Wells (WEL) National Estuarine Research Reserve Meteorological Metadata
January-December 2002
Latest Update: **October 10, 2023**

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

Contact Persons:
Dr. Michele Dionne, Research Coordinator
E-mail: dionne@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 136
Jim Dochtermann, SWMP Technician / Research Associate
E-mail: jdoc@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 104
Scott Orringer, Research Associate
E-mail: sorringer@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 112

Address:
Wells NERR
342 Laudholm Farm Road
Wells, ME 04090
Phone: (207)646-1555
FAX: (207)646-2930

2) Entry verification:

a) Data Input Procedures

The 15-minute, 1-hour average, and 24-hour meteorological data were downloaded from each instrument on the weather station to a Campbell Scientific CR10X datalogger. The CDMO Data Logger Program 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 CR10X then interfaced with the PC208W software supplied by Campbell Scientific. This software was located on a computer to which the data was uploaded (every 15 minutes) via a short haul modem to a computer located at the Coastal Ecology Center. The data was saved as a raw data file (LF_RAW.dat) onto a separate hard drive and backed up.

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 and 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. Any anomalous data were investigated and are noted below in Anomalous Data section. Any data corrections that were performed are noted in the Data Correction section below.

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 relative humidity change of greater than 25% in a 15 minute period. All errors of these types were double checked with other data that could support such "anomalous" weather changes and noted in the sections that follow. Both raw data files and Access databases were saved to the DCP server with daily tape back-up.

Jim Dochtermann error checked and compiled the 2002 weather data.

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 long-term meteorological data for Wells, in order to supplement SWMP water quality YSI data and research data, and to observe any environmental changes or trends over time.

4) Research Methods

The Campbell Scientific weather station (CR10X datalogger) is programmed to measure parameters every 5 seconds to produce both hourly and daily averages of measurements, including air temperature, relative humidity, barometric pressure, LiCor (solar radiation), rainfall, wind speed and wind direction. An instantaneous sample is taken every 15 minutes and that data is stored in array 150. Data are downloaded to a desktop computer from the datalogger via the SC32A interface. On-site weather conditions are measured to verify the accuracy of the readings by the sensors. Sensors on the weather station are inspected for damage or debris periodically. Sensors are sent back to Campbell Scientific for calibration at a minimum of every two years.

The data is analyzed using the Weather Data Management Program where a database and error report is create for each month from the raw data files. The error reports are used to assist in the QA/QC of the data. Data is then edited in Access and recompiled in the WDMP. All edits and errors are documented in the metadata.

5) Site location and character

The Wells National Estuarine Research Reserve is located in York County, within the Town of Wells, on the coast of southern Maine and faces the Atlantic Ocean. The Wells NERR is approximately 31 km (20 miles) south of Portland, Maine and 110 km (70 miles) north of Boston, Massachusetts. The Reserve encompasses 1,690 acres along the Gulf of Maine coastline of tidally flushed wetlands, riparian and transitional upland fields and forests within the Little River Estuary and the larger Webhannet River Estuary. Both estuaries arise in the sandy glacial outwash plain about eight miles inland. Both rivers empty into Wells Bay, a sandy basin stretching for approximately ten miles along the Atlantic coast. Bordering each river's inlet are double spit barrier beaches attached to the mainland. The backbarrier system is approximately 5 sq. km and is composed of large intertidal marshes (predominantly S. patens and S. alterniflora), intertidal sand and mud flats, and tidal channels. The watershed for the Webhannet River estuary covers an area of 35 sq. km and has a total of 6 streams, brooks or creeks, which enter the estuary. These tributaries flow across sand and gravel deposits near the headwaters and the impermeable sandy mud of the Presumpscot Formation in the lower reaches. The Webhannet River is connected to the ocean via Wells Inlet, which has a

spring tidal prism of 28,200,000 cub. m (Ward 1993). The force and volume of tidal action affect the salinity level of both rivers. In the Wells region, the annual mean wave height is almost 20 inches. The estuarine system is dominated by semi-diurnal tides having a range of 8.5 to 9.8 feet. The volume of freshwater influx into both estuaries is moderate to low (on the order of 0.5 cubic meters/second), especially in the summer, because of the rivers' relatively small drainage areas and the presence of deep glacial deposits. The relatively low flows from these two rivers taken in with the 20 inch per year average runoff of the area surrounding the estuaries combine to form a freshwater flow that is dwarfed by tidal flushing. Twelve-foot tides dwarf the freshwater flow into the Webhannet estuary, which has a drainage area of 14.1 square miles. The Webhannet estuary, fed by both Blacksmith and Depot Brooks, is adjacent to the harbor and greatly developed land. It offers a valuable opportunity for comparison with the relatively pristine Little River estuary. The land use of the Webhannet estuary include a total of 15% for wetland, fresh water, and tidal marsh; a total of 63.7 % for woodland; and a total of 18.6% for developed land (compared to a total of 5.7% development in the Little River estuary) (WNERR RMA 1996; Holden 1997).

The following information regarding annual weather patterns in the area was supplied by Maine State Climatologist Professor Gregory A. Zielinski extracted from "Monthly Station Normals of Temperature,Precipitation, Heating and Cooling Degree Days 1971-2000", Climatography of the United States No. 81, National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, NC. and "Daily Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971-2000", Climatography of the United States No. 84: "Average monthly temperatures range from 21.6F in January to 66.7F in July with daily highs averaging just below freezing in January and lows around 11F. Daily highs in July average around 76F and daily lows around 57F. The sea breeze often keeps daily highs lower during the summer than areas inland. Annual average temperature is 44.6F. Annual precipitation is 47.07 inches, including the water equivalent of snowfall, with monthly averages ranging from 3.01 inches in July to 4.77 inches in October. August receives just 3.02 inches on average. Annual snowfall is around 66 inches." According to Zielinski, "cool ocean temperatures keep down the number of afternoon showers and especially thunderstorms resulting in low summer precipitation amounts."

The weather station is located (43 deg 20.244 Latitude, 70 deg 33.000 Longitude) on a 32' telephone pole surrounded by mowed grass. The temperature and humidity probes are located on the north side of the pole at a height of 10'. To the NW of the pole is the Coastal Ecology Center, a 20' high, 111' long building, at a distance of 37', running NE/SW. Further to the NW (153' from the pole) is the library, in a 25' high wing of the barn. The barn itself is 223' from the station and runs NE/SW. It is 38' high and is the largest obstruction

in the area. The rain gauge is located 9' southeast of the weather station pole and is situated on a post with the top of the funnel is 10' from the ground.

There are three SWMP water quality sampling sites in the Webhannet River estuary. These are located at the Head of Tide, Mile Road, and at the Inlet. The tidal range at each of these sites is 2.6-2.9 meters.

The Head of Tide site is located 4 miles south of the Wells Reserve, just downstream of the Webhannet Falls (freshwater) and 10 feet east of Route One (43 deg 17' 54.25227" Latitude, 70 deg 35' 13.82728" Longitude). Route One is used heavily with traffic all year, especially during the summer tourist months. This site has soft mud, sand, and a rocky substrate, and the low and high tide depth is relatively shallow. The salinity range here is 0-31 ppt, with a mean of 3.6 ppt. These headwaters of the Webhannet are relatively undeveloped. This site is located just 10 feet east of the Route One bridge, and is our roving site.

The Mile Road site is located 3.5 miles south of the Wells Reserve, on Mile Road roughly 300' north of the bridge (N43 deg 18.300' Latitude,W 70 deg 34.583 Longitude). This site has soft mud and a rocky substrate, and the low and high tide depth is relatively shallow. The salinity range here is 3.6-33.4 ppt, with a mean of 27.0 ppt.

The Inlet site is located 1.5 miles south of the Wells Reserve, at the Wells Harbor pier (43 deg 19' 12.44804" Latitude, 70 deg 33' 13.82728" Longitude). The mouth of the Webhannet estuary forms an extensive wetland/salt marsh area which is surrounded by development. Wells Harbor, which was most recently dredged in 1971, has moorings for approximately 200 commercial fishing and recreational boats. The mouth of the river flows between two jetties to the Atlantic Ocean. This channel was dredged in 1974. This site has a predominately sand substrate and is characterized by strong current during incoming and outgoing tides. The maximum depth of the Inlet site is 3 meters. The salinity range here is 7-35 ppt, with a mean of 31 ppt. The Inlet site is heavily impacted at the Wells Harbor dock and is our long-term monitoring site.

There is one SWMP water quality sampling site located at the Little River Mouth site .4 miles east of the Wells Reserve. Due to problems with heavy sediment movement in the inlet of the Little River, we were forced to relocate the site (see Sec 14-Other Remarks/Notes). The first location (N 43 deg 20.176 Latitude, W 70 deg 32.497 Longitude) was located in the main channel of the river, just inland of a spit, beside a bank. The second location (N 43 deg 20.083 Latitude, W 70 deg 32.585 Longitude) was located 1/8 mi. southwest of the first site, within an inlet, just inland of a spit. The second site was located in an area of much lower current than the first site and often drains completely during low tides. It was also placed within a pool next to incipient low marsh peat that retains calm water during low tides. Both sites were abandoned (see Sec 14-Other Remarks/Notes).

6) Data collection period
Weather data has been collected at the Wells NERR since December 1996. Data was collected for the entire year in 2002.

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

WELLS NATIONAL ESTUARINE RESEARCH RESERVE RESEARCH AT THE RESERVE for 2002(Please visit our website: www.wellsreserve.org/research.htm for further information on the Wells NERR research program):

The Research Program at the Wells NERR conducts and supports research, monitoring, workshops, and research/resource management planning of relevance at local, regional and national levels. The overall aim of our work is to produce science-based information needed to sustain or

restore Gulf of Maine coastal habitats and resources, especially those found in salt marsh estuaries and watersheds. During 2000-2001 twenty-three different studies (involving 79 scientists, students, and staff from the Reserve, 26 academic institutions and 19 resource management groups) focused on several related themes:1) the quality of water resources in salt marsh estuaries and watersheds 2) land conservation strategies to protect coastal watersheds 3) factors controlling salt marsh accretion, erosion and plant community vigor 4) the value of salt marsh as habitat for fish, shellfish and birds, and 5) restoration of salt marsh habitat degraded through human actions.

Estuarine Water Resource Quality

Water quality is monitored continuously at several stations with automated instruments as part of a NERRS systemwide monitoring program, as well as bimonthly at 15-20 stations through our WET volunteer monitoring program. The WET program also monitors two important biological parameters: fecal coliform bacterial contamination (an indicator of human health risk) and phytoplankton productivity (an indicator of estuarine health). These data have 1) allowed us to identify several bacterial "hot spots" that we will be working to eliminate, 2) are used to identify and open areas safe for shellfishing, and 3) have uncovered a relation between tides and low dissolved oxygen (a stressful condition for marine life) that needs further study. Our water quality work has contributed to the designation of several Priority Watersheds in coastal Southern Maine by the Maine Department of Environmental Protection.

Coastal Conservation Strategies

In response to requests for support from the conservation community to increase the quantity, quality and ecological integrity of conserved lands in our region research staff organize and facilitate meetings, workshops, and communications for 18 partner conservation groups. A key element of the Project is the Conservation Resource Center, a Reserve staffed GIS facility with a growing database able to provide maps of property, natural features and other data needed to develop effective conservation goals and strategies. The Project is nearing completion of conservation lands maps for 13 Southern Maine coastal towns, and is undertaking an initiative to develop coastal watershed conservation strategies for 12 coastal watersheds within these towns. The Reserve has a particular interest in educating communities about the ecologic and economic benefits of land conservation, especially along estuarine and riverine shorelines.

Salt Marsh Habitats and Communities

Factors that control the dynamics and vigor of salt marsh plant

communities and marsh peat formation consequently determine the ability of a salt marsh to persist in the face of sea level rise. Through a combination of experimental manipulations and long term monitoring, a number of multi-year studies are currently producing data to answer questions concerning the sustainability of salt marsh habitats in this region. These studies are looking at nutrient-plant relations, plant community responses to physical and hydrologic disturbance, and the relative contribution of short-term natural events (e.g. storms) and human activities (dredging, tidal restriction) on patterns of sediment accretion and erosion. The Reserve's marshes and beaches are already among the best studied sites in the U.S. with regard to long term accretion and erosion (over thousands of years).

HABITAT VALUE FOR FISH, SHELLFISH AND BIRDS

The Reserve combines long-term monitoring with periodic surveys and short-term experiments to identify species and measure trends and changes in populations of fish, crustaceans, clams and birds. We have 10 years of data on upland and shore birds with which to assess the status of resident and migratory avian populations, and 8 years of wading bird data that we use as a gross level indicator of salt marsh health, which appears to be stable. Our periodic larval, juvenile and adult fish surveys have produced the best available data for fish utilization of salt marsh estuaries in the Gulf of Maine. In the coming year we plan to develop a long-term monitoring program for finfish that will be coordinated with other sites within the Gulf of Maine and along the east coast. Since 1994 we have been conducting surveys and field experiments to look at the survival and growth of hatchery seed, juvenile and adult softshell clam with regard to habitat characteristics and predation by the invasive green crab.

Salt Marsh Degradation and Restoration

Salt marsh ecosystems in the Gulf of Maine have sustained themselves in the face of sea-level rise and other natural disturbances for nearly five thousand years. Since colonial times large areas of salt marsh (up to half of the total area) have been lost through diking, draining and filling. Today, the remaining marshland is fairly well protected from outright destruction, but during the past 100 years, and especially since the 1950's, salt marshes have been divided into fragments by roads, causeways, culverts and tide gates. Most of these fragments have severely restricted tidal flow, leading to chronic habitat degradation and greatly reduced access for fish and other marine species. Since 1991, the Wells Reserve has been studying the impact of these restrictions on salt marsh functions and values, and the response of salt marshes to tidal restoration. We have been working to promote an awareness of the damage being done and the benefits of salt marsh restoration throughout the Gulf of Maine.

Research Program Update:
In addition to the Reserve-sponsored projects outlined above, numerous visiting investigators will be involved in on-site research. Topics include: the effects of land use, sea level, and climate on estuarine productivity; the relationship between soil nutrients and plant community patterns; the influence of soil salinity on plant community interactions; the effect of tidal restriction on marsh peat accretion; the comparative ecology of fringe marshes and back barrier marshes; habitat use by upland birds, and the ecology of lyme disease.

• The Wells NERR Research Dept. is working on the following projects: "Ecological processes, energy pathways, and the impact of human activities on Maine marsh-estuarine secondary production: a salt marsh panne model". We used stable isotopic tracers (15N additions and naturally abundant 13C) coupled with secondary production measurements (nekton, invertebrates) to track energy flow on the high marsh surface in southern Maine salt marsh systems. The project is still under way.

"Ecological Functions of Fringing Salt Marshes Susceptible to Oil Spills in Casco Bay, Maine". We examined the ecological function of 9 different fringing marsh systems in Casco Bay that ranged from undisturbed to disturbed. Physical parameters measured included sedimentation rates, total suspended solids, and tidal range. Biological parameters included primary production, macroinvertebrate community composition and secondary production (4cm sediment cores), and resident and transient nekton community composition (fyke net). The project is still under way.

"BENTHIC HABITAT CORRELATES OF JUVENILE FISH DISTRIBUTION IN THE BIGELOW BIGHT AND ADJACENT ESTUARIES: LINKAGES BETWEEN FISH, HABITATS, SUBSTRATE AND HUMAN ACTIVITY". This project was a collaboration between the Wells N.E.R.R. and several members of the local fishing community. Through the use of beam trawls, gill nets, fish traps, van veen ponar, and a sediment profile imager (SPI camera), we are attempting to correlate benthic habitat type to juvenile groundfish an dinvertebrate assemblages in estuarine, nearshore, and offshore habitat. Stations were also established near dredge spoil dump sites as well as sweage outflow to determine the impacts of human activity on the coast to benthic habitat. The project is still under way.

• The Wells NERR Research Dept. also completed the work on the following project:
In partnership with the York Rivers Association and the Town of York, the Wells Reserve conducted a survey of the York River watershed. In

this survey, volunteers looked for sources of pollution within a 250-foot buffer of the river and its tributaries (erosion, trash and debris and runoff from roads and lawns could have a negative impact on water quality). Most pollutants entering water bodies come from such undefined sources. Therefore, this type of survey is the best way to begin to address the problems of pollution in a water body. The idea of the project was to work with the community and landowners to help them understand the problems that come from these types of pollution and learn activities they might be able to do on their own land that would help prevent this pollution from entering the water. The results of the survey will become part of a Watershed Management Plan to improve and restore the water quality of the York River.

•The Wells NERR Research Dept. is involved with the following CICEET Projects (information on CICEET can be found on the website http://www.ciceet.unh.edu):

I. Project Title: Estuarine Responses to Dredging: Analysis of Sedimentary and Morphological Change in Back Barrier Marsh to Aid Local Management and Develop a Regional Management Tool Principal Investigator (s): Michele Dionne, Wells NERR, ME; Duncan Fitzgerald, Boston University; Joe Kelley, University of Maine; David Burdick and Larry Ward, University of New Hampshire

Management Issue: Coastal management tool for assessing the impacts of dredging in estuaries. Project Summary: An adequate supply of sediment is essential for maintaining salt marshes. Human activities, such as channel dredging and tidal restriction due to road construction, can alter water flows in estuaries and result in dramatic changes in salt marsh sediment supply, affecting the speed of salt marsh erosion. The objective of this project is to determine the impact of dredging and tidal restriction on salt marshes in the Wells NERR. A digital coastal management guide will be created on CD ROM, providing coastal managers with useful conceptual models for predicting the impacts of dredging and other activities that affect water flow and sediment deposition in salt marshes.

II. Project Title: Microbial Source Tracking in Two Southern Maine Watersheds. A two year project written by Maine Sea Grant associate Kristen Whiting-Grant, and funded by Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), involving Wells NERR, UNH Jackson Estuarine Lab (JEL), USM Muskie School, AmeriCorps and the Maine Conservation Corps. We are pioneering the use in Maine of genetic analysis as a means of determining the source species associated with bacterial contamination in the Webhannet and Little River Estuary. Volunteers collect water samples from streams and the estuaries, staff test for and isolate E. coli. At JEL, a genetic technique (ribotyping) creates a genetic fingerprint of the bacteria

which is compared to known sources. The project is still underway.

Wells NERR Past Graduate Research Fellowships (GRF's):
1)Patrick Ewanchuck and Mark Bertness, Ph.D.; Brown University
Project Title: Patch persistence and seedling dynamics in a Southern Maine marsh and the process and pattern in western Atlantic salt marsh plant communities: a biogeographical perspective.
2)Lindsay Whitlow, University of Michigan
Project Title: Integration of individual behavior and community dynamics to determine mechanisms by which the invasive green crab impacts populations of the native soft-shell clam.
3)Pamela Morgan, University of New Hampshire
Project Title: Functions and values of salt marshes in northern New England: a comparison of fringing marshes and back barrier marshes.

Other Onsite Research:
Michele Dionne, Wells NERR, Nancy McReel, Chuck Lubelczyk
Project Title: Effect of herbivory by deer on forest regeneration

June Ficker
Project Title: Monitoring avian productivity and survivorship

Outside Researchers:
•Theresa Theodose, Ph.D., University of Southern Maine
Project Title: Relationships between soil nutrient availability and species composition of a high salt marsh in southern Maine.

•David Burdick, Ph.D. and Roelof Boumans, Ph.D.
University of New Hampshire, University of Maryland
Project Title: Sediment dynamics in salt marshes: functional assessment of accretionary biofilters

•Peter Rand, M.D., Chuck Lubelczyk, Robert Smith, M.D.
Maine Medical Center
Project Title: Ecological determinants of the spread of the tick vector of Lyme disease and other pathogens.

II. Physical Structure Descriptors

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

CSI LiCor Quantum Sensor
Model # LI190SB
Stability: <±2% change over one year
Operating Temperature: -40 to 65°C
Sensitivity: typically 5 µA per 1000µmoles s-1 m-2
Light spectrum wavelength: 400 to 700 nm

Date of last calibration: 10-17-01

CSI Wind Sentry
Model # 03001
Range: 0-50 m/s; 360° mechanical
Date of last calibration: 10-17-01

CSI Temperature and Relative Humidity
Model #: HMP45C
Operating Temperature: -40 to +60°C
Temperature Measurement Range: -40 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: 10-17-01

CSI Barometric Sensor
Model #PTB101B
Operating Range: Pressure: 600-1060 mb
Temperature: -40 to +60C
Humidity: non-condensing
Accuracy: ±0.5 to 6.0 mb (+20 to 60C)
Stability: ± 0.1 mb per year
Date of Last calibration: 10-17-01

Met One Tipping Bucket Rain Gauge
Model #: 385/385M
Range: 0.1 mm
Accuracy: ±0.5%<0.5"(1.27 cm)/hr rate
±2.0%<3.0"(7.62 cm)/hr rate
Date of Last calibration: 10-17-01

10) Coded variable code definitions

LF = Laudholm Farm

11) Data anomalies/Data corrections

Arrays:
During 2022 all pre-2007 weather data were revisited by the CDMO. Historically those datasets included 15 minute, hourly (60), and daily data arrays (144). As directed by the NERRS Data Management Committee, the CDMO removed the hourly and daily data arrays leaving only the 15 minute data to make the entire NERRS SWMP weather dataset consistent in its reporting. All references to the 60 and 144 arrays were left in the metadata document as they may still provide valuable information, but users should be aware that they are largely no longer relevant. The updated datasets were uploaded to the database and made available through the various data applications at www.nerrsdata.org/get/landing.cfm throughout the fall of 2022.

January 2002

The following erroneous data was caused by an undocumented
and unexplained glitch or power down that caused the CR10X to reset and
record erroneous hourly averages and daily averages. Data was edited
accordingly for arrays 101 and 102 at time 1600 and arrays 241, 242, 243,
and 244 at time 2400, for 9 (9):

Array	CalD	JulD	Time	Error Message
101	9	9	1600	Technician changed 101 Array data from 9 (9) 1600 to 9 (9) 1600
102	9	9	1600	Technician changed 102 Array from 9 (9) 1600 to 9 (9) 1600
241	9	9	2400	Technician changed 241 Array from 9 (9) 2400 to 9 (9) 2400
242	9	9	2400	Technician changed 242 Array from 9 (9) 2400 to 9 (9) 2400
243	1	1	2400	Technician changed 243 Array data from 1 (1) 2400 to 15 (15) 2400
244	1	1	2400	Technician changed 244 Array data from 1 (1) 2400 to 15 (15) 2400

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

February 2002

The following erroneous data was caused by an undocumented
and unexplained glitch or power down that caused the CR10X to reset and
record erroneous hourly averages and daily averages. Data was edited
accordingly for arrays 101 and 102 at time 1200 and arrays 241, 242, 243,
and 244 at time 2400, for 2 (2):

Array	CalD	JulD	Time	Error Message
101	2	33	1200	Technician changed 101 Array data from 2 (33) 1200 to 2 (33) 1200
102	2	33	1200	Technician changed 102 Array from 2 (33) 1200 to 2 (33) 1200
241	2	33	2400	Technician changed 241 Array from 2 (33) 2400 to 2 (33) 2400
242	2	33	2400	Technician changed 242 Array from 2 (33) 2400 to 2 (33) 2400
243	2	33	2400	Technician changed 243 Array data at 2 (33) 2400 to 28 (59) 2400
244	2	33	2400	Technician changed 244 Array data at 2 (33) 2400 to 28 (59) 2400

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	16	47	1500	Air temp difference from 16 (47) 1500 (11.599) to 16 (47) 1515 (8.46) is greater than 3.0 degrees C
150	19	50	2215	Rel hum difference from 19 (50) 2215 (47.384) to 19 (50) 2230 (77.498) is greater than 25%

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

March 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	1	60	1415	Air temp difference from 1 (60) 1415 (3.8026) to 1 (60) 1430 (6.8123) is greater than 3.0 degrees C
150	14	73	1215	Air temp difference from 14 (73) 1215 (14.514) to 14 (73) 1230 (10.903) is greater than 3.0 degrees C
150	14	73	1345	Air temp difference from 14 (73) 1345 (13.449) to 14 (73) 1400 (10.175) is greater than 3.0 degrees C
150	27	86	1645	Air temp difference from 27 (86) 1645 (8.9386) to 27 (86) 1700 (5.6627) is greater than 3.0 degrees C
150	14	73	1215	Rel hum difference from 14 (73) 1215 (31.132) to 14 (73) 1230 (60.456) is greater than 25%
150	28	87	1915	Rel hum difference from 28 (87) 1915 (34.303) to 28 (87) 1930 (61.651) is greater than 25%
150	31	90	645	Rel hum difference from 31 (90) 645 (37.111) to 31 (90) 700 (71.08) is greater than 25%

The following erroneous data was caused by an undocumented
and unexplained glitch or power down that caused the CR10X to reset and
record erroneous hourly averages and daily averages. Data was edited
accordingly for arrays 101 and 102 at time 2100 and arrays 241,242, 243,
and 244 at time 2400, for 20 (79):

Array	CalD	JulD	Time	Error Message
101	20	79	2100	Technician changed 101 Array data from 20 (79) 2100 to 20 (79) 2100
102	20	79	2100	Technician changed 102 Array from 20 (79) 2100 to 20 (79) 2100
241	20	79	2400	Technician changed 241 Array from 20 (79) 2400 to 20 (79) 2400
242	20	79	2400	Technician changed 242 Array from 20 (79) 2400 to 20 (79) 2400
243	1	60	2400	Technician changed 243 Array data at 1 (60) 2400 to 31 (90) 2400
244	1	60	2400	Technician changed 244 Array data at 1 (60) 2400 to 31 (90) 2400

The following data is suspect due to the offset being output when there was no wind recorded. This datum can be interpreted as 0:

Array	CalD	JulD	Time	Error Message
150	15	74	1830	Wind direction is greater than 360 or less than 0 on 15 (74) 1830 (-.095)

All LiCor data for entire month is incorrect due to a wrong multiplier in the csi program. All 15 min (150), 1 hour (105) and daily averages (245), and max (243) and min (244) data have been deleted and replaced with 55555.

April 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	10	100	45	Air temp difference from 10 (100) 45 (11.279) to 10 (100) 100 (14.889) is greater than 3.0 degrees C
150	13	103	1215	Air temp difference from 13 (103) 1215 (23.297) to 13 (103) 1230 (18.69) is greater than 3.0 degrees C
150	13	103	1230	Air temp difference from 13 (103) 1230 (18.69) to 13 (103) 1245 (22.561) is greater than 3.0 degrees C
150	13	103	1245	Air temp difference from 13 (103) 1245 (22.561) to 13 (103) 1300 (16.286) is greater than 3.0 degrees C
150	13	103	1300	Air temp difference from 13 (103) 1300 (16.286) to 13 (103) 1315 (13.216) is greater than 3.0 degrees C
150	14	104	500	Air temp difference from 14 (104) 500 (8.6712) to 14 (104) 515 (11.88) is greater than 3.0 degrees C
150	16	106	2230	Air temp difference from 16 (106) 2230 (9.674) to 16 (106) 2245 (18.7) is greater than 3.0 degrees C
150	17	107	715	Air temp difference from 17 (107) 715 (25.441) to 17 (107) 730 (21.296) is greater than 3.0 degrees C
150	17	107	1030	Air temp difference from 17 (107) 1030 (24.953) to 17 (107) 1045 (31.226) is greater than 3.0 degrees C
150	17	107	1330	Air temp difference from 17 (107) 1330 (32.928) to 17 (107) 1345 (18.718) is greater than 3.0 degrees C
150	17	107	1330	Rel hum difference from 17 (107) 1330 (26.689) to 17 (107) 1345 (63.455) is greater than 25%

The following erroneous data was caused by an undocumented and unexplained glitch or power down that caused the CR10X to reset and record erroneous hourly averages and daily averages. Data was edited accordingly for arrays 101 and 102 at time 2200 and arrays 241,242, 243, and 244 at time 2400, for 25 (115):

Array	CalD	JulD	Time	Error Message
101	25	115	2200	Technician changed 101 Array data from 25 (115) 2200 to 25 (115) 2200
102	25	115	2200	Technician changed 102 Array from

25 (115) 2200 to 25 (115) 2200
241 25 115 2400 Technician changed 241 Array from
25 (115) 2400 to 25 (115) 2400
242 25 115 2400 Technician changed 242 Array from
25 (115) 2400 to 25 (115) 2400
243 1 91 2400 Technician changed 243 Array data
at 1 (91) 2400 to 30 (120) 2400
244 1 91 2400 Technician changed 244 Array data
at 1 (91) 2400 to 30 (120) 2400

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

May 2002

The following data appear to be correct:
Array CalD JulD Time Error Message
150 4 124 1945 Air temp difference from 4 (124) 1945 (12.459)
to 4 (124) 2000 (8.2576) is greater than 3.0 degrees C
150 5 125 800 Air temp difference from 5 (125) 800 (12.097)
to 5 (125) 815 (15.431) is greater than 3.0 degrees C
150 7 127 2315 Air temp difference from 7 (127) 2315 (10.267)
to 7 (127) 2330 (13.543) is greater than 3.0 degrees C
150 7 127 2345 Air temp difference from 7 (127) 2345 (14.144)
to 7 (127) 2400 (17.286) is greater than 3.0 degrees C
150 8 128 1300 Air temp difference from 8 (128) 1300 (18.24)
to 8 (128) 1315 (14.099) is greater than 3.0 degrees C
150 16 136 1045 Air temp difference from 16 (136) 1045 (19.999)
to 16 (136) 1100 (16.924) is greater than 3.0 degrees C
150 16 136 1215 Air temp difference from 16 (136) 1215 (20.249)
to 16 (136) 1230 (15.371) is greater than 3.0 degrees C
150 16 136 2000 Air temp difference from 16 (136) 2000 (17.066)
to 16 (136) 2015 (20.207) is greater than 3.0 degrees C
150 24 144 1215 Air temp difference from 24 (144) 1215 (26.558)
to 24 (144) 1230 (23.547) is greater than 3.0 degrees C
150 24 144 1630 Air temp difference from 24 (144) 1630 (17.245)
to 24 (144) 1645 (21.121) is greater than 3.0 degrees C
150 24 144 1645 Air temp difference from 24 (144) 1645 (21.121)
to 24 (144) 1700 (26.399) is greater than 3.0 degrees C
150 28 148 945 Air temp difference from 28 (148) 945 (16.191)
to 28 (148) 1000 (13.116) is greater than 3.0 degrees C
150 31 151 1615 Air temp difference from 31 (151) 1615 (16.045)
to 31 (151) 1630 (19.319) is greater than 3.0 degrees C
150 4 124 1945 Rel hum difference from 4 (124) 1945 (35.418)
to 4 (124) 2000 (80.006) is greater than 25%

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

June 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	5	156	2300	Air temp difference from 5 (156) 2300 (16.537) to 5 (156) 2315 (19.741) is greater than 3.0 degrees C
150	5	156	2400	Air temp difference from 5 (156) 2400 (20.131) to 6 (157) 15 (16.787) is greater than 3.0 degrees C
150	6	157	700	Air temp difference from 6 (157) 700 (14.318) to 6 (157) 715 (18.994) is greater than 3.0 degrees C
150	10	161	1330	Air temp difference from 10 (161) 1330 (23.963) to 10 (161) 1345 (20.825) is greater than 3.0 degrees C
150	18	169	1130	Air temp difference from 18 (169) 1130 (20.825) to 18 (169) 1145 (17.753) is greater than 3.0 degrees C
150	27	178	1945	Air temp difference from 27 (178) 1945 (25.823) to 27 (178) 2000 (22.82) is greater than 3.0 degrees C
150	30	181	2330	Air temp difference from 30 (181) 2330 (16.131) to 30 (181) 2345 (19.806) is greater than 3.0 degrees C

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

July 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	1	182	1045	Air temp difference from 1 (182) 1045 (25.841) to 1 (182) 1100 (22.163) is greater than 3.0 degrees C
150	1	182	1915	Air temp difference from 1 (182) 1915 (22.103) to 1 (182) 1930 (25.38) is greater than 3.0 degrees C
150	2	183	930	Air temp difference from 2 (183) 930 (25.43) to 2 (183) 945 (22.025) is greater than 3.0 degrees C
150	2	183	1115	Air temp difference from 2 (183) 1115 (27.432) to 2 (183) 1130 (23.489) is greater than 3.0 degrees C
150	2	183	1400	Air temp difference from 2 (183) 1400 (27.957) to 2 (183) 1415 (23.017) is greater than 3.0 degrees C
150	8	189	1200	Air temp difference from 8 (189) 1200 (29.212) to 8 (189) 1215 (24.336) is greater than 3.0 degrees C
150	8	189	1600	Air temp difference from 8 (189) 1600 (26.961) to 8 (189) 1615 (31.033) is greater than 3.0 degrees C
150	13	194	1700	Air temp difference from 13 (194) 1700 (29.691) to 13 (194) 1715 (26.62) is greater than 3.0 degrees C

150 14 195 1015 Air temp difference from 14 (195) 1015 (25.03) to 14 (195) 1030 (21.624) is greater than 3.0 degrees C
150 16 197 1700 Air temp difference from 16 (197) 1700 (24.432) to 16 (197) 1715 (20.626) is greater than 3.0 degrees C
150 18 199 1415 Air temp difference from 18 (199) 1415 (28.739) to 18 (199) 1430 (23.4) is greater than 3.0 degrees C
150 22 203 2230 Air temp difference from 22 (203) 2230 (21.256) to 22 (203) 2245 (24.796) is greater than 3.0 degrees C
150 29 210 930 Air temp difference from 29 (210) 930 (24.239) to 29 (210) 945 (29.442) is greater than 3.0 degrees C
150 31 212 1530 Air temp difference from 31 (212) 1530 (32.794) to 31 (212) 1545 (28.325) is greater than 3.0 degrees C
150 31 212 1630 Air temp difference from 31 (212) 1630 (30.944) to 31 (212) 1645 (25.474) is greater than 3.0 degrees C
150 13 194 1515 Rel hum difference from 13 (194) 1515 (59.947) to 13 (194) 1530 (29.706) is greater than 25%
151 15 196 1815 Precip difference from 15 (196) 1815 (5.334) to 15 (196) 1830 (.254) is greater than 5 mm

All LiCor data for entire month is incorrect due to a wrong multiplier in the csi program. All 15 min (150), 1 hour (105) and daily averages (245), and max (243) and min (244) data have been deleted and replaced with 55555.

August 2002

The following data appear to be correct:

Array CalD JulD Time Error Message
150 1 213 600 Air temp difference from 1 (213) 600 (20.534) to 1 (213) 615 (23.602) is greater than 3.0 degrees C
150 5 217 1445 Air temp difference from 5 (217) 1445 (28.479) to 5 (217) 1500 (33.152) is greater than 3.0 degrees C
150 14 226 930 Air temp difference from 14 (226) 930 (31.025) to 14 (226) 945 (27.676) is greater than 3.0 degrees C
150 14 226 2115 Air temp difference from 14 (226) 2115 (22.314) to 14 (226) 2130 (25.988) is greater than 3.0 degrees C
150 16 228 1915 Air temp difference from 16 (228) 1915 (24.574) to 16 (228) 1930 (27.784) is greater than 3.0 degrees C
150 22 234 1730 Air temp difference from 22 (234) 1730 (21.446) to 22 (234) 1745 (24.518) is greater than 3.0 degrees C
150 27 239 1030 Air temp difference from 27 (239) 1030 (25.092) to 27 (239) 1045 (21.817) is greater than 3.0 degrees C
150 27 239 1030 Rel hum difference from 27 (239) 1030 (41.993) to 27 (239) 1045 (67.091) is greater than 25%

All LiCor data for entire month is incorrect due to a wrong multiplier in the csi program. All 15 min (150), 1 hour (105) and daily averages (245), and max (243) and min (244) data have been deleted and replaced with 55555.

September 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	10	253	2030	Air temp difference from 10 (253) 2030 (20.051) to 10 (253) 2045 (24.462) is greater than 3.0 degrees C
150	21	264	1200	Air temp difference from 21 (264) 1200 (22.16) to 21 (264) 1215 (26.5) is greater than 3.0 degrees C
150	21	264	1230	Air temp difference from 21 (264) 1230 (27.368) to 21 (264) 1245 (24.228) is greater than 3.0 degrees C
151	23	266	215	Precip difference from 23 (266) 215 (.254) to 23 (266) 230 (5.588) is greater than 5 mm
151	23	266	245	Precip difference from 23 (266) 245 (6.096) to 23 (266) 300 (.762) is greater than 5 mm

The following precipitation data was deleted due to the technician cleaning and testing the rain gauge, causing erroneous data to be collected:

Array	CalD	JulD	Time	Error Message
151	10	253	1245	Technician changed 151 Array at 10 (253) 1245

All LiCor data for entire month is incorrect due to a wrong multiplier in the csi program. All 15 min (150), 1 hour (105) and daily averages (245), and max (243) and min (244) data have been deleted and replaced with 55555.

October 2002

The following data appear to be correct:

Array	CalD	JulD	Time	Error Message
150	16	289	130	Air temp difference from 16 (289) 130 (5.5594) to 16 (289) 145 (8.7038) is greater than 3.0 degrees C

The following erroneous data was caused by an undocumented and unexplained glitch or power down that caused the CR10X to reset and record erroneous hourly averages and daily averages. Data was edited accordingly for arrays 101 and 102 at time 300 and arrays 241,242, 243, and 244 at time 2400, for 15 (288):

Array	CalD	JulD	Time	Error Message
101	15	288	300	Technician changed 101 Array data from 15 (288) 300 to 15 (288) 300
102	15	288	300	Technician changed 102 Array from 15 (288) 300 to 15 (288) 300
241	15	288	2400	Technician changed 241 Array from 15 (288) 2400 to 15 (288) 2400
242	15	288	2400	Technician changed 242 Array from

15 (288) 2400 to 15 (288) 2400
243 1 274 2400 Technician changed 243 Array data
at 1 (274) 2400 to 31 (304) 2400
244 1 274 2400 Technician changed 244 Array data
at 1 (274) 2400 to 31 (304) 2400

The following erroneous data was caused by an undocumented
and unexplained glitch or power down that caused the CR10X to reset and
record erroneous hourly averages and daily averages. Data
was edited accordingly for array 101 at time 300 and arrays 241, 243,
244 at time 2400, for 22 (295):
Array CalD JulD Time Error Message
101 22 295 1500 Technician changed 101 Array data from 22
(295) 1500 to 22 (295) 1500
102 22 295 1500 Technician changed 102 Array data from 22
(295) 1500 to 22 (295) 1500
241 22 295 2400 Technician changed 241 Array from 22 (295)
2400 to 22 (295) 2400
242 22 295 2400 Technician changed 242 Array from 22 (295)
2400 to 22 (295) 2400
243 22 295 2400 Technician changed 243 Array from 22 (295)
2400 to 22 (295) 2400
244 22 295 2400 Technician changed 244 Array from 22 (295)
2400 to 22 (295) 2400

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

November 2002

The following data appear to be correct:
Array CalD JulD Time Error Message
150 6 310 945 Air temp difference from 6 (310) 945 (4.8817)
to 6 (310) 1000 (7.9594) is greater than 3.0 degrees C
150 11 315 1745 Air temp difference from 11 (315) 1745 (13.993)
to 11 (315) 1800 (17.469) is greater than 3.0 degrees C

The following erroneous Air_TempC data was caused by an undocumented
and unexplained glitch or power down that caused the CR10X to reset and
record erroneous hourly averages and daily averages. All data were edited
accordingly for array 101, 102, 241, 242, 243, 244 on day 2 (306) and day 17 (321):
Array CalD JulD Time Error Message
101 2 306 1200 Technician changed 101 Array data from 2 (306)
1200 to 2 (306) 1200
102 2 306 1200 Technician changed 102 Array data from 2
(306) 1200 to 2 (306) 1200

241 2 306 2400 Technician changed 241 Array from 2 (306) 2400 to 2 (306) 2400
242 2 306 2400 Technician changed 242 Array from 2 (306) 2400 to 2 (306) 2400
243 2 306 2400 Technician changed 243 Array from 2 (306) 2400 to 2 (306) 2400
244 2 306 2400 Technician changed 244 Array from 2 (306) 2400 to 2 (306) 2400
101 17 321 2000 Technician changed 101 Array data from 17 (321) 2000 to 17 (321) 2000
102 17 321 2000 Technician changed 102 Array data from 17 (321) 2000 to 17 (321) 2000
241 17 321 2400 Technician changed 241 Array from 17 (321) 2400 to 17 (321) 2400
242 17 321 2400 Technician changed 242 Array from 17 (321) 2400 to 17 (321) 2400
243 17 321 2400 Technician changed 243 Array from 17 (321) 2400 to 17 (321) 2400
244 17 321 2400 Technician changed 244 Array from 17 (321) 2400 to 17 (321) 2400

The following data is suspect due to the offset being output when there was no wind recorded. The following datum can be interpreted as 0:
Array CalD JulD Time Error Message
150 5 309 2115 Wind direction is greater than 360 or less than 0 on 5 (309) 2115 (-.095)

The following 15 min and 1 hour data for wind speed is suspect due to a possible but undocumented, sensor freeze or malfunction. Daily averages, and max and min data are also suspect:
Array CalD JulD Time Error Message
102 17 321 700 Wind speed is less than 0.5 m/s from 17 (321) 700 to 18 (322) 300

All LiCor data for entire month is incorrect due to a wrong multiplier in the csi program. All 15 min (150), 1 hour (105) and daily averages (245), and max (243) and min (244) data have been deleted and replaced with 55555.

December 2002

The following data appear to be correct:
Array CalD JulD Time Error Message
150 31 365 945 Air temp difference from 31 (365) 945 (2.8979) to 31 (365) 1000 (-.11374) is greater than 3.0 degrees C

The following data is suspect due to the offset being output when there was no wind recorded. The following datum can be interpreted as 0:
Array CalD JulD Time Error Message

150 17 351 615 Wind direction is greater than 360 or less than 0 on 17 (351) 615 (-.09513)

The following erroneous Air_TempC data was caused by an undocumented and unexplained glitch or power down that caused the CR10X to reset and record erroneous hourly averages and daily averages. All data were edited accordingly for arrays 101, 102, 241, 242, 243, 244 on day 1 (335), 2 (336), 24 (358) and 31 (365):

Array	CalD	JulD	Time	Error Message
101	1	335	700	Technician changed 101 Array data from 1 (335) 700 to 1 (335) 700
102	1	335	700	Technician changed 102 Array data from 1 (335) 700 to 1 (335) 700
101	2	336	1700	Technician changed 101 Array data from 2 (336) 1700 to 2 (336) 1700
102	2	336	1700	Technician changed 102 Array data from 2 (336) 1700 to 2 (336) 1700
101	24	358	400	Technician changed 101 Array data from 24 (358) 400 to 24 (358) 400
102	24	358	400	Technician changed 102 Array data from 24 (358) 400 to 24 (358) 400
101	31	365	1800	Technician changed 101 Array data from 31 (365) 1800 to 31 (365) 1800
102	31	365	1800	Technician changed 102 Array data from 31 (365) 1800 to 31 (365) 1800
241	1	335	2400	Technician changed 241 Array from 1 (335) 2400 to 2 (336) 2400
242	1	335	2400	Technician changed 242 Array from 1 (335) 2400 to 2 (336) 2400
243	1	335	2400	Technician changed 243 Array from 1 (335) 2400 to 2 (336) 2400
244	1	335	2400	Technician changed 244 Array from 1 (335) 2400 to 2 (336) 2400
241	24	358	2400	Technician changed 241 Array from 24 (358) 2400 to 24 (358) 2400
242	24	358	2400	Technician changed 242 Array from 24 (358) 2400 to 24 (358) 2400
243	24	358	2400	Technician changed 243 Array from 24 (358) 2400 to 24 (358) 2400
244	24	358	2400	Technician changed 244 Array from 24 (358) 2400 to 24 (358) 2400
241	31	365	2400	Technician changed 241 Array data at 31 (365) 2400 to 31 (365) 2400
242	31	365	2400	Technician changed 242 Array data at 31 (365) 2400 to 31 (365) 2400
243	31	365	2400	Technician changed 243 Array data at 31 (365) 2400 to 31 (365) 2400
244	31	365	2400	Technician changed 244 Array data at 31 (365)

2400 to 31 (365) 2400

All LiCor data for entire month is incorrect due to a wrong multiplier
in the csi program. All 15 min (150), 1 hour (105) and daily averages (245),
and max (243) and min (244) data have been deleted and replaced with 55555.

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 2002

The following missing data is missing due to the raw data file being
lost in desktop computer breakdown:
Array CalD JulD Time Error Message
150 16 16 1515 Missing 150 Array data (15 minute data)
from 16 (16) 1515 to 31 (31) 2400
101 16 16 1600 Missing 101 Array data (Hourly Averages)
from 16 (16) 1600 to 31 (31) 2400
102 16 16 1600 Missing 102 Array data (Hourly Average
Wind Parameters) from 16 (16) 1600 to 31 (31) 2300
241 16 16 2400 Missing 241 data (Daily Averages) from
16 (16) 2400 to 30 (31) 2400
242 16 16 2400 Missing 242 data (Daily Average Wind
parameters) from 16 (16) 2400 to 30 (31) 2400
243 16 16 2400 Missing 243 data (Daily Max/Time Values)
from 16 (16) 2400 to 30 (31) 2400
244 16 16 2400 Missing 244 data (Daily Min/Time Values)
from 16 (16) 2400 to 30 (31) 2400

February 2002
The following missing data is missing due to the raw data file being
lost in desktop computer breakdown:
Array CalD JulD Time Error Message
150 1 32 30 Missing 150 Array data (15 minute data)
from 1 (32) 30 to 2 (33) 1115
101 1 32 100 Missing 101 Array data (Hourly Averages)
from 1 (32) 100 to 2 (33) 1100
102 1 32 100 Missing 102 Array data (Hourly Average
Wind Parameters) from 1 (32) 100 to 2 (33) 1100

March 2002
None

April 2002
None

May 2002
None

June 2002
None

July 2002
None

August 2002
The following missing data may be due to a glitch in the CR10X datalogger:

Array	CalD	JulD	Time	Error Message
150	29	241	300	Missing 150 Array data (15 minute data) from 29 (241) 300 to 31 (243) 2400
101	29	241	300	Missing 101 Array data (Hourly Averages) from 29 (241) 300 to 31 (243) 2400
102	29	241	300	Missing 102 Array data (Hourly Average Wind Parameters) from 29 (241) 300 to 31 (243) 2400
241	29	241	2400	Missing 241 data (Daily Averages) from 29 (241) 2400 to 31 (243) 2400
242	29	241	2400	Missing 242 data (Daily Average Wind Parameters) from 29 (241) 2400 to 31 (243) 2400
243	29	241	2400	Missing 243 data (Daily Max/Time Values) from 29 (241) 2400 to 31 (243) 2400
244	29	241	2400	Missing 244 data (Daily Min/Time Values) from 29 (241) 2400 to 31 (243) 2400

September 2002
None

October 2002
None

November 2002
None

December 2002
None

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.

Rain Events: (Monthly totals for January, February and August are not available or not complete due to missing data.)

January

Date	Rain Amount (mm)
7	5.080
8	.762
10	.762

13	22.860
14	1.016
16	.508

Monthly Total n/a (see missing data section)

February

Date	Rain Amount (mm)
10	6.350
11	8.636
17	3.556
21	10.922
27	13.716
28	.254

Monthly Total 43.4 mm (see missing data section)

March

Date	Rain Amount (mm)
3	26.670
10	13.208
13	1.016
16	2.032
18	1.524
19	.762
20	16.764
21	.762
25	1.016
26	17.018
27	9.144
30	4.318

Monthly Total 94.2 mm

April

Date	Rain Amount (mm)
1	15.240
3	8.382
10	.508
13	6.350
14	.254
15	10.922
20	1.270
22	2.286
25	26.670
26	3.810
28	9.906

29	6.350

Monthly Total 91.9 mm

May

Date	Rain Amount (mm)
2	17.272
9	4.064
10	2.794
12	8.382
13	40.132
14	11.684
18	18.796
28	1.016
29	1.270
31	21.082

Monthly Total 126.5 mm

June

Date	Rain Amount (mm)
1	.254
2	1.778
4	.254
5	9.906
6	12.954
7	9.906
9	.254
11	6.096
12	22.606
15	20.574
16	1.016
17	3.048
22	14.224
23	1.016
24	.254
27	5.334
28	8.128

Monthly Total 117.6 mm

July

Date	Rain Amount (mm)
6	.762
9	11.684

10	.254
15	6.350
19	1.016
20	.762
23	31.242
28	2.032
	Monthly Total 54.1 mm

August

Date	Rain Amount (mm)
1	3.556
5	3.302
6	.254
13	.254
20	1.016
22	.508
23	.254
24	2.540
25	.254
	Monthly Total 11.9 mm (see missing data section)

September

Date	Rain Amount (mm)
2	.508
3	2.794
4	.508
5	.254
11	1.778
15	11.684
16	23.622
23	28.956
26	.254
27	15.240
28	5.334
	Monthly Total 90.9 mm

October

Date	Rain Amount (mm)
2	.508
3	2.794
4	.508
5	.254
11	1.778

15	11.684
16	23.622
23	28.956
26	.254
27	15.240
28	5.334

Monthly Total 96.8 mm

November

Date	Rain Amount (mm)
4	.508
6	23.114
11	2.032
12	12.446
13	9.398
16	2.032
17	28.956
18	4.826
19	.254
21	.762
22	7.620
23	.762
25	1.524
27	1.270

Monthly Total 95.5 mm

December

Date	Rain Amount (mm)
2	.254
3	.254
12	8.890
14	41.402
20	26.416
25	1.778
26	1.270
31	.762

Monthly Total 81.0 mm