is attached vertically off of a small pier near midchannel of the river and has an average depth of 1.6m. The YSI is deployed 0.25 m off of the river bottom. The site is roughly 1km downstream of a large (20 mgd) wastewater treatment plant effluent. The river is approximately 15m wide and flows through extensive riparian buffers. Both banks of the river are flanked by hardwood flora. Mean tidal fluctuation is approximately 0.6 m. Salinity at this site is generally 0.1 ppt. Bottom habitat is soft sediment, and grassbeds are evident during the summer months. USGS streamflow for the closest gauge (Latitude 38°48'51.2"N, Longitude 76°44'55.4"W NAD83): yearly mean of approximately 100 – 130 cfs. In addition, a wastewater treatment plant discharges about 15 – 30 cfs about 1 km upstream of site.

Otter Point Creek (OC)
39° 27.047'N, 76° 16.474'W (NAD 83)
39.45078333, -76.27456667 (GIS Format)

Site OC is located approximately 0.3km from the Anita C. Leight Estuary Center. OC is deployed vertically in a perforated PVC pipe and has an average depth of 0.7m. The YSI is deployed 0.25 m off of the creek bottom. Bottom habitat is extremely soft sediment, and grass beds inundate the site during summer months. Salinity at this station rarely rises above 0.1 ppt. Mean tidal fluctuation is about 0.3 m. The average water levels are generally lower in the winter due to north and northwest winds that increase the egress from Chesapeake Bay. The sonde is periodically exposed to very low tides, and sediments at the site are extremely fine and flocculent. Because of the shallowness of the tidal marsh, coupled with the dramatic daily changes in the depth and width of the stream, deployments at the site present many problems. These problems include periodic exposure of the sonde, very high turbidity, sedimentation rates associated with tidal infiltration, and wind and wave generated resuspension that causes severe fouling of the probes. Water quality at the site represents extreme shallow water habitats. Thus it is not uncommon to see very large fluctuations in temperature and dissolved oxygen at this site ranging from complete anoxia to full saturation, due in part to the shallow nature of the site and the effects of marsh processes on water quality. Additionally, the site is seasonally dominated by dense SAV communities from June-October and thus water quality conditions during this time are likely influenced by the presence of these macrophytes. USGS streamflow for the closest gauge (Latitude 39°26'21.4"N, Longitude 76°18'21.7"W NAD83): yearly mean of approximately 90 cfs. Site is in substantially urban environment which accounts for its flashiness. Pollutants are mostly urban run-off, with some industrial discharge possible.

Monie Bay (MB) (Secondary SWMP Station)
38 12.513' N, 75 48.275' W (NAD83)
38.20855, -75.80458333 (GIS Format)

Site MB is located on Little Monie Creek, a tidal creek draining into Monie Bay. Monie Bay is a small embayment of the Chesapeake Bay of Maryland's Eastern Shore. MB is located approximately 4km upstream of the mouth of Little Monie Creek, attached to the end of a pier at the Monie Bay Field Station. Much of the creek is flanked on both sides by emergent brackish tidal marsh, however upstream of the station agricultural areas comprise the majority of the watershed, with a small woodland buffer between the agricultural areas and the fringing tidal marsh. The sonde is housed in a vertical PVC pipe, approximately 0.25m off of the creek bottom, which is composed of soft unconsolidated sediments. The average depth is 0.8m. The semi-diurnal tidal fluctuation is approximately 0.8m. Salinity at this site rarely falls below 4 ppt or above 15 ppt., except during exceptional events. Due to the tidal nature of this station, large variation of the data, both seasonally and daily is observed. No USGS streamflow gauge is available.

SWMP Station Timeline

| Station Code | SWMP Status | Station Name | Location | Active Dates | Reason Decommissioned | Notes |
|---|---|---|---|---|---|---|
| RR | P | Railroad Bridge | 38°57’21.3”N 76°41’37.3”W | 04/04/03 – present | NA | NA |
| IP | P | Iron Pot Landing | 38°48’51.2”N 76°44’55.4”W | 04/04/03 – present | NA | NA |
| MC | P | Mattaponi Creek | 38° 44.599'N, 76° 42.446'W | 04/22/03 – present | NA | NA |
| OC | P | Otter Point Creek | 39°26’21.4”N 76°18’21.7”W | 04/15/03 - present | NA | NA |
| MB | S | Monie Bay | 38 12.513' N 75 48.275’ W | 07/18/06 - present | NA | NA |
| JB | P | Jug Bay | 38° 46' 45.12 N, 76° 42' 27.72 W | 7/1/95 - 12/1/02 | Inadequate deployment structure, poor representation of river | NA |
| PR | P | Patuxent River | 38° 46' 23.52 N, 76° 42' 32.76 W | 7/1/95 - 12/1/02 | Inadequate deployment structure, poor representation of river | NA |

**6) Data collection period** - Included in annual metadata document.

**Iron Pot Landing (IP)**

| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time |
|---|---|---|---|
| 12/18/2019 | 10:45 | 1/23/2020 | 11:15 |
| 1/23/2020 | 11:30 | 2/20/2020 | 10:30 |
| 2/20/2020 | 10:45 | 5/28/2020 | 8:45 |
| 5/28/2020 | 9:00 | 6/11/2020 | 8:45 |
| 6/11/2020 | 9:00 | 6/25/2020 | 9:30 |
| 6/25/2020 | 9:45 | 7/8/2020 | 8:15 |
| 7/8/2020 | 8:30 | 7/21/2020 | 9:00 |
| 7/21/2020 | 9:15 | 8/4/2020 | 8:45 |
| 8/4/2020 | 9:00 | 8/17/2020 | 9:00 |
| 8/17/2020 | 9:15 | 9/1/2020 | 10:15 |
| 9/1/2020 | 10:30 | 9/18/2020 | 8:00 |
| 9/18/2020 | 8:15 | 9/29/2020 | 9:30 |
| 9/29/2020 | 9:45 | 10/13/2020 | 9:00 |
| 10/13/2020 | 9:15 | 10/27/2020 | 9:00 |
| 10/27/2020 | 9:15 | 11/24/2020 | 12:00 |
| 11/24/2020 | 12:15 | 12/22/2020 | 11:15 |
| 12/22/2020 | 11:30 | 1/21/2021 | 10:45 |

**MB**

| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time |
|---|---|---|---|
| 1/1/2020 | 00:00* | 2/3/2020 | 11:00 |
| 2/3/2020 | 11:15 | 3/4/2020 | 10:00 |
| 3/4/2020 | 10:15 | 5/27/2020 | 11:15 |
| 5/27/2020 | 11:30 | 6/29/2020 | 9:30 |
| 6/29/2020 | 9:45 | 7/27/2020 | 11:00 |
| 7/27/2020 | 11:15 | 8/24/2020 | 10:30 |
| 8/24/2020 | 10:45 | 9/24/2020 | 10:30 |
| 9/24/2020 | 10:45 | 10/22/2020 | 11:00 |
| 10/22/2020 | 11:15 | 11/23/2020 | 12:45 |
| 11/23/2020 | 13:00 | 12/17/2020 | 10:30 |
| 12/17/2020 | 10:45 | 1/5/2021 | 11:15 |

*Monie Bay is a new primary site as of 2020

**MC**

| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time |
|---|---|---|---|
| 12/18/2019 | 13:15 | 1/23/2020 | 12:00 |
| 5/28/2020 | 10:00 | 6/11/2020 | 9:45 |
| 6/11/2020 | 10:00 | 6/25/2020 | 12:30 |
| 6/25/2020 | 13:00 | 7/8/2020 | 9:15 |
| 7/8/2020 | 9:30 | 7/21/2020 | 10:15 |
| 7/21/2020 | 10:30 | 8/17/2020 | 10:00 |
| 8/17/2020 | 10:15 | 9/1/2020 | 11:15 |
| 9/1/2020 | 11:30 | 9/14/2020 | 10:15 |
| 9/14/2020 | 10:45 | 9/29/2020 | 10:30 |
| 9/29/2020 | 10:45 | 10/13/2020 | 10:00 |
| 10/13/2020 | 10:15 | 10/27/2020 | 10:15 |
| 10/27/2020 | 10:30 | 11/24/2020 | 14:30 |
| 11/24/2020 | 14:45 | 12/22/2020 | 13:30 |
| 12/22/2020 | 13:45 | 1/21/2021 | 11:45 |

**OC**

| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time |
|---|---|---|---|
| 5/26/2020 | 10:15 | 6/9/2020 | 8:45 |
| 6/9/2020 | 9:00 | 6/23/2020 | 7:45 |
| 6/23/2020 | 8:00 | 7/9/2020 | 9:15 |
| 7/9/2020 | 9:30 | 7/22/2020 | 7:45 |
| 7/22/2020 | 8:00 | 8/4/2020 | 12:45 |
| 8/4/2020 | 13:00 | 8/18/2020 | 8:45 |
| 8/18/2020 | 9:00 | 9/1/2020 | 9:15 |
| 9/1/2020 | 9:45 | 9/15/2020 | 8:00 |
| 9/15/2020 | 8:15 | 10/1/2020 | 9:15 |
| 10/1/2020 | 9:30 | 10/14/2020 | 7:45 |
| 10/14/2020 | 8:00 | 10/29/2020 | 7:30 |
| 10/29/2020 | 7:45 | 11/10/2020 | 9:15 |
| 11/10/2020 | 9:30 | 12/8/2020 | 13:30 |
| 12/8/2020 | 13:45 | 1/5/2021 | 9:30 |

**RR**

| Deploy Date | Deploy Time | Retrieve Date | Retrieve Time |
|---|---|---|---|
| 12/18/2019 | 9:15 | 1/23/2020 | 9:30 |

| | | | |
|---|---|---|---|
| 1/23/2020 | 9:45 | 2/20/2020 | 9:00 |
| 2/20/2020 | 9:15 | 5/28/2020 | 7:30 |
| 5/28/2020 | 7:45 | 6/11/2020 | 7:15 |
| 6/11/2020 | 7:30 | 6/25/2020 | 7:45 |
| 6/25/2020 | 8:00 | 7/8/2020 | 7:15 |
| 7/8/2020 | 7:30 | 7/21/2020 | 7:30 |
| 7/21/2020 | 7:45 | 8/4/2020 | 7:30 |
| 8/4/2020 | 7:45 | 8/17/2020 | 7:30 |
| 8/17/2020 | 7:45 | 9/1/2020 | 8:30 |
| 9/1/2020 | 8:45 | 9/14/2020 | 8:00 |
| 9/14/2020 | 8:15 | 9/29/2020 | 8:15 |
| 9/29/2020 | 8:30 | 10/13/2020 | 7:45 |
| 10/13/2020 | 8:00 | 10/27/2020 | 7:45 |
| 10/27/2020 | 8:00 | 11/24/2020 | 10:15 |
| 11/24/2020 | 10:30 | 12/22/2020 | 9:45 |
| 12/22/2020 | 10:00 | 1/20/2021 | 10:15 |

**7) Distribution**

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: http://www.nerrsdata.org/; *accessed* 12 October 2012..

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page www.nerrsdata.org. Data are available in comma delimited format.

**8) Associated researchers and projects -** Included in annual metadata document.

As part of the SWMP long-term monitoring program, CBM NERR also monitors 15-minute meteorological along with monthly grab samples and diel sampling for nutrient data which may be correlated with this water quality dataset. These data are available at www.nerrsdata.org.

## II. Physical Structure Descriptors

**9) Sensor specifications –**

During 2020 CBM NERR deployed 6600 V2 data sondes with ROX DO sensors and non-vented depth at IP and MC. YSI EXO2 sondes were used at MB, RR, and OC.

YSI 6600V2 data logger:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 50 °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 (range dependent)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1% of reading or 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/-1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/-15% of the reading
Resolution: 0.01 mg/L

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

Parameter: pH – bulb probe or EDS flat glass probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561 or 6561FG
Range: 0 to 14 units
Accuracy: +/- 0.2 units

Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence
Units: micrograms/Liter
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6025
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: CT2 probe, Thermistor
Model#: 599870
Range: -5 to 50 C
Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: CT2 probe, 4-electrode cell with autoranging
Model#: 599870
Range: 0 to 200 mS/cm
Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Sensor Type: CT2 probe, Calculated from conductivity and temperature
Range: 0 to 70 psu
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 psu

OR

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Wiped probe; Thermistor
Model#: 599827
Range: -5 to 50 C
Accuracy: ±0.2 C
Resolution: 0.001 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)
Sensor Type: Wiped probe; 4-electrode cell with autoranging
Model#: 599827
Range: 0 to 100 mS/cm
Accuracy: ±1% of the reading or 0.002 mS/cm, whichever is greater
Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Model#: 599827
Sensor Type: Wiped probe; Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: ±2% of the reading or 0.2 ppt, whichever is greater
Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
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: +/- 5% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 5% 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 33 ft (10 m)
Accuracy: +/- 0.013 ft (0.004 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701(guarded) or 599702(wiped)
Range: 0 to 14 units
Accuracy: +/- 0.1 units within +/- 10° of calibration temperature, +/- 0.2 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90 degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading

Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Parameter: Chlorophyll
Units: micrograms/Liter
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

**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 1.02 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.

**NOTE: older depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method.** The following equation is used for corrected depth/level data provided by the CDMO beginning in 2010:
((1013-BP)*0.0102)+Depth/Level = cDepth/cLevel.

**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.

**Chlorophyll Fluorescence Disclaimer:**

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements.

### 10) Coded variable definitions

| Water Quality Sampling station: | Sampling Site code: | Station code: |
|---|---|---|
| Railroad Bridge | RR | cbmrrwq |
| Mattaponi Creek | MC | cbmmcwq |
| Iron Pot Landing | IP | cbmipwq |
| Otter Point Creek. | OC | cbmocwq |
| Monie Bay | MB | cbmmbwq |

### 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
SCS Chlorophyll spike
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** - Included in annual metadata document.

IP

| Deploy Date | Sonde Nickname | SpCond | ROXDO1 | pH 7 | pH 10 | Turb | Turb | Depth | CHL(0) | CHL(118) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/23/2020 | Grover | 6.521(6.668) | 101.2 | 7.03 | 10.03 | 0.2(0.0) | 122.6(126.0) | 0.153(0.177) | -0.5 | 110.2 |
| 2/20/2020 | He Man | 6.545(6.668) | 92.6 | 7.34 | 10.37 | 0.4(0.0) | 105.3(126.0) | 0.015(0.041) | -0.4 | 36.1 |
| 5/28/2020 | Joker | 6.421(6.668) | 98.8 | 7.01 | 10.01 | -0.5(0.0) | 131.8(126.0) | 0.018(0.014) | -2 | 120.3 |
| 6/11/2020 | He Man | 6.825(6.668) | 99.1 | 7.1 | 10.06 | -0.6(0.0) | 130.9(126.0) | 0.024(0.027) | 0 | 107.1 |
| 6/25/2020 | Widgie | 6.591(6.668) | 97.7 | 7.03 | 10.05 | 0.2(0.0) | 138.5(126.0) | -0.0070(0.0) | -0.2 | 116.9 |
| 7/8/2020 | Joker | 2.845(6.668) | 97.3 | 7.14 | 10.16 | -0.2(0.0) | 123.1(126.0) | 0.0050(0.014) | 0.1 | 103.9 |
| 7/21/2020 | He Man | 6.557(6.668) | 99.7 | 7.11 | 10.06 | 1.1(0.0) | 137.3(126.0) | -0.0010(0.014) | 1.7 | 100.2 |
| 8/4/2020 | Beaker | 3.36(6.668) | 99.1 | 7.03 | 9.98 | -1.4(0.0) | 120.8(126.0) | -0.023(-0.027) | -0.5 | 111.1 |
| 8/17/2020 | He Man | 6.604(6.668) | 100.1 | 7.2 | 10.19 | 0.0(0.0) | 125.2(126.0) | -0.0090(-0.014) | -0.1 | 102.5 |
| 9/1/2020 | Eor | 6.561(6.668) | 96.7 | 7.13 | 10.08 | -1.1(0.0) | 134.0(126.0) | -0.036(0.014) | 0.7 | 117.4 |
| 9/18/2020 | Joker | 6.71(6.668) | 100.1 | 6.88 | 9.85 | -0.1(0.0) | 111.5(126.0) | -0.057(-0.054) | 2.3 | |
| 9/29/2020 | Beaker | 6.427(6.668) | 99.2 | 6.97 | 9.98 | 0.6(0.0) | 128.4(126.0) | 0.016(0.027) | 0.4 | 82.6 |
| 10/13/2020 | He Man | 6.699(6.668) | 99.4 | 7.04 | 9.98 | -0.3(0.0) | 124.7(126.0) | 0.02(0.027) | 0 | 128.6 |
| 10/27/2020 | Beaker | 6.514(6.668) | 100.7 | 7.14 | 10.07 | 0.1(0.0) | 133.2(126.0) | 0.114(0.122) | 0.9 | |
| 11/24/2020 | Grover | 6.63(6.668) | 102.3 | 7.08 | 10.04 | 1.6(0.0) | 131.6(126.0) | 0.171(0.177) | 0.3 | 120.2 |
| 12/22/2020 | Beaker | 6.491(6.668) | 100.4 | 7.03 | 9.96 | 1.2(0.0) | 135.0(126.0) | -0.105(-0.082) | 1.2 | 111.4 |

**MB**

| Deploy Date | Sonde Nickname | SpCond | ROXDO1 | pH 7 | pH 10 | Turb | Turb | Depth | CHL(0) | CHL(118) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/6/2020 | She-Ra | 24.719(24.82) | 99.9 | 7 | 10.01 | 1.7(0.0) | 122.9(124.0) | -0.059(-0.054) | 1 | 65.1 |
| 2/3/2020 | Oddball | 24.453(24.82) | 100.8 | 7.05 | 10.12 | 2.7(0.0) | 125.5(124.0) | 0.068(0.082) | 0.5 | 67.1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3/4/2020 | She-Ra | 23.984(24.82) | 94.6 | 7.1 | 10.05 | 1.46(0.0) | 131.52(124.0) | 0.078(0.041) | 1.82 | 66.56 |
| 5/27/2020 | Oddball | 24.512(24.82) | 96.3 | 7.08 | 9.94 | 2.3(0.0) | 118.8(124.0) | -0.014(-0.014) | 0.1 | 64.2 |
| 6/29/2020 | Hedgehog | 24.18(24.82) | 100.4 | 7.05 | 10.23 | 1.9(0.0) | 119.3(124.0) | -0.027(-0.041) | -2.9 | 67 |
| 7/27/2020 | Oddball | 26.436(24.82) | 98.6 | 7.37 | 10.14 | 3.0(0.0) | 123.9(124.0) | -0.014(-0.014) | 1.5 | 64 |
| 8/24/2020 | She-Ra | 23.906(24.82) | 95.8 | 7.07 | 10.06 | 0.8(0.0) | 150.1(124.0) | 0.054(0.054) | 0 | 68.6 |
| 9/24/2020 | Oddball | 23.556(24.82) | 99.2 | 8.61 | 11.38 | 0.9(0.0) | 128.3(124.0) | 0.084(0.082) | 1.3 | 60.8 |
| 10/22/2020 | Hedgehog | 25.38(24.82) | 100.5 | 7 | 9.99 | 1.07(0.0) | 144.0(124.0) | 0.149(0.163) | 0.56 | 75.4 |
| 11/23/2020 | She-Ra | 24.677(24.82) | 100.9 | 7.65 | 10.45 | 1.1(0.0) | 122.6(124.0) | 0.118(0.122) | 0.2 | 63.8 |
| 12/17/2020 | Rogue | 24.57(24.82) | 98.3 | 7.02 | 9.97 | 0.0(0.0) | 118.7(124.0) | -0.054 | 0 | 68.5 |

**MC**

| Deploy Date | Sonde Nickname | SpCond | ROXDO1 | pH 7 | pH 10 | Turb | Turb | Depth | CHL(0) | CHL(118) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5/28/2020 | Eor | 6.53(6.668) | 98.7 | 7.08 | 10.12 | 0.0(0.0) | 129.7(126.0) | 0.0060(0.014) | -2 | 120.1 |
| 6/11/2020 | Grover | 6.833(6.668) | 98.4 | 7.08 | 10.13 | -0.8(0.0) | 125.4(126.0) | 0.026(0.027) | -0.4 | 110.6 |
| 6/25/2020 | Xenotime | 6.385(6.668) | 97.9 | 7.01 | 9.99 | -1.9(0.0) | 143.4(126.0) | 0.0020(0.0) | 1 | 123.3 |
| 7/8/2020 | Eor | 6.647(6.668) | 96.8 | 7.06 | 10.08 | 1191.2(0.0) | -126 | 0.0090(0.014) | 0 | 105.1 |
| 7/21/2020 | Grover | 4.741(6.668) | 99.9 | 7.11 | 10.1 | 0.4(0.0) | 78.0(126.0) | -0.038(-0.027) | 0.1 | 102.7 |
| 8/17/2020 | Joker | 6.41(6.668) | 99.4 | 6.97 | 9.9 | -0.8(0.0) | 127.3(126.0) | -0.019(-0.014) | -0.5 | 117.4 |
| 9/1/2020 | Grover | 6.674(6.668) | 100.4 | 7.14 | 10.05 | 0.0(0.0) | 124.6(126.0) | 0.096(0.122) | -0.9 | 116.7 |
| 9/14/2020 | Luna | 6.674(6.668) | 98.7 | 6.95 | 9.93 | 1.3(0.0) | 114.2(126.0) | -0.062(-0.054) | 0.6 | 81.8 |
| 9/29/2020 | Eor | 6.537(6.668) | 99.1 | 7.02 | 10.01 | 0.9(0.0) | 130.8(126.0) | 0.04(0.027) | 1.9 | 82.9 |
| 10/13/2020 | Joker | 6.484(6.668) | 98.6 | 7.06 | 10.05 | 0.7(0.0) | 125.0(126.0) | 0.01(0.027) | -0.3 | 130.5 |
| 10/27/2020 | Eor | 6.585(6.668) | 101.5 | 7.18 | 10.13 | -1.5(0.0) | 134.7(126.0) | 0.131(0.122) | -0.3 | 115.2 |
| 11/24/2020 | He Man | 6.653(6.668) | 101.4 | 7.43 | 10.43 | 0.2(0.0) | 134.0(126.0) | 0.164(0.177) | -0.1 | 111.9 |
| 12/22/2020 | Eor | 6.68(6.668) | 98.9 | 7.1 | 10.07 | 1.0(0.0) | 135.1(126.0) | -0.109(-0.082) | 1.1 | 113 |

**OC**

| Deploy Date | Sonde Nickname | SpCond | ROXDO1 | pH 7 | pH 10 | Turb | Turb | Depth | CHL(0) | CHL(118) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5/26/2020 | Gecko | 6.565(6.668) | 96.6 | 7.04 | 10.05 | -0.2(0.0) | 123.3(124.0) | 0.032(0.0) | 0.2 | 68.3 |
| 6/9/2020 | Nimrod | 6.486(6.668) | 96.6 | 7.2 | 10.25 | 2.1(0.0) | 125.3(124.0) | -0.031(-0.014) | 3.1 | 67.3 |
| 6/23/2020 | Rogue | 6.53(6.668) | 100.4 | 7.09 | 10.07 | 1.1(0.0) | 125.2(124.0) | -0.023(-0.027) | 0.3 | 67.9 |
| 7/9/2020 | She-Ra | 6.614(6.668) | 98.5 | 7.04 | 10.06 | 1.6(0.0) | 123.7(124.0) | 0.041(0.041) | 0.3 | 63.9 |
| 7/22/2020 | Chuck Norris | 6.637(6.668) | 100.6 | 7.11 | 10.02 | -0.3(0.0) | 122.3(124.0) | 0.063(0.027) | -0.2 | 64.8 |
| 8/4/2020 | Bumble Bee | 6.668(6.668) | 100.3 | 7.11 | 10.19 | 0.5(0.0) | 125.4(124.0) | 0.052(0.041) | -0.33 | 75.4 |
| 8/18/2020 | Rogue | 6.684(6.668) | 96.7 | 7.07 | 10.03 | 1.4(0.0) | 124.7(124.0) | 0.043(-0.014) | 0.5 | 63.2 |
| 9/1/2020 | Nimrod | 6.317(6.668) | 98.1 | 7.11 | 9.98 | -0.25(0.0) | 130.26(124.0) | 0.116(0.095) | 0.21 | 68.28 |
| 9/15/2020 | Rogue | 6.469(6.668) | 100.5 | 6.98 | 10 | -4.0(0.0) | 126.2(124.0) | 0.09(0.027) | 0.2 | 47.1 |
| 10/1/2020 | Gecko | 6.643(6.668) | 98.1 | 7.14 | 10.19 | 0.68(0.0) | 129.6(124.0) | 0.05(0.014) | 0.71 | 68 |
| 10/14/2020 | She-Ra | 6.698(6.668) | 97.5 | 7.08 | 10.05 | 0.5(0.0) | 125.2(124.0) | -0.166(-0.15) | 0.2 | 78.6 |
| 10/29/2020 | Gecko | 6.702(6.668) | 100.6 | 7.15 | 10.04 | 0.87(0.0) | 129.8(124.0) | 0.069(0.027) | 0.17 | 66.69 |
| 11/10/2020 | Nimrod | 6.572(6.668) | 100.3 | 7.08 | 10.13 | -0.2(0.0) | 121.4(124.0) | 0.02(-0.014) | -0.2 | 66 |
| 12/8/2020 | Hulk | 6.675(6.668) | 100.1 | 6.97 | 9.9 | 1.3(0.0) | 119.8(124.0) | 0.096(0.054) | 0 | 71 |

**RR**

| Deploy Date | Sonde Nickname | SpCond | ROXDO1 | pH 7 | pH 10 | Turb | Turb | Depth | CHL(0) | CHL(118) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/23/2020 | Gecko | 6.579(6.668) | 101 | 7.03 | 9.98 | 0.7(0.0) | 122.0(124.0) | 0.176(0.177) | 0.1 | 65 |
| 2/20/2020 | Nimrod | 6.294(6.668) | 98.6 | 7.23 | 10.12 | 0.65(0.0) | 132.9(124.0) | 0.05(0.041) | 0.14 | 63.89 |
| 5/28/2020 | Hulk | 6.563(6.668) | 98.8 | 7.07 | 10.1 | -0.2(0.0) | 132.0(124.0) | 0.032(0.014) | -0.4 | 71.5 |
| 6/11/2020 | She-Ra | 6.776(6.668) | 99.3 | 7.03 | 10.04 | 4.0(0.0) | 126.8(124.0) | 0.042(0.027) | 0.7 | 63.9 |
| 6/25/2020 | Hulk | 6.464(6.668) | 97.8 | 6.99 | 10.1 | 3.98(0.0) | 140.67(124.0) | 0.035(0.0) | 2.84 | 78.28 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7/8/2020 | Nimrod | 2.02(6.668) | 97.1 | 7.11 | 10.16 | -0.6(0.0) | 129.4(124.0) | 0.059(0.014) | 0.1 | 61.7 |
| 7/21/2020 | Hulk | 5.0(6.668) | 99.7 | 7.11 | 10.04 | 2.7(0.0) | 116.9(124.0) | 0.057(0.014) | -0.2 | 59.3 |
| 8/4/2020 | Nimrod | 6.668(6.668) | 100.3 | 7.12 | 10.08 | 1.8(0.0) | 121.8(124.0) | -0.011(-0.027) | 0.22 | 62.9 |
| 8/17/2020 | Hulk | 6.59(6.668) | 99 | 7.02 | 9.97 | 0.2(0.0) | 121.5(124.0) | 0.018(-0.014) | 0 | 66 |
| 9/1/2020 | Hedgehog | 6.721(6.668) | 101.8 | 7.28 | 10.2 | 4.9(0.0) | 122.5(124.0) | 0.16(0.122) | 1.3 | 67.9 |
| 9/14/2020 | Hulk | 6.481(6.668) | 99 | 7.04 | 10.01 | 0.9(0.0) | 106.3(124.0) | -0.0040(-0.054) | 0.1 | 49.3 |
| 9/29/2020 | Nimrod | 6.572(6.668) | 98.9 | 7.11 | 10.06 | 0.17(0.0) | 117.6(124.0) | 0.114(0.027) | -0.01 | 60.4 |
| 10/13/2020 | Rogue | 6.614(6.668) | 98.1 | 7.17 | 10.11 | 8.6(0.0) | 96.8(124.0) | 0.04(0.027) | -0.1 | 35.9 |
| 10/27/2020 | Hulk | 6.599(6.668) | 102.2 | 7.02 | 9.95 | 0.92(0.0) | 125.58(124.0) | 0.131(0.122) | 0.23 | 72.08 |
| 11/24/2020 | Oddball | 6.689(6.668) | 101.9 | 7.06 | 10.03 | 1.34(0.0) | 125.3(124.0) | 0.156(0.177) | 0.03 | 70.49 |
| 12/22/2020 | Hedgehog | 6.668(6.668) | 102 | 7.01 | 10 | 0.2(0.0) | 131.5(124.0) | 0.015(-0.054) | 0 | 64.9 |

**14) Other remarks/notes**

In addition to the sampling described above, several other data sets were collected. Photosynthetically Active Radiation (PAR) was also collected using a LiCor 1400 display two sensors: one underwater quantum sensor and one ambient quantum sensor along with Secchi depth. Additional nutrient samples were also collected during the months of April through October. These data are available through the Maryland Department of Natural Resources. Visit www.eyesonthebay.net for more information.

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.

All sites: Due to the COVID-19 pandemic, field operations ceased on March 16, 2020. They resumed on May 26, 2020. Some data from the first quarter are therefore appearing in the second quarter files. This delay in field operations also resulted in longer than normal deployments at all sites. Deployments using EXO sondes were marked CSM after the 6-week mark, 6 series sondes were marked CSM after the 4-week mark.

**Railroad Bridge (RR)**
Sonde out of water for a brief period on 7/16 due to repairs on PVC tube setup – damage likely caused by large rainstorm on 7/7.

Sonde died before end of final deployment for the quarter on 10/10/20 – suspect issue drawing power from telemetry

**Iron Pot Landing (IP)**
Missing data in April until new deployment in late May due to power failure, as the sonde had been deployed for the duration of the MD DNR COVID shutdown, far past its expected battery life.

As noted above the February 22, 2021 deployments ran long due to COVID shutdowns. The pH probe posted off. This may have been due to the deployment length along with fouling that built up over time.

During the 12/22 deployment the DO probe failed and the wiper stopped working. Low values and values or 0 are rejected.

**Mataponi Creek (MC)**
The final deployment at MC for 2019 carried over into Q1 of 2020, but the station was subsequently pulled due to freezing temperatures.

Instrument had not been deployed prior to COVID shutdown. Data logging for the quarter began on May 28, 2020, after field operations had resumed.

**Otter Point Creek (OC)**
No sonde was deployed prior to shutdown of field operations.
Instrument had not been deployed prior to COVID shutdown. Data logging for the quarter began on May 26, 2020, after field operations had resumed.

Turbidity data during the 09/15/2021 deployment are marked 1 SIC CSM. We believe the DI water used for the 0 calibration was dirty.

**Monie Bay (MB)**
Missing data due to power failure 1/28/2020 @1630 – deployment of new sonde 2/3/2020 @1115. Power cable inside the box came unwired.

SpCond and salinity data during the July 27, 2020 deployment were impacted by a bad calibration. We believe there were air bubbles in the ports of the conductivity probe at calibration. When this happens it causes the readings to be lower than what is expected. Typically, the sonde is shaken to dislodge these bubbles but this is not always successful. This caused the readings to be off from where they should have been.