The Cellular Cooperative Observer (CCOOP) Project

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Project Goal

Short Term:

The Cellular Cooperative Observer Program (CCOOP) project looks to restore closed, inactive and poorly sited long-term Cooperative Observer (COOP) Stations

Long Term:

As an ***approved prototype*** CCOOP is being considered as a possible solution to modernization in the National COOP Modernization Project.

One NOAA!!!!

Amy Fritz - NWS National Cooperative Observer Program Leader

Richard Vogel - NWS National Reconditioning Center

Pilar Trevino - NWS Paducah KY Weather Forecast Office

Brian Warren - NWS Western Region Headquarters

Keith Berger - NWS Gaylord MI Weather Forecast Office

Bryant Korzeniewski - NOAA National Centers for Environmental Information (NCEI)

Kevin Farina - NWS Louisville KY Weather Forecast Office

Greg McCurdy - NOAA Western Regional Climate Center

Pamela Lacy - NOAA Western Regional Climate Center

Lyle Pritchett - NOAA Western Regional Climate Center

Brian Walawender - NWS Central Region Headquarters

Tim Kearns and Bob Brauch - retired

Why Modernize

This COOP network once numbered over 13,000 weather observers nationwide. Unfortunately, with a changing demographic in our fast-paced society, its numbers are now just over 8000 volunteers. As it becomes more difficult to find volunteers, a shift to automation is critically necessary.

Priority Stations for CCOOP deployment

Historical Climate Network (HCN) – Maintain historical data locations to ensure climate and weather records are continued at these excellent data points.

Long Term Record Sites – Although not part of the HCN, these sites are excellent data points with over 70 years of records.

NWS WFO Critical Stations

NCEI Critical Stations

What is changing?

A circuit board and cellular modem are added to the Maximum/Minimum Temperature Sensor (MMTS) and Fischer Porter Weighing Rain Gauge (FPR).

Circuit boards consist of onboard data logger processors, multiple access ports for different communication mediums and plenty of digital and analog input/output ports for future utilization.

Circuit boards query MMTS and FPR utilizing existing communication pathways to record temperature and rainfall measurements without altering the devices' normal operating parameters.

Software Updates

Leverage over the air (OTA) updates to keep the client CCOOP units updated with the latest software.

Allows us to keep remote clients updated without the need for a visit from a technician.

Can quickly add new functionality or address software issues.

Data Transmission

An onboard cellular modem (AT&T, Verizon, T-Mobile) uses the Mosquitto Message Broker Service (MQTT) to send the reports to a server a Central Region Headquarters.

The server SHEF encodes the messages and relays them to the WxCoder servers at Western Regional Climate Center.

The WxCoder servers perform basic quality control checks, formats the data and then transmits the messages via the NWS Telecommunications Gateway.

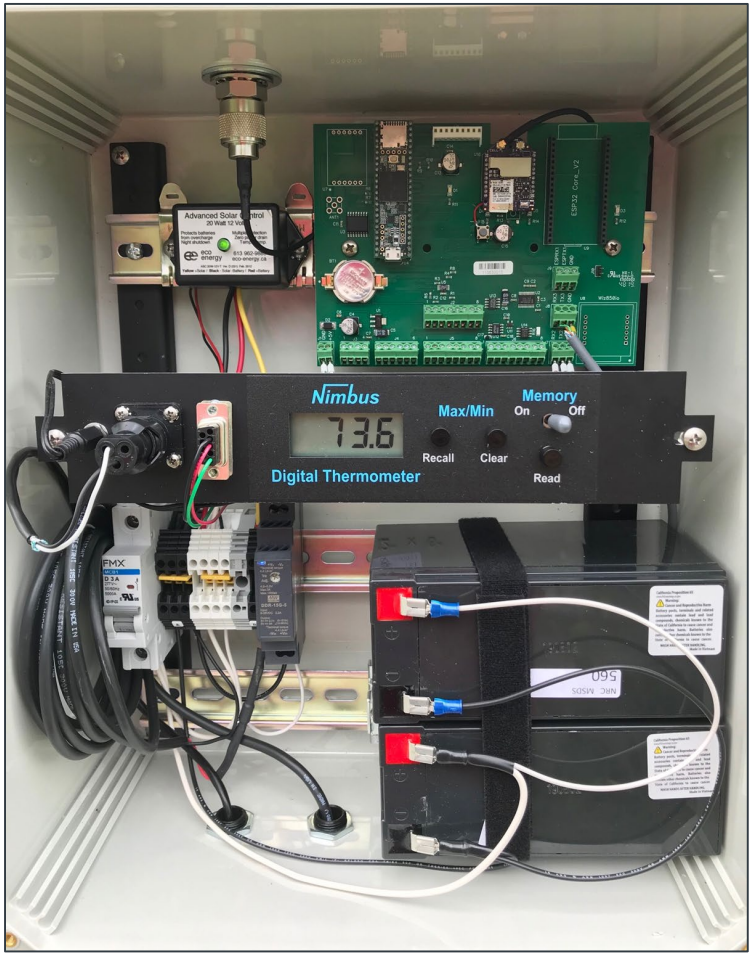
Sand Lake National Wildlife Refuge, SD

East Jordan, MI Wastewater Treatment Plant CCOOP

University of Kansas CCOOP

Original Design

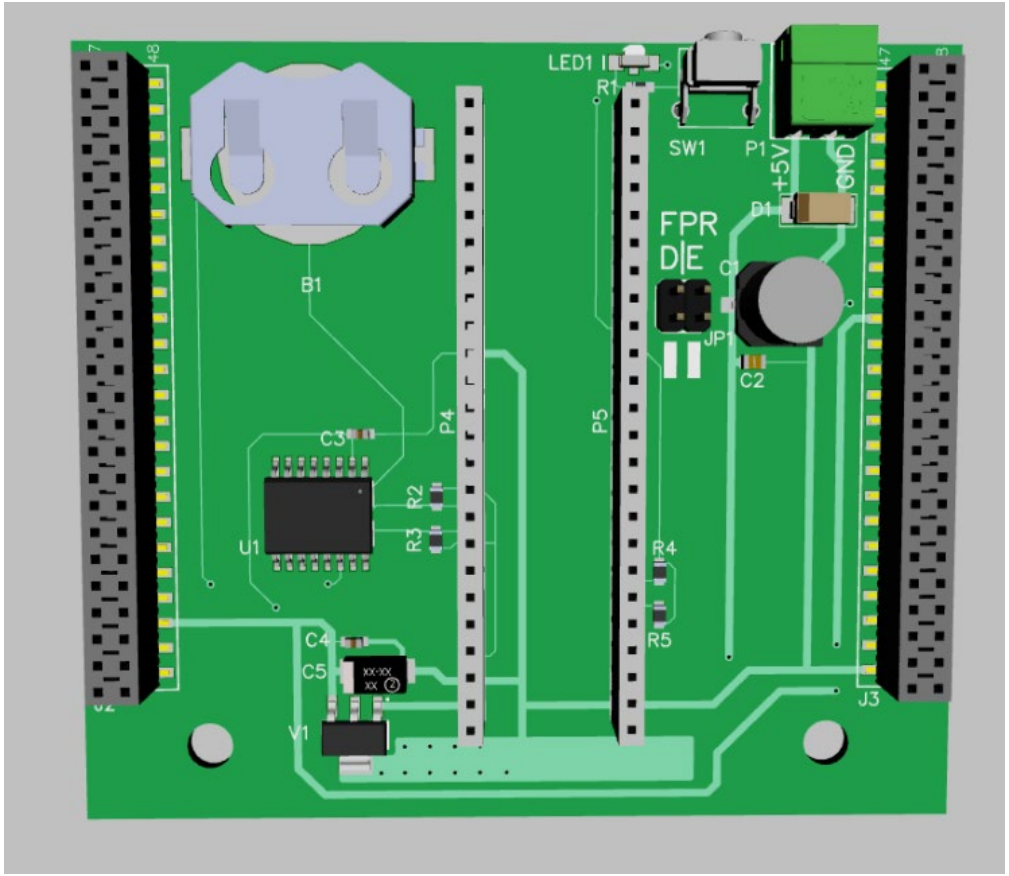
Second generation



Third generation

Current Unit

Latest Prototype



Costs

Current unit costs approximately $850.

Comms Costs - $6 per month per unit

What data is available

Once a day

- 24 hour Min and Max Temperature
- At observation temperature
- 24 hour precipitation

Extras

- Current Temperature - every 5 minutes
- Precipitation Level - every 15 minutes
- Automatic transmission of monthly hourly precipitation data (HPD) log files to NCEI

What does the data look like

Daily RR3 Product

.A KUSK1 220509 C DH0700/TX 74/TN 59/TA 70/PP 0.03

Five Minute Temperature Product

.A KUSK1 220509 C DH1310/TA 87.5/DC2205091310

Fifteen Minute Temperature and Precipitation Product

.AR KUSK1 220509 C DH1300/TA 86.6/VB 13.9/PCIRP 16.24/DC2205091300

https://www.weather.gov/crh/ccoop

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Choose COOP Station

KU-Field Station, KS - KUSK1

Currently

KU-Field Station, KS - KUSK1

87.6° F

Mon May 9 1:35:00 PM

Daily Summary

High Temperature: 74.2° F

Low Temperature: 58.6° F

24 Hour Precip: 0.03"

Ending Mon May 9 7:00:00 AM

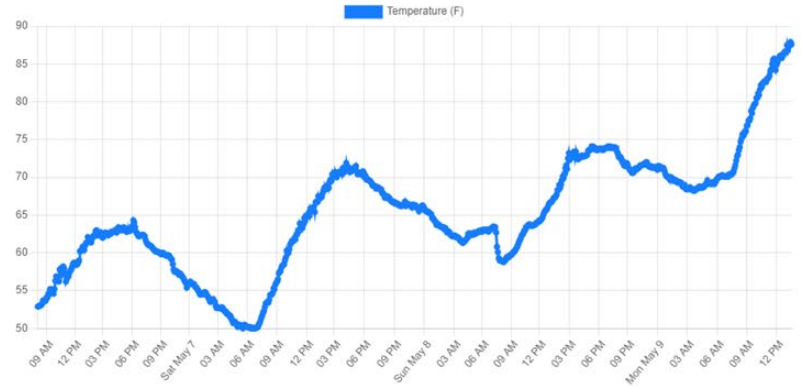
Precipitation Summary

Last Hour 0.00"

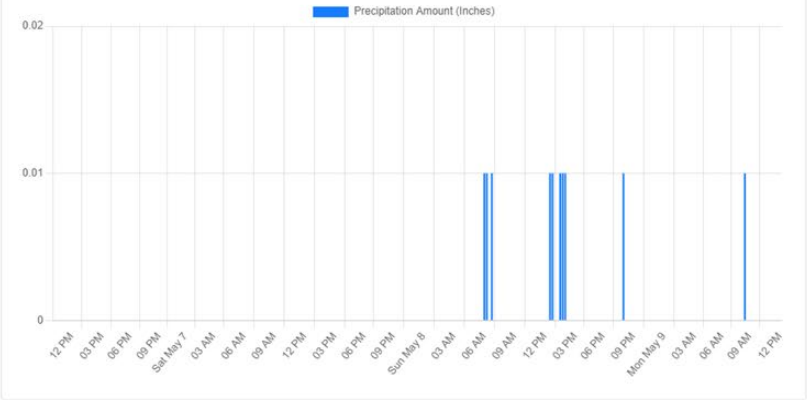
Last 6 Hours 0.00"

Last 12 Hours 0.00"

Temperature Trend



Precipitation Trend



Current Network

Heavy Rain Event

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Choose COOP Station

Select Station

Currently

KU-Field Station, KS - KUSK1

71.9° F

Fri Aug 13 10:20:00 AM

Daily Summary

High Temperature: 96.1° F

Low Temperature: 66.6° F

24 Hour Precip: 4.12"

Ending Fri Aug 13 7:00:00 AM

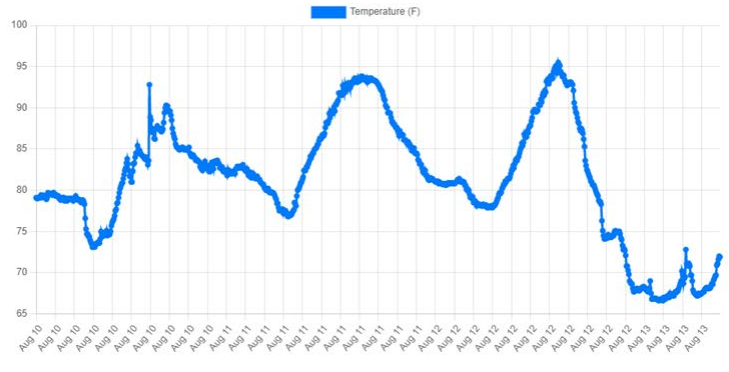
Precipitation Summary

Last Hour 0.00"

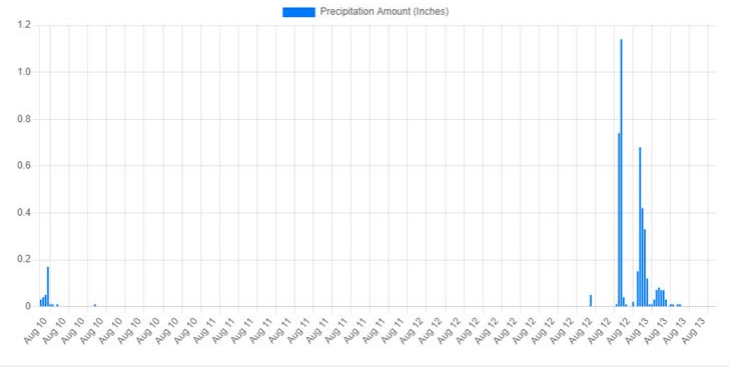
Last 6 Hours 0.14"

Last 12 Hours 4.07"

Temperature Trend



Precipitation Trend



Challenges

15 minute data from the Fischer Porter Weighing Rain Gauge can contain errors:

- **Evaporation (negative accumulation)**
- **False Readings from strong winds**

We attempt to address these issues by performing basis software checks prior to transmission.

The Weather Forecast Offices quality control the daily observations and correct as needed.

Office focal points are automatically notified when the FPR becomes too full and needs maintenance.

Will be testing a wetness sensor this summer and fall.

Supply chain issues!!!!

The Future

Additional sensors

- Wind
- Pressure
- Relative humidity
- Soil Moisture
- All in one weather sensor

Indefinite delivery, indefinite quantity (IDIQ) contract to produce CCOOP units

Summary

Through the use of automation, the cellular cooperative observer (CCOOP) project seeks to maintain long standing cooperative observer stations (COOP) where recruiting an observer is no longer possible or practical.