North Carolina (NOC) National Estuarine Research Reserve
Research Creek Meteorological Metadata Report
January – December 2002
Latest Update: **October 10, 2023**

I. Data Set and Research Descriptors

1. Principal investigator(s) and contact persons

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2. Entry verification

a) Data Input Procedures

The 15-minute data, one-hour average, maximum and minimum data, and 24-hour average, totals, maximum and minimum data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger (the CDMO datalogger program was loaded into the CR10X and controls the sensors and data collection schedule (see Part B of section 2 for the data collection schedule)). The CR10X then interfaced with the PC208W software supplied by Campbell Scientific. This software was located on a computer at the NOC NERR lab, to which the data were uploaded every hour via telemetry. The data were saved in two separate areas on the computer and the Real Time Data Display software (provided by Campbell), displayed the near real time data in graphs and charts. Using an automated software package (Automate, by Unisyn), the data were uploaded hourly as jpeg files to our website server.

Once a month the data were backed-up on zip disk and transferred to another computer at the NOC NERR lab. The data file was cut into month files and then converted to an Access database using the CDMO Weather Data Management Program (WDMP). This program was developed in Visual Basic to interface with the NERRS data collection schedule (see Part B of this section for the data collection schedule). To convert the raw monthly data file to an access database, the WDMP performed three main steps. First, it converted the comma delimited monthly raw data file into an Access Database. Secondly, it checked the data against a predetermined set of error criteria (see Part C of this section). Finally, it produced error and summary reports. Any anomalous data, missing data or data corrections were investigated and noted below in the Anomalous data, missing data and data corrections section. Common errors noted in the monthly error reports were wind speeds below the 0.5 m/s criteria, temperature change of greater than 3°C in a 15-minute period, and the precipitation difference of greater than 5mm in 15 minutes. All errors of these types were double checked with other data that could support such "anomalous" weather changes and were noted in the sections that follow.

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 NOC NERR objectives are to establish long-term monitoring of the weather in the vicinity of Masonboro Island, to obtain better data on storms and to be able to correlate the weather and water quality data. Additionally, the weather data collected will be used in support

of other ongoing projects within the Reserve and nearby area.

4. Research methods (Campbell Weather Station)

The weather station is located on an inactive dredge spoil island next to Research Creek east of the Intracoastal Waterway near Masonboro Island. It is 2.1 km from the NOC NERR lab, directly across the Intracoastal Waterway from Whiskey Creek, at 34° 9.328'N, 77° 51.054'W. The weather station consists of a 3-meter aluminum tower, which is slightly offset from the top of the spoil. The tower holds the wind sensor (wind speed and direction) at a height of 3.68 m; the Li-COR sensor is at a height of 3.66 m. The temperature and relative humidity sensor is mounted on the tower at 2.39 m and the barometric pressure, which is inside of the CR10X housing, is mounted at a height of 1.75 m. The rain gauge is located on a separate platform 7.62 m east south east of the tower and is mounted at a height of 1.79 m. The sensors were wired to the CR10X (Campbell datalogger) according to the protocol in the CDMO Manual. The Campbell datalogger records parameters every 5 seconds to produce 15-minute data as well as hourly and daily averages. Data are downloaded hourly to a PC located in the NOCNERR lab via telemetry using the PC208W software package. Data are compared to values recorded by other local weather stations to verify accuracy. The weather station is inspected monthly for cleaning and/or repair. Sensors are replaced and/or calibrated according to the manufacturer's guidelines (one to two years).

5. Site location and character

The four components of North Carolina's National Estuarine Research Reserve (from north to south) are: Currituck Banks, Rachel Carson, Masonboro Island and Zeke's Island. They are located along the southeastern coast of the United States in the Atlantic Ocean. Currently, only water quality and weather data from Masonboro and Zeke's Island components are transferred to the CDMO. The four water quality sites and meteorological station are:

a) Research Creek, Masonboro Island
The first Masonboro Island site is 0.72 km north east from the mouth of Whiskey Creek, and east of the Intracoastal Waterway (ICW), in a small navigable channel called Research Creek at 34° 09'21.7" N and 77° 50'59.9" W. The site has a salinity range of 18-35 ppt and a tidal range that averages 1.2 meters.

b) Loosin Creek, Masonboro Island
The second Masonboro Island site is 1.2 km east of the ICW, and 2.5 km south west of Masonboro Inlet, in a small navigable channel called Loosin Creek at 34° 10'20.0" N and 77° 49'58.1" W. The site has a salinity range from 18-35 ppt and a tidal range that averages 1.7 meters.

c) East Crib, Zeke's Island
The first Zeke's Island site is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33° 56'23.5" latitude and 77° 56'28.1" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site has a salinity range of 15-35 ppt and

a tidal range that averages 2 meters.

d) Zeke's Basin, Zeke's Island
The second Zeke's Island site is located 0.8 km south east of the Federal Point boat launch in a tidal basin estuary at 33° 57'17.0" N and 77° 56'6.0" W. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site has a salinity range from 11-35 ppt and a tidal range that averages 2 meters.

d) Research Creek Meteorological Station
The meteorological site is located on Masonboro Island, 2.09 km from the NOC NERR lab, and approximately 76.2 m from the Masonboro Island water quality deployment site. The station sits at an elevation of approximately 4.88 m above sea level, slightly offset from the highest point of the spoil, which has a maximum elevation of approximately 5.8 m. The site is on an abandoned dredge spoil with scrub surrounding the periphery, and grassy cover in the central areas.

6. Data collection period

Collection of meteorological data began on 15 March 1997. Instruments were deployed prior to this date; however, data were for initial testing and verification of functions, and have since been discarded.

7. Distribution

According to the Ocean and Coastal Resource Management (OCRM) Data Dissemination Policy for the NERRS System Wide Monitoring Program (SWMP), National Oceanic and Atmospheric Administration (NOAA)/Estuarine Reserves Division (ERD) retains the right to analyze, synthesize and publish summaries of the NERRS SWMP 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 publication 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 ERD, OCRM, National Ocean Service (NOS), NOAA. The data enclosed within the package/transmission are 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 of 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 (see section I. 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (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 and Access data tables.

8. Associated researchers and projects

The NOC NERR water quality site at Masonboro Island is located adjacent to the weather station. The principal objective of the water quality monitoring is to record long-term water quality data in order to observe and document any physical and chemical changes or trends in water quality over time. The weather station data will be used to augment this study.

Additional projects are ongoing and continually changing. Check with the Research Coordinator or other contact person for an updated list of research (see section I.1.).

II. Physical Structure Descriptors

9. Sensor specifications, range, accuracy and date of last calibration

From 1 January 2002 to 31 December 2002

Ecoharmony tipping bucket rain gauge
Model # TB4.
Range: 0 to 600 mm/hr
Accuracy: 0.01 inches per bucket tip; +/- 3% for intensities from 25-600 mm/hr
Date of last calibration: 10/30/02

Campbell Scientific Temperature and Relative Humidity
Model # HMP45AC (deployed from 01/01/02 to 10/01/02)
Range of –40 to 60°C; 0 to 100% non-condensing
Accuracy is +/- 0.2°C @ 20°C; @ 20°C +/- 2% RH (0 – 90% RH), +/- 3% RH (90 – 100% RH)
Date of last calibration: 02/12/01 (installed new in May 2001)

Campbell Scientific Temperature and Relative Humidity
Model # HMP35C (deployed from 10/01/02 to 12/31/02)
Range: -35- to +50°C; 0 to 100%
Accuracy: +/- 0.4°C; @ 20°C +/- 2% RH (0 – 90% RH), +/- 3% RH (90 – 100% RH)
Date of last calibration: 10/05/01 (installed 10/01/02)

LiCor Pyranometer Quantum Sensor.
Model # LI190SB
Range: 1% up to 10,000 µmoles s-1m-2, 400-700 nm
Accuracy: 5 µA per 1000 µmoles s-1m-2, with a stability of <+/- 2% change per year
Date of last calibration: 01/18/01 (installed new in May 2001)

R.M. Young Wind Sentry set (anemometer and sine vane)
Model # 03001 (deployed from 01/01/02 to 07/15/02)

Range: 0-50 m/s (0-112 mph); 360° mechanical, 355° electrical (5° open)
Accuracy: 0.8 m/s at 10 degree displacement, and 1.8 m/s at 5 degree displacement
Date of last calibration: 04/01

Vaisala Ultrasonic Wind Sensor
Model # 425 (deployed from 07/15/02 to 12/31/02)
Range: 0...65 m/s (0...144 mph, 0...125 knots); 0...360°
Accuracy: ±0.135 m/s (±0.3 mph, ±0.26 knots) or 3% of reading, whichever is greater; ±2°
Date of last calibration: N/A (no calibration needed) installed new on 07/15/02

Vaisala Barometric Pressure
Model # PTB101B
Range: 600-1060 mb
Accuracy: +/- 0.45 mb
Date of last calibration: 11/22/00 (installed new in May 2001)

Campbell Scientific CR10X Wiring Panel. Has 128K of flash memory (EEPROM), in which it stores the operating system and it's program (that it uses to run the weather station). Additionally, there are 128K of SRAM, which it uses to run the program and store its measurements and for final data storage.

10. Coded variable indicator and variable code definitions

NOC – North Carolina	rel hum – relative humidity
RC – Research Creek	°C – degrees Celsius
temp – temperature	mb - millibars
m/s – meters per second	V – volt
par – photosynthetic active radiation	ppt – parts per thousand
µA – microamps	µmoles - micromoles

11. Data anomalies and 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

The following data appear to be correct:

Array		Day	Date	Time	Error Message
150	19	19	2145	Air temp difference from 19 (19) 2145 (18.234) to	

19 (19) 2200 (10.595) is greater than 3.0 degrees C
150 21 21 1345 Air temp difference from 21 (21) 1345 (16.693) to 21 (21) 1400 (11.935) is greater than 3.0 degrees C
150 25 25 1615 Rel hum difference from 25 (25) 1615 (78.78) to 25 (25) 1630 (52.9) is greater than 25%
151 6 6 1215 Precip difference from 6 (6) 1215 (.762) to 6 (6) 1230 (6.858) is greater than 5 mm

February 2002

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	27	58	245	Rel hum difference from 27 (58) 245 (88.626) to 27 (58) 300 (62.351) is greater than 25%

March 2002

The following data appear to be correct and the result of a thunderstorm in the area:

Array	Day	Date	Time	Error Message
151	13	72	515	Precip difference from 13 (72) 515 (.762) to 13 (72) 530 (8.382) is greater than 5 mm
151	13	72	600	Precip difference from 13 (72) 600 (13.716) to 13 (72) 615 (2.286) is greater than 5 mm

The following negative data (offset values) are reported when there is a lack of wind. Data were converted to zero for the following dates and times:

Array	Day	Date	Time	Error Message
150	5	64	400	Wind direction is greater than 360 or less than 0 on 5 (64) 400 (-.09538)
150	22	81	2315	Wind direction is greater than 360 or less than 0 on 22 (81) 2315 (-.09532)

April 2002

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	7	97	200	Air temp difference from 7 (97) 200 (10.369) to 7 (97) 215 (6.2134) is greater than 3.0 degrees C
150	20	110	1145	Air temp difference from 20 (110) 1145 (31.029) to 20 (110) 1200 (28.017) is greater than 3.0 degrees C

Due to problems related to timekeeping for the RTDM PC clock, the CR10X clock and the PC clock were synchronized several times throughout the month resulting in missing data (see section 12). There were no program reloads or power downs documented, therefore, daily data were retained. However, daily data for April 5, 8, 10, 11, 18 and 23 may be suspect due to missing data for these dates.

Duplicate data were recorded for several dates and times for unknown reasons. These

duplicate data were deleted:

Array	Day	Date	Time
150	5	95	115 to 145
150	6	96	115
150	7	97	115 to 300
150	10	100	115 to 230
150	17	107	115
150	11	101	2245
101	7	97	200 and 300
101	10	100	200
102	7	97	200 and 300
102	10	100	200

May 2002

Duplicate data were recorded for several dates and times for unknown reasons. These duplicate data were deleted:

Array	Day	Date	Time	
150	4		124	15 to 200
101	4		124	15 to 200
102	4		124	15 to 200
150	5		125	15 to 230
101	5		125	15 to 230
102	5		125	15 to 230
150	13		133	15 to 245
101	13		133	15 to 245
102	13		133	15 to 245
150	15		135	2315

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	10	130	1830	Air temp difference from 10 (130) 1830 (24.768) to 10 (130) 1845 (20.348) is greater than 3.0 degrees C
151	29	149	230	Precip difference from 29 (149) 230 (5.842) to 29 (149) 245 (.254) is greater than 5 mm
151	30	150	130	Precip difference from 30 (150) 130 (.508) to 30 (150) 145 (6.35) is greater than 5 mm

During routine maintenance on 16 May, erroneous precipitation data were recorded at 945. The data (array 151) were removed.

Array	Day	Date	Time	Error Message
151	16	136	945	Technician changed 151 Array at 16 (136) 945

Data for the following hourly and daily arrays were removed due to missing data from clock synchronization or program reloads:

Array	Day	Date	Time	Error Message
101	6	126	1000	Technician changed 101 Array data from 6 (126) 1000
101	13	133	600	Technician changed 101 Array data from 13 (133) 600

102	6	126	1000	Technician changed 102 Array from 6 (126) 1000
102	13	133	600	Technician changed 102 Array from 13 (133) 600
241	6	126	2400	Technician changed 241 Array from 6 (126) 2400
241	13	133	2400	Technician changed 241 Array from 13 (133) 2400
241	15	135	2400	Technician changed 241 Array from 15 (135) 2400 to 17 (137) 2400
241	20	140	2400	Technician changed 241 Array from 20 (140) 2400
242	6	126	2400	Technician changed 242 Array from 6 (126) 2400
242	13	133	2400	Technician changed 242 Array from 13 (133) 2400
242	15	135	2400	Technician changed 242 Array from 15 (135) 2400 to 17 (137) 2400
242	20	140	2400	Technician changed 242 Array from 20 (140) 2400
243	6	126	2400	Technician changed 243 Array data from 6 (126) 2400
243	13	133	2400	Technician changed 243 Array data from 13 (133) 2400
243	15	135	2400	Technician changed 243 Array data from 15 (135) 2400 to 17 (137) 2400
243	20	140	2400	Technician changed 243 Array from 20 (140) 2400
244	6	126	2400	Technician changed 244 Array data from 6 (126) 2400
244	13	133	2400	Technician changed 244 Array data from 13 (133) 2400
244	15	135	2400	Technician changed 244 Array data from 15 (135) 2400 to 17 (137) 2400
244	20	140	2400	Technician changed 244 Array from 20 (140) 2400

All temperature and solar radiation data were removed from 1300 on 17 May to 1200 on 20 May due to an incorrect program that was sent to the CR10X on 17 May. The program was corrected on 20 May. Consider relative humidity data for this time period suspect as well.

Array	Day	Date	Time	Error Message
150	17	137	1300	Technician changed 150 Array data from 17 (137) 1300 to 17 (137) 1445
150	17	137	1545	Technician changed 150 Array data from 17 (137) 1545 to 20 (140) 1200
101	17	137	1300	Technician changed 101 Array data from 17 (137) 1300 to 17 (137) 1400
101	17	137	1600	Technician changed 101 Array data from 17 (137) 1600 to 20 (140) 1200
241	15	135	2400	Technician changed 241 Array from 17 (137) 2400 to 20 (140) 2400
242	15	135	2400	Technician changed 242 Array from 17 (137) 2400 to 20 (140) 2400
243	15	135	2400	Technician changed 243 Array data from 17 (137) 2400 to 20 (140) 2400
244	15	135	2400	Technician changed 244 Array data from 17 (137) 2400 to 20 (140) 2400

An erroneous value (599 mb) for the daily minimum pressure (array 244) was recorded on May 28 due to an unknown reason. This value was replaced with 55555.

Array	Day	Date	Time	Error Message
244	28	148	2400	Technician changed 244 Array data from 28 (148) 2400

June 2002

The following data appear to be correct and the result of thunderstorms in the area:

Array	Day	Date	Time	Error Message
150	14	165	2130	Air temp difference from 14 (165) 2130 (25.832) to 14 (165) 2145 (22.082) is greater than 3.0 degrees C
151	14	165	2200	Precip difference from 14 (165) 2200 (6.858) to 14 (165) 2215 (.508) is greater than 5 mm
151	18	169	900	Precip difference from 18 (169) 900 (4.318) to 18 (169) 915 (14.732) is greater than 5 mm
151	18	169	915	Precip difference from 18 (169) 915 (14.732) to 18 (169) 930 (19.812) is greater than 5 mm
151	18	169	930	Precip difference from 18 (169) 930 (19.812) to 18 (169) 945 (9.144) is greater than 5 mm
151	18	169	945	Precip difference from 18 (169) 945 (9.144) to 18 (169) 1000 (3.302) is greater than 5 mm
151	22	173	145	Precip difference from 22 (173) 145 (1.524) to 22 (173) 200 (13.208) is greater than 5 mm
151	22	173	200	Precip difference from 22 (173) 200 (13.208) to 22 (173) 215 (6.096) is greater than 5 mm
151	27	178	915	Precip difference from 27 (178) 915 (2.286) to 27 (178) 930 (9.398) is greater than 5 mm
151	27	178	930	Precip difference from 27 (178) 930 (9.398) to 27 (178) 945 (2.54) is greater than 5 mm

July 2002

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	20	201	1715	Air temp difference from 20 (201) 1715 (31.427) to 20 (201) 1730 (28.149) is greater than 3.0 degrees C
150	31	212	1400	Air temp difference from 31 (212) 1400 (29.284) to 31 (212) 1415 (24.804) is greater than 3.0 degrees C
151	11	192	1515	Precip difference from 11 (192) 1515 (5.334) to 11 (192) 1530 (.254) is greater than 5 mm
151	14	195	1700	Precip difference from 14 (195) 1700 (.508) to 14 (195) 1715 (6.35) is greater than 5 mm

While performing routine weather station maintenance on 3 July, erroneous temperature (time 1245), relative humidity (time 1245), and precipitation (time 1315) data were recorded. These values were removed (arrays 150, 151, and 243).

Array	Day	Date	Time	Error Message
150	3	184	1245	Technician changed temp and RH 150 Array data at 3 (184) 1245
151	3	184	1315	Technician changed precip 151 Array at 3 (184) 1315
243	3	184	2400	Technician changed temp and RH 243 Array data at 3 (184) 2400

All data for daily arrays (241-244) for 15 July were removed because of program reloads and power downs for that day.

Array	Day	Date	Time	Error Message
241	15	196	2400	Technician changed 241 Array data at 15 (196) 2400
242	15	196	2400	Technician changed 242 Array data at 15 (196) 2400
243	15	196	2400	Technician changed 243 Array data at 15 (196) 2400
244	15	196	2400	Technician changed 244 Array data at 15 (196) 2400

A new ultrasonic wind sensor was installed on 15 July. All wind speed data after 1300 on this date through 31 July were discarded due to errors in the CR10X program. All wind direction values (15 minute data, hourly averages, and 24 hour averages) for this period were corrected by adding 8 degrees to each value (the wind sensor was mistakenly aligned to magnetic north rather than 'true' north).

Array	Day	Date	Time	Error Message
102	15	196	1400	Technician changed 102 Array data at 15 (196) 1400 to 31 (212) 2400
150	15	196	1315	Technician changed 150 Array data from 15 (196) 1315 to 15 (196) 1500
150	15	196	1600	Technician changed 150 Array data at 15 (196) 1600 to 31 (212) 2400
242	15	196	2400	Technician changed 242 Array data at 15 (196) 2400 to 31 (212) 2400
243	15	196	2400	Technician changed 243 Array data at 15 (196) 2400 to 31 (212) 2400
244	15	196	2400	Technician changed 244 Array data at 15 (196) 2400 to 31 (212) 2400

August 2002

The new ultrasonic wind sensor installed in July was mistakenly aligned to magnetic north rather than 'true' north until 1 October. The magnetic deviation from 'true' north for this site is 8 degrees West. All wind direction values (15 minute data, hourly averages, and 24 hour averages) prior to this date were corrected by adding 8 degrees to each value.

Erroneous values for wind speed were reported from 0000 on 1 August through 1300 on 2 August due to troubleshooting and installation of a new wind sensor in July. All wind speed data during this time were removed.

Array	Day	Date	Time	Error Message
102	1	213	100	Technician changed 102 Array from 1 (213) 100 to 2 (214) 1300
150	1	213	15	Technician changed 150 Array data from 1 (213) 15 to 2 (214) 1300
242	1	213	2400	Technician changed 242 Array from 1 (213) 2400 to 2 (214) 2400
243	1	213	2400	Technician changed 243 Array data from 1 (213) 2400 to 2 (214) 2400
244	1	213	2400	Technician changed 244 Array data from 1 (213) 2400 to 2 (214) 2400

Wind speed values from 2 August at 1300 through 26 August at 1400 were initially reported as miles per hour. The data were corrected from miles per hour to meters per second by multiplying the reported value by 0.447. All wind speed values after this time are correctly reported as meters per second.

Daily arrays (241-244) were removed for 1 August, 2 August, and 29 August because of program reloads and power downs.

Array	Day	Date	Time	Error Message

241 1 213 2400 Technician changed 241 Array from 1 (213) 2400 to 2 (214) 2400
241 29 241 2400 Technician changed 241 Array from 29 (241) 2400 to 29 (241) 2400
242 1 213 2400 Technician changed 242 Array from 1 (213) 2400 to 2 (214) 2400
242 29 241 2400 Technician changed 242 Array from 29 (241) 2400 to 29 (241) 2400
243 1 213 2400 Technician changed 243 Array data from 1 (213) 2400 to 2 (214) 2400
243 29 241 2400 Technician changed 243 Array data from 29 (241) 2400 to 29 (241) 2400
244 1 213 2400 Technician changed 244 Array data from 1 (213) 2400 to 2 (214) 2400
244 29 241 2400 Technician changed 244 Array data from 29 (241) 2400 to 29 (241) 2400

Power down occurred August 29 at 1315 to wire the YSI cable to the CR10X. Hourly data at 1400 was removed as well as daily data at 2400.

Array Day Date Time Error Message
101 29 241 1400 Technician changed 101 Array data (Hourly Averages) at 29 (241) 1400
102 29 241 1400 Technician changed 102 Array data (Hourly Average Wind Parameters) at 29 (241) 1400

The following data appear to be correct:

Array Day Date Time Error Message
150 19 231 1545 Air temp difference from 19 (231) 1545 (34.36) to 19 (231) 1600 (30.948) is greater than 3.0 degrees C
150 19 231 1600 Air temp difference from 19 (231) 1600 (30.948) to 19 (231) 1615 (27.805) is greater than 3.0 degrees C
151 30 242 245 Precip difference from 30 (242) 245 (7.62) to 30 (242) 300 (1.016) is greater than 5 mm
151 31 243 2115 Precip difference from 31 (243) 2115 (.762) to 31 (243) 2130 (19.304) is greater than 5 mm
151 31 243 2130 Precip difference from 31 (243) 2130 (19.304) to 31 (243) 2145 (7.112) is greater than 5 mm
151 31 243 2145 Precip difference from 31 (243) 2145 (7.112) to 31 (243) 2200 (1.27) is greater than 5 mm
150 26 38 1400 Pressure difference from 26 (238) 1400 (1010.3) to 29 (241) 1030 (1015.6) is greater than 5 mb

September 2002

The new ultrasonic wind sensor installed in July was mistakenly aligned to magnetic north rather than 'true' north until 1 October. The magnetic deviation from 'true' north for this site is 8? West. All wind direction values (15 minute data, hourly averages, and 24 hour averages) prior to this date were corrected by adding 8 to each value.

Relative humidity data is suspect throughout the month as indicated by RH > 100%, however there were significant rain events occuring on or around the days that showed unusually high relative humidity. It was also time for the RH/Temp sensor to be replaced according to the calibration schedule, so it is possible there was some sensor error. Data was retained but considered suspect.

The following error
messages were displayed for this time period:

Array	Day	Date	Time	Error Message
150	1	244	415	Rel hum difference from 1 (244) 415 (225.78) to 1 (244) 430 (121.26) is greater than 25%
150	1	244	430	Rel hum difference from 1 (244) 430 (121.26) to 1 (244) 445 (196.57) is greater than 25%
150	1	244	445	Rel hum difference from 1 (244) 445 (196.57) to 1 (244) 500 (129.1) is greater than 25%
150	1	244	500	Rel hum difference from 1 (244) 500 (129.1) to 1 (244) 515 (101.23) is greater than 25%
150	2	245	1745	Rel hum difference from 2 (245) 1745 (155.46) to 2 (245) 1800 (105.5) is greater than 25%
150	2	245	2115	Rel hum difference from 2 (245) 2115 (98.957) to 2 (245) 2130 (151.75) is greater than 25%
150	5	248	1445	Rel hum difference from 5 (248) 1445 (146.74) to 5 (248) 1500 (110.52) is greater than 25%
150	5	248	1500	Rel hum difference from 5 (248) 1500 (110.52) to 5 (248) 1515 (136.29) is greater than 25%
150	5	248	1515	Rel hum difference from 5 (248) 1515 (136.29) to 5 (248) 1530 (100.95) is greater than 25%

The maximum and minimum daily temperature for the following date and times were replaced with 55555 due to erroneous values (168 and 1.5):

Array	Day	Date	Time	Error Message
243	1	244	2400	Technician changed 243 Array at 1 (244) 2400
244	1	244	2400	Technician changed 244 Array at 1 (244) 2400

The following data appear to be correct:

Array	Day	Date	Time	Error Message
151	28	271	1715	Precip difference from 28 (271) 1715 (.762) to 28 (271) 1730 (7.112) is greater than 5 mm

The maximum hourly and daily wind speeds for the following dates and times were replaced with 55555 due to an erroneous value (446.96):

Array	Day	Date	Time	Error Message
102	21	264	1600	Technician changed 102 Array from 21 (264) 1600 to 21 (264) 1600
102	26	269	1300	Technician changed 102 Array from 26 (269) 1300 to 26 (269) 1300
243	21	264	2400	Technician changed 243 Array from 21 (264) 2400
243	26	269	2400	Technician changed 234 Array from 26 (269) 2400

The weather station was powered down on 12 September from approximately 1219 to 1243. Data for the 1300 hourly arrays (101 and 102) and the daily arrays (241-244) for this date were removed.

Array	Day	Date	Time	Error Message
241	12	255	2400	Technician changed 241 Array from 12 (255) 2400

242	12	255	2400	Technician changed 242 Array from 12 (255) 2400
243	12	255	2400	Technician changed 243 Array data from 12 (255) 2400
244	12	255	2400	Technician changed 244 Array data from 12 (255) 2400

October 2002

Wind direction data (15 minute data and hourly averages) prior to 1300 on 1 October were corrected to 'true' north by adding 8 to each value.

The weather station was powered down on 1 October from around 1230 to 1300 for Temp/RH sensor exchange. Data for the 1300 hourly arrays (101 and 102) and the daily arrays (241-244) for this date were removed.

An errorneous minimum relative humidity value (0 %) was recorded in array 244 on day 2. Datum was deleted, however value is suspected to be a result of new sensor installation on 10/1.

Array	Day	Date	Time	Error Message
244	2	275	2400	Technician changed 244 Array at 2 (275) 2400

The following data appear to be correct:

Array	Day	Date	Time	Error Message
151	21	294	1545	Precip difference from 21 (294) 1545 (8.128) to 21 (294) 1600 (.508) is greater than 5 mm

Inaccurate precipitation data were collected due to recalibration of the rain gauge. Precipitation data for the following date and times were removed:

Array	Day	Date	Time	Error Message
151	30	303	1415	Technician changed 151 Array from 30 (303) 1415 to 30 (303) 1515

November 2002

The maximum hourly and daily wind speed for the following date and time was replaced with 55555 due to an erroneous value (446.96):

Array	Day	Date	Time	Error Message
102	14	318	1600	Technician changed 102 Array from 14 (318) 1600 to 14 (318) 1600
243	14	318	2400	Technician changed 243 Array at 14 (3180 2400

December 2002

The maximum hourly and daily wind speed for the following date and time was replaced with 55555 due to an erroneous value (446.96):

Array	Day	Date	Time	Error Message
102	22	356	1400	Technician changed 102 Array from 22 (356) 1400 to 22 (356) 1400
243	22	356	2400	Technician changed 243 Array at 22 (356) 2400

The following data appear to be correct:

Array	Day	Date	Time	Error Message
150	23	357	1315	Rel hum difference from 23 (357) 1315 (27.274) to 23 (357) 1330 (56.224) is greater than 25%
151	20	354	900	Precip difference from 20 (354) 900 (2.286) to 20 (354) 915 (7.62) is greater than 5 mm
151	20	354	915	Precip difference from 20 (354) 915 (7.62) to 20 (354) 930 (.508) is greater than 5 mm

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.

February 2002

The following data are missing for unknown reasons:

Array	Day	Date	Time	Error Message
150	18	49	1100	Missing 150 Array (15 minute data)
150	20	51	100	Missing 150 Array (15 minute data)
101	18	49	1100	Missing 101 Array (Hourly Averages)
101	20	51	100	Missing 101 Array (Hourly Averages)
102	18	49	1100	Missing 102 Array (Hourly Average Wind Parameters)
102	20	51	100	Missing 102 Array (Hourly Average Wind Parameters)

April 2002

Due to problems related to timekeeping for the RTDM PC clock, the CR10X clock and the PC clock were synchronized several times throughout the month resulting in missing data. The following data are missing:

Array	Day	Date	Time	Error Message
150	5	95	700	Missing 150 Array data (15 minute data) from 5 (95) 700 to 5 (95) 745
150	5	95	1415	Missing 150 Array data (15 minute data) from 5 (95) 1415 to 5 (95) 1445
150	8	98	345	Missing 150 Array data (15 minute data) from 8 (98) 345 to 8 (98) 400
150	8	98	630	Missing 150 Array (15 minute data)
150	8	98	830	Missing 150 Array data (15 minute data) from 8 (98) 830 to 8 (98) 1030

150 10 100 930 Missing 150 Array (15 minute data)
150 10 100 1000 Missing 150 Array data (15 minute data) from 10 (100) 1000 to 10 (100) 1130
150 11 101 100 Missing 150 Array (15 minute data)
150 11 101 2245 Missing 150 Array (15 minute data)
150 18 108 100 Missing 150 Array (15 minute data)
150 23 113 1515 Missing 150 Array data (15 minute data) from 23 (113) 1515 to 23 (113) 1645
101 5 95 700 Missing 101 Array (Hourly Averages)
101 8 98 400 Missing 101 Array (Hourly Averages)
101 8 98 900 Missing 101 Array data (Hourly Averages) from 8 (98) 900 to 8 (98) 1000
101 10 100 1000 Missing 101 Array data (Hourly Averages) from 10 (100) 1000 to 10 (100) 1100
101 11 101 100 Missing 101 Array (Hourly Averages)
101 18 108 100 Missing 101 Array (Hourly Averages)
101 23 113 1600 Missing 101 Array (Hourly Averages)
102 5 95 700 Missing 102 Array (Hourly Average Wind Parameters)
102 8 98 400 Missing 102 Array (Hourly Average Wind Parameters)
102 8 98 900 Missing 102 Array data (Hourly Average Wind Parameters) from 8 (98) 900 to 8 (98) 1000
102 10 100 1000 Missing 102 Array data (Hourly Average Wind Parameters) from 10 (100) 1000 to 10 (100) 1100
102 11 101 100 Missing 102 Array (Hourly Average Wind Parameters)
102 18 108 100 Missing 102 Array (Hourly Average Wind Parameters)
102 23 113 1600 Missing 102 Array (Hourly Average Wind Parameters)

May 2002

The following data are missing:

Array	Day	Date	Time	Error Message
150	6	126	515	Missing 150 Array data (15 minute data) from 6 (126) 515 to 6 (126) 945
150	9	129	100	Missing 150 Array (15 minute data)
150	13	133	300	Missing 150 Array data (15 minute data) from 13 (133) 300 to 13 (133) 545
150	13	133	1300	Missing 150 Array (15 minute data)
150	15	135	1500	Missing 150 Array (15 minute data)
150	15	135	1600	Missing 150 Array (15 minute data)
150	16	136	200	Missing 150 Array (15 minute data)
150	17	137	1100	Missing 150 Array data (15 minute data) from 17 (137) 1100 to 17 (137) 1245
150	17	137	1500	Missing 150 Array data (15 minute data) from 17 (137) 1500 to 17 (137) 1530
101	6	126	600	Missing 101 Array data (Hourly Averages) from 6 (126) 600 to 6 (126) 900
101	9	129	100	Missing 101 Array (Hourly Averages)
101	13	133	300	Missing 101 Array data (Hourly Averages) from

13 (133) 300 to 13 (133) 500
101 13 133 1300 Missing 101 Array (Hourly Averages)
101 15 135 1500 Missing 101 Array data (Hourly Averages) from
15 (135) 1500 to 15 (135) 1600
101 16 136 200 Missing 101 Array (Hourly Averages)
101 17 137 1100 Missing 101 Array data (Hourly Averages) from
17 (137) 1100 to 17 (137) 1200
101 17 137 1500 Missing 101 Array (Hourly Averages)
102 6 126 600 Missing 102 Array data (Hourly Average Wind Parameters)
from 6 (126) 600 to 6 (126) 900
102 9 129 100 Missing 102 Array (Hourly Average Wind Parameters)
102 13 133 300 Missing 102 Array data (Hourly Average Wind Parameters)
from 13 (133) 300 to 13 (133) 500
102 13 133 1300 Missing 102 Array (Hourly Average Wind Parameters)
102 15 135 1500 Missing 102 Array data (Hourly Average Wind Parameters)
from 15 (135) 1500 to 15 (135) 1600
102 16 136 200 Missing 102 Array (Hourly Average Wind Parameters)
102 17 137 1100 Missing 102 Array data (Hourly Average Wind Parameters)
from 17 (137) 1100 to 17 (137) 1200
102 17 137 1500 Missing 102 Array (Hourly Average Wind Parameters)

July 2002

The following data are missing due to power downs and program reloads:
Array Day Date Time Error Message
150 15 196 1300 Missing 150 Array (15 minute data)
150 15 196 1515 Missing 150 Array data (15 minute data) from 15 (196)
1515 to 15 (196) 1545
101 15 196 1300 Missing 101 Array (Hourly Averages)
102 15 196 1300 Missing 102 Array (Hourly Average Wind Parameters)

August 2002

All data from 26 August after 1415 through 29 August at 1015 are missing due to an incomplete program reload caused by telemetry failure.
Array Day Date Time Error Message
150 26 238 1415 Missing 150 Array data (15 minute data) from
26 (238) 1415 to 29 (241) 1015
150 29 241 1315 Missing 150 Array (15 minute data)
101 26 238 1500 Missing 101 Array data (Hourly Averages) from
26 (238) 1500 to 29 (241) 1000
102 26 238 1500 Missing 102 Array data (Hourly Average Wind Parameters)
from 26 (238) 1500 to 29 (241) 1000
241 26 238 2400 Missing 241 data (Daily Averages) from 26 (238) 2400
to 28 (240) 2400
242 26 238 2400 Missing 242 data (Daily Average Wind Parameters) from
26 (238) 2400 to 28 (240) 2400
243 26 238 2400 Missing 243 data (Daily Max/Time Values) from

26 (238) 2400 to 28 (240) 2400
244 26 238 2400 Missing 244 data (Daily Min/Time Values) from
26 (238) 2400 to 28 (240) 2400

Power down occurred August 29 at 1315 to wire the YSI cable to the CR10X. Hourly data at 1400 was removed as well as daily data at 2400.

Array	Day	Date	Time	Error Message
150	29	241	1315	Missing 150 Array (15 minute data)
101	29	241	1400	Missing 101 Array data (Hourly Averages) at 29 (241) 1400
102	29	241	1400	Missing 102 Array data (Hourly Average Wind Parameters) at 29 (241) 1400

September 2002

The weather station was powered down on 12 September from approximately 1219 to 1243. The following data are missing:

Array	Day	Date	Time	Error Message
150	12	255	1230	Missing 150 Array (15 minute data)

October 2002

The weather station was powered down on 1 October from around 1230 to 1300 for sensor exchange. The following data are missing:

Array	Day	Date	Time	Error Message
150	1	274	1245	Missing 150 Array data (15 minute data) from 1 (274) 1245

The following data are missing for unknown reasons:

Array	Day	Date	Time	Error Message
101	16	289	1500	Missing 101 Array (Hourly Averages)
102	16	289	1500	Missing 102 Array (Hourly Average Wind Parameters)

13. Other Remarks

On 10/10/2023 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.

In June 2009, in order to repopulate data tables, the Centralized Data Management Office removed all -99999 from SWMP weather data files and replaced them with -99.

Wind direction data show that the wind direction was mainly out of the North-Northeast for the months of July and August, which is dissimilar to wind direction for other months. These data may be suspect or they could be indicative of true events.

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.

Rain Events:
Please note that monthly rain totals are not available during months where data was missing due to maintenance or other power down of the station.

January

Date	RainAmount (mm)
2	2.032
3	1.016
4	2.540
5	.254
6	24.130
12	5.080
13	4.572
14	12.192
15	1.016
19	2.286
20	1.016
21	4.064
22	.508
23	2.032
24	.254
25	6.350

"Monthly Total"69.3

February

Date	RainAmount (mm)
1	.254
6	.762
7	25.146
10	8.636
15	3.048
20	.254
21	2.286
23	3.048
27	.762

March

Date	RainAmount (mm)
2	21.336
3	13.208
12	4.572
13	80.772
16	2.540
20	2.286
21	1.270
26	5.334
27	2.032
30	.254

31	11.684

"Monthly Total"145.3

April

Date	RainAmount (mm)
2	21.336
3	13.208
12	4.572
13	80.772
16	2.540
20	2.286
21	1.270
26	5.334
27	2.032
30	.254
31	11.684

May

Date	RainAmount (mm)
4	3.302
5	.254
10	9.906
11	2.032
13	19.304
18	7.112
19	4.318
29	20.066
30	12.954

June

Date	RainAmount (mm)
7	4.572
14	19.558
17	1.016
18	59.944
19	1.270
20	.254
21	5.334
22	40.640
23	1.524
26	1.016
27	22.606
28	1.778
29	5.080

"Monthly Total"164.6

July

Date	RainAmount (mm)
5	6.096
6	3.302
10	11.938
11	14.478
13	7.366
14	30.988
15	13.970
20	1.270
21	.762
23	24.130
24	1.524
25	8.128
26	7.874
31	8.890

August

Date	Rainamount (mm)
4	.762
6	5.334
16	.254
19	2.032
24	11.684
29	8.382
30	48.260
31	72.898

September

Date	RainAmount (mm)
1	24.130
2	10.922
6	4.318
7	.762
9	10.668
10	5.842
12	.254
14	8.890
15	13.716
16	5.334
23	13.462
24	13.716

26	6.604
27	4.064
28	13.208

October

Date	Rainamount (mm)
10	5.080
11	23.622
13	4.064
14	.762
15	23.368
21	16.002
22	8.128
24	16.002
28	3.302
29	.254
30	1.270

November

Date	Rainamount (mm)
4	1.524
5	2.032
6	10.922
9	1.524
10	3.810
11	4.318
12	10.160
13	7.112
16	22.098
17	7.620

"Monthly Total"71.1

December

Date	RainAmount (mm)
4	4.318
5	2.794
8	.254
10	21.336
11	.508
13	27.686
19	4.826
20	11.938
24	17.272
25	.254

31 6.350

"Monthly Total"97.5