

ACE Basin National Estuarine Research Reserve Meteorological Metadata
January - December 2002
Latest Update: **October 26, 2023**

I. Data Set & Research Descriptors

1. Principal investigator & contact persons:

SCDNR/Marine Resources Division	ACE Basin NERR field station
217 Fort Johnson Road	15717 Bennett's Point Road
Charleston, SC 29422	Green Pond, SC 29441
(843) 953-9300	(843) 844-8822

Contact Persons:

Dr. Elizabeth Wenner, Research Coordinator
E-mail: wennere@mrd.dnr.state.sc.us; (843) 953-9226
Saundra Upchurch, Reserve Biologist
E-mail: upchurchs@mrd.dnr.state.sc.us; (843) 953-9223
Amy Whitaker Dukes, Reserve Technician
E-mail: whitakera@mrd.dnr.state.sc.us; (843) 953-9225
Amy Cook, Water Quality Technician
E-mail: cooka@mrd.dnr.state.sc.us; (843) 953-9225

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.

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

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.

b) Data Collection Schedule

i) Data is collected in the following formats:

- 1) 15 minute data are instantaneous readings except for PAR and precipitation data that are totalized from 5 second samples sorted by date and time.
(Arrays 150 and 151)
- 2) Hourly averages (Arrays 101 and 102) are calculated from 5 second samples sorted by date and time except for PAR and precipitation data that are hourly totals calculated from 15 minute totals (Arrays 105 and 106).
- 3) Daily average (arrays 241 and 242), maximum with time, and minimum with time (arrays 243 and 244) are calculated from 5 second samples sorted by date and time except for PAR and precipitation data which are 24 hour totals calculated from hourly totals (arrays 245 and 246).

ii) 15 minute sample point parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), LiCor (PAR), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (Array 150); Rainfall (mm) (Array 151)

iii) Hourly average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb) (Array 101); Wind Speed (m/s), Wind Direction, Wind Speed Maximum (Array 102)

iv) Hourly total parameters: LiCor (PAR) (Array 105); Rainfall (mm) (Array 106)

v) Daily Average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb) (Array 241); Wind Speed (m/s), Wind Direction, Wind Direction Standard Deviation (using Yamartino's Algorithm) (Array 242)

vi) Daily Total parameter: LiCor (PAR) (Array 245); Rainfall (mm) (Array 246)

vii) Daily Maximum parameters: Date, Time, Air Temperature (°C), Time, Relative Humidity (%), Time, LiCor (PAR), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time (Array 243)

viii) Daily Minimum parameters: Date, Time, Air Temperature (°C), Time, Relative Humidity (%), Time, LiCor (PAR), Time, Barometric Pressure (mb), Time, Wind Speed (m/s), Time, Battery Voltage, Time (Array 244)

c) Error/Anomalous Data Criteria

Air Temp:

- 15 min sample greater than max for the day
- 15 min sample less than the min for the day
- 15 min sample greater than 3.0 °C from the previous 15 minutes
- Max and Min values not recorded for the day
- 1-hour average greater than 10% above the greatest 15 min sample recorded in the hour

Relative Humidity:

- Changed by more than 25% from the previous 15 minutes
- Max and Min values not recorded for the day
- 1-hour average greater than 10% above the greatest 15 min sample recorded in the hour

Rainfall:

- Precipitation greater than 5 mm in 15 minutes
- No precipitation for the month

Wind Speed:

- Wind speed greater than 30 m/s
- Wind speed less than 0.5 m/s

Wind Direction:

- Wind direction greater than 360 degrees
- Wind direction less than 0 degrees

Pressure:

- Pressure greater than 1040 mb or less than 980 mb
- Pressure changes greater than 5 mb per hour
- Max and Min values not recorded for the day
- 1-hour average greater than 10% above the greatest 15 min sample recorded in the hour

Time:

- 15-minute interval not recorded

For all data:

- Duplicate interval data

3. Research objectives

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 (32° 33.5623'N,

80° 27.2715'W) 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 Wind Sentry sensor and Temperature/Relative Humidity sensor are attached to a cross bar mounted on top of a 3 m pole. The Solar Panel is attached to 2.5 m long pole, and is oriented to the east at approximately a 47-degree angle. The LiCor sensor is attached to the outside top of the box. 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
12/18/01 (352), 15:30	01/08/02 (008), 13:15
01/08/02 (008), 13:30	01/22/02 (022), 13:30
01/22/02 (022), 13:45	02/05/02 (036), 09:00
02/05/02 (036), 09:15	03/04/02 (063), 12:00
03/04/02 (063), 12:15	03/19/02 (078), 11:00
03/19/02 (078), 11:15	04/09/02 (099), 11:00
04/09/02 (099), 11:15	04/23/02 (113), 10:00
04/23/02 (113), 10:15	05/14/02 (134), 08:45
05/14/02 (134), 09:00	05/28/02 (148), 12:00
05/28/02 (148), 12:15	06/11/02 (162), 10:15
06/11/02 (162), 10:30	07/02/02 (183), 12:00
07/02/02 (183), 12:15	07/16/02 (197), 11:30
07/16/02 (197), 11:45	08/06/02 (218), 09:15
08/06/02 (218), 09:30	08/20/02 (232), 10:15
08/20/02 (232), 10:30	09/03/02 (246), 11:15
09/03/02 (246), 11:30	09/24/02 (267), 11:30
09/24/02 (267), 11:45	10/08/02 (281), 09:00
10/08/02 (281), 09:15	10/22/02 (295), 09:30
10/22/02 (295), 09:45	11/14/02 (318), 15:15
11/14/02 (318), 15:30	11/26/02 (330), 11:15
11/26/02 (330), 11:30	12/09/02 (343), 12:15
12/09/02 (343), 12:30	12/23/02 (357), 13:15
12/23/02 (357), 13:30	01/07/03 (007), 11:00

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 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 will continue 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 will be conducted in April of 2003.

The results of 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-190SA

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

Operating Temperature: -20 to +65 °C

Sensitivity: Typically 30 nA per 100 klux

Light Spectrum Wavelength: 400 to 700 nanometers

Date of last calibration: 11/13/2000

Wind Sentry

Model #: 03001

Range: 0-50 m/s; 360° Mechanical

Date of last calibration: Exact date is unknown; Purchase date 10/27/2000

Temperature and Relative Humidity

Model #: HMP45C

Operating Temperature: -40 to +60 °C

Temperature Measurement Range: -40 to +60 °C

Temperature Accuracy: +/- 2% °C @ 20 °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: 09/11/2000

Barometric Sensor

Model #: 090C-26/32-1

Calibrated Range: 26" - 32" (Standard)

Supply Voltage: 12 VDC at 12 mA

Accuracy: +/- 0.7 of span

Operating Temperature Range: -22 to +55 °C

Date of last calibration: 11/22/2000

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/Data Corrections

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 2002

a) The following data appear to be correct.

From January 4 at 18:00 to January 5 at 09:00, wind speed was less than 0.5 m/s.

From January 11 at 19:00 to January 12 at 07:00, wind speed was less than 0.5 m/s.

From January 13 at 18:00 to January 14 at 10:00, wind speed was less than 0.5 m/s.

From January 16 at 17:00 to January 17 at 09:00, wind speed was less than 0.5 m/s.

From January 17 at 18:00 to January 18 at 08:00, wind speed was less than 0.5 m/s.

From January 21 at 19:00 to January 22 at 07:00, wind speed was less than 0.5 m/s.

From January 28 at 19:00 to January 29 at 09:00, wind speed was less than 0.5 m/s.

From January 29 at 19:00 to January 30 at 13:00, wind speed was less than 0.5 m/s.

From January 30 at 19:00 to January 31 at 12:00, wind speed was less than 0.5 m/s.

b) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0. At 10:00 on January 12, wind direction was greater than 360 or less than 0 degrees, (-0.09484).

c) The following data appear to be correct. The increase in temperature is caused by a change in wind direction. The wind direction shifted from an offshore to an onshore wind.

From 03:45 to 04:00 on January 23, air temp difference is greater than 3.0 degrees C, (11.422 to 15.161).

d) On January 29, the Weather Station was powered down from approximately 10:50 am to 11:10 am. A connection problem was discovered while the technician attempted to download the data from the Campbell Scientific data logger to a laptop computer.

Powering down the station allowed the system to reset itself and the problem was corrected. The hourly averages (array 101 and 102) were deleted for the 10:00 and 11:00 AM hours. The daily averages, maximums, and minimums (array 241, 242, 243, and 244) were deleted at the 24:00 hour.

February 2002

a) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0. At 18:30 on February 5, wind direction was greater than 360 or less than 0 degrees, (-0.09483).

b) The following data appear to be correct.
From February 11 at 18:00 to February 12 at 11:00, wind speed was less than 0.5 m/s.
From February 15 at 20:00 to February 16 at 09:00, wind speed was less than 0.5 m/s.
From February 21 at 19:00 to February 22 at 10:00, wind speed was less than 0.5 m/s.
From February 22 at 15:00 to February 23 at 05:00, wind speed was less than 0.5 m/s.
From February 24 at 19:00 to February 25 at 07:00, wind speed was less than 0.5 m/s.

c) The following data are suspect. The reason for the sudden increase in relative humidity is not known at this time.
From 15:15 to 15:30 on February 14, relative humidity difference is greater than 25%, (32.238 to 58.935).

March 2002

a) The following data appear to be correct.
From March 5 at 19:00 to March 6 at 08:00, wind speed was less than 0.5 m/s.
From March 13 at 20:00 to March 14 at 08:00, wind speed was less than 0.5 m/s.
From March 14 at 20:00 to March 15 at 09:00, wind speed was less than 0.5 m/s.
From March 16 at 19:00 to March 17 at 08:00, wind speed was less than 0.5 m/s.
From March 17 at 19:00 to March 18 at 08:00, wind speed was less than 0.5 m/s.
From March 23 at 19:00 to March 24 at 09:00, wind speed was less than 0.5 m/s.
From March 24 at 20:00 to March 25 at 09:00, wind speed was less than 0.5 m/s.
From March 25 at 20:00 to March 26 at 08:00, wind speed was less than 0.5 m/s.

b) The following data appear to be correct. The rise in temperature is caused by a decrease in relative humidity and a shift in wind direction.
From 00:15 to 00:30 on March 11, air temp difference is greater than 3.0 degrees C, (7.0087 to 10.02).

c) The following data appear to be correct. The drop in temperature is caused by an increase in relative humidity and a rainfall event.

From 20:00 to 20:15 on March 26, air temp difference is greater than 3.0 degrees C, (21.184 to 18.182).

d) 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.

From 20:15 to 20:30 on March 26, precipitation difference greater than 5 mm occurred.

e) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0. At 21:00 on March 25, wind direction was greater than 360 or less than 0 degrees,(-0.09477).

April 2002

a) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0. At 02:45 on April 8, wind direction was greater than 360 or less than 0 degrees,(-0.0948).

b) The following data appear to be correct.

From April 13 at 20:00 to April 14 at 08:00, wind speed was less than 0.5 m/s.

From April 15 at 21:00 to April 16 at 10:00, wind speed was less than 0.5 m/s.

From April 16 at 20:00 to April 17 at 08:00, wind speed was less than 0.5 m/s.

c) The following data appear to be correct. The drop in temperature is caused by an increase of relative humidity and a shift in wind direction.

From 15:15 to 15:30 on April 20, air temp difference is greater than 3.0 degrees C, (33.964 to 30.76).

d) At 10:15 on April 23, the fifteen-minute rainfall recording was deleted. A natural rain event did not occur. The rain gauge bucket was accidentally tipped while cleaning debris from the gauge.

May 2002

a) The following data appear to be correct.

From May 6 at 20:00 to May 7 at 08:00, wind speed was less than 0.5 m/s.

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.

From 14:15 to 14:30 on May 18, precipitation difference greater than 5 mm occurred.

From 14:30 to 14:45 on May 18, precipitation difference greater than 5 mm occurred.

c) The following data appear to be correct. The drop in temperature is caused an increase in wind speed and a rainfall event.

From 18:45 to 19:00 on May 18, air temp difference is greater than 3.0 degrees C, (19.917 to 16.38).

June 2002

a) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0.

At 01:15 on June 5, wind direction was greater than 360 or less than 0 degrees,(-0.09475).

At 23:00 on June 10, wind direction was greater than 360 or less than 0 degrees,(-0.09475).

At 23:15 on June 10, wind direction was greater than 360 or less than 0 degrees,(-0.09475).

At 23:45 on June 10, wind direction was greater than 360 or less than 0 degrees,(-0.09476).

b) The following data appear to be correct. The drop in temperature is caused by an increase in relative humidity and a rainfall event.

From 13:15 to 13:30 on June 7, air temp difference is greater than 3.0 degrees C, (23.965 to 20.897)

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.

From 13:45 to 14:00 on June 7, precipitation difference greater than 5 mm occurred.

From 14:00 to 14:15 on June 7, precipitation difference greater than 5 mm occurred.

From 06:30 to 06:45 on June 18, precipitation difference greater than 5 mm occurred.

From 06:45 to 07:00 on June 18, precipitation difference greater than 5 mm occurred.

From 14:00 to 14:15 on June 20, precipitation difference greater than 5 mm occurred.

From 14:15 to 14:30 on June 20, precipitation difference greater than 5 mm occurred.

From 15:00 to 15:15 on June 21, precipitation difference greater than 5 mm occurred.

From 05:30 to 05:45 on June 25, precipitation difference greater than 5 mm occurred.

d) The following data appear to be correct.

From June 11 at 21:00 to June 12 at 09:00, wind speed was less than 0.5 m/s.

July 2002

a) The following data appear to be correct.

From July 1 at 21:00 to July 2 at 10:00, wind speed was less than 0.5 m/s.

b) The following data appear to be correct. The drop in temperature is caused by an increase in relative humidity and rainfall events.

From 12:00 to 12:15 on July 22, air temp difference is greater than 3.0 degrees C,

(30.435 to 26.567).

From 12:15 to 12:30 on July 22, air temp difference is greater than 3.0 degrees C, (26.567 to 23.165).

From 18:00 to 18:15 on July 26, air temp difference is greater than 3.0 degrees C, (29.768 to 23.899).

From 17:15 to 17:30 on July 31, air temp difference is greater than 3.0 degrees C, (35.081 to 28.213).

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.

From 16:15 to 16:30 on July 11, precipitation difference greater than 5 mm occurred.

From 12:30 to 12:45 on July 22, precipitation difference greater than 5 mm occurred.

From 12:45 to 13:00 on July 22, precipitation difference greater than 5 mm occurred.

From 18:30 to 18:45 on July 31, precipitation difference greater than 5 mm occurred.

August 2002

a) The following data appear to be correct. The drop in temperature is caused by an increase in relative humidity and rainfall events.

From 13:45 to 14:00 on August 2, air temp difference is greater than 3.0 degrees C, (31.436 to 26.033).

From 13:30 to 13:45 on August 4, air temp difference is greater than 3.0 degrees C, (29.101 to 25.566).

From 16:15 to 16:30 on August 5, air temp difference is greater than 3.0 degrees C, (32.77 to 29.701).

From 24:00 on August 24 to 00:15 on August 25, air temp difference is greater than 3.0 degrees C, (29.174 to 25.978).

From 15:30 to 15:45 on August 25, air temp difference is greater than 3.0 degrees C, (30.168 to 24.032).

b) The following data appear to be correct.

From August 5 at 21:00 to August 6 at 09:00, wind speed was less than 0.5 m/s.

From August 25 at 18:00 to August 26 at 08:00, wind speed was less than 0.5 m/s.

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.

From 02:45 to 03:00 on August 25, precipitation difference greater than 5 mm occurred.

From 15:45 to 16:00 on August 25, precipitation difference greater than 5 mm occurred.

From 16:00 to 16:15 on August 25, precipitation difference greater than 5 mm occurred.

From 23:30 to 23:45 on August 28, precipitation difference greater than 5 mm occurred.

From 00:45 to 01:00 on August 29, precipitation difference greater than 5 mm occurred.

From 01:00 to 01:15 on August 29, precipitation difference greater than 5 mm occurred.

From 01:30 to 01:45 on August 30, precipitation difference greater than 5 mm occurred.
From 01:45 to 02:00 on August 30, precipitation difference greater than 5 mm occurred.
From 02:00 to 02:15 on August 30, precipitation difference greater than 5 mm occurred.
From 08:00 to 08:15 on August 30, precipitation difference greater than 5 mm occurred.
From 08:15 to 08:30 on August 30, precipitation difference greater than 5 mm occurred.
From 08:30 to 08:45 on August 30, precipitation difference greater than 5 mm occurred.
From 09:00 to 09:15 on August 30, precipitation difference greater than 5 mm occurred.
From 18:15 to 18:30 on August 31, precipitation difference greater than 5 mm occurred.
From 18:30 to 18:45 on August 31, precipitation difference greater than 5 mm occurred.

September 2002

a) The following data appear to be correct. The drop in temperature is caused by an increase in relative humidity and wind speed, and a shift in wind direction.

From 12:30 to 12:45 on September 13, air temp difference is greater than 3.0 degrees C, (29.635 to 26.500).

From 22:45 to 23:00 on September 14, air temp difference is greater than 3.0 degrees C, (26.522 to 23.520).

b) The wind sentry sensor used to measure wind direction has a written disclaimer stating that wind directions near or at due north (360 degrees) may read slightly skewed. Slightly negative numbers sometimes occur when no wind is blowing. The value was changed to 0. At 07:45 on September 15, wind direction was greater than 360 or less than 0 degrees, (-0.09475).

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.

From 09:45 to 10:00 on September 15, precipitation difference greater than 5 mm occurred.

From 12:00 to 12:15 on September 15, precipitation difference greater than 5 mm occurred.

From 12:15 to 12:30 on September 15, precipitation difference greater than 5 mm occurred.

From 14:30 to 14:45 on September 15, precipitation difference greater than 5 mm occurred.

From 07:00 to 07:15 on September 25, precipitation difference greater than 5 mm occurred.

From 07:15 to 07:30 on September 25, precipitation difference greater than 5 mm occurred.

d) The following data appear to be correct.

From September 16 at 18:00 to September 17 at 08:00, wind speed was less than 0.5 m/s.

From September 17 at 19:00 to September 18 at 09:00, wind speed was less than 0.5 m/s.

October 2002

a) The following data appear to be correct.

From October 2 at 19:00 to October 3 at 08:00, wind speed was less than 0.5 m/s.

From October 3 at 18:00 to October 4 at 07:00, wind speed was less than 0.5 m/s.

From October 5 at 20:00 to October 6 at 08:00, wind speed was less than 0.5 m/s.

From October 6 at 20:00 to October 7 at 10:00, wind speed was less than 0.5 m/s.

From October 11 at 18:00 to October 12 at 07:00, wind speed was less than 0.5 m/s.

From October 12 at 17:00 to October 13 at 09:00, wind speed was less than 0.5 m/s.

From October 20 at 19:00 to October 21 at 10:00, wind speed was less than 0.5 m/s.

From October 26 at 16:00 to October 27 at 08:00, wind speed was less than 0.5 m/s.

From October 27 at 17:00 to October 28 at 09:00, wind speed was less than 0.5 m/s.

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.

From 18:15 to 18:30 on October 10, precipitation difference greater than 5 mm occurred.

From 18:30 to 18:45 on October 10, precipitation difference greater than 5 mm occurred.

From 18:45 to 19:00 on October 10, precipitation difference greater than 5 mm occurred.

From 21:15 to 21:30 on October 10, precipitation difference greater than 5 mm occurred.

From 21:45 to 22:00 on October 10, precipitation difference greater than 5 mm occurred.

From 22:00 to 22:15 on October 10, precipitation difference greater than 5 mm occurred.

From 22:30 to 22:45 on October 10, precipitation difference greater than 5 mm occurred.

From 20:45 to 21:00 on October 28, precipitation difference greater than 5 mm occurred.

From 21:00 to 21:15 on October 28, precipitation difference greater than 5 mm occurred.

November 2002

a) The following data appear to be correct.

From November 2 at 17:00 to November 3 at 11:00, wind speed was less than 0.5 m/s.

From November 7 at 17:00 to November 8 at 08:00, wind speed was less than 0.5 m/s.

From November 8 at 17:00 to November 9 at 11:00, wind speed was less than 0.5 m/s.

From November 13 at 18:00 to November 14 at 07:00, wind speed was less than 0.5m/s.

From November 14 at 16:00 to November 15 at 07:00, wind speed was less than 0.5m/s.

From November 15 at 17:00 to November 16 at 11:00, wind speed was less than 0.5m/s.

From November 18 at 18:00 to November 19 at 09:00, wind speed was less than 0.5m/s.

From November 19 at 17:00 to November 20 at 07:00, wind speed was less than 0.5m/s.

From November 21 at 18:00 to November 22 at 08:00, wind speed was less than 0.5m/s.

From November 23 at 18:00 to November 24 at 09:00, wind speed was less than 0.5m/s.

From November 24 at 18:00 to November 25 at 11:00, wind speed was less than 0.5m/s.

From November 26 at 17:00 to November 27 at 06:00, wind speed was less than 0.5m/s.

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.

From 11:00 to 11:15 on November 10, precipitation difference greater than 5 mm occurred.

From 07:45 to 08:00 on November 12, precipitation difference greater than 5 mm occurred.

From 08:00 to 08:15 on November 12, precipitation difference greater than 5 mm occurred.

From 13:45 to 14:00 on November 16, precipitation difference greater than 5 mm occurred.

December 2002

a) The following data appear to be correct.

From December 1 at 18:00 to December 2 at 08:00, wind speed was less than 0.5 m/s.

From December 7 at 17:00 to December 8 at 09:00, wind speed was less than 0.5 m/s.

From December 8 at 13:00 to December 9 at 02:00, wind speed was less than 0.5 m/s.

From December 11 at 18:00 to December 12 at 11:00, wind speed was less than 0.5 m/s.

From December 16 at 18:00 to December 17 at 07:00, wind speed was less than 0.5 m/s.

From December 21 at 18:00 to December 22 at 08:00, wind speed was less than 0.5 m/s.

From December 26 at 18:00 to December 27 at 11:00, wind speed was less than 0.5 m/s.

From December 29 at 17:00 to December 30 at 11:00, wind speed was less than 0.5 m/s.

From December 30 at 18:00 to December 31 at 12:00, wind speed was less than 0.5 m/s.

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. From 12:15 to 12:30 on December 24, precipitation difference greater than 5 mm occurred.

12. 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.

There are no missing data for January thru December of 2002.

13. Other Remarks – Daily Total Rainfall Amounts Measured in Millimeters

On 10/26/2023 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 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 throughout early 2023.

Calendar Day	Precipitation Total (mm)
January 2002	
6	6.858
12	2.540
21	0.762
25	8.128
31	0.254

February 2002

6	4.064
7	15.494
10	4.826
20	0.508
21	8.128

March 2002

2	26.162
3	12.700
12	3.302
13	8.382
21	4.826
26	8.128
31	11.684

April 2002

1	0.254
10	10.414
11	1.016
12	0.254
25	0.254
26	0.254
27	0.254

May 2002

3	3.048
13	0.508
18	19.304

June 2002

7	43.942
8	0.254
18	57.658
20	27.940
21	22.860
22	53.848
23	0.508

24	3.302
25	35.814
27	1.778

July 2002

6	1.016
7	0.762
11	28.956
13	0.508
20	2.794
22	20.320
26	4.826
31	12.954

August 2002

2	2.540
3	0.254
4	4.318
5	0.254
14	0.508
15	2.286
22	2.032
25	71.628
26	11.938
27	3.048
28	29.210
29	63.246
30	89.408
31	25.400

September 2002

1	5.334
2	5.842
8	3.810
14	8.128
15	60.452
18	2.286
19	10.414
20	10.160
25	30.988
26	3.556

27	1.778
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October 2002

5	2.032
8	0.254
9	1.016
10	158.496
11	0.508
13	12.954
14	7.366
15	11.684
21	1.778
22	0.254
24	2.032
25	2.032
27	0.254
28	12.192
29	0.254
30	4.318

November 2002

4	0.254
5	11.430
6	6.350
10	26.924
11	7.366
12	23.876
16	40.132

December 2002

20	5.080
24	22.352
25	2.032
31	5.588