

ACE Basin National Estuarine Research Reserve  
Meteorological Metadata Report  
January - December 2006

Latest Update: **October 19, 2023**

I. Data Set & Research Descriptors

1. Principal investigator & contact persons:

|                                 |                              |
|---------------------------------|------------------------------|
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2. Entry Verification

a) Data Input Procedures:

The 15-minute, 1-hour average and 24-hour meteorological data recorded by each sensor are stored in a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program (nerr4\_3.csi) that is loaded into the datalogger controls the sensors and data collections schedule (see 2b of the Entry Verification section for the data collection schedule). The CR10X then interfaced with the PC208W software supplied by Campbell Scientific. In June 2006, the CR10X data logger was replaced with a CR1000 data logger and Version 3 of the CDMO Data Logger Program. LoggerNet software, supplied by Campbell Scientific, now interfaces with logger for programming and communication.

The PC208W /LoggerNet software's are installed on a desktop and a laptop computer. The weather station is hard wired to the ACE Basin NERR field station located adjacent to the weather station. The weather data is downloaded from the datalogger weekly via the desktop computer located in the field station. The laptop computer is primarily used for a back-up, and the weather data is downloaded from the datalogger via a SC32A interface. These data are saved in a text file (\*.DAT). With the installation of the CR1000, a direct 9 pin serial cable is used to communicate with the datalogger via a laptop computer. In October, 2006, a NL115 Ethernet connection was established, which allows ACE staff in to download data and trouble shoot station problems remotely when away from the station.

Data are uploaded from the CR10X/CR1000 data logger or storage module to a Personal Computer (IBM compatible). Files are exported from PC208W or LoggerNet in a comma-delimited format (.DAT) and opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a date column (mm/dd/yyyy), correct the time column format and reformat the data to the appropriate number of decimal places. The pre-processed file is then ready to be copied into the EQWin weather.eqi file where the data are QA/QC checked and archived in a database. EQWin queries, reports and graphs are used to discover data set outliers (values which fall outside the range that the instrument is designed to measure) and large changes in the data. EQWin is also used to generate statistics, view graphs, create customized queries and reports of the data, cross query the water, weather and nutrient data and finally export the data to the CDMO.

Gemteck's EQwin version 5 and the CDMO developed Microsoft Excel EQWinFormat.xls macro now replaces the WDMF as the NERR MET database management program and primary QA/QC program.

The Centralized Data Management Office converted all SWMP weather data collected with CR10X program versions prior to version 4.0 which was distributed in October 2003. This was necessary in order to merge the old data format (12 array output) with the new data format found in version 4.0 (3 array output). The new format produces averages, maximums and minimums every fifteen minutes (array 15), every hour (array 60) and every day (array 144) for any sensors hooked up to the CR10X. Specifically, the 150 and 151 fifteen-minute data were converted to the new 15 array; the hourly 101, 102, 105 and 106 data were converted to the new 60 array; and the daily 241, 242, 243, 244, 245 and 246 data were converted to the new 144 array. With the new format, the use of 55555's to code for deleted data and 11111's to code for missing data has been abandoned. Hence, all 55555's or 11111's contained in the SWMP weather data collected prior to Version 4.0 of the CR10X program were removed and left blank.

For data collection, the CR10X and CR1000 data loggers were programmed to collect data in the following formats:

- i) 15-minute data are collected instantaneously for Air Temperature (C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). 15-minute Precipitation (mm) and PAR (mmol/m<sup>2</sup>) data are totaled from 5-second readings
- ii) 15-minute average, maximum and minimum data are averages of 5-second readings for Air Temperature (degree C), Relative Humidity (%), Barometric Pressure (mb) and Wind Speed (m/s)
- iii) Hourly average, maximum, and minimum data are averages of 5-second readings for Air Temperature (degree C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). Hourly totals for PAR (mmol/m<sup>2</sup>) and Precipitation (mm) are totals of 15-minute readings.
- iv) Daily average, maximum and minimum data are averages of 5-second readings for Air Temperature (degree C), Relative Humidity (%), Barometric Pressure (mb), Wind

Speed (m/s), and Wind Direction (degrees). Daily totals for PAR (mmol/m<sup>2</sup>) and Precipitation (mm) are totals of 15-minute readings.

Data were stored on a Campbell Scientific storage module (SM192 or SM4M), which was retrieved monthly, but ACE NERR staff use the storage module as a back-up equipment if the CR10X data logger were to fail. With the installation of the NL115, ACE staff installed a data storage card into the Ethernet connection to serve as a back-up for the CR1000 datalogger. The data were downloaded and pre-processed as described in Section 2. QA/QC of the data was conducted using EQWin. EQWin error reports and queries were based on the following anomalous data criteria:

Air Temp:

- 15 min sample not greater than max for the day
- 15 min sample not less than the min for the day
- Sample not greater than 50 C or less than -30 C

Relative Humidity:

- Sample not greater than 100% or less than 0%

Pressure:

- Sample not greater than 1060 mb or less than 900 mb

Wind Speed:

- Wind speed not greater than 30 m/s
- Wind speed not less than 0.5 m/s for 12 consecutive hours

Wind Direction:

- Wind direction not greater than 360 degrees or less than 0 degrees

Rainfall:

- Precipitation not greater than 5 mm in 15 min

Photo synthetically Active Radiation (PAR):

- Sample not greater than 5000 mmol/m<sup>2</sup> or less than -0.5 mmol/m<sup>2</sup>

Time:

- 15-minute interval recorded

For all data:

- No duplicate data

Amy Whitaker Dukes and Julie L. Dingle are responsible for the above tasks.

3. Research objectives (Campbell Weather Station):

The principal objective of the Weather Monitoring Program is to record long-term meteorological data for the ACE Basin NERR in order to observe any environmental changes or trends over time.

#### 4. Research Methods

The Campbell Scientific weather station measures the parameters every 5 seconds to produce both hourly and daily averages of those measurements of air temperature, relative humidity, barometric pressure, rainfall, and wind speed and wind direction. An instantaneous sample is taken every 15 minutes and that data is stored in array 15. The PC208W software is installed on a desktop and a laptop computer. The weather station is hard wired to the ACE Basin NERR field station located adjacent to the weather station. The weather data is downloaded from the datalogger via the desktop computer located in the field station. The laptop computer is primarily used for direct connection to the data logger and serves as a back-up communication device. These data are saved in a text file (\*.DAT). This configuration changed in late June 2006 with the installation of the CR1000. The Campbell Scientific weather station, with the CR1000 data logger, still measures the same parameters every 5 seconds, however, the fifteen minute data outputs are an average of the parameters measured values collected over that time period. The maximum and minimum values for each parameter measured are recorded on the same output line with the corresponding time of the outlier value.

On-site in-situ weather conditions are measured to verify the accuracy of the readings by the sensors, using a Kestrel 400 hand-held. After downloading data, sensors on the weather station are inspected for damage or debris. If any problems are found, it is repaired and/or cleaned. Tree limbs and other shrubs are cut back to prevent obstruction of the sensors. Sensors will be removed and sent back to Campbell Scientific for calibration at a minimum of every two years.

With the installation of the CR1000 data logger, the station also installed a NOAA GOES satellite transmitting system, NESDID ID # 3B01E672. The transmissions are scheduled hourly and contain four (4) datasets reflective of the fifteen minute data sampling interval. The telemetry weather data is transmitted via the NOAA satellite to the CDMO server. The real time provisional data can be viewed on the following CDMO website: <http://cdmo.baruch.sc.edu>

#### 5. Site Location and Character

The ACE Basin National Estuarine Research Reserve (NERR) is located on the Southeastern Atlantic coast of the United States, including portions of Charleston, Colleton and Beaufort Counties in South Carolina. The study area encompasses the Ashepoo, Combahee, and South Edisto River basins, which empty into St. Helena Sound. Diverse estuarine wetlands provide extensive and complex habitat types for fish and wildlife. The NERR consists of approximately 92,000 acres of tidal marshes. Of this, 65,600 acres are salt marshes, 13,600 acres are brackish marshes and 12,100 acres are freshwater marshes. Interspersed within these three tidal marsh zones are approximately 26,000 acres of managed wetlands, marsh impoundments, and hammock islands. St. Helena Sound comprises approximately 23,870 acres of open coastal marine and estuarine waters.

The weather station is located at the Bennett's Point field station on Mosquito Creek, a navigable tributary off of the Ashepoo River. The weather station's latitudinal and longitudinal coordinates are: 32° 33.5623'N, 80° 27.2715'W and is elevated at sea level. The station is approximately 90 m from the creek (800 m from the Ashepoo River) in a grassy field, 80 m to the southwest of the field station. The closest wind obstructions are oak trees, 25 m to the south and southwest of the weather

station and 70 m from a public paved road. The closest SWMP water quality station, Mosquito Creek, is approximately 1655m from the weather station.

The CR10X/CR1000 data loggers and the barometric sensor are enclosed in a Campbell Scientific enclosure box with moisture/humidity indicators and 2 desiccant packets. A 15 foot galvanized steel tower elevates the sensors above potential barriers and enhances the performance of each sensor. The LiCor and the Wind Sentry sensors are attached to a cross T bar at the top of the tower and the Temperature/Relative Humidity sensor is attached approximately half way up the tower. The Solar Panel is attached to 2.5 m long pole, and is oriented to the east at approximately a 47-degree angle. The Tipping Bucket Rain gauge (1.3 m height) is located 2.5 m to the southeast of the box on a concrete level platform. The sensors are wired to the CR10X/CR1000 following protocol in the CDMO Manual, with minor changes due to upgraded sensors. A new larger enclosure box and solar panel were necessary with the installation of the GOES system.

#### 6. Data Collection Period

Weather data have been collected at the ACE Basin NERR Bennett's Point weather station since the station became operational in March 2001. Data was collected for the entire year in 2006, with the exception of:

March 21, 2006 @ 10:00 thru March 23, 2006 @ 21:00 – The reason is unknown.

June 29, 2006 @9:15 thru June 30, 2006 @9:00 – Sensor replacement and station upgrade.

September 22, 2006 @ 9:45 – The reason is unknown.

The following data were not recorded by the CR1000 data logger. Campbell experts believe the CR1000 was simply not storing the data in the data logger, and was confused by the GOES output transmission log. To correct this problem, the data download process was altered by Reserve staff to download individual files at each time of data collection instead of appending to a single file. This action proved to be successful. Some of the data was recovered from the GOES output dataset; however, the data set is not complete. The GOES transmission is limited to time and space, meaning only some of the data collected by the data logger can be transmitted during the allotted time window to the NOAA satellite.

July 18, 2006 @11:00 thru August 15, 2006 @ 10:30

September 1, 2006 @ 9:00 thru September 13, 2006 @ 9:45

#### 7. Distribution

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

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from the NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves

Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance/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 Section 1 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 text format.

#### 8. Associated Researchers and Projects

The NERR Water Quality Monitoring Project is a study, which records long-term water quality data for the ACE Basin in order to observe any physical changes or trends in water quality over time. The four sampling sites are in separate tributaries of the South Edisto and Ashepoo Rivers. Two sites represent an urban or "treatment" site, and the other two sites represent pristine areas within the Reserve. A salinity gradient is also observed between these four sites:

Big Bay Creek - approximately 14 kilometers from the weather station, GPS coordinates: 32.4941 N and -80.3241 W. The station is surrounded by residential and commercial development and subject to nonpoint source pollution.

St. Pierre Creek - approximately 9 kilometers from the weather station, GPS coordinates: 32.5233 N and -80.3568 W. The station is surrounded by a wide expanse of *Spartina alterniflora* marsh. Extensive mud flats and oyster reefs fringe the banks. Development in the immediate area is sparse, and this creek is subject to relatively light boat traffic.

Fishing Creek – approximately 12 kilometers from the weather station, GPS coordinates: 32.6358 N and -80.3655 W. The station is near Jehossee Island, a protected USFWS property, and is surrounded by extensive *Spartina cynosuroides* marsh and vast mud flats. The upland area is characterized by slash pine, live oak, and cabbage palmetto.

Mosquito Creek – approximately 2 kilometers from the weather station, GPS coordinates: 32.5558 N and -80.4380 W. The station is surrounded by agriculture fields and impounded wetlands. A public boat landing and a commercial seafood business with three commercial shrimp boats and a fueling station are located about 0.8 km (0.5 mi) downstream of the monitoring station.

Measurements for all sites are taken every thirty minutes over roughly a two-week collection period.

In July 1997, the Reserve staff initiated nutrient monitoring study. The objective of the study is to ascertain the annual and tidal fluctuations in nutrient levels near our two data logger sites. Nutrient levels are measured during a complete tidal cycle each month, and the samples are analyzed for ammonia, nitrite-nitrate, ortho-phosphate, and chlorophyll a concentrations. In January of 2002, the nutrient monitoring protocol was added to the NERR System Wide Monitoring Program (SWMP).

Dr. Charles Wenner of SCDNR/Marine Resources Research Institute received funding through the National Marine Fisheries Service in January of 2001 to continue an ongoing survey of red drum (*Sciaenops ocellatus*) in the South Edisto and Combahee River basins, by electro-fishing in tidal freshwater and low salinity brackish water. Although red drum are the target species, all catches are separated, measured and weighted to provide a distribution and population size for each species.

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

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

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

The results from these studies and addition studies conducted in the ACE Basin can be obtained by contacting the Reserve.

## II. Physical Structure Descriptors

### 9. Sensor Specifications, Operating Range, Accuracy, Date of Last Calibration

#### LiCor Quantum Sensor

Model #: LI-190SZ

Stability: < +/- 2% change over a 1 year period

Operating Temperature: -20 to +65 degree C

Sensitivity: Typically 30 nA per 100 klux

Light Spectrum Wavelength: 400 to 700 nanometers

Date of last calibration: 06/29/2005

#### Wind Sentry

Model #: 03001

Range: 0-50 m/s; 360° Mechanical

Date of last calibration: Exact date is unknown; Purchase date 07/01/2005

#### Temperature and Relative Humidity

Model #: HMP45AC

Operating Temperature: -40 to +60 degree C

Temperature Measurement Range: -40 to +60 degree C

Temperature Accuracy: +/- 2% degree C @ 20 degree C

Relative Humidity Measurement Range: 0 - 100% non-condensing

RH Accuracy: +/- @% RH (0 - 90%) and +/- 3% (90 - 100%)

Uncertainty of calibration: +/- 1.2% RH

Date of last calibration: 04/25/2005

#### Barometric Sensor

Model #: PTB101B

Calibrated Range: 26" - 32" (Standard)

Supply Voltage: 12 VDC at 12 mA

Accuracy: +/- 0.7 of span

Operating Temperature Range: -22 to +55 degree C

Date of last calibration: 05/13/2005

#### Tipping Bucket Rain Gauge

Texas Electronics

Model #: TR-525I

Calibration: 0.01 inch per tip

Accuracy: +/- 3% (Rates of 1 to 6 inches per hour)

Date of last calibration: August 2006

#### Storage Module

Model # SM4M

Storage capacity: 2 million low-resolution data values

Program storage: stores up to 8 program with a total capacity of 128 KB

Processor: Hitachi H8S

Operating system: 64 KB, flash memory based, user downloadable

Operating range: Temp: -35 to +65 degree C

Baud rates: 9600, 76800

Power requirements: 5 +/- 0.3 VDC @ 100 mA

The Campbell Scientific CR10X (Jan 06 to Jun 06) datalogger and wiring panel has 128K flash memory (EEPROM), in which it stores the operating system and the actual weather program used to make the station operational. Additionally, there is 128K of SRAM, which it uses to run the program and store its measurements for final data storage.

The Campbell Scientific CR1000 (Jul 06 to Dec 06) datalogger has two MB 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) is 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.

#### 10. Coded Variable Indicator and Variable Code Definition

|                   |                     |               |
|-------------------|---------------------|---------------|
| Sampling station: | Sampling site code: | Station code: |
| Bennett's Point   | BP                  | acebpmet      |

#### 11. Data Anomalies / Suspect Data

##### **Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

##### January –May 2006

LiCor/PAR: Negative LiCor/PAR data outside the maximum signal noise error of +/- 2.214 mmoles/m<sup>2</sup> over a 15 minute interval were recorded during the night on occasion from January-May 2006. Values less than -2.214 mmoles/m<sup>2</sup> over a 15 minute interval were recorded; however, the data were retained for their usefulness in trend analysis.

##### June – September 2006

The new program uploaded to the CR1000 data logger had an error in the code written for the wind speed sensor. The program used the incorrect wind speed multiplier and offset which are used to compute the recorded values to the data logger. The recorded values were mathematically corrected to reflect the correct wind speed multiplier and offset.

June 30, 2006 @ 9:15 to September 1, 2006 @ 8:30

##### October 2006

No Anomalies Data

##### November 2006

From November 20, 2006 to November 22, 2006 no rain was recorded by the tipping rain gage; however an in-situ collector, located less than 5 meters away, recorded 1.62 inches of rain (calculates to 36.288 millimeters of rain). A Belfort rain gage located less than two miles north of

the weather station, confirmed intermittent rain events occurring between 11/21 and 11/23. On November 28, 2006, a visual inspection of the weather station by ACE staff, found that a large piece of plastic, blown in from a near by construction site, wrapped around the base of the tipping rain bucket. The plastic was not covering the bucket at that time. After reviewing the ACE weather station data, no rainfall was recorded during this same time period. The plastic was most likely covering the gage during the time of the rain event. ACE staff believe that the calculated rainfall value is valid representation of the rainfall during this time period. Previous comparisons between the ACE weather station and both in-situ collectors have shown that the recorded rain fall values are similar.

December 2006  
No Anomalies Data

## 12. Deleted Data

### **Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

January – May 2006  
No deleted data.

### June 2006

The weather station was powered down on June 29, 2006 @ 9:15 to replace the CR10X data logger with the new CR1000 data logger. Prior to station shut down, the barometric pressure sensor was unwired from the data logger. The weather program recorded inaccurate barometric data to the data logger and the data were deleted.

Array 15 from 8:30 thru 9:00 and array 60 at 9:00, the inaccurate barometric pressure data (instantaneous, maximum and minimum values) were deleted.

All readings on June 30, 2006 at 9:15 were deleted due to missing 5 second data when the weather station was programmed after the CR1000 installation.

### July 2006

The following LiCor/PAR data were deleted. There was an error in the written code of the weather program which caused the sensor range on the probe to be set to low in order to record a real value. The program recorded “NAN”, meaning Not a Number, in place of an actual value. This error was corrected.

July 7, 2006 from 12:15 to 13:15

July 12, 2006 from 10:00 to 10:15; and 13:30 to 14:00

August 2006

The following relative humidity, barometric pressure, wind speed, and wind direction data were deleted. The data were out of sensor range and were determined to be inaccurate.

September 10, 2006 @ 20:15.

The following LiCor data were deleted. ACE staff neglected to insert the LiCor/PAR variable into the weather program after a new program was uploaded to the CR1000. The sensor recorded zeros in the place holder.

August 15, 2006 @10:45 to August 30, 2006 @ 10:00

September - December 2006

No deleted data.

### 13. Missing Data

#### **Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of calibration of equipment, or repair/replacement of the sampling station platform. The weather station was shut down on June 29, 2006 @ 9:15 thru June 30, 2006 @ 9:00 to replace to CR10X data logger with the new CR1000 data logger, and to install the necessary equipment for the GOES satellite transmission. See also the Data Collection Period Section 6.).

For more details on deleted data, see the Deleted Data Section (12.). If additional information on missing data is needed, contact the Research Coordinator at the Reserve submitting the weather data.

### 14. Other Remarks – Daily Total Rainfall Amounts Measured in Millimeters

**On 10/19/2023 this dataset was updated to include embedded QAQC flags for anomalous/suspect data.** System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all, but

suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

### **Arrays:**

During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout the fall of 2022.

### **Precipitation:**

During the initial years of NERRS SWMP weather data collection the CR10X programming was inconsistent in how precipitation values were recorded. For most reserves, zeros were not recorded when rainfall had not occurred between 2001-2003, instead no rainfall was represented by a blank cell. The CDMO verified which datasets were impacted by this issue for the 2001-2006 datasets and inserted zeros when the metadata indicated that no precipitation occurred and data were not missing for other reasons. In some cases, zero values for precipitation data were evaluated and removed where the metadata confirmed that no rainfall should have been in the dataset. The pre-2007 data did not go through a thorough QAQC process again at that time (in addition to previous QAQC); however, if discrepancies were noticed between what was documented in the metadata and what was in the dataset, additional updates may have been made. The updated datasets were uploaded to the database and made available through the various data applications at [www.nerrsdata.org/get/landing.cfm](http://www.nerrsdata.org/get/landing.cfm) throughout early 2023.

LiCor/PAR: Negative LiCor/PAR data have been observed during the night. These small negative values are within the range of the sensor and are due to normal errors within the sensor and the CR10X datalogger. The Maximum signal noise error for the Licor sensor is +/- 2.214 mmoles/m<sup>2</sup> over a 15 minute interval. These data were not corrected to zero.

Precipitation Outliers: Rain events that record more than 5 millimeters of precipitation in a fifteen minute period are flagged. Coastal South Carolina often experiences heavy rainfall events that accumulate large amounts of precipitation in a short time period. These data were not anomalies and were not deleted.

Calendar Day    Precipitation Total measured in Millimeters (mm)

|              |          |        |
|--------------|----------|--------|
| January 2006 | 01/01/06 | 2.032  |
|              | 01/02/06 | 28.702 |
|              | 01/13/06 | 4.064  |

|               |          |        |
|---------------|----------|--------|
|               | 01/18/06 | 1.27   |
|               | 01/22/06 | 2.032  |
|               | 01/23/06 | 17.526 |
|               | 01/24/06 | 1.016  |
|               | 01/30/06 | 11.938 |
|               | 01/31/06 | 2.032  |
| February 2006 | 02/02/06 | 35.052 |
|               | 02/03/06 | 0.254  |
|               | 02/04/06 | 1.016  |
|               | 02/07/06 | 0.762  |
|               | 02/23/06 | 0.254  |
|               | 02/25/06 | 13.208 |
|               | 02/26/06 | 0.254  |
| March 2006    | 03/28/06 | 0.254  |
| April 2006    | 04/08/06 | 21.336 |
|               | 04/18/06 | 0.254  |
|               | 04/19/06 | 5.334  |
|               | 04/22/06 | 0.762  |
|               | 04/26/06 | 21.336 |
|               | 04/27/06 | 3.302  |
| May 2006      | 05/05/06 | 11.43  |
|               | 05/07/06 | 27.432 |
|               | 05/14/06 | 4.826  |
|               | 05/15/06 | 2.032  |
|               | 05/16/06 | 0.762  |
|               | 05/27/06 | 2.54   |
|               | 05/30/06 | 0.254  |
| June 2006     | 06/01/06 | 0.254  |
|               | 06/03/06 | 13.97  |
|               | 06/05/06 | 0.254  |
|               | 06/13/06 | 42.418 |
|               | 06/14/06 | 1.016  |
|               | 06/25/06 | 19.812 |
|               | 06/26/06 | 5.334  |
| July 2006     | 07/06/06 | 0.508  |
|               | 07/07/06 | 0.254  |
|               | 07/12/06 | 13.208 |
|               | 07/16/06 | 0.254  |
|               | 07/23/06 | 11.8   |
|               | 07/24/06 | 5.7    |

|                                                                                                  |          |        |
|--------------------------------------------------------------------------------------------------|----------|--------|
|                                                                                                  | 07/25/06 | 0.3    |
|                                                                                                  | 07/29/06 | 18.5   |
|                                                                                                  | 07/30/06 | 0.3    |
| August 2006                                                                                      | 08/04/06 | 22.8   |
|                                                                                                  | 08/08/06 | 17     |
|                                                                                                  | 08/09/06 | 34.9   |
|                                                                                                  | 08/10/06 | 12.4   |
|                                                                                                  | 08/11/06 | 9.5    |
|                                                                                                  | 08/12/06 | 37.4   |
|                                                                                                  | 08/13/06 | 1.4    |
|                                                                                                  | 08/17/06 | 3.556  |
|                                                                                                  | 08/18/06 | 1.016  |
|                                                                                                  | 08/19/06 | 3.048  |
|                                                                                                  | 08/22/06 | 40.132 |
|                                                                                                  | 08/23/06 | 1.27   |
|                                                                                                  | 08/24/06 | 33.02  |
|                                                                                                  | 08/25/06 | 1.27   |
|                                                                                                  | 08/31/06 | 29.718 |
| September 2006                                                                                   | 09/13/06 | 11.176 |
|                                                                                                  | 09/14/06 | 4.826  |
|                                                                                                  | 09/19/06 | 2.794  |
|                                                                                                  | 09/28/06 | 27.432 |
| October 2006                                                                                     | 10/06/06 | 5.842  |
|                                                                                                  | 10/08/06 | 5.08   |
|                                                                                                  | 10/09/06 | 0.254  |
|                                                                                                  | 10/17/06 | 0.762  |
|                                                                                                  | 10/18/06 | 8.636  |
|                                                                                                  | 10/19/06 | 0.254  |
|                                                                                                  | 10/22/06 | 11.176 |
|                                                                                                  | 10/27/06 | 12.192 |
|                                                                                                  | 10/28/06 | 0.254  |
| November 2006                                                                                    | 11/06/06 | 4.064  |
|                                                                                                  | 11/07/06 | 52.07  |
|                                                                                                  | 11/08/06 | 1.27   |
|                                                                                                  | 11/12/06 | 0.508  |
|                                                                                                  | 11/16/06 | 25.146 |
|                                                                                                  | 11/21/06 | *      |
|                                                                                                  | 11/22/06 | *      |
|                                                                                                  | 11/23/06 | *      |
|                                                                                                  | 11/30/06 | 0.254  |
| * Total rainfall between 11/21 to 11/23 estimated at 36.288 millimeters of rain. See Section 12. |          |        |
| December 2006                                                                                    | 12/03/06 | 1.016  |

|          |        |
|----------|--------|
| 12/13/06 | 0.508  |
| 12/22/06 | 23.114 |
| 12/23/06 | 0.762  |
| 12/25/06 | 27.178 |
| 12/31/06 | 5.842  |

|                   |           |          |
|-------------------|-----------|----------|
| Annual Total 2006 | 874.02 mm | 39.02 in |
|-------------------|-----------|----------|

#### Historical Annual Precipitation Totals at ACE NERR Bennett's Point Weather Station:

|                   |           |          |
|-------------------|-----------|----------|
| Annual Total 2005 | 1157.8 mm | 51.69 in |
| Annual Total 2004 | 802.6 mm  | 35.83 in |
| Annual Total 2003 | 794.1 mm  | 35.45 in |
| Annual Total 2002 | 1281.7 mm | 57.22 in |