

Padilla Bay (PDB) NERR Meteorological Metadata

January – December 2001

Latest Update: **February 21, 2023**

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

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2) Entry verification

a) Data Input Procedures:

The 15-minute, 1-hour average, and 24-hour data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program (PADBA_01.csi) was loaded into the CR10X and controls the sensors and data collection schedule (see 2b of the Entry Verification section for the data collection schedule). The data is downloaded once a month in the field to a Toshiba laptop computer connected to the storage module using PC208W software supplied by Campbell Scientific.

Once an entire month of data was 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 will automatically input and convert 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 "Data anomalies/ Data corrections" 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 zip disks.

Common errors noted in the monthly error reports are "Air temp difference (over a 15 minute time period) is greater than 3.0 degrees C" and "Rel hum difference (over a 15 minute time period) is greater than 25%". All errors were double checked with other data that could support such "anomalous" weather changes and noted in Section 11.

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 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:

Data is downloaded once a month from the weather station because the storage module can only hold 49 days of data before the datalogger begins to overwrite data and the Weather Data Management Program cannot organize and sort raw data files that span more than two months. 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 can 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 (48° 30' N; 122° 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 on Padilla Farm near the southeast corner of Padilla Bay on a 40 hectare demonstration farm that is owned by the Reserve (48° 27' 50.58" N; 122° 28' 4.81" W). Flat fields that are farmed for seasonal crops surround the site. Access is off 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 is 1.2 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 10 at 13:00 to December 31 at 24:00, 2001

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 and Access data tables.

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: $<\pm 2\%$ change over 1 yr

Operating Temperature: -40°C to 65°C

Sensitivity: typically $5\ \mu\text{A}$ per $1000\ \mu\text{moles s}^{-1}\text{ m}^{-2}$

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 $+60^{\circ}\text{C}$

Temperature Measurement Range: -40°C to $+60^{\circ}\text{C}$

Temperature Accuracy: $\pm 0.2^{\circ}\text{C}$ @ 20°C

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

RH Accuracy: $\pm 2\%$ RH (0-90%) and $\pm 3\%$ (90-100%)

Uncertainty of calibration: $\pm 1.2\%$ RH

Date of Last calibration: December 2000

Vaisala Barometric Sensor

Model # CS-105

Operating Range:

Pressure: 600-1060 mb

Temperature: -40°C to $+60^{\circ}\text{C}$

Humidity: non-condensing

Accuracy: ± 0.5 to 6.0 mb ($+20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$)

Stability: $\pm 0.1\text{ mb}$ per year

Date of Last calibration: December 2000

Fluid Isolation Technology Tipping Bucket Rain Gauge

Model #: RG-2000-C

Range: 0.01 inch per tip

Accuracy: $\pm 1.0\%$ (at 14" per hour)

Date of Last calibration: June 2001

10) Coded variable indicator and variable code definitions:

Padilla Farm = PF

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.

*Please note that both Julian Day and Calendar Day are recorded and indicated as follows in the documentation below: JulD=Julian Day and CalD=Calendar Day.

January 2001

During the first nine days of the month there were no sensors installed at the weather station because they had been removed for calibration. See Missing Data Section.

On January 10th wind direction and velocity sensors, PAR sensor, and Temp/RH probe were installed and began recording at 13:00. Rainfall and barometric pressure data are missing for the entire month because these sensors were not installed. Even though no sensor was installed values for barometric pressure were recorded for the month beginning on January 10, 13:00 so these data were removed as indicated in the error report:

Array	CalD	JulD	Time	Error Message
101	10	10	1300	Technician changed pressure in 101 Array data at 10 (10) 1300 to 31 (31) 2400
150	10	10	1300	Technician changed pressure in 150 Array data at 10 (10) 1300 to 31 (31) 2400
151	10	10	1300	Technician changed rainfall in 151 Array at 10 (10) 1300
241	10	10	2400	Technician changed pressure in 241 Array data at 10 (10) 2400 to 31 (31) 2400
243	10	10	2400	Technician changed pressure in 243 Array data at 10 (10) 2400 to 31 (31) 2400
244	10	10	2400	Technician changed pressure in 244 Array data at 10 (10) 2400 to 31 (31) 2400

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	23	23	230	Air temp difference from 23 (23) 230 (2.9835) to 23 (23) 245 (6.4784) is greater than 3.0 degrees C
150	23	23	515	Air temp difference from 23 (23) 515 (6.3185) to 23 (23) 530 (2.8082) is greater than 3.0 degrees C
150	23	23	715	Air temp difference from 23 (23) 715 (.06429) to 23 (23) 730 (3.3337) is greater than 3.0 degrees C
150	23	23	715	Rel hum difference from 23 (23) 715 (91.736) to 23 (23) 730 (66.183) is greater than 25%

February 2001

The rain gauge and barometric pressure sensor were installed on February 13th at About 13:30. It was later discovered that the rain gauge was not working properly so rain data is missing for this month.

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	12	43	1945	Air temp difference from 12 (43) 1945 (3.4633) to 12 (43) 2000 (.23131) is greater than 3.0 degrees

For the following time period barometric pressure data were removed because no sensor was installed:

Array	CalD	JulD	Time	Error Message
150	1	32	15	Technician changed barometric pressure in 150 Array data from 1 (32) 15 to 13 (44) 1330
101	1	32	100	Technician changed barometric pressure in 101 Array data from 1 (32) 100 to 13 (44) 1400
241	1	32	2400	Technician changed barometric pressure in 241 Array from 1 (32) 2400 to 13 (44) 2400
243	1	32	2400	Technician changed barometric pressure in 243 Array data from 1 (32) 2400 to 13 (44) 2400
244	1	32	2400	Technician changed barometric pressure in 244 Array data from 1 (32) 2400 to 13 (44) 2400

March 2001

The rain gauge was not working properly so rain data is missing for this month. See Missing data section.

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	24	83	330	Air temp difference from 24 (83) 330 (4.4802) to 24 (83) 345 (7.7234) is greater than 3.0 degrees C

April 2001

The rain gauge was not working properly so the erroneous data that were recorded were deleted and replaced with 55555's for the following dates:

Array	CalD	JulD	Time	Error Message
151	17	107	1145	Technician changed 151 Array from 17 (107) 1145
151	22	112	15	Technician changed 151 Array from 22 (112) 15
151	29	119	830	Technician changed 151 Array from 29 (119) 830
151	29	119	1145	Technician changed 151 Array from 29 (119) 1145
151	29	119	1230	Technician changed 151 Array from 29 (119) 1230
151	29	119	1330	Technician changed 151 Array from 29 (119) 1330
151	30	120	800	Technician changed 151 Array from 30 (120) 800

151 30 120 1100 Technician changed 151 Array from 30 (120) 1100 to 30 (120) 1115

On April 3rd a new program was downloaded to the weather station resulting in missing 5 second data during the following date and times:

Array	CalD	JulD	Time	Error Message
101	3	93	1400	Technician changed entire 101 Array data from 3 (93) 1400
102	3	93	1400	Technician changed entire 102 Array from 3 (93) 1400
241	3	93	2400	Technician changed entire 241 Array from 3 (93) 2400
242	3	93	2400	Technician changed entire 242 Array from 3 (93) 2400
243	3	93	2400	Technician changed entire 243 Array data from 3 (93) 2400
244	3	93	2400	Technician changed entire 244 Array data from 3 (93) 2400

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	10	100	2345	Air temp difference from 10 (100) 2345 (1.904) to 10 (100) 2400 (6.5316) is greater than 3.0 degrees C
150	11	101	745	Air temp difference from 11 (101) 745 (9.8176) to 11 (101) 800 (6.5758) is greater than 3.0 degrees C
150	11	101	745	Rel hum difference from 11 (101) 745 (41.384) to 11 (101) 800 (71.469) is greater than 25%
150	15	105	2130	Rel hum difference from 15 (105) 2130 (85.226) to 15 (105) 2145 (57.42) is greater than 25%

May 2001

The rain gauge was not working properly so erroneous data were removed for the following dates; rain data is missing for this month:

Array	CalD	JulD	Time	Error Message
151	8	128	1315	Technician changed 151 Array from 8 (128) 1315
151	12	132	2045	Technician changed 151 Array from 12 (132) 2045

June 2001

The rain gauge was not working properly so bogus data were removed for the following dates; rain data is missing for this month:

Array	CalD	JulD	Time	Error Message
151	7	158	1330	Technician changed 151 Array from 7 (158) 1330 to 7 (158) 1345

The rain gauge was removed and returned to the manufacturer again for calibration.

July 2001

There was no rain gauge installed from July 1 at 00:00 to July 10 at 13:00 so rain data is missing for this time period. When the rain gauge was installed July 10th at 13:00 the tipper was tested for accuracy; the data generated during testing was removed as indicated below:

Array	CalD	JulD	Time	Error Message
151	10	191	1300	Technician changed 151 Array from 10 (191) 1300

August 2001

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	2	214	1515	Air temp difference from 2 (214) 1515 (20.876) to 2 (214) 1530 (17.41) is greater than 3.0 degrees C
151	22	234	1545	Precip difference from 22 (234) 1545 (6.604) to 22 (234) 1600 (.762) is greater than 5 mm

September 2001

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	2	245	1400	Air temp difference from 2 (245) 1400 (22.407) to 2 (245) 1415 (19.372) is greater than 3.0 degrees C
150	13	256	115	Air temp difference from 13 (256) 115 (10.67) to 13 (256) 130 (14.794) is greater than 3.0 degrees C
150	29	272	1600	Air temp difference from 29 (272) 1600 (20.992) to 29 (272) 1615 (16.753) is greater than 3.0 degrees C

The following data were changed to zero:

Array	CalD	JulD	Time	Error Message
150	9	252	745	Wind direction is greater than 360 or less than 0 on 9 (252) 745 (-.09491)
150	11	254	2000	Wind direction is greater than 360 or less than 0 on 11 (254) 2000 (-.09485)

October 2001

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	3	276	2345	Air temp difference from 3 (276) 2345 (9.7624) to 3 (276) 2400 (6.5151) is greater than 3.0 degrees C
150	4	277	915	Rel hum difference from 4 (277) 915 (30.671) to 4 (277) 930 (64.138) is greater than 25%

The following data were changed to zero:

Array	CalD	JulD	Time	Error Message
150	5	278	200	Wind direction is greater than 360 or less than 0 on 5 (278) 200 (-.095)

November 2001

Sometime between down loading data at the weather station on November 8 and December 5 the funnel on the rain gauge became clogged and was dislodged. Since there was no rain data recorded after November 15 and there was a storm event that began on November 14 the funnel was probably dislodged by high winds sometime on the 14th when for three hours from 19:00 to 22:00 the wind speed averaged over 12.6 m/s (~28 mph) with gusts up to 19.25 m/s (~43 mph). Rain data on November 14 and December 5 should be considered incomplete and all rain data between these dates is missing.

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	19	323	215	Air temp difference from 19 (323) 215 (7.0957) to 19 (323) 230 (10.417) is greater than 3.0 degrees C
150	19	323	215	Rel hum difference from 19 (323) 215 (78.89) to 19 (323) 230 (52.816) is greater than 25%

December 2001

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	22	356	615	Air temp difference from 22 (356) 615 (4.756) to 22 (356) 630 (.94672) is greater than 3.0 degrees C
150	27	361	115	Air temp difference from 27 (361) 115 (2.7693) to 27 (361) 130 (6.3958) is greater than 3.0 degrees C

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.

January 2001

During the first nine days of the month there were no sensors installed at the weather station because they had been removed for calibration.

Array	CalD	JulD	Time	Error Message
150	1	1	15	Missing 150 Array data (15 minute data) from 1 (1) 15 to 10 (10) 1245
101	1	1	100	Missing 101 Array data (Hourly Averages) from 1 (1) 100 to 10 (10) 1200
102	1	1	100	Missing 102 Array data (Hourly Average Wind Parameters) from 1 (1) 100 to 10 (10) 1200

241	1	1	2400	Missing 241 data (Daily Averages) from 1 (1) 2400 to 9 (9) 2400
242	1	1	2400	Missing 242 data (Daily Average Wind Parameters) from 1 (1) 2400 to 9 (9) 2400
243	1	1	2400	Missing 243 data (Daily Max/Time Values) from 1 (1) 2400 to 9 (9) 2400
244	1	1	2400	Missing 244 data (Daily Min/Time Values) from 1 (1) 2400 to 9 (9) 2400

Rainfall and barometric pressure data are missing for the entire month because these sensors were not installed, they had been returned to the manufacturers for calibration.

February 2001

The rain gauge and barometric pressure sensor were installed on February 13th just after 13:30. It was later discovered that the rain gauge was not working properly so rain data is missing for this month.

March 2001

The rain gauge was not working properly so rain data is missing for this month.

April 2001

Rain data is missing for this month. See anomalous data section.

Station was powered down.

Array	CalD	JulD	Time	Error Message
150	3	93	1245	Missing 150 Array data (15 minute data) from 3 (93) 1245 to 3 (93) 1300

May 2001

There is no rain data for this month. See anomalous data section.

June 2001

Rain data is missing for this month. See anomalous data section.

The rain gauge was removed and sent back to the manufacturer after discovering it had not been calibrated in January as when it was first sent in.

July 2001

There was no rain gauge installed from July 1 at 00:00 to July 10 at 13:00 so rain data is missing for this time period.

August 2001
None

September 2001
None

October 2001
None

November 2001
Sometime between down loading data at the weather station on November 8 and December 5 the funnel on the rain gauge became clogged and was dislodged. Because there was no rain data recorded after November 15 and there was a storm event that began on November 14 the funnel was probably dislodged by high winds sometime on the 14th when for three hours from 19:00 to 22:00 the wind speed averaged over 12.6 m/s (~28 mph) with gusts up to 19.25 m/s (~43 mph). Rain data on November 14 and December 5 should be considered incomplete and all rain data between these dates is missing.

December 2001
None

13) Other Remarks/notes

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.

On January 10th the sensors were reinstalled after being calibrated. On April 3rd a new program was downloaded that contained a new multiplier for the LiCor PAR sensor. It was later discovered to be incorrect because the output value on the certificate of calibration from LiCor was in different units, millivolts, than the usual microamps. The millivolt output was already corrected for the resistor so when that value was put into our equation for the multiplier the resistor value was factored in a second time. All of the PAR data from April 3rd at 13:15 through the end of the year was corrected by multiplying all 15-minute data by a correction factor of .604 (the ratio of the correct/incorrect multiplier) then the data was recompiled using the Weather Data Management 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.

Rain Events:

January

Date	RainAmount (mm)
none	

February

Date	RainAmount (mm)
14	.508
15	1.270
16	3.810
21	.508
22	1.270
23	.254

Monthly Total 7.6

March

Date	RainAmount (mm)
none	

April

Date	RainAmount (mm)
none	

May

Date	RainAmount (mm)
none	

June

Date	RainAmount (mm)
none	

July

Date	RainAmount (mm)
15	.254
16	.254
17	1.778
27	4.826
28	6.350

Monthly Total 13.5

August

Date	Rainamount (mm)
3	.508
21	17.272
22	29.718
23	.254
31	.254

Monthly Total 48.0

September

Date	RainAmount (mm)
1	.762
3	.254
6	.254
21	4.318

25	.508
26	10.668
28	.254

Monthly Total 17.0

October

Date	Rainamount (mm)
8	.254
10	9.906
12	5.588
13	4.064
14	3.810
16	5.334
18	19.558
19	10.160
21	10.922
22	9.398
23	3.048
24	17.018
25	3.810
26	20.320
27	5.588
28	.254
30	2.794
31	10.160

Monthly Total 142.0

November

Date	Rainamount (mm)
1	.254
4	2.794
10	.254
11	.508
12	1.270
13	6.350
14	17.526

Monthly Total 29.0

December

Date	RainAmount (mm)
5	1.016
6	6.604

7	.508
8	7.366
9	1.016
10	5.334
11	2.286
12	5.080
13	22.352
14	6.096
15	1.524
16	7.874
18	4.318
19	1.016
20	.254
28	1.016
31	5.842

Monthly Total 79.5