

ACE Basin National Estuarine Research Reserve
Meteorological Metadata Report
January - December 2003

Latest Update: **January 30, 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 (nerr30.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.

The PC208W software is installed on a laptop computer. This computer is used to download the weather data from the datalogger via a SC32A interface. This data are saved in a text file (*.DAT).

Once an entire month of data is collected, the CDMO Weather Data Management Program (WDMP) is used to convert the files to an Access database. This program was developed in Visual Basic to interface with the NERR Meteorological Data Collection Schedule (see 2b of the Entry Verification section for the data collection schedule). The WDMP inputs and converts the monthly raw data file into the database, as described below. First, it converts the comma delimited monthly raw data file into an Access database. Next, it checks the data against a predetermined set of error criteria (see Appendix G for the CDMO Meteorological Data Collection Error/Anomalous Data Criteria). Finally, it produces error and summary reports. Any anomalous data are investigated and noted in the Anomalous Data/Data Corrections Section. Any data corrections that are performed are noted in the Anomalous Data/Data Correction Section below.

Beginning November 12 @ 14:00, when the NERR4.CSI program (version 4 of the datalogger program) was loaded into the CR10X datalogger the data were processed as follows. Data are uploaded from the CR10X 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.

Common error noted in the monthly error reports was missing data, which was caused by a faulty solar panel regulator and lead acid battery.
Saundra Upchurch and Amy Whitaker Dukes are responsible for these tasks.

Under Entry Verification:

Gemteck's EQwin version 5 and the CDMO developed Microsoft Excel EQWinFormat.xls macro now replaces the WDMP 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 datalogger was 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/m²) data are totaled from 5-second readings, prior to NERR_4.CSI

ii) 15-minute average, maximum and minimum data are averages of 5-second readings for Air Temperature (oC), Relative Humidity (%), Barometric Pressure (mb) and Wind Speed (m/s) with NERR_4.CSI.

iii) Hourly average, maximum, and minimum data are averages of 5-second readings for Air Temperature (oC), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). Hourly totals for PAR (mmol/m²) 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 (oC), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), and Wind Direction (degrees). Daily totals for PAR (mmol/m²) 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. The data were downloaded and pre-processed as described in Section 2. QA/QC of the data was conducted using either the WDMP or EQWin. WDMP error reports and EQWin 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
- 15 min sample not greater than 3.0 C from the previous 15 minutes (WDMP only)
- Max and min temp recorded for the day (WDMP only)
- 1-hour average not greater than 10% above the greatest 15 min sample recorded in the hour (WDMP only)
- Sample not greater than 50 C or less than -30 C (EQWin only)

Relative Humidity:

- Not changed by more than 25% from the previous 15 minutes (WDMP only)
- Max and min humidity recorded for the day (WDMP only)
- 1-hour average not greater than 10% above the greatest 15 min sample recorded in the hour (WDMP only)
- Sample not greater than 100% or less than 0% (EQWin only)

Pressure:

- Pressure not greater than 1040 mb or less than 980 mb (WDMP only)
- Pressure changes greater than 5 mb per hour (WDMP only)
- Maximum and minimum values recorded for the day (WDMP only)
- 1-hour average not greater than 10% above the greatest 15 min sample recorded in the hour (WDMP only)
- Sample not greater than 1060 mb or less than 900 mb (EQWin only)

Wind Speed:

- Wind speed not greater than 65 m/s or less than 0.5 m/s (WDMP only)
- Wind speed not greater than 30 m/s (EQWin only)
- Wind speed not less than 0.5 m/s for 12 consecutive hours (EQWin only)

Wind Direction:

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

Rainfall:

- Precipitation not greater than 5 mm in 15 min
- No precipitation for the month (WDMP only)

Photosynthetically Active Radiation (PAR):

- Sample not greater than 5000 mmol/m² or less than -0.5 mmol/m²

Time:

- 15-minute interval recorded

For all data:

- No duplicate data

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 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 150. A laptop computer is used to download the data from the datalogger via the SC32A interface. On-site weather conditions are measured to verify the accuracy of the readings by the sensors. 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.

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 consist 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. 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 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 CR10X datalogger and the barometric sensor are enclosed in a 1.8 m elevated aluminum box. Two long poles are attached to the aluminum box, which elevate sensors above potential barriers and enhance the performance of each sensor. The LiCor sensor is attached to the outside top of the box. The Wind Sentry sensor and Temperature/Relative Humidity sensor are attached to a cross bar mounted on top of a 3 m pole. During the summer of 2003, ACE Basin staff installed a 15 foot galvanized steel tower. The Wind Sentry, Temperature/Relative Humidity, and the LiCor sensors are now suspended off the tower, elevating the sensors approximately 15 feet above the ground. 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 following protocol in the CDMO Manual, with minor changes due to upgraded sensors.

6. Data Collection Period

Bennett's Point Weather Station

BEGIN

END

12/23/02 (357), 13:30	01/07/03 (007), 11:00
01/07/03 (007), 11:15	01/21/03 (021), 11:45
01/21/03 (021), 12:00	02/04/03 (035), 11:45
02/04/03 (035), 12:00	02/18/03 (049), 11:15
02/18/03 (049), 11:30	03/11/03 (070), 11:00
03/11/03 (070), 11:15	03/25/03 (084), 10:15
03/25/03 (084), 10:30	04/08/03 (098), 11:45
04/08/03 (098), 12:00	04/22/04 (112), 10:45
04/22/04 (112), 11:00	05/06/03 (126), 10:00
05/06/03 (126), 10:15	05/19/03 (139), 09:45
Weather station powered down to replace all weather probes and sensors.	
05/20/03 (140), 11:45	06/12/03 (163), 10:30
06/12/03 (163), 10:45	07/01/03 (182), 12:00
07/01/03 (182), 12:15	07/15/03 (196), 11:30
07/15/03 (196), 11:45	07/23/03 (204), 12:30

07/23/03 (204), 12:45	08/05/03 (217), 11:00
08/05/03 (217), 11:15*	08/26/03 (238), 11:15*
*Intermittent missing data due to solar panel/battery failure.	
08/26/03 (238), 11:30	09/02/03 (245), 11:15
09/02/03 (245), 11:30	09/13/03 (256), 05:15
09/13/03 (256), 5:30	10/14/03 (287), 09:45
10/14/03 (287), 10:00	10/21/03 (294), 11:00
10/21/03 (294), 11:15	11/11/03 (315), 12:00
11/11/03 (315), 12:15	11/12/03 (316), 13:45
Weather station powered down to install new PC208 program.	
11/14/03 (318), 09:15	11/25/03 (329), 10:15
12/05/03 (339), 11:15	12/16/03 (350), 12:00
12/16/03 (350), 12:15	12/23/03 (357), 09:45
12/26/03 (360), 10:30	01/06/04 (006), 11:30

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://inlet.geol.sc.edu/cdmohome.html>. Data are available in text format and Access data tables.

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 two sampling sites are in separate tributaries of the South Edisto

River. One site represents an urban or "treatment" site in a tidal marsh creek off Big Bay Creek (approximately 14 kilometers from the weather station, GPS coordinates: 32°29'38.72125N and 80°19'21.69864W). It is surrounded by residential and commercial development and subject to nonpoint source pollution. The other site is our pristine site and is located in a tidal creek off St. Pierre Creek (approximately 9 kilometers from the weather station, GPS coordinates: 32°31'40.59518N and 80°21'41.25481W). The tidal creek and St. Pierre Creek are 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. Measurements for both 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).

In the spring of 2000, SCDNR Geologists completed the construction of sediment/erosion tables (SET) in the ACE Basin NERR, including our water quality stations, to determine the effects hydrologic changes on the marsh elevation. The geologists monitor the SET stations monthly.

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.

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 for five years. 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.

The ACE Basin participated in the NOAA funded, NERR Invasive Decapod Pilot project. Sampling efforts began in August of 2002, and continued through June of 2003. Utilizing the established NERR systems, four northwestern NERR sites and five southeastern NERR sites were selected to participate in the pilot project. The project was designed to understand which crabs have invaded which sites. Identical crab collectors are deployed at the participating Reserves, and all crabs found in collectors are identified, measured, and counted. The sex and general condition of crabs (reproductive status, molt stage, obvious

parasites, etc.) are noted as well.

Dr. Clark Alexander of Skidaway Institute and ACE Basin Reserve staff conducted a spatial distribution of salinity, at high slack water, in each of the rivers of the ACE Basin in September of 2002. This study was initiated after severe drought conditions impacted the NERR during the summer of 2002. A second sample was conducted in April of 2003.

The results of additional 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 oC

Sensitivity: Typically 30 nA per 100 klux

Light Spectrum Wavelength: 400 to 700 nanometers

Date of last calibration: 09/18/2002

Wind Sentry

Model #: 03001

Range: 0-50 m/s; 360o Mechanical

Date of last calibration: Exact date is unknown; Purchase date 04/24/2003

Temperature and Relative Humidity

Model #: HMP45AC

Operating Temperature: -40 to +60 oC

Temperature Measurement Range: -40 to +60 oC

Temperature Accuracy: +/- 2% oC @ 20 oC

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

RH Accuracy: +/- 2% RH (0 - 90%) and +/- 3% (90 - 100%)

Uncertainty of calibration: +/- 1.2% RH

Date of last calibration: 03/12/2003

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 oC

Date of last calibration: 02/27/2003

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: Exact date is unknown; Purchase date June of 2001

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 throughout the fall of 2022.

January 2003

a) Data appear to be correct.

Wind speed less than 0.5 m/s from January 4 at 1800 to January 5 at 900.

Wind speed less than 0.5 m/s from January 13 at 1700 to January 14 at 800.

Wind speed less than 0.5 m/s from January 15 at 1800 to January 16 at 900.

Wind speed less than 0.5 m/s from January 24 at 1800 to January 25 at 900.

Wind speed less than 0.5 m/s from January 25 at 1800 to January 26 at 800.

Wind speed less than 0.5 m/s from January 29 at 2100 to January 30 at 1000.

b) Data appear to be correct. WDMP program error with negative temperature values.

Air temperature average in 1 hour data (-0.78929) is greater than 15 minute maximum data (-0.91534) by at least 10%.

February 2003

a) Data appear to be correct.

Wind speed less than 0.5 m/s from February 1 at 2000 to February 2 at 800.

Wind speed less than 0.5 m/s from February 8 at 2000 to February 9 at 1100.

Wind speed less than 0.5 m/s from February 13 at 2200 to February 14 at 1100.

Wind speed less than 0.5 m/s from February 18 at 1800 to February 19 at 800.

Wind speed less than 0.5 m/s from February 21 at 1600 to February 22 at 400.

Wind speed less than 0.5 m/s from February 23 at 1900 to February 24 at 900.

Wind speed less than 0.5 m/s from February 24 at 2000 to February 25 at 1100.

b) Data appear to be correct.

During this time period there was a decrease in cloud cover, an increase of wind speed and a change in wind direction. These factors could account for the decrease in temperature and the increase in relative humidity.

Air temperature difference from February 2 at 1615 to 1630 is greater than 3.0 degrees Celsius. (20.658 to 16.986)

Relative humidity difference from February 2 at 1615 to 1630 is greater than 25%. (30.629 to 57.119)

March 2003

a) Data appear to be correct.

Wind speed less than 0.5 m/s from March 9 at 1800 to March 10 at 800.

Wind speed less than 0.5 m/s from March 11 at 1800 to March 12 at 1000.

Wind speed less than 0.5 m/s from March 12 at 2000 to March 13 at 800.

Wind speed less than 0.5 m/s from March 13 at 1800 to March 14 at 700.

Wind speed less than 0.5 m/s from March 21 at 2000 to March 22 at 900.

Wind speed less than 0.5 m/s from March 22 at 1900 to March 23 at 1400.

Wind speed less than 0.5 m/s from March 23 at 1900 to March 24 at 700.

Wind speed less than 0.5 m/s from March 24 at 1900 to March 25 at 1000.

Wind speed less than 0.5 m/s from March 28 at 2000 to March 29 at 1000.

b) Data appear to be correct.

During this time period there was an increase of wind speed and a precipitation event, which could account for the decrease in temperature.

Air temperature difference from March 6 at 1130 to 1145 is greater than 3.0 degrees Celsius. (22.598 to 19.254)

c) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from March 20 at 1115 to 1130 is greater than 5 mm. (1.016 to 6.096)

April 2003

a) Data appear to be correct.

Wind speed less than 0.5 m/s from April 5 at 1900 to April 6 at 800.

Wind speed less than 0.5 m/s from April 12 at 2000 to April 13 at 1100.

Wind speed less than 0.5 m/s from April 13 at 2000 to April 14 at 1000.

Wind speed less than 0.5 m/s from April 15 at 2200 to April 16 at 1100.

Wind speed less than 0.5 m/s from April 16 at 1900 to April 17 at 1000.

Wind speed less than 0.5 m/s from April 20 at 1900 to April 21 at 800.

Wind speed less than 0.5 m/s from April 23 at 1900 to April 24 at 1000.

Wind speed less than 0.5 m/s from April 24 at 1900 to April 25 at 800.

Wind speed less than 0.5 m/s from April 28 at 2000 to April 29 at 900.

Wind speed less than 0.5 m/s from April 29 at 2100 to April 30 at 1000.

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from April 7 at 600 to 615 is greater than 5 mm.
(8.89 to 0.762)

Precipitation difference from April 25 at 1000 to 1015 is greater than 5 mm.
(1.778 to 8.382)

May 2003

a) Data appear to be correct.

Wind speed less than 0.5 m/s from May 1 at 1900 to May 2 at 700.

Wind speed less than 0.5 m/s from May 9 at 1900 to May 10 at 700.

Wind speed less than 0.5 m/s from May 15 at 1600 to May 16 at 1000.

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from May 6 at 1945 to 2000 is greater than 5 mm.
(11.43 to 5.08)

Precipitation difference from May 16 at 1845 to 1900 is greater than 5 mm.
(0.508 to 13.716)

Precipitation difference from May 16 at 1915 to 1930 is greater than 5 mm.
(13.716 to 0.508)

Precipitation difference from May 18 at 2115 to 2130 is greater than 5 mm.
(0.254 to 5.842)

c) Data appear to be correct.

During the following time periods there was an increase of wind speed and precipitation events, which could account for the decrease in temperature.

Air temperature difference from May 16 at 1845 to 1900 is greater than 3.0 degrees Celsius. (23.912 to 20.512)

Air temperature difference from May 26 at 1500 to 1515 is greater than 3.0 degrees Celsius. (27.567 to 22.565)

Air temperature difference from May 31 at 2300 to 2315 is greater than 3.0 degrees Celsius. (27.78 to 24.314)

June 2003

a) Data appear to be correct.

During this time period there was an increase in wind speed and precipitation event, which could account for the decrease in temperature.

Air temperature difference from June 3 at 1715 to 1730 is greater than 3.0 degrees Celsius. (25.844 to 21.508)

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of

rainfall in a short amount of time.

Precipitation difference from June 3 at 1730 to 1745 is greater than 5 mm.
(10.922 to 2.286)

Precipitation difference from June 7 at 1845 to 1900 is greater than 5 mm.
(6.096 to 0.508)

Precipitation difference from June 28 at 1930 to 1945 is greater than 5 mm.
(5.842 to 14.986)

Precipitation difference from June 28 at 1945 to 2000 is greater than 5 mm.
(14.986 to 22.86)

Precipitation difference from June 28 at 2000 to 2015 is greater than 5 mm.
(22.86 to 8.89)

Precipitation difference from June 28 at 2015 to 2030 is greater than 5 mm.
(8.89 to 3.048)

Precipitation difference from June 28 at 2115 to 2130 is greater than 5 mm.
(2.286 to 7.874)

Precipitation difference from June 28 at 2130 to 2145 is greater than 5 mm.
(7.874 to 2.54)

July 2003

a) Data appear to be correct.

During these time periods there was an increase in wind speed and precipitation events, which could account for the decrease in temperature.

Air temperature difference from July 2 at 1015 to 1030 is greater than 3.0 degrees Celsius. (27.512 to 23.775)

Air temperature difference from July 2 at 1600 to 1615 is greater than 3.0 degrees Celsius. (28.368 to 23.298)

Air temperature difference from July 17 at 1745 to 1800 is greater than 3.0 degrees Celsius. (28.768 to 25.099)

Air temperature difference from July 19 at 1630 to 1645 is greater than 3.0 degrees Celsius. (29.501 to 25.166)

Air temperature difference from July 23 at 1430 to 1445 is greater than 3.0 degrees Celsius. (27.834 to 23.899)

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from July 2 at 1015 to 1030 is greater than 5 mm.
(0.254 to 6.858)

Precipitation difference from July 2 at 1030 to 1045 is greater than 5 mm.
(6.858 to 0.762)

Precipitation difference from July 2 at 1615 to 1630 is greater than 5 mm.
(5.842 to 0.254)

Precipitation difference from July 17 at 1845 to 1900 is greater than 5 mm.
(5.588 to 0.254)

Precipitation difference from July 19 at 1700 to 1715 is greater than 5 mm.

(10.922 to 0.254)

Precipitation difference from July 23 at 1530 to 1545 is greater than 5 mm.

(10.414 to 4.064)

c) Data appear to be correct.

Wind speed less than 0.5 m/s from July 20 at 2000 to July 21 at 800.

August 2003

a) Data appear to be correct.

During these time periods there was an increase in wind speed and precipitation events, which could account for the decrease in temperature.

Air temperature difference from August 1 at 1245 to 1300 is greater than 3.0 degrees Celsius. (31.102 to 27.701)

Air temperature difference from August 4 at 1800 to 1815 is greater than 3.0 degrees Celsius. (27.634 to 23.765)

Air temperature difference from August 18 at 1830 to 1845 is greater than 3.0 degrees Celsius. (29.101 to 24.699)

Air temperature difference from August 20 at 1230 to 1245 is greater than 3.0 degrees Celsius. (28.678 to 25.614)

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from August 18 at 1900 to 1915 is greater than 5 mm. (3.302 to 12.446)

Precipitation difference from August 18 at 1915 to 1930 is greater than 5 mm. (12.446 to 5.08)

Precipitation difference from August 20 at 1300 to 1315 is greater than 5 mm. (6.096 to 0.508)

c) Data appear to be correct.

Wind speed less than 0.5 m/s from August 1 at 1800 to August 2 at 1000.

September 2003

a) Data appear to be correct.

During these time periods there was an increase in wind speed and precipitation events, which could account for the decrease in temperature.

Air temperature difference from September 1 at 1330 to 1345 is greater than 3.0 degrees Celsius. (29.235 to 25.766)

Air temperature difference from September 14 at 1330 to 1345 is greater than 3.0 degrees Celsius. (27.901 to 24.299)

Air temperature difference from September 14 at 1630 to 1645 is greater than 3.0 degrees Celsius. (28.501 to 25.166)

Air temperature difference from September 16 at 1700 to 1715 is greater than 3.0 degrees Celsius. (27.1 to 22.831)

Air temperature difference from September 22 at 1345 to 1400 is greater than 3.0 degrees Celsius. (29.768 to 26.633)

During this time period there was a decrease in wind speed and a precipitation event, which could account for the increase in temperature.

Air temperature difference from September 1 at 1145 to 1200 is greater than 3.0 degrees Celsius. (26.3 to 29.435)

b) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from September 1 at 1415 to 1430 is greater than 5 mm. (3.048 to 12.446)

Precipitation difference from September 1 at 1430 to 1445 is greater than 5 mm. (12.446 to 0.254)

c) Data appear to be correct.

Wind speed less than 0.5 m/s from September 12 at 1900 to September 13 at 700.

Wind speed less than 0.5 m/s from September 19 at 1900 to September 20 at 700.

Wind speed less than 0.5 m/s from September 27 at 1800 to September 28 at 600.

October 2003

a) The following data are suspect. The rain gauge may have malfunctioned due to the high volume of rainfall, although, rain showers and thunderstorms often drop large amounts of rainfall in a short amount of time.

Precipitation difference from October 28 at 2230 to 2245 is greater than 5 mm. (3.81 to 11.176)

Precipitation difference from October 28 at 2245 to 2300 is greater than 5 mm. (11.176 to 1.524)

Precipitation difference from October 28 at 2315 to 2330 is greater than 5 mm. (1.524 to 7.874)

b) Data appear to be correct.

Wind speed less than 0.5 m/s from October 4 at 1900 to October 5 at 800.

Wind speed less than 0.5 m/s from October 19 at 1800 to October 20 at 600.

Wind speed less than 0.5 m/s from October 20 at 1800 to October 21 at 800.

Wind speed less than 0.5 m/s from October 27 at 1700 to October 28 at 800.

November 2003

a) Data correction. Negative Licor values were recorded during night-time periods from November 14 to November 24. These small negatives values (i.e. -0.1 to -0.5) were corrected to zero.

December 2003

a) Data correction. Negative Licor values were recorded during night-time periods from December 5 to December 23, and December 26 to December 31. These small negatives values (i.e. -0.1 to -0.5) were corrected to zero.

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 throughout the fall of 2022.

January 2003

No deleted data.

February 2003

No deleted data.

March 2003

No deleted data.

April 2003

No deleted data.

May 2003

The Weather Station was powered down on 5/19 at 10:00 to change out the sensors and was not powered on again until 5/20 at 11:30. Therefore all data is missing from this time period

a) All barometric pressure data (array 15, 60, and 144) was deleted from May 19 at 10:00 to May 31 at 23:45. There was an error in the PC208 programming.

b) Array 144 was deleted on May 21, because the station was powered down in order to change out the weather sensors on the station.

June 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from June 1 at 00:00 to June 30 at 23:45. There was an error in the PC208 programming.

July 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from July 1 at 00:00 to July 31 at 23:45. There was an error in the PC208 programming.

August 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from August 1 at 00:00 to August 31 at 23:45. There was an error in the PC208 programming.

b) Array 60 was deleted on August 21 at 10:00, because the data station was experiencing intermittent data collection and not a complete hour array 15 was recorded. Subsequently, array 144 on August 22 at 00:00 was also deleted.

c) Array 60 was deleted on August 23 at 10:00, because the data station was experiencing intermittent data collection and not a complete hour array 15 was recorded. Subsequently, array 144 on August 24 at 00:00 was also deleted.

d) Array 60 was deleted on August 26 at 11:00, because the data station was experiencing intermittent data collection and not a complete hour array 15 was recorded. Subsequently, array 144 on August 27 at 00:00 was also deleted.

September 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from September 1 at 00:00 to September 30 at 23:45. There was an error in the PC208 programming.

October 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from October 1 at 00:00 to October 31 at 23:45. There was an error in the PC208 programming.

November 2003

a) All barometric pressure data (array 15, 60, and 144) was deleted from November 1 at 00:00 to November 20 at 13:45. There was an error in the PC208 programming.

b) Barometric pressure data for array 144 was deleted on November 21, because the sensor was replaced and the programming error was corrected.

c) The weather station was powered down on 11/12 at 14:00 to transfer a new PC208 program. Subsequently, data from that time until 11/14 @ 9:15 are missing.

December 2003

a) Array 60 was deleted on December 5 at 11:00, because the data station was experiencing intermittent data collection and not a complete hour array 15 was recorded. Subsequently, array 144 on December 6 at 00:00 was also deleted.

b) Array 60 was deleted on December 26 at 11:00, because the data station was experiencing intermittent data collection and not a complete hour array 15 was recorded. Subsequently, array 144 on December 27 at 00:00 was also deleted.

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 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. 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

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.nerrdata.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.nerrdata.org/get/landing.cfm throughout early 2023.

LiCor:

Prior to the installation of the new NERR_4.CSI program, all values less than 0 were altered in the raw data to read 0. These values may indicate an incorrect multiplier, calibration problems, or a sensor malfunction. Because these values are changed in the raw data, we cannot confirm that they are all valid data points.

Relative Humidity:

Prior to the installation of the new NERR_4.CSI program, all values over 100% were altered in the raw data to read 100%. These values may indicate super saturated air, calibration problems, or a sensor malfunction. Because these values are changed in the raw data, we cannot confirm that they are all valid data points.

Calendar Day	Precipitation Total (mm)
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January 2003	
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1	1.778
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February 2003	
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22	9.652
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March 2003	
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2	0.508
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6	5.842
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7	9.652
---	-------

13	13.716
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19	1.016
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20	25.146
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April 2003	
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5	1.016
---	-------

7	33.274
---	--------

25	22.606
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26	1.778
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May 2003	
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3	1.524
---	-------

6	18.796
---	--------

15	10.414
----	--------

16	32.004
----	--------

18	21.082
----	--------

19	0.508
----	-------

22	50.546
----	--------

23	7.874
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26	4.826
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31	1.270
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June 2003	
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3	16.510
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4	15.494
---	--------

6	22.098
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7	8.382
---	-------

8	6.858
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16	0.254
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17	1.778
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18	0.508
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28	73.406
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29	8.382
30	0.254

July 2003

1	1.016
2	14.224
7	0.508
12	7.366
14	4.318
17	8.636
19	16.256
20	0.254
23	18.542
24	21.336
25	1.778
26	35.560
28	0.254
31	2.540

August 2003

1	0.254
2	0.254
4	2.540
6	1.524
10	1.016
15	0.508
16	1.524
18	21.590
20	11.938

September 2003

1	17.780
3	1.778
4	0.508
5	2.286
6	22.606
7	4.064
8	3.810
11	1.270
14	4.064
16	5.334
22	0.254
23	3.810
27	10.668

October 2003

7	0.254
8	0.762
9	1.016
10	0.254
11	0.254
14	0.254
27	3.302
28	71.882
29	7.874

November 2003

3	1.524
4	0.254
5	0.508
18	5.334
19	13.0
24	0.254

December 2003

10	6.1
17	0.5334