

North Inlet – Winyah Bay (NIW) NERR Water Quality Metadata
January-December, 2021
Latest Update: December 5, 2022

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 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. 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.

Research Specialist, Baker Stevens, edited and archived the 2021 data for Thousand Acre, Debidue Creek, Oyster Landing, Clambank Landing, Winyah Bay surface and Winyah Bay bottom.

3) Research objectives

The principal objective of this study is to quantify short-term variability and long-term changes in the water quality of the North Inlet and Winyah Bay estuaries. Currently, there are five sites established as long-term monitoring sites, which collectively represent a range of locations and conditions within the two estuaries. The Oyster Landing site is located near the western edge of the North Inlet estuary, at the confluence of two first-order creeks that drain undeveloped forest and forested wetlands. As such, the site is considered 'pristine' and classified as containing 'Outstanding Resource Waters (ORW)' of by the state of South Carolina. The Clambank Landing site is located more centrally within the North Inlet basin and also classified as relatively pristine and also has an ORW designation by the state. The Debidue Creek site receives drainage from the one large residential and golf course development in North Inlet's watershed. As such, the site is considered anthropogenically impacted and lies within the region of North Inlet with restricted shellfish harvesting. The

Winyah Bay sites are also considered anthropogenically impacted given the extent of development, agriculture and industry in Winyah Bay's extensive watershed. The Winyah Bay Surface and Bottom sites are located in the main central channel of the Bay and capture inputs entering the Bay from the five rivers that join to form Winyah Bay's mainstem. The Thousand Acre site is located at the mouth of a brackish marsh (and former rice impoundment) on the eastern edge of Winyah Bay that drains undeveloped forested wetlands, but receives degraded Winyah Bay water on flood tides and therefore also considered an impacted site.

4) Research methods

Clambank Landing (CB) and Thousand Acre (TA)

YSI EXO2 sondes are mounted on a dock piling for Clambank Landing, and on a bridge piling for Thousand Acre. The sondes are deployed in a 4 inch diameter PVC pipe with a copper bottom which is strapped to a piling using 19 mm nylon banding. The PVC pipe is offset from the piling by inserting a 2x6 inch piece of PVC trim board coated with anti-fouling paint between the pipe and piling. This offset allows better flow over the sensors at the bottom of the pipe. The end of each pipe rests on the bottom of the creek and has a copper stop bolt through its center 30 cm from the bottom of the pipe, ensuring that the sonde is seated 30 cm from the bottom of the creek. For the copper tubes, four 2x12 inch flow holes are cut around the pipe directly above the stop bolt to allow for water flow over the sonde sensors. Two 2.5 inch holes are drilled perpendicular to each other at 1 foot intervals along the remaining length of the PVC pipe to allow for flushing.

Debidue Creek (DC), Oyster Landing (OL), Winyah Bay (WS, WB)

YSI EXO2 sondes are currently mounted on stand-alone pilings for Debidue Creek, Oyster Landing and Winyah Bay. At the Winyah Bay station, the infrastructure consists of four 12 inch butt pilings spaced approximately 6 feet apart with a platform in the center. Each sonde is deployed in a 4 inch diameter copper pipe (10-15 feet long) topped with a 4 inch PVC pipe (5 feet long) which is strapped to a piling using 19 mm nylon banding. The PVC pipe is offset from the piling by inserting a 2x6 inch piece of PVC trim board coated with anti-fouling paint between the pipe and piling. This offset allows better flow over the sensors at the bottom of the pipe. At Debidue Creek and Oyster Landing, the end of each pipe rests on the bottom of the creek and has a copper stop bolt through its center 30 cm from the bottom of the pipe, ensuring that the sonde is seated 30 cm from the bottom of the creek. At the Winyah Bay station, the pipes are affixed to two of the station's pilings at fixed depths of approximately 0.2 m below the surface at MLW (WS) and approximately 1 m above the sediment surface (WB). For the copper tubes, four 2x12 inch flow holes are cut around the pipe directly above the stop bolt to allow for water flow over the sonde sensors. Above these flow holes, a series of two 2x6 inch holes are located opposite each other and spaced equi-distant along the remaining length of the pipe to allow for tidal flushing. Copper pipes were deployed at Oyster Landing and Debidue Creek in 2015 and at Clambank Landing and Thousand Acre in 2019 to reduce the excessive biofouling that these sites are prone to, and were adopted for the new Winyah Bay station installed in 2016. We currently don't anticipate needing to switch these tubes due to the anti-fouling properties of the copper.

Every 15 minutes measurements of specific conductivity, salinity, percent saturation, dissolved oxygen, water temperature, pH, turbidity, and water level are recorded (with the addition of chlorophyll at Oyster Landing and Winyah Surface). The two-week sampling interval was selected due to biofouling of the individual probes and expected battery life. Prior to deployment, the sondes are calibrated according to the procedures in the YSI Service Manual and the Standard Operating Procedures V4.1 provided by the NERR CDMO. Calibrations conducted prior to deployment of the instruments include a pH calibration using a two-point method with 7 and 10 unit standards. The turbidity calibration also uses a two-point method using 0 and 124 NTU standards. Specific Conductivity was calibrated using a one-point method with a 10 mS/cm standard that was purchased through YSI, Inc. Depth and dissolved oxygen are calibrated according to the barometric pressure at the time of calibration. Dissolved oxygen is calibrated using the air-saturated water method. The chlorophyll calibration is a four point method using a 0 standard and a temperature dependent rhodamine dye solution, where both

chlorophyll RFU and chlorophyll mg/L are calibrated. The central wiper is thoroughly cleaned of all contaminants before reinstallation. All of the sonde probes' non-measuring surfaces are covered with copper tape to minimize biofouling. At the end of each sampling interval, the sondes are brought back to the laboratory to be downloaded and cleaned. The sondes are allowed to continue recording data for at least 1 hour under lab conditions in a water-saturated air environment. Before the instruments are cleaned, a post calibration reading is taken from each instrument in fresh standard to see if any of the instruments exhibit drift (see Section 13). Post calibration readings of depth and dissolved oxygen are taken once sonde readings have stabilized in a bucket of bubbling (air saturated) tap water. Two sondes are assigned to each of the four monitoring stations to allow the sondes to be switched out the same day, and minimize data loss.

A WaterLOG Storm 3 transmitter was installed at the Oyster Landing station on 03/25/021 and transmits data to the NOAA GOES satellite, NESDIS ID #3B031302. A Sutron Sat-Link2 transmitter was installed at the Debidue Creek station on 04/28/09 and transmits data to the NOAA GOES satellite, NESDIS ID #3B049722. Two Sutron Sat-Link2 transmitters were installed at the Winyah Bay station on June 9, 2016, for the surface site (WS NESDIS ID#3B002F44) and for the bottom site (WB NESDIS ID#3B003C32). 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 www.nerrsdata.org.

5) Site location and character

The North Inlet-Winyah Bay National Estuarine Research Reserve is located on the southeastern coast of the United States on the Atlantic Ocean in two tidal estuaries, North Inlet and Winyah Bay, near Georgetown, South Carolina. The North Inlet estuary is an ocean-dominated bar-built estuary, which contains numerous winding tidal creeks that drain extensive *Spartina alterniflora* marsh. The system is considered a pristine tidal estuary due to minimal anthropogenic impacts. The watershed drains a 24.8 km² area of mostly pine forest and a moderately developed residential watershed to the north. The Winyah Bay estuary, on the other hand, is a classic drowned-river valley estuary that has its headwaters in the Blue Ridge Mountains of North Carolina. Its watershed consists of the sub-basins on 6 major rivers, which collectively represent a cumulative area of 47,060 km², making it one of the largest watersheds on the Eastern Seaboard. As a result of extensive agriculture, residential development and industry in the watershed, Winyah Bay is considered a relatively impacted salt-wedge estuary. The two estuaries are connected by a pair of subtidal creeks that provide exchange and passage between the two estuaries, although the presence of strong tidal nodes in these creeks largely limits the mixing of each estuary's distinct water mass. Descriptions of the five individual monitoring sites that comprise the NI-WB NERR SWMP are as follows:

A) **Clambank Landing (CB)** - (lat 33°20'02.05" N, long 79°11'34.62" W) The Clambank Landing monitoring site is located roughly in the center of the reserve boundary. This site is surrounded by a *Spartina alterniflora* marsh and does not drain a defined sub-basin of the North Inlet estuary (as is the case for Crabhaul and Debidue Creeks). It is predominantly influenced by oceanic waters due to its close proximity to North Inlet, but is occasionally influenced by water entering from Winyah Bay at the creek's southern end. Salinity has ranged from 5 to 39, with a long-term average of 33. The bottom is mostly comprised of oyster shell hash and some fine sediment. This site is considered relatively pristine and is influenced by its close proximity to the Inlet mouth. Water quality, nutrient and chlorophyll monitoring was initiated at this site in 2001.

B) **Debidue Creek (DC)** - (lat 33°21'36.49" N, long 79°10'02.81" W) The Debidue Creek monitoring site is located in an ocean-dominated *Spartina* marsh that was formerly surrounded by pine-dominated uplands. The site is approximately 1 km south of the Debordieu Colony, a large development built on man-made canals that drain into the northern portion of Debidue Creek, and as a result, may be considered an impacted site. Salinity can range from 0 to 36 parts per thousand and average tidal flux is approximately 2 meters. The creek has an average depth of 2.2 m MHW and an average width of 70 m MHW at the sample site. The bottom is mostly

comprised of oyster shell hash with some fine sediment and detritus. Water quality, nutrient and chlorophyll monitoring was initiated at this site in 1998.

C) Oyster Landing (OL) - (lat. 33°20'57.70" N, long. 79°11'19.97" W) The Oyster Landing monitoring site is located near the western, upland edge of the North Inlet basin, at the confluence of two 1st order tidal creeks: the upper reaches of Crabhaul Creek and a much smaller un-named creek that directly drains pine forested uplands and wetlands. The sampling site is approximately 2.8 km from the terminus of Crabhaul Creek. The vegetation of the Crabhaul Creek sub-basin is dominated by *Spartina alterniflora* that transitions into salt pan, *Juncus roemerianus* and mixed vegetation communities along its upland edge. At the monitoring site the creek has an average depth of approximately 2m at MHW and an average width of approximately 150m at MHW. The average tidal range is about 1.4 m. Salinity has ranged from 0 – 39, with a long-term average of 32. The creek bottom is comprised mostly of oyster shell hash with some fine sediment and detritus. The site is considered to represent relatively pristine conditions due to the absence of significant disturbance in its drainage area. Water quality, nutrient and chlorophyll monitoring was initiated at this site in 1993. This is also the site of the NERR's meteorological station as well as a NOAA/NOS NWLON tide gauge (Station 8662245).

D) Thousand Acre (TA) - (lat. 33°17'57.03" N, long. 79°15'21.75" W) The Thousand Acre monitoring site is located approximately 15 m from the mouth of a creek that drains a tidal brackish marsh that empties into the northeastern side of the mid-portion of Winyah Bay. The marsh, which is now dominated by brackish plants such as *Spartina cynosuroides* was formerly impounded for rice cultivation. Rice cultivation was abandoned prior to the Civil War. The upland drainage consists of undeveloped pine forest and forested wetlands. At the monitoring site, the creek depth is approximately 2 m at MHW and creek width is roughly 10 m. The average tidal range is 1 m. Salinity has ranged from 0 to 33, with a long-term average of 8.5. The bottom is mostly composed of fine sediments and detritus. While the creek drains marsh and undeveloped uplands on ebb tides, it receives degraded Winyah Bay water on flood tides and is therefore considered an impacted site. Water quality, nutrient and chlorophyll monitoring was initiated at this site in 1993.

E) Winyah Bay (WS and WB) – (lat. 33°18'33.88" N, long. 79°17'19.57" W and lat. 33°18'33.94" N, long. 79°17'19.58" W respectively) The Winyah Bay monitoring site has both a surface water sonde (WS) and a bottom water sonde (WB). The site is located in the mainstem portion of Winyah Bay, on the western edge of the natural channel adjacent to Frazier Point Bend. This is roughly 6 km down-bay of the confluence of the Black, Pee Dee and Waccamaw rivers and 4 km down-bay of the mouth of the Sampit River. The City of Georgetown, located at the mouth of the Sampit River, is the home to a number of heavy industries, including a steel plant, paper mill, chemical plant, as well as a coal fired power plant and a public sewage treatment plant. This monitoring station is thus well located to represent the collective inputs to Winyah Bay from its anthropogenically-impacted watershed. Water depth at the station is on the order of 5 m at MLW. Tidal range is approximately 1 m and the site exhibits pronounced salinity stratification, especially on flooding tides. The sondes are maintained at fixed depths of approximately 0.2 m below the surface at MLW (WS) and approximately 1 m above the sediment surface (WB). As water quality monitoring was only initiated at this site in May of 2016, long-term average salinities and tidal datums have not yet been established.

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
CB	P	Clambank Landing	33°20'02.05" N 79°11'34.62" W	08/17/2001 09:30 - current	NA	NA
DC	P	Debidue Creek	33°21'36.49" N 79°10'02.81" W	03/05/1998 14:30 - current	NA	NA

OL	P	Oyster Landing	33°20'57.70" N 79°11'19.97" W	01/01/1996 00:00 - current	NA	NA
TA	P	Thousand Acre	33°17'57.03" N 79°15'21.75" W	01/01/1995 00:00 - current	NA	NA
WS	S	Winyah Bay surface	33°18'33.88" N 79°17'19.57" W	05/11/2016 12:45 - current	NA	NA
WB	S	Winyah Bay bottom	33°18'33.94" N 79°17'19.58" W	05/11/2016 12:30 - current	NA	NA
CA	P	Caledonia	33°27'13.80" N 79°09'17.51" W	06/01/1995 00:00 – 12/01/1995	Outside of reserve boundary	Initially deployed as part of a short-term project.

6) Data collection period –

Thousand Acre data collection began January 1, 1995. Debidue Creek sampling began March 5, 1998. Oyster Landing data collection began in 1995; however, it was not considered a SWMP site until 1996 when the collection site was switched from Caledonia to Oyster Landing. Sampling at Clambank Landing began in February 1981 and continued through June 1995; however, it was not considered a SWMP site until sampling resumed on August 17, 2001. Winyah Bay surface and Winyah Bay bottom were established as secondary SWMP stations and began sampling on May 11, 2016. All sampling is ongoing.

Deployment dates and times (in Eastern Standard Time) for 2021 follow:

Site: **Clambank Landing**

Deploy Date	Time	Retrieve Date	Time
12/16/2020	10:15	01/05/2021	11:30
01/05/2021	11:45	01/25/2021	07:30
01/25/2021	07:45	02/14/2021	10:15
02/14/2021	10:30	03/04/2021	11:00
03/03/2021	11:15	03/23/2021	13:30
03/23/2021	13:45	04/06/2021	14:45
04/06/2021	15:00	04/22/2021	14:30
04/22/2021	14:45	05/05/2021	13:45
05/05/2021	14:15	05/19/2021	13:00
05/19/2021	13:15	06/01/2021	13:00
06/01/2021	13:15	06/14/2021	09:45
06/14/2021	10:00	06/28/2021	11:45
06/28/2021	12:00	07/12/2021	10:45
07/12/2021	11:00	07/27/2021	10:00
07/27/2021	10:15	08/11/2021	11:15
08/11/2021	11:30	08/26/2021	09:30
08/26/2021	10:00	09/12/2021	11:00
09/12/2021	11:15	09/28/2021	12:30
09/28/2021	12:45	10/12/2021	12:00
10/12/2021	12:15	10/27/2021	11:00
10/27/2021	11:15	11/11/2021	13:15
11/11/2021	13:30	11/30/2021	15:45

11/30/2021	16:00	12/20/2021	12:00
12/20/2021	12:15	01/10/2022	13:45

Site: **Debidue Creek**

Deploy Date	Time	Retrieve Date	Time
12/16/2020	10:00	01/05/2021	11:00
01/05/2021	11:30	01/25/2021	10:30
01/25/2021	10:45	02/14/2021	10:00
02/14/2021	10:15	03/04/2021	10:45
03/04/2021	11:00	03/23/2021	13:15
03/23/2021	13:30	04/06/2021	14:30
04/06/2021	14:45	04/22/2021	14:15
04/22/2021	14:30	05/05/2021	13:30
05/05/2021	13:45	05/19/2021	12:45
05/19/2021	13:00	06/01/2021	12:45
06/01/2021	13:00	06/14/2021	09:15
06/14/2021	09:45	06/16/2021	12:15
06/16/2021	12:30	06/28/2021	12:15
06/28/2021	12:30	07/12/2021	11:15
07/12/2021	11:30	07/27/2021	11:45
07/27/2021	12:00	08/11/2021	11:30
08/11/2021	11:45	08/26/2021	09:15
08/26/2021	09:30	09/12/2021	10:30
09/12/2021	10:45	09/28/2021	12:15
09/28/2021	12:30	10/12/2021	11:15
10/12/2021	11:30	10/27/2021	12:45
10/27/2021	13:00	11/11/2021	13:00
11/11/2021	13:15	11/30/2021	14:30
11/30/2021	14:45	12/21/2021	08:30
12/21/2021	09:00	01/10/2022	13:15

Site: **Oyster Landing**

Deploy Date	Time	Retrieve Date	Time
12/16/2020	09:30	01/05/2021	14:00
01/05/2021	14:15	01/25/2021	10:00
01/25/2021	10:15	02/14/2021	12:00
02/14/2021	12:15	03/04/2021	13:15
03/04/2021	13:30	03/23/2021	15:15
03/23/2021	15:30	04/06/2021	16:45
04/06/2021	17:00	04/22/2021	16:15
04/22/2021	16:30	05/05/2021	15:30
05/05/2021	15:45	05/19/2021	12:30
05/19/2021	12:45	06/01/2021	15:00
06/01/2021	15:15	06/14/2021	14:30
06/14/2021	14:45	06/28/2021	12:30
06/28/2021	12:45	07/12/2021	11:30
07/12/2021	11:45	07/27/2021	12:15
07/27/2021	12:30	08/11/2021	12:00

08/11/2021	12:15	08/26/2021	11:30
08/26/2021	12:00	09/12/2021	13:30
09/12/2021	13:45	09/28/2021	14:45
09/28/2021	15:00	10/12/2021	13:45
10/12/2021	14:00	10/27/2021	13:00
10/27/2021	13:15	11/11/2021	14:45
11/11/2021	15:00	11/30/2021	13:00
11/30/2021	13:15	12/20/2021	12:30
12/20/2021	12:45	01/10/2022	15:15

Site: Thousand Acre

Deploy Date	Time	Retrieve Date	Time
12/16/2020	10:45	01/05/2021	12:00
01/05/2021	12:15	01/13/2021	13:45
01/25/2021	08:15	02/09/2021	10:30
02/14/2021	11:00	03/03/2021	23:15
03/04/2021	11:30	03/23/2021	14:00
03/23/2021	14:15	04/06/2021	15:15
04/06/2021	15:30	04/22/2021	15:00
04/22/2021	15:15	05/05/2021	14:15
05/05/2021	14:30	05/19/2021	13:30
05/19/2021	13:45	06/01/2021	13:15
06/01/2021	13:45	06/14/2021	10:15
06/14/2021	10:30	06/28/2021	10:00
06/28/2021	10:15	07/12/2021	10:30
07/12/2021	10:45	07/28/2021	11:30
07/28/2021	11:45	08/11/2021	09:30
08/11/2021	09:45	08/26/2021	10:00
08/26/2021	10:15	09/12/2021	11:30
09/12/2021	11:45	09/28/2021	13:00
09/28/2021	13:15	10/12/2021	12:30
10/12/2021	12:45	10/27/2021	11:30
10/27/2021	11:45	11/11/2021	13:45
11/11/2021	14:00	11/30/2021	15:00
11/30/2021	15:15	12/21/2021	09:00
12/21/2021	09:15	01/10/2022	14:00

Site: Winyah Bay Bottom

Deploy Date	Time	Retrieve Date	Time
12/16/2020	11:15	01/05/2021	12:15
01/05/2021	12:30	01/25/2021	08:45
01/25/2021	09:00	02/14/2021	11:15
02/14/2021	11:30	03/04/2021	11:45
04/04/2021	12:00	03/23/2021	14:30
03/23/2021	14:45	04/06/2021	15:45
04/06/2021	16:00	04/22/2021	15:30
04/22/2021	15:45	05/05/2021	14:30
05/05/2021	14:45	05/19/2021	13:45
05/19/2021	14:00	06/01/2021	13:45
06/01/2021	14:00	06/14/2021	11:00

06/14/2021	11:15	06/28/2021	10:45
06/28/2021	11:00	07/12/2021	09:30
07/12/2021	09:45	07/27/2021	10:30
07/27/2021	10:45	08/11/2021	10:00
08/11/2021	10:15	08/26/2021	10:15
08/26/2021	10:45	09/12/2021	11:45
09/12/2021	12:00	09/28/2021	13:30
09/28/2021	13:45	10/12/2021	13:00
10/12/2021	13:15	10/27/2021	11:45
10/27/2021	12:00	11/11/2021	14:45
11/11/2021	14:30	11/30/2021	15:15
11/30/2021	15:30	12/21/2021	09:30
12/21/2021	09:45	01/10/2022	14:30

Site: Winyah Bay Surface

Deploy Date	Time	Retrieve Date	Time
12/16/2020	11:30	01/05/2021	12:15
01/05/2021	12:30	01/25/2021	08:45
01/25/2021	9:00	02/14/2021	11:15
02/14/2021	11:30	03/04/2021	11:45
03/04/2021	12:00	03/23/2021	14:30
03/23/2021	14:45	04/06/2021	15:45
04/06/2021	16:00	04/22/2021	15:30
04/22/2021	15:45	05/05/2021	14:30
05/05/2021	14:45	05/19/2021	13:45
05/19/2021	14:00	06/01/2021	13:45
06/01/2021	14:00	06/14/2021	11:00
06/14/2021	11:15	06/28/2021	10:45
06/28/2021	11:00	07/12/2021	09:30
07/12/2021	09:45	07/27/2021	10:30
07/27/2021	10:45	08/11/2021	10:00
08/11/2021	10:15	08/26/2021	10:15
08/26/2021	10:45	09/12/2021	11:45
09/12/2021	12:00	09/28/2021	13:00
09/28/2021	13:30	10/12/2021	13:00
10/12/2021	13:15	10/27/2021	11:45
10/27/2021	12:00	11/11/2021	14:45
11/11/2021	14:30	11/30/2021	15:15
11/30/2021	15:30	12/21/2021	09:30
12/21/2021	09:45	01/10/2022	14:30

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 2021.

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

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

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

A study of the optical characteristics of dissolved organic matter (DOM) is currently being conducted at Oyster Landing in association with the NIW NERR water quality and water chemistry sampling. Absorbance from 250 - 450 nm are quantified on filtered sub-samples of water collected during (ISCO) diel nutrient sampling and used to determine carbon-normalized DOM absorbance and spectral slope. Study objectives include using DOM optical characteristics as a tracer for the input of aromatic-rich DOM from higher plant and terrestrially-derived DOM sources to estuarine waters. Dr. Erik Smith (NIW NERR Manager) is the principle investigators on this project.

II. Physical Structure Descriptors

9) Sensor specifications –

NIW NERR deployed EXO2 dataloggers in 2021.

EXO2 dataloggers were deployed at:

Clambank Landing (CB) – 12/13/2017 - present

Debidue Creek (DC) – 01/01/2015 – present

Oyster Landing (OL) – 01/01/2015 – present

Thousand Acre (TA) – 11/03/2016 – present

Winyah Bay Surface (WS) & Winyah Bay Bottom (WB) – 05/11/2016 - present

Each EXO2 datalogger uses a 599090 central wiper, a 599827 wiped specific conductivity/temperature probe, a 599702 wiped pH sensor, and a 599100 optical dissolved oxygen probe, a 599101 turbidity probe. Oyster Landing and Winyah Bay Surface has the addition of a 599102 BGA PC probe, and a 599104 fDOM probe (data not submitted). Winyah Bay bottom has the addition of a 599104 fDOM probe (data not submitted).

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Wiped conductivity/temperature
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 conductivity/temperature
Model#: 599827
Range: 0 to 100 mS/cm
Accuracy: +/- 1% of the reading or 0.002 mS/cm, whichever is greater
Resolution: 0.0001 mS/cm to 0.01 mS/cm (range dependent)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 2% of reading or 0.2ppt, whichever is greater
Resolution: 0.01 ppt

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 (0.04 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599702
Range: 0 to 14 units
Accuracy: +/- 0.01 units within +/- 10° of calibration temperature, +/- 0.02 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:

$$((1013-BP)*0.0102)+\text{Depth/Level} = \text{cDepth/cLevel.}$$

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

Sampling station:	Sampling site code:	Station code:
Clambank Landing	CB	niwcbwq
Debidue Creek	DC	niwdcwq
Oyster Landing	OL	niwolwq
Thousand Acre	TA	niwtawq
Winyah Bay surface	WS	niwwswq
Winyah Bay bottom	WB	niwwbwq

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

Site: Clambank Landing

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)
01/05/2021	9.98	7.08	10.08	0.097	0.00	766.6	101.6
01/25/2021	10.04	7.06	10.07	0.006	0.04	760.4	100.2
02/14/2021	9.97	7.03	10.03	0.052	-0.06	763.5	101.1
03/04/2021	9.96	7.00	9.95	0.132	0.05	764.1	101.3
03/23/2021	9.94	7.07	10.05	0.030	-0.15	762.2	99.9
04/06/2021	10.00	7.03	10.00	0.034	0.02	761.2	100.9
04/22/2021	9.96	7.07	10.04	0.118	0.03	767.7	100.6
05/05/2021	10.01	7.14	10.01	0.028	0.01	761.6	100.2
05/19/2021	9.98	7.05	10.06	0.162	0.00	771.9	101.0
06/01/2021	9.96	7.14	10.08	0.078	0.14	764.3	100.0
06/14/2021	10.0	7.11	10.06	-0.019	0.03	757.0	99.2
06/28/2021	9.99	7.09	10.00	0.106	0.11	768.9	101.3
07/12/2021	9.91	7.16	10.11	0.114	0.01	766.8	99.9
07/27/2021	10.02	7.06	10.04	0.020	0.14	761.4	100.0
08/11/2021	9.92	7.10	10.08	0.098	0.01	766.1	101.4
08/26/2021	9.96	7.06	10.03	0.095	0.05	765.4	99.6
09/12/2021	9.94	7.08	10.02	0.085	0.01	766.0	105.0
09/28/2021	9.96	7.13	10.08	0.026	0.13	761.5	107.1
10/12/2021	9.97	7.06	10.05	0.040	0.01	762.5	101.1
10/27/2021	9.96	7.14	10.12	-0.011	0.10	755.0	100.9
11/11/2021	10.00	7.07	10.14	0.011	0.01	761.5	100.1
11/30/2021	10.05	7.08	10.02	0.127	0.08	767.5	99.4
12/20/2021	9.91	7.11	10.13	-0.049	0.08	755.9	100.5
01/10/2022	9.94	7.05	10.02	0.188	0.04	774.8	104.8

Site: Debidue Creek

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)
01/05/2021	10.01	7.01	10.03	0.099	-0.04	766.6	101.7
01/25/2021	9.99	7.00	9.96	-0.002	0.03	760.1	101.8
02/14/2021	9.97	7.03	10.03	0.061	0.19	763.9	100.7
03/04/2021	9.96	7.08	9.95	0.046	0.02	763.2	100.2
03/23/2021	9.95	7.08	10.04	0.033	-0.02	762.6	102.2
04/06/2021	9.94	6.99	9.96	0.004	0.03	760.5	100.2

04/22/2021	9.98	7.09	10.10	0.112	-0.02	767.7	101.1
05/05/2021	10.00	7.11	10.05	0.022	-0.03	761.3	99.8
05/19/2020	9.98	7.11	10.08	0.162	0.00	771.9	100.5
06/01/2021	9.99	7.08	9.99	0.058	0.01	764.3	100.0
06/14/2021	9.99	7.07	10.04	-0.023	0.05	757.0	99.4
06/16/2021	10.00	7.19	10.19	-0.007	0.00	759.8	99.3
06/28/2021	9.99	6.97	9.97	0.127	0.00	768.9	101.9
07/12/2021	9.93	7.15	10.09	0.102	0.01	766.8	100.8
07/27/2021	9.98	7.07	10.04	0.033	0.03	761.4	99.5
08/11/2021	9.93	7.06	10.05	0.085	0.00	766.1	100.9
08/26/2021	9.95	7.06	10.05	0.081	0.06	765.4	104.5
09/12/2021	9.88	7.09	9.98	0.080	0.05	766.0	102.2
09/28/2021	9.95	7.07	10.01	0.017	0.13	760.8	100.0
10/12/2021	9.97	7.12	10.13	0.033	0.05	762.5	101.2
10/27/2021	9.96	7.07	10.06	-0.029	0.20	756.0	99.5
11/11/2021	9.98	7.03	10.00	0.061	-0.09	762.4	100.3
11/30/2021	9.89	7.33	9.82	0.185	0.07	767.5	101.9
12/21/2021	9.93	7.03	10.03	0.008	0.05	755.9	100.1
01/10/2022	9.95	7.16	10.17	0.204	0.07	774.0	100.4

Site: **Oyster Landing**

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)	Chl (mg/l)
01/05/2021	10.06	7.09	10.07	0.088	-0.03	766.6	100.9	68.91
01/25/2021	9.97	7.08	10.01	0.00	0.03	760.7	99.9	67.45
02/14/2021	9.97	7.11	10.06	0.026	0.03	761.8	99.5	67.75
03/04/2021	9.91	7.07	10.07	0.042	0.02	763.3	100	71.82
03/23/2021	9.96	7.11	10.04	0.028	0.02	761.8	99.6	62.25
04/06/2021	9.99	7.09	10.08	0.013	0.03	761.2	99.7	65.35
04/22/2021	9.97	7.18	10.15	0.108	0.02	767.0	99.8	70.69
05/05/2021	9.96	7.11	10.09	-0.044	0.04	759.8	100	66.58
05/19/2021	9.84	7.08	10.06	0.159	0.00	771.6	103.6	65.19
06/01/2021	9.99	7.10	10.11	0.060	0.05	764.0	101.9	64.47
06/14/2021	9.93	7.21	10.15	-0.054	0.01	755.8	102.7	65.26
06/28/2021	10.01	7.06	10.07	0.148	0.00	768.9	101.6	63.86
07/12/2021	9.95	7.07	10.02	0.142	-0.30	769.4	101.2	65.05
07/27/2021	10.02	7.01	9.97	0.021	0.01	761.4	100.5	66.14
08/11/2021	9.95	7.07	10.11	0.089	0.05	766.1	100.5	65.22
08/26/2021	9.92	7.01	10.07	0.083	0.00	765.8	100.5	64.51
09/12/2021	10.00	6.93	10.01	0.077	0.02	765.7	101.0	65.52
09/28/2021	9.95	7.06	10.09	0.010	-0.01	760.8	104.4	64.23
10/12/2021	9.96	7.13	10.07	0.021	0.02	761.8	99.7	65.51
10/27/2021	9.99	7.02	10.04	-0.045	0.06	756.8	100.0	67.38
11/11/2021	9.99	7.07	10.11	0.006	0.05	761.5	99.5	63.40
11/30/2021	9.96	7.09	10.10	0.079	0.02	766.0	100.1	68.73
12/20/2021	10.03	7.10	10.11	-0.026	0.03	757.6	99.5	72.00
01/10/2022	9.96	7.06	10.04	0.181	0.04	773.5	102.7	68.08

Site: **Thousand Acre**

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)
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01/05/2021	9.99	7.07	10.09	0.114	0.02	765.8	101.4
01/25/2021	10.06	7.16	10.17	0.055	0.24	760.4	100.2
02/14/2021	10.04	7.04	10.02	0.055	0.03	762.88	101.6
03/04/2021	9.98	6.99	10.11	0.064	0.00	763.3	100.3
03/23/2021	10.02	7.11	10.12	0.058	0.00	762.2	100.4
04/06/2021	9.96	6.94	9.93	-0.014	0.00	762.1	100.3
04/22/2021	10.33	7.11	10.13	0.125	0.03	767.7	100.9
05/05/2021	9.98	7.09	10.15	0.021	0.02	761.1	99.7
05/19/2021	9.96	7.11	10.11	0.165	0.04	771.6	100.9
06/01/2021	10.00	7.11	10.02	0.102	0.09	765.3	100.4
06/14/2021	9.94	7.09	10.07	-0.027	0.05	757.0	99.2
06/28/2021	9.90	7.11	10.05	0.119	0.04	768.9	101.5
07/12/2021	9.83	7.11	10.10	0.150	0.00	769.4	100.9
07/28/2021	9.99	7.22	10.22	-0.086	0.03	761.1	101.4
08/11/2021	9.84	7.12	9.99	0.101	0.01	766.1	101.2
08/26/2021	9.88	7.09	10.02	0.117	-0.01	765.8	101.0
09/12/2021	9.99	7.12	10.07	0.085	0.01	766.3	100.9
09/28/2021	9.82	7.12	10.08	0.025	0.02	761.5	99.9
10/12/2021	9.97	7.12	10.10	0.055	-0.04	763.0	101.4
10/27/2021	9.81	7.11	10.02	0.024	0.14	756.0	99.6
11/11/201	9.97	7.06	10.07	0.030	0.08	762.4	100.5
11/30/2021	10.00	7.09	10.08	0.118	0.07	766.3	101.5
12/21/2021	9.98	7.07	10.03	-0.053	0.07	755.9	100.5
01/10/2022	9.95	7.05	9.91	0.194	0.09	774.8	101.1

Site: **Winyah Bay Bottom**

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)
01/05/2021	9.95	7.14	10.21	0.083	0.00	765.8	102
01/25/2021	10.00	7.01	10.03	0.087	0.01	760.4	100
02/14/2021	10.00	7.05	10.01	0.045	0.00	763.2	101.7
03/04/2021	9.98	7.05	10.12	0.100	-0.06	764.3	100.6
03/23/2021	9.95	7.04	10.03	0.042	-0.03	762.8	100.1
04/06/2021	9.95	7.06	10.05	0.023	0.00	760.5	100.0
04/22/2021	10.01	7.10	10.07	0.101	0.02	767.7	101.0
05/05/2021	10.00	7.13	10.14	0.040	0.19	761.1	99.7
05/19/2021	9.96	7.07	10.09	0.152	0.03	771.6	100.7
06/01/2021	9.93	7.11	10.04	0.110	0.09	764.3	100.3
06/14/2021	9.95	7.10	10.06	-0.041	0.01	756.4	98.8
06/28/2021	9.95	7.10	10.09	0.134	0.08	768.9	101.1
07/12/2021	9.94	7.06	10.05	0.118	-0.01	769.0	115.5
07/27/2021	10.02	7.02	10.00	0.033	0.03	761.4	100.3
08/11/2021	9.90	7.04	10.01	0.083	0.02	766.1	102.8
08/26/2021	9.95	7.03	10.02	0.127	0.04	765.4	100.4
09/12/2021	9.98	7.09	10.03	0.081	0.02	766.3	102.4
09/28/2021	9.92	7.06	10.04	0.060	0.07	761.5	107.8
10/12/2021	9.96	7.10	10.05	0.034	-0.02	762.5	100.1
10/27/2021	10.01	7.02	10.03	0.010	0.29	756.8	99.9
11/11/2021	9.98	7.04	10.10	0.020	0.02	761.5	100.7
11/30/2021	10.03	7.00	10.00	0.114	0.05	765.9	100.6
12/21/2021	9.98	6.97	10.00	-0.040	0.01	757.2	100.4
01/10/2022	10.02	7.10	10.14	0.198	0.01	775.0	103.9

Site: **Winyah Bay Surface**

Post Cal Date	Sp.Con. (10 mS/cm)	pH (7)	pH (10)	Depth	Turbidity (0 NTU)	BP (mm Hg)	ODO% (% air sat.)	Chl (mg/l)
01/05/2021	10.10	7.15	10.19	0.107	0.00	766.6	101.5	69.15
01/25/2021	9.94			-0.003	-0.03	760.2	100.0	67.71
02/14/2021	9.93	7.12	10.10	0.022	-0.10	761.0	100.4	67.11
03/04/2021	9.91	7.09	10.03	0.049	-0.02	763.0	100.3	71.47
03/23/2021	9.92	7.13	10.11	0.028	-0.11	761.8	100.1	61.84
04/06/2021	9.95	7.05	9.97	0.011	0.00	760.8	99.7	64.33
04/22/2021	9.91	7.13	10.13	0.118	0.01	767.0	100.6	72.36
05/05/2021	9.96	7.06	10.01	0.011	0.20	760.6	100.1	67.05
05/19/2021	9.89	7.14	10.09	0.165	-0.09	771.6	105.2	68.26
06/01/2021	9.98	7.19	10.11	0.071	0.05	763.8	100.2	64.62
06/14/2021	9.95	7.12	10.09	-0.057	0.00	755.8	99.9	66.65
06/28/2021	9.97	7.10	10.10	0.126	0.04	768.9	101.6	64.46
07/12/2021	9.95	7.09	10.10	0.138	-0.04	769.4	101.0	68.10
07/27/2021	9.99	7.07	10.02	0.002	0.02	761.4	104.9	66.44
08/11/2021	9.88	7.13	10.14	0.094	0.04	766.1	101.0	65.04
08/26/2021	9.94	7.06	10.00	0.082	0.10	765.8	102.1	64.92
09/12/2021	9.97	7.10	10.09	0.080	0.02	764.9	100.2	67.18
09/28/2021	9.95	7.04	10.03	0.010	0.13	760.8	100.0	63.74
10/12/2021	9.99	7.08	10.04	0.025	0.04	761.8	100.0	65.22
10/27/2021	9.98	7.05	10.13	-0.038	0.08	756.8	99.5	69.52
11/11/2021	9.95	7.09	10.11	0.022	0.08	761.5	99.9	64.72
11/30/2021	9.96	7.06	10.07	0.076	0.06	766.0	102.0	69.20
12/21/2020	10.00	7.05	10.05	-0.016	-0.01	757.6	100.0	71.80
01/10/2021	9.93	7.05	10.02	0.180	0.08	773.5	101.3	68.42

14) Other remarks/notes

- A) All sites** - 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.
- B) All sites** - In instances where rainfall affected data, the first period where the effects were seen was coded as CRE (significant rain event) for each parameter affected.
- C) All sites** - In instances where strong winds or a combination of wind and rain affected data, the first period where the effects were seen was coded as CWE (significant weather event) for each parameter affected.
- D) DC** – Between 11/03/21 12:30 and 11/03/21 13:15 the sonde was taken out of the water while a new deployment tube was installed to replace the tube that was heavily fouled by barnacle growth.
- E) OL** – There were two deployments where logging was stopped mid-deployment due to upgrading to a STORM telemetry unit and then telemetry troubleshooting. On 03/25/21 8:45 and 04/07/21 16:00 the

sonde was pulled and the logging was stopped creating two raw files for the 03/23/21 and 04/06/21 deployments. However, there was only one continuous deployment in each of these cases.

- F)** The following are daily rainfall totals > 2.54 mm (0.1”) for the year of 2021 recorded at the NIWB-NERR weather station at Oyster Landing. Note that significant rainfall amounts can affect all measured parameters, most noticeably salinity, turbidity and pH. Please note that tropical events are associated with heavy winds that may also affect tidal depth.

Date	Total Daily Precip (mm)
01/01/2021	9.1
01/02/2021	6.1
01/03/2021	4.3
01/07/2021	2.8
01/08/2021	22.6
01/15/2021	4.1
01/27/2021	14.5
01/31/2021	32.8
02/01/2021	4.8
02/06/2021	8.9
02/09/2021	5.3
02/13/2021	17.5
02/14/2021	36.3
02/15/2021	11.2
02/18/2021	9.4
02/19/2021	24.4
02/22/2021	3.6
03/03/2021	30.7
04/01/2021	2.5
04/24/2021	8.1
05/03/2021	22.9
05/04/2021	3.0
05/29/2021	6.1
06/03/2021	9.1
06/04/2021	88.4
06/05/2021	6.6
06/06/2021	23.1
06/10/2021	10.4
06/11/2021	20.1
06/12/2021	17.8
06/15/2021	2.5
06/20/2021	97.0
06/22/2021	5.6
06/26/2021	16.8
07/02/2021	23.1
07/07/2021	11.4
07/08/2021	45.7
07/11/2021	9.1
07/13/2021	21.3
07/19/2021	21.6
7/22/2021	20.8
07/26/2021	4.6
07/27/2021	87.9

07/28/2021	9.4
08/02/2021	12.4
08/03/2021	26.7
08/06/2021	23.4
08/07/2021	16.8
08/15/2021	13.5
08/16/2021	7.9
08/17/2021	17.8
08/18/2021	8.6
08/21/2021	36.8
08/22/2021	11.2
09/08/2021	7.1
09/09/2021	30.0
09/22/2021	24.1
10/05/2021	8.6
10/07/2021	15.7
10/27/2021	9.9
11/06/2021	11.9
11/07/2021	21.3
12/08/2021	32.3
12/12/2021	6.9
12/21/2021	26.7
12/30/2021	23.1