Padilla Bay (PDB) NERR Meteorological Metadata
January – December 2003
Latest Update: **October 11, 2023**

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

Contact Persons:
Dr. Douglas Bulthuis, Research Coordinator;
Email: bulthuis@padillabay.gov
Robin Cottrell, Lab Manager;
Email: cottrell@padillabay.gov

Address:
Padilla Bay NERR
10441 Bayview-Edison Road
Mount Vernon, WA 98273-9668
Phone: (360) 428-1558

2) Entry verification

a) Data Input Procedures:

The 15-minute, 1-hour average, and 24-hour data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. From January 1, 2003 through November 26,2003 the CDMO Data Logger Program (PADBA_01.csi) was loaded into the CR10X and controlled the sensors and data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The data were downloaded once a month in the field to a Toshiba laptop computer connected to the storage module using PC208W software or a Palm m515 using PConnect software, both are Campbell Scientific software. Once an entire month of data were available, the CDMO Weather Data Management Program (WDMP) was used to convert the files to an Access database. This program was developed in Visual Basic to interface with the NERRS data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The WDMP automatically inputs and converts the monthly raw data file into an Access Database. There are three main steps the WDMP performs. First, it converts the comma delimited monthly raw data file into an Access Database. Secondly, it checks the data against a predetermined set of error criteria (see Part C of this section). Finally, it produces error and summary reports. All anomalous data were investigated and are noted below in the "Anomalous Data/Suspect Data" section, along with any corrections that were preformed. The raw data and Access tables are stored on the laptop, on the desktop SWMP computer in the lab and archived on compact discs.

After November 26, 2003 at 12:00 the new CDMO data logger program

(NERR_4.CSI) was loaded into the CR10X and a larger storage module (SM4M) was installed. Data are downloaded to a Toshiba laptop computer using PC208W. The files are exported in a comma-delimited format (.DAT) and opened in Microsoft Excel for pre-processing with the EQWin format macro (EQWinFormat.xls) 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. The raw data, Excel files and EQWin database are stored on the laptop, on the desktop SWMP computer in the lab and archived on an external hard drive and compact discs.

EQwin now replaces the WDMP as the NERR MET 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.

Any anomalous data are investigated and noted in the Anomalous Data/Suspect Data section. Any missing data are noted in the Missing Data section. The most common errors/anomalies noted in 2003 are:

1. Air temp difference (over a 15 minute time period) is greater than 3.0 degrees C
2. Relative humidity difference (over a 15 minute time period) is greater than 25%
3. Wind speed is less than 0.5 m/s

All errors were double checked with other data that could support such "anomalous" weather changes and noted in Section 11.

b) Data Collection Schedule

i) Data are 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). (EQWin array 15).
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). (EQWin array 60).
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). (EQWin array 144).

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

iii) Hourly average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction, Wind Direction Standard Deviation (using Yamartino's Algorithm)

iv) Hourly total parameters: LiCor (PAR), Rainfall (mm)

v) Daily Average parameters: Date, Time, Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction

vi) Daily Total parameter: LiCor (PAR), Rainfall (mm)

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

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

c) Error/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/m^2 or less than –0.5 mmol/m^2

Time:
- 15-minute interval recorded

For all data:
- No duplicate data

3) Research objectives:

The principal objective is to record meteorological data at Padilla Bay for use in studies investigating correlations between meteorological data and water quality data, biological data, or other phenomenon in Padilla Bay and its watershed.

4) Research methods:

From January through November 26,2003 data were downloaded once a month from the weather station because the storage module could only hold 49 days of data before the datalogger began to overwrite data and the Weather Data Management Program could not organize and sort raw data files that span more than two months. In November a new program was uploaded to the CR10X that is formatted to be used with EQWin, which is a database application that is replacing the Weather Data Management Program.
The sensors are visually inspected at this time for debris or damage except for the PAR sensor that cannot be seen from the ground so is inspected less often. Due to the location of the weather station in the middle of flat farm fields the sensors require very little cleaning.

The most common problem occurs seasonally from air borne seeds partially blocking the rain gauge funnel. To mitigate this problem weeds near the site are cut before they set seed. Sensors are sent in to Campbell Scientific to be calibrated according to their maintenance schedule recommendations. On occasion very high or very low barometric pressures were checked against weather data collected in Oak Harbor on Whidbey Island.

5) Site location and character:

Padilla Bay (48º 30' N; 122º 30' W) is a shallow embayment in northern Puget Sound located in the greater Puget Sound-Georgia Basin estuary. It is an "orphaned" estuary in that the Skagit River, which formed the delta mud flats of Padilla Bay, no longer enters the bay directly. The tide flats are dominated by the eelgrass Zostera marina, which covers approximately 3,000 ha. Zostera japonica, a recent invader to the region, now covers about 350 ha of the bay. Tides are mixed semi-diurnal with a mean range of 1.55m. Salinity varies from about 15 to 30 PSU. Most of the land in the 9300 ha Padilla Bay watershed is agricultural, and is drained by four sloughs which empty into the bay. Some freshwater from the Skagit now enters Padilla Bay from the south through the Swinomish Channel which connects Padilla Bay to Skagit Bay. Other major freshwater flows into this area of the Puget Sound-Georgia Basin estuary from the Fraser and Nooksack Rivers to the north.
Padilla Bay is bordered on the east and south by flat, diked farmland; farther to the east are foothills of the Cascade Range. March Point, on the western edge of the reserve, is the site of two large oil refineries. To the north and west are the San Juan Islands of northern Puget Sound.

The weather station is located near the southeast corner (122° 28' 4.81" W; 48° 27' 50.58" N) of Padilla Bay on a 40 hectare demonstration farm that is owned by the Reserve. Flat fields that are farmed for seasonal crops surround the site. Access is off of Bayview-Edison road about 150 m down a gravel driveway.

The sensors are mounted on a 3 m tower that is secured to a concrete pad as specified by the manufacturer, Campbell Scientific. The relative humidity/temperature sensor is mounted 2 m high and the wind and PAR sensors are at the top of the tower 3 m above ground level. The tipping-bucket rain gauge is bolted to a slab of wood that is attached to the top of a 55 gallon metal drum filled with water for stability, the top of the rain gauge is1.2 m above ground level. Surrounding the site is a six foot high chain link fence for security. The weather station is about 300 m from the diked edge of the bay and approximately 4 km SE of the Bayview Channel YSI deployment site and about 4 km south of the Padilla Bay Research Reserve laboratory.

6) Data collection period:

January 1 at 00:00 to December 31 at 24:00.

7) Distribution

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

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:

None

II. Physical Structure Descriptors

9) Sensor specifications, operating range, accuracy, date of last calibration:

LiCor Quantum Sensor
Model # LI190SB
Stability: <±2% change over 1 yr
Operating Temperature: -40°C to 65°C
Sensitivity: typically 5 µA per 1000 µmoles s-1 m-2
Light spectrum wavelength: 400 to 700 nm
Date of last calibration: December 2000

Wind Sentry
Model # 03001
Wind Speed Range: 0-50 m/s; Threshold: 0.5 m/s
Wind Direction Range: 360° mechanical, 355° electrical (5° open)
Date of last calibration: December 2000

Temperature and Relative Humidity
Model #: HMP35C
Operating Temperature: -40°C to +60°C
Temperature Measurement Range: -40°C to +60°C
Temperature Accuracy: ± 0.2 °C @ 20°C
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: December 2000
New sensor (HMP45C, same specifications) installed: November 2003

Vaisala Barometric Sensor
Model # CS-105
Operating Range:
Pressure: 600-1060 mb
Temperature: -40°C to +60°C
Humidity: non-condensing
Accuracy: ±0.5 to 6.0 mb (+20°C to +60°C)
Stability: ± 0.1 mb per year
Date of Last calibration: December 2000
New sensor installed: November 2003

Fluid Isolation Technology Tipping Bucket Rain Gauge
Model #: RG-2000-C
Range: 0.01 inch per tip
Accuracy: ±1.0% (at 14? per hour)
Date of Last calibration: June 2001
Field calibration check: November 2003

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:

Sampling station:	Sampling site code:	Station code:
Padilla Bay Farm	PF	pdbpfmet

11) Anomalous Data/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

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	3	3	145	Air temp difference from 3 (3) 145 (10.103) to 3 (3) 200 (6.8001) is greater than 3.0 degrees C
102	8	8	1800	Wind speed is less than 0.5 m/s from 8 (8) 1800 to 9 (9) 700
102	13	13	2300	Wind speed is less than 0.5 m/s from 13 (13) 2300 to 15 (15) 800
102	15	15	1700	Wind speed is less than 0.5 m/s from 15 (15) 1700 to 16 (16) 1000
102	19	19	1700	Wind speed is less than 0.5 m/s from 19 (19) 1700 to 20 (20) 500
102	24	24	2100	Wind speed is less than 0.5 m/s from 24 (24) 2100 to 25 (25) 1300
102	26	26	2000	Wind speed is less than 0.5 m/s from 26 (26) 2000 to 27 (27) 1000
102	29	29	2400	Wind speed is less than 0.5 m/s from 29 (29) 2400 to 30 (30) 1300

February 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	12	43	45	Air temp difference from 12 (43) 45 (4.5801) to 12 (43) 100 (-.05412) is greater than 3.0 degrees C
102	1	32	1700	Wind speed is less than 0.5 m/s from 1 (32) 1700 to 2 (33) 1000
102	5	36	2100	Wind speed is less than 0.5 m/s from 5 (36) 2100 to 6 (37) 1200
102	9	40	2000	Wind speed is less than 0.5 m/s from 9 (40) 2000 to 10 (41) 900
102	10	41	2100	Wind speed is less than 0.5 m/s from 10 (41) 2100 to 11 (42) 900
102	26	57	2000	Wind speed is less than 0.5 m/s from 26 (57) 2000 to 27 (58) 900
101	5	36	2300	Air temp average in 1 hour data (-.40945) is greater than 15 minute maximum (-.45568) by at least 10%

March 2003

None

April 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	19	109	1545	Rel hum difference from 19 (109) 1545 (47.746) to 19 (109) 1600 (73.856) is greater than 25%

May 2003

None

June 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	4	155	500	Air temp difference from 4 (155) 500 (7.633) to 4 (155) 515 (11.252) is greater than 3.0 degrees C
150	5	156	2230	Air temp difference from 5 (156) 2230 (18.793) to 5 (156) 2245 (14.654) is greater than 3.0 degrees C
150	7	158	300	Air temp difference from 7 (158) 300 (13.218) to 7 (158) 315 (16.324) is greater than 3.0 degrees C

July 2003

None

August 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	5	217	1545	Air temp difference from 5 (217) 1545 (24.918) to 5 (217) 1600 (21.787) is greater than 3.0 degrees C
150	19	231	300	Air temp difference from 19 (231) 300 (10.853) to 19 (231) 315 (14.149) is greater than 3.0 degrees C

September 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	1	244	230	Air temp difference from 1 (244) 230 (6.8485) to 1 (244) 245 (13.109) is greater than 3.0 degrees C
150	26	269	530	Air temp difference from 26 (269) 530 (7.428) to 26 (269) 545 (10.766) is greater than 3.0 degrees C

October 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
150	6	279	1315	Air temp difference from 6 (279) 1315 (20.254) to 6 (279) 1330 (15.884) is greater than 3.0 degrees C
150	31	304	400	Air temp difference from 31 (304) 400 (.81028) to 31 (304) 415 (-2.193) is greater than 3.0 degrees C
150	6	279	1315	Rel hum difference from 6 (279) 1315 (49.533) to 6 (279) 1330 (76.903) is greater than 25%

November 2003

The following data appear to be correct:

Array	Day	Julian	Time	Error message
102	1	305	1900	Wind speed is less than 0.5 m/s from 1 (305) 1900 to 3 (307) 1300

December 2003

None

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.

November 2003

Sensors were rewired on November 5 to conform to a new program developed for the weather station. Due to difficulties loading the new program there are no data for the following sensors from 11/5 to 11/26 (bogus values were removed by the technician): temperature; relative humidity; barometric pressure and wind direction.

Array	Day	Julian	Time	Error message
101	5	309	1300	Technician changed 101 Array data from 5 (309) 1300 to 26 (330) 1100
102	5	309	1300	Technician changed 102 Array from 5 (309) 1300 to 26 (330) 1100
150	5	309	1230	Technician changed 150 Array data from 5 (309) 1230 to 12 (316) 1215

150	12	316	1245	Technician changed 150 Array data from 12 (316) 1245 to 26 (330) 1130
241	5	309	2400	Technician changed 241 Array from 5 (309) 2400 to 25 (329) 2400
242	5	309	2400	Technician changed 242 Array from 5 (309) 2400 to 25 (329) 2400
243	5	309	2400	Technician changed 243 Array data from 5 (309) 2400 to 25 (329) 2400
244	5	309	2400	Technician changed 244 Array data from 5 (309) 2400 to 25 (329) 2400

Precipitation data were removed for the following time periods because they were the result of a calibration check of the rain gauge:

Array	Day	Julian	Time	Error message
151	5	309	1145	Technician changed 151 Array at 5 (309) 1145
151	6	310	1100	Technician changed 151 Array at 6 (310) 1100

Precipitation data were removed for the following time periods because they occurred when the rain gauge tipping bucket was being cleaned:

Array	Day	Julian	Time	Error message
151	12	316	1215	Technician changed 151 Array at 12 (316) 1215
151	12	316	1245	Technician changed 151 Array at 12 (316) 1245
151	20	324	1230	Technician changed 151 Array at 20 (324) 1230

During the following period data are missing because the power was turned off for more than 15 minutes, therefore the following data were removed:

Array	Day	Julian	Time	Error message
101	12	316	1300	Missing 101 Array (Hourly data)
102	12	316	1300	Missing 102 Array (Hourly data)
241	12	316	2400	Missing 241 Array (Daily data)
242	12	316	2400	Missing 242 Array (Daily data)
243	12	316	2400	Missing 243 Array (Daily data)
244	12	316	2400	Missing 244 Array (Daily data)

On 11/5 at about 13:45 and on 11/20 at about 12:15 the technician attempted to upload a new program to the CR10X, because this erases the 5 second data for that day the one hour and 24 hour average data for those periods were deleted.
On November 26 a new program was uploaded to the CR10X so the hourly data (60) for 12:00 and the daily data (144) were 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.

November 2003

During the following period data are missing because the power was turned off for more than 15 minutes:

Array	Day	Julian	Time	Error message
150	12	316	1230	Missing 150 Array (15 minute data)

14) Other Remarks/notes

On 10/11/2023 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.

During the first week of November there were very low temperatures associated with a cold weather event with the low temperatures in the negative temperature range.

Occasionally throughout the year, prior to the installation of the new NERR_4.CSI program on 11/26/2003, wind direction values were recorded as small negative numbers (<-0.99). According to Campbell Scientific newer programs correct this to zero so these values have been changed to zero.

PAR values:
Prior to the installation of the new NERR_4.CSI program on 11/26/2003, all values less than 0 were altered in the raw data to read 0. Those values may have indicated an incorrect multiplier, calibration problems or a sensor malfunction. Because they were changed in the raw data, we cannot confirm that they are all valid data points.

Relative Humidity values:
Prior to the installation of the new NERR_4.CSI program on 11/26/2003, all values over 100% were altered in the raw data to read 100%. Those values may have indicated super saturated air, calibration problems or a sensor malfunction. Because they were changed in the raw data, we cannot confirm that they are all valid data points.

Rainfall:

January

Day	Daily Precip.
3	3.810
4	3.048
1	7.620
11	.254
12	2.700
13	4.826
14	.254
15	.254
19	.508
21	0.668
22	8.128
23	1.430
24	.762
25	3.048
26	7.366
27	1.270
29	7.366
30	6.604

31	.254
Monthly	90.2

February

Day	Daily Precip.
1	1.270
2	1.016
3	.254
5	.254
7	.254
9	.254
12	.254
15	1.524
16	7.366
17	.508
18	.254
19	2.032
20	6.858
21	4.224
22	.254
28	3.810
Monthly	40.4

March

Day	Daily Precip
2	4.318
3	.254
5	1.524
6	1.524
7	.254
8	3.302
9	3.556
10	.254
11	7.874
12	1.270
13	1.778
14	.508
15	.762
16	2.794
17	.762

19	1.016
20	3.810
21	1.270
22	4.064
23	1.778
24	.254
26	3.302
27	3.556
30	8.128
31	2.032

Monthly 59.9

April

Day	Daily Precip
1	3.048
2	.254
3	1.684
4	1.270
5	3.556
6	3.810
8	6.858
9	.254
12	1.016
13	2.540
15	.254
16	2.032
17	1.684
18	.762
19	.254
21	1.778
23	8.382
24	6.604

Monthly 66.0

May

Day	Daily Precip
3	2.540
4	.254
6	.508

14	1.778
15	1.778
16	3.556
18	.508
20	.508
21	.254
22	2.286
24	2.032
30	1.270
31	.254

Monthly 17.5

June

Day	Daily Precip
1	.254
10	1.016
13	.254
22	.254
30	3.048

Monthly 4.8

August

Day	Daily Precip
5	.508
6	2.032
9	2.794

Monthly 5.3

September

Day	Daily Precip
6	.762
7	5.080
8	1.524

10	4.572
11	1.524
14	.254
15	2.286
16	1.524
17	.254

Monthly 17.8

October

Day	Daily Precip
4	.254
6	1.176
7	.254
11	.508
12	9.398
15	3.302
16	0.066
17	6.096
18	.254
19	6.350
20	8.702
21	6.604
22	1.176
23	6.096
27	.254
28	8.128
29	5.080
30	.254

Monthly 24.0

November

Day	Daily Precip
10	3.020
13	.254
15	4.064
16	1.176
17	9.906
18	8.354
19	6.858

20	.254
21	.254
23	1.270
24	.508
25	4.572
26	1.524

Monthly	12.0