

## **Sage Lot Meteorology Station Metadata**

Last updated: September 2019

### A. Background/Purpose

The Sage Lot Meteorology (MET) Station, including photosynthetically active radiation (PAR), total solar radiation, precipitation, and wind sensors, was installed in February 2013 as part of the “Bringing Wetlands to Market” (BWM) NERRS Science Collaborative Project, awarded in Fall 2011. The temperature probes were installed in May 2013 for the same project. However, we continue to maintain the meteorology station, after the completion of the BWM project, for current and future research projects located at the Sage Lot marsh which might benefit from the data and environmental context. The minimal costs associated with the replacement loggers and sensors come out of the NOAA Research Budget.

From February 2013 to September 2015, the meteorology station collected data at 10-minute intervals. However, starting in September 2015, the recording interval for the MET and temperature probes was changed to 15 minutes for easier comparison of data with the System-Wide Monitoring Program water quality and meteorology datasets, whose data are both collected at 15-minute intervals. Additionally, the temperature probes were initially set to 5-minute intervals when installed in May 2013 to capture high resolution of temperature change. Starting in February 2014, the temperature probes were set to 10-minute intervals because higher recording frequency was unnecessary.

### B. Downloading and Maintenance Protocols

The loggers are checked every one to three months. During these routine checks, the data is downloaded onto a Dell XFR (“tough book”) laptop using the Onset Hoboware software. The date and time of the download and current battery power are noted in a Rite N’ Rain field book. The time of launch is also recorded as well as any other observations regarding logger or sensor function.

Starting in 2016, a handheld Kestrel can be taken out during checks. By selecting the current status readings in the Hoboware software, the wind speed and temperature can be compared between the handheld Kestrel and the Onset weather station. All data (including PAR, total solar radiation, and precipitation) should be notated during the current status readings check. Lastly, the precipitation gauge is checked to see if bird droppings have collected in the funnel and tipping bucket. If so, these are cleaned out with a paper towel.

The batteries are normally replaced once a year in December. This ensures the best battery power for the coldest part of the year when batteries are most likely to fail. Desiccant packs are also

replaced when batteries are exchanged. Desiccant packs are reused; dried in drying oven for 2 days at 60°C. Battery terminals should be sprayed with WD40 to prevent corrosion. Also, silicon caulking is placed over the entire seam of the lid to prevent rainwater or salt spray from entering the logger.

The total solar radiation sensor and PAR sensors are wiped clean with DI and Kimwipes in the spring (sometime in April through June). Starting in 2016, the precipitation gauge calibration (level must be plum) have been checked annually in June.

### C. Logger and Sensor Details

#### “MET Station”

Data Logger Model: Onset Micro Station Data Logger, #H21-002

SN: 1248044                      Install Date: 02/14/2013                      Removed: 10/25/2013

SN: 10438286                      Install date: 12/05/2013                      Removed: 11/01/2018

PAR Sensor: Onset PAR Smart Sensor, # S-LIA-M003

SN: 1224428                      Installed: 02/14/2013                      Removed: 11/01/2018

Solar Radiation Sensor: Onset Silicon Pyranometer Smart Sensor

SN: 1218699                      Installed: 02/14/2013                      Removed: 11/01/2018

Wind Sensor:

Model: Unknown

SN: 1249375                      Installed: 02/14/2013                      Removed: 06/30/2016

Model: Onset Davis Wind Speed and Direction Smart Sensor, #S-WCF-M003

SN: 10959102                      Installed: 6/30/2016                      Removed: 11/01/2018

Precipitation Gauge: Onset 0.01” Rain Gauge Smart Sensor, #S-RGA-M002(10m cable?)

SN: 10247309                      Installed: 02/14/2013                      Removed 05/07/2019

#### “Temp Probes”

Data Logger Model: Onset Micro Station Data Logger, #H21-002

SN: 10337314                      Install Date: 05/22/2013                      Removed: 05/07/2019

Air Temperature Sensor: Smart Temp Sensor (12-bit with 2m cable), #S-TMB-M002

SN: 10335000                      Install Date: 05/22/2013                      Removed: 05/07/2019

Surface Temperature Sensor: Smart Temp Sensor (12-bit with 2m cable), #S-TMB-M002

SN: 10335005                      Install Date: 05/22/2013                      Removed: 05/07/2019

15cm Soil Depth Temp: Smart Temp Sensor (12-bit with 2m cable), #S-TMB-M002

SN: 10334998                      Install Date: 05/22/2013                      Removed: 11/01/2018

30cm Soil Depth Temp: Smart Temp Sensor (12-bit with 2m cable), #S-TMB-M002

SN: 10334990                      Install Date: 05/22/2013                      Removed: 06/30/2016

SN: 10962017                      Install Date: 06/30/2016                      Removed: 05/07/2019

#### D. QAQC Protocols

The stations are checked for data logging errors during the routine download checks. If a problem is noted, the data are checked for erroneous data points. For example, in 2015 there was an issue with the 30cm temperature probe; it would record a data point outside acceptable range. Those data points were discovered in the dataset and removed.

The MET and Temp probe datasets are generally updated within 3-6 months of the last download. During Daylight Savings, the time is adjusted to Eastern Standard Time (GMT-5:00) in the master dataset. A row is left blank in the compiled datasets to mark when downloads occur.

All data are converted to the following units in the compiled files:

Wind speed/Gust speed: meters per second (m/s)

Wind direction: degrees (°; no conversion necessary)

Total Solar Radiation: Watts per square meter ( $W/m^2$ ; no conversion necessary)

Photosynthetically active radiation:  $\mu E$  or  $\mu mol$  per square meter per second ( $\mu mol/m^2/s$ ; no conversion necessary) *Note: multiply SWMP Carriage House data by 1.11 to convert to  $\mu mol/m^2/s$*

Rain: inches (in)

Air and soil temperature: degrees Fahrenheit (°F)

#### E. Metadata Notes

In general, wind direction data is unreliable at Sage Lot station. The bearings on the Onset wind sensors cannot handle the high saline environment in the salt marsh. The bearings corrode causing the weathervane to stick and lose its orientation. For more reliable wind direction data, refer to Doc Taylor's data from the Menauhant Yacht Club, available on Data Garrison (<https://datagarrison.com/#1>). The login information for the Menauhant station is as follows:

User ID: ocean

Password: beach

Wind direction data (along with wind speed, barometric pressure, air temperature, relative humidity, PAR, and precipitation) can also be accessed from the Carriage House NERRS System-Wide Monitoring Station located at the Waquoit Bay NERR (131 Waquoit Hwy, Waquoit, MA, 02536). The Waquoit Bay weather data is publicly available at <http://cdmo.baruch.sc.edu/get/export.cfm>.

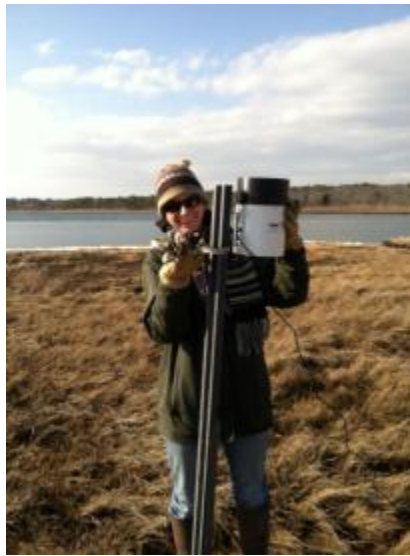
*Field notes:*

2/8/2013 Station installed three days before the blizzard “Nemo” hit. No damage or problems to station during blizzard.



5/16/2013 At MET download, noted that the wind sensor was bent and stuck at 223 degrees.

5/22/2013 Installed and launched temperature probe station. Launched successfully at 4:00pm.



9/12/2013 At MET download, noted that batter was at 0%. The station was not re-launched.

9/23/2013 MET station batteries were replaced. One of the batteries corroded so the terminals were cleaned. Also replaced the “DampRid”.

9/30/2013 MET station download. Battery power at 100% but station had stopped recording a few days before. Cause unknown. Re-launched successfully.

10/22/2013 MET station had stopped recording on 10/4/2013. MET station troubleshooting:  
1) Took off front cover and removed batteries – no obvious sign of corrosion  
2) Sprayed with fluid film (used on battery terminals and cable jacks)  
3) Replaced batteries (also sprayed and wiped new batteries)

12/5/2013 MET station micro station data logger replaced with a new unit. During precipitation gauge check, bird droppings were removed from tipping bucket. During tipping bucket cleaning, the tipping bucket moved several times, so the manipulated data has been removed at 11:00.

2/4/2014 Temperature probes change from 5-minute intervals to 10-minute intervals.

3/25/2014 Problem started after data download and re-launch with temperature probes. They began collecting irregular data (jumps of ~3 degrees in all sensors every 10 minutes). All data suspect data is removed from compiled dataset.

4/10/2014 Temperature probes stopped taking data altogether..

4/18/2014 Temperature depths reestablished at 9:22 EST. No data collected during the depth probe maintenance. Desiccant packs replaced. Batteries still good.

12/15/2014 Batteries replaced and desiccant packs replaced on 12/19/2014.

3/16/2015 Checked precipitation bucket: clear of debris.

5/6/2015 The pole that the 30cm soil temperature probe was pushed over by ice. Straightened at 10:45 EST.

09/21/2015 Noted that weathervane looked loose. Replaced batteries and desiccant packs. Started recording MET and temperature probes in 15-minute intervals.

02/2/2016 Temperature batteries died. Stopped recording on 12/26/2015.

2/29/2016 Wind speed data were not recording correctly; data were not within acceptable range. Tightened wind sensor and set direction with compass. Replaced temperature batteries.

04/13/2016-06/30/2016 No wind speed or wind gust data. Sensor error.

06/30/2016 Replaced wind sensor and 30cm soil depth temperature probe. See photos below.



06/30/2016 to 12/04/2016 Wind direction data reliable during this period, but on 12/04/2016, wind direction sensor begins to stick.

11/3/2016 Checked precipitation gauge: cleaned tipping bucket.

12/04/2016 Weathervane snaps – no more wind direction data.

06/14/2017 Checked and cleaned precipitation bucket. Gauge still level, so full calibration not performed. Data from 10:45 deleted due to maintenance.

5/21/2018 Replaced batteries and desiccant packs in both microstations (MET and Temperature probes). Cleaned precipitation funnel of debris.

10/04/2018 Wind sensor is making noise – don't trust wind speed data.

11/1/2018 Because the tripod was extremely corroded and the feet were nearly rusted through, the weather station (including PAR, total solar radiation, and wind sensor) was removed from the marsh. Additionally, at this time the precipitation sensor was moved to the temperature station. Note, the precipitation gauge did not change locations but the electronic connection was moved to the microstation unit with the temperature probes. To allow for the precipitation sensor connection, the 15cm temperature probe was disconnected and removed from the marsh. Unable to start newly configured microstation because the laptop battery died.

11/7/2018 Started temperature and precipitation gauge station. Launched at 14:37 EST; first reading at 14:45 EST.

5/7/2019

Unfortunately, over the course of the winter, the stake that lasted the previous five years in the marsh was pulled out by ice and wind causing the microstation to be flooded by saltwater. The data collected since 11/7/2019 was irretrievable. The station was removed from the marsh as the electronics sustained considerable damage.

