Reserve Name WKB NERR Meteorological Metadata
Months and year the documentation covers – 01/2012 through 12/2012
Latest Update: 09/09/2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

Scott Phipps – Research Coordinator
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Address: Weeks Bay NERR
11300 Highway 98
Fairhope, Al 36532

2) Entry verification

Data are uploaded from the CR1000 data logger to a Personal Computer (IBM compatible). Files are exported from LoggerNet in a comma-delimited format and uploaded to the CDMO where they undergo automated primary QAQC and become part of the CDMO's online provisional database. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve 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 graphs the data for review. It allows the user to apply QAQC flags and codes to the data, append files, and export the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database. For more information on QAQC flags and QAQC codes, see Sections 11 and 12.

Scott Phipps is responsible for all data management.

3) Research objectives –

The principle objective is to record long-term meteorological data for Weeks Bay in order to 1)observe any environmental changes or trends over time, 2) use as a reference for research projects at the reserve, and 3) give meteorological context to our fifteen minute SWMP water quality data.

4) Research methods –

Campbell Scientific data telemetry equipment was installed at the WKB station on 07/31/06 and transmits data to the NOAA GOES satellite, NESDIS ID 3B01A578. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at http://cdmo.baruch.sc.edu.

The Campbell Scientific CR1000 datalogger uses 5-second data downloaded from the weather station sensors to calculate 15-minute data . The CR1000 stores only 15 minute data. Parameters measured are air temperature, relative humidity, barometric pressure, rainfall, wind speed, wind direction, and photosynthetically active radiation (PAR). Periodically, sensors on the weather station are inspected for damage or debris. If any are found, it is repaired and/or cleaned. Sensors are removed and calibrated on an annual or every 2 years basis.

The 15 minute Data are collected in the following formats for the **CR1000**:

Averages from 5-second data:

Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (degrees), Battery Voltage (volts)

Maximum and Minimum Air Temperature (°C) and their times from 5-second data (these data are available from the Reserve)

Maximum Wind Speed (m/s) and time from 5-second data

Wind Direction Standard Deviation (degrees)

Totals:

Precipitation (mm), PAR (millimoles/m^2), and Cumulative Precipitation (mm)

5) Site location and character

The Weeks Bay National Estuarine Research Reserve is located near the Gulf coast, southeast of the city of Fairhope, Alabama. Weeks Bay (30 23' N, 87 50' W) is a small, shallow, microtidal sub-estuary, located on the eastern shore of Mobile Bay in the northern Gulf of Mexico. The bay is nearly diamond shaped, and its longitudinal axis (3.4 km long) runs nearly north-south from the head, where the Fish River flows in, to the mouth, where water is exchanged with Mobile Bay. Its widest point (3.1 km) is located near the center of the estuary, where the Magnolia River discharges into eastern side of Weeks Bay. Average depth is 1.4 m, although there are two areas where depths are significantly greater. The first is in the mouth of the bay, where the average depth is 6 m; the second is about 100 m upstream of the mouth of the Fish River, where the average depth is 3.5 m. Tides are principally diurnal, and have a mean range of 0.4 m.

The Fish River drainage basin encompasses 14300 hectares and contributes approximately 73% to the total incoming freshwater flow with the Magnolia River supplying the rest. Mean combined discharge is 9 cubic meters per second; although freshets up to 4 times larger occur throughout the year. These characteristics result in a freshwater residence time of 13 days under average discharge conditions, with a range from 0.5 to 100 days. Salinity in Weeks Bay varies substantially both temporally and spatially. During periods of high flow in the river, salinity in the bay may be fresh from the head to the mouth, except in the deeper holes of the estuary that are not as easily flushed. However, during periods of low flow in the river, wind velocity and tidal stage are strong factors influencing salinity structure. Salinity greater than 25 ppt is infrequently observed in Weeks Bay and is usually restricted to the southern portion of the estuary near the mouth.

CDMO Edits – station measurements updated September 2025. Previous versions of the metadata were not updated and measurements listed were from the original weather station site.
The weather station is located on a reserved owned property, near a restored marsh, about 700 meters from the west bank of Fish River (30°25'14.5"N 87°49'46.6"W) north of highway 98, on a property known to locals as "Safe Harbor". The wind sentry, temperature/RH sensor, and PAR sensor are mounted at the heights listed in the Station Measurements table below. The barometric pressure sensor, height listed below, is located in the datalogger mounting box. Tipping bucket rain gauge is located 6.5m south southwest from the tower.

Station Measurements

Tower and sensor heights	**Height (*meters*)**	**Notes**
Tower	6.1	Measurements were taken from the ground for the tower and all sensors
Temperature/Relative Humidity	2.0	

Barometric Pressure	1.7	In the enclosure mounted to the tower
Wind	5.3	
PAR	3.0	
Precipitation gauge	0.6	6.5m SSW from tower

6) Data collection period

Weather data has been collected from January 1, 2001, and is current through December 31, 2012
This metadata is applicable only to data collected from January 1, 2012 00:00 through December 31, 2012 23:45.

7) Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined 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.

NERR weather 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 http://cdmo.baruch.sc.edu/. Data are available in comma separated format.

8) Associated researchers and projects

The System-Wide Monitoring Program (SWMP) also includes 4 hydrographic stations within Weeks Bay where dataloggers collect water temperature, salinity and conductivity, pH, dissolved oxygen turbidity and depth. These data are collected every 15 minutes continuously. At the 4 hydrographic stations, nutrient data are collected once a month at low tide and at one site twelve samples are collected for nutrients over a tidal cycle (low tide to low tide). Nutrient data collected are total dissolved phosphorus, nitrate, nitrite, ammonia, and chlorophyll. Both nutrient and hydrographic (water quality) data are maintained at the CDMO.

The Geological Survey of Alabama, in cooperation with the United States Geological Survey, maintains two rain gauges within the Weeks Bay watershed. One is located at the highway 98 Magnolia River overpass; the other is located at the highway 104 Fish River overpass.
The following researchers have directly requested and received meteorological data generated from the Weeks Bay weather station for use as either primary or ancillary information significant to their respective projects.

Caffrey, Jane. University of West Florida. Modeling estuarine ecosystem trophic status using continuous nitrate and water quality data.

Canion, Andrew. University of South Alabama.

Murrah, Adam. Mississippi State University.

II. Physical Structure Descriptors

9) Sensor specifications

Parameters: Temperature and Relative Humidity
Units: Celsius for temperature and percent for relative humidity
Sensor type: Campbell Scientific
Model #: HMP45C
Operating Temperature: -40-+60°C
Temperature Measurement Range: -40 to +60°C
Temperature Accuracy: ± 0.2 °C @ 20°C
Relative Humidity Measurement Range: 0-100% non-condensing
RH Accuracy: at 20°C: +/- 2% RH(0-90%) and +/-3% (90-100%)
Temperature dependence of RH measurement: +/- 0.05%RH/°C
Serial Number: unknown
Date of Last Calibration: unknown
Dates of Sensor Use: 3/23/2011 - 04/04/2013

Parameter: Barometric Pressure
Units: millibars (mb)
Sensor type: Vaisala Barocap © silicon capacitive pressure sensor
Model #: CS-105
Operating Range: Pressure: 600 to 1060 mb; Temperature: -40°C to +60°C;
Humidity: non-condensing
Accuracy: ± 0.5 mb @ 20°C; +/- 2 mb @ 0°C to 40°C; +/- 4 mb @ -20°C to 45°C; +/- 6 mb @ -40°C to 60°C
Stability: ± 0.1 mb per year
Serial Number: unknown
Date of last calibration: unknown
Dates of Sensor Use: 02/10/2009 - 04/12/2017

Parameters: Wind Speed and Wind Direction
Units: Wind speed - meter per second (m/s); Wind direction – compass degrees
Sensor type: RM Young Wind Monitor (marine version)
Model # 5106m
Range: 0-50 m/s; 360° mechanical
Serial Number: WM00071877
Date of last calibration: unknown
Dates of Sensor Use: 02/10/2009 – 04/12/2017

Parameter: Photosynthetically Active Radiation (PAR)
LI-COR Quantum Sensor
Units: mmoles m^{-2} (total flux)
Sensor type: High stability silicon photovoltaic detector (blue enhanced)
Model #: LI190SB

Light spectrum waveband: 400 to 700 nm
Temperature dependence: 0.15% per °C maximum
Stability: <±2% change over 1 yr
Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%
Sensitivity: typically 5 μA per 1000 μmoles s-1 m-2
Serial Number: unknown
Date of last calibration: unknown
Multiplier: unknown
Dates of Sensor Use: 12/20/2009 – 04/03/2013

Parameter: Precipitation
Units: millimeters (mm)
Sensor type: Tipping Bucket Rain Gauge
Model #: TE525
Rainfall per tip: 0.01 inch
Operating range: Temperature: 0° to 50°C; Humidity: 0 to 100%
Accuracy: +/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr
Serial Number: unknown
Date of Last calibration: 12/10/09
Dates of Sensor Use: 02/10/2009 – 04/04/2013

The CR1000 has 2 MB of Flash EEPROM that is used to store the Operating System. Another 128 K Flash is used to store configuration settings. A minimum of 2 MB SRAM is (4 MB optional upgrade) available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CFM100 Compact Flash Module
Serial Number: 5578
Date CR1000 Installed: 2007

CR1000 Firmware Version (s): unknown

CR1000 Program Version(s): Use naming convention (Reserve Code-Site Code-MET_Program Version: WKBWBMET_5.5_070208

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Weeks Bay	sh	wkbshmet

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 -2, flags are applied automatically to indicate data that is above or below sensor range or missing. All remaining data are then flagged 0, as 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 Passed Initial QAQC Checks
1 Suspect Data
2 *Open – Reserved for later flag*
3 *Open – Reserved for later flag*
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 CR1000 datalogger, 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.

General Errors

GIM	Instrument Malfunction
GIT	Instrument Recording Error, Recovered Telemetry Data
GMC	No Instrument Deployed due to Maintenance/Calibration
GMT	Instrument Maintenance
GPD	Power Down
GPF	Power Failure / Low Battery
GPR	Program Reload
GQR	Data Rejected Due to QA/QC Checks
GSM	See Metadata

Sensor Errors

SDG	Suspect due to sensor
SIC	Incorrect Calibration Constant, Multiplier or Offset
SIW	Incorrect Wiring
SMT	Sensor Maintenance
SNV	Negative Value
SOC	Out of Calibration
SQR	Data rejected due to QAQC checks
SSN	Not a Number / Unknown Value
SSM	Sensor Malfunction
SSR	Sensor Removed

Comments

CAF	Acceptable Calibration/Accuracy Error of Sensor
CDF	Data Appear to Fit Conditions
CML	Snow melt from previous snowfall event
CRE*	Significant Rain Event
CSM*	See Metadata
CCU	Cause Unknown
CVT*	Possible Vandalism/Tampering
CWE*	Significant weather event

13) Other remarks/notes

Data are missing due to equipment or associated specific sensors 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.

Small negative PAR values are within range of the sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m2 over a 15 minute interval.

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3%.

Data recorded for all parameters (with the exception of cumulative precipitation) at the midnight timestamp (00:00) are the 15 minute averages and totals for the 23:45-23:59 time period of the previous day. Cumulative precipitation data at the midnight timestamp (00:00) are the sum of raw (unrounded) precipitation data from 00:00 to 23:59 of the previous day. Summing each individual 15-minute total precipitation value from the same period will result in small differences from cumulative precipitation due to rounding. It is especially important to note how data at the midnight timestamp are recorded when using January 1st and December 31st data.

There is some confusion over exact dates for sensor calibrations and sensor swaps that occurred during 2009 (some of these sensors were in use during 2012). By comparing the MetLog dates and dates for sensor maintenance, these are the dates that were considered to be the most accurate.

Sensor installation 02/10/2009: BP, wind, and precipitation
Sensor installation 12/20/2009: PAR

Based on the above installation dates, BP and Wind parameters are considered out of calibration from 02/10/2012 until 12/31/2012. Precipitation data are considered out of calibration beginning 01/01/2012 until 12/31/2012. PAR data are considered out of calibration 12/20/2012 – 12/31/2012. These data are flagged and coded as suspect and out of calibration, <1> [SOC] (CSM).

PAR data are considered suspect for 2012, <1> (CSM). Values were lower than expected for the year and reasons are unknown; however, sensor drift or sensor degradation may have contributed to the lower values. The sensor was never recalibrated once it was removed in April 2013, so any drift between calibrations cannot be determined. In addition, see above, PAR data are considered suspect during the period that telemetry data was used to replace logger data, <1> [GIT] (CSM)and beginning 12/20/2012 – 12/31/2012 due to being collected with an out of calibration sensor, <1> [SOC] (CSM). Negative and slightly elevated nightly values are included in the suspect flagging with the exception of negative values less than -2.2, those values were rejected.

Data were overwritten on the CR1000 from 02/02/2012 11:15 – 03/13/2012 07:45 and were unrecoverable from the logger. Telemetry data were used to replace the overwritten data, {CSM} <1> [GIT]. It should be noted that there are occasional gaps in the telemetry files, {CSM} <-2> [GIT]. Sensors that were considered out of calibration were coded as out of calibration, SOC, instead of recovered telemetry data, GIT.

Cumulative precipitation values on 03/12/2012 09:00 – 03/13/2012 00:00, in addition to the above reason for being suspect, include rainfall that was not recorded for total precipitation. There was a transmission gap in the telemetry data on 03/12/2012 08:00 – 08:45 with an increase in cumulative values after the missing records. Even though total precipitation readings were missed during the missed transmissions it appears as though cumulative totals continued to be calculated during the rain event.