

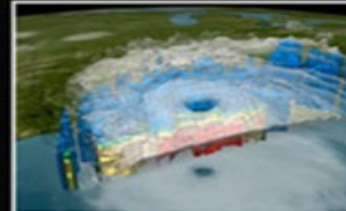
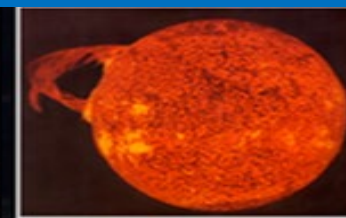
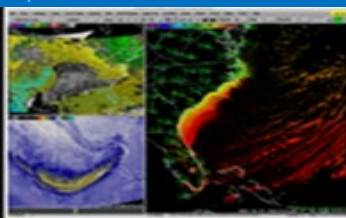


**NOAA**  
National  
Weather  
Service

# The Cellular Cooperative Observation Program (CCOOP)

May 26, 2022

Pilar Trevino





# The Team



Brian Walawender: Project Lead

Bryant Korzeniewski: National Centers  
for Environmental Information (NCEI)



Amy Fritz: COOP Program Manager

Greg McCurdy: WRCC



Richard Vogel: Lead Engineer

Pamela Lacy: WRCC

Keith Berger: NWS Central Region

Lyle Pritchitt: WRCC

Pilar Trevino: NWS Central Region

Bob Brauch: NWS retired

Kevin Farina: NWS Central Region

Tim Kearns: NWS retired

Brian Warren: NWS Western Region





# Outline



- Project Goals



- Systems Engineering



- Data Transmission and display

- Data Quality Control (QC) and Archive



- Deployment, Cost & Future



- Possible Future Sensor





# Project Goals



## Short Term:

Restore closed, inactive and poorly sited long-term COOP Stations



## Long Term:

As an approved prototype, CCOOP is being considered as a solution to modernization in the National COOP Plan





# Why?



-The COOP network once numbered over 13,000 volunteer weather observing sites nationwide.



-Today, with a changing demographic in our fast-paced society, its numbers have decreased to around 8,100 sites.



-It is more difficult to find volunteers; a shift to automation is necessary.





# System Engineering



A circuit board, cellular modem, and a Maximum/Minimum Temperature Sensor (MMTS) are combined into one unit and then connected to a Fischer Porter Weighing Rain Gauge (FPR).



The circuit board has a data logger processor, with multiple access ports for different communication mediums, and plenty of digital and analog input/output ports for future utilization.



The circuit board query MMTS & FPR, by utilizing existing comms pathways to record temperature & rainfall measurements without altering the devices' normal operating parameters.



# System Design

First Design  
Verizon JetPack

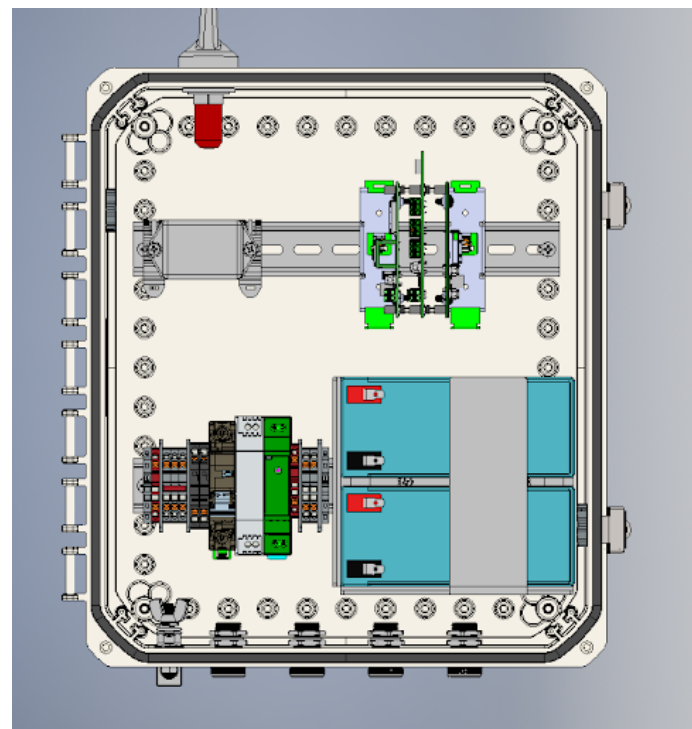
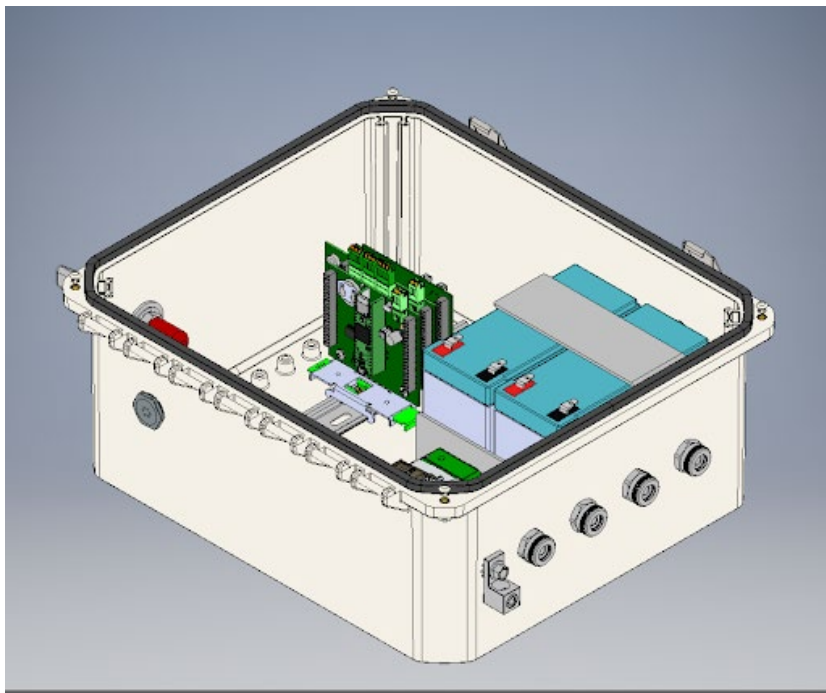


AT&T, T-Mobile, XBee Board  
(Verizon planned for FY23 Q4)



Solar Design









# System Design



**Sand Lake National  
Wildlife Refuge, SD  
CCOOP**



**East Jordan, MI  
Wastewater  
Treatment Plant  
CCOOP**



**University of Kansas  
CCOOP**





# Data Available from the System



## Daily

- 24 hour Max and Min Temperature
- At Observation Temperature
- 24 hour Precipitation



## *Extras*

- 5 minutes Temperature
- 15 minutes Precipitation
- Automatic transmission of monthly Hourly Precipitation Data (HPD) log files to NCEI





# Current System Engineering Challenges



## FPR:

15 minute data from the FPR can contain errors:



- Evaporation (negative accumulation)

- False Readings from strong winds



## How do we Mitigate?

These are automatically QC'd out of the daily report



After-the-Fact QC performed at the WFO (Weather Forecast Office)

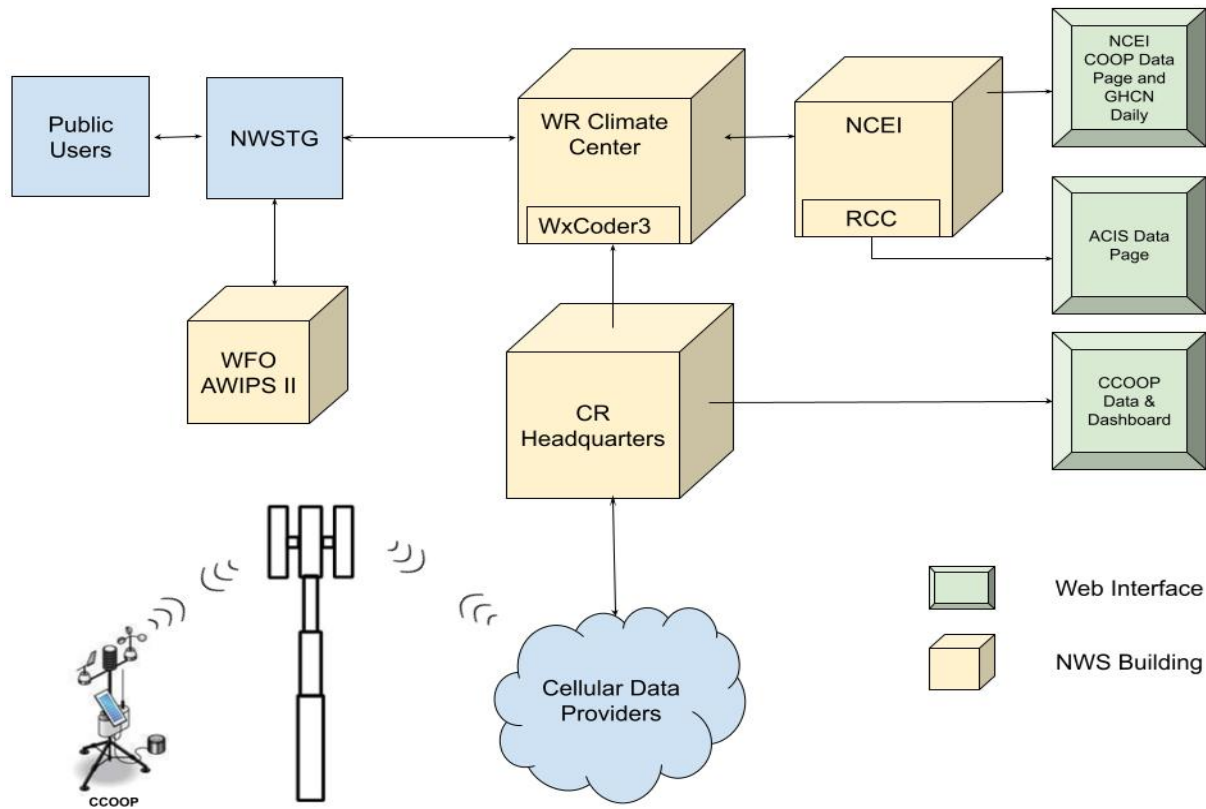


Incorporating a wetness sensor





# Data Flow





# Data Encoded



## SHEF Coded message:

### Daily - RR3 Product



.A HIAK1 200619 C DH0700/TX 90.2/TN 67.1 /TA 67.3/PPDRP 0.37/

.A - HIAK1 - 200619 - C - DH0700 - TX 90.2 - TN 67.1 - TA 67.3 - PPDRP 03.7



Format - Loc ID - Date - T Zone - Time - Max - Min - At OB Temp - precip

### 'Extra Data' - RR8 product



.A HIAK1 20200619 C DH1230/PCIRP 1.55

.A HIAK1 200619 C DH1330/TA 73.2/





# Where Can the Data be viewed?



- In AWIPS via RR8, RR3, WFO Hydrologic Forecast System (WHFS) Time Series



- CCOOP Website



- Iowa Environmental Mesonet Website



- Mesowest Website

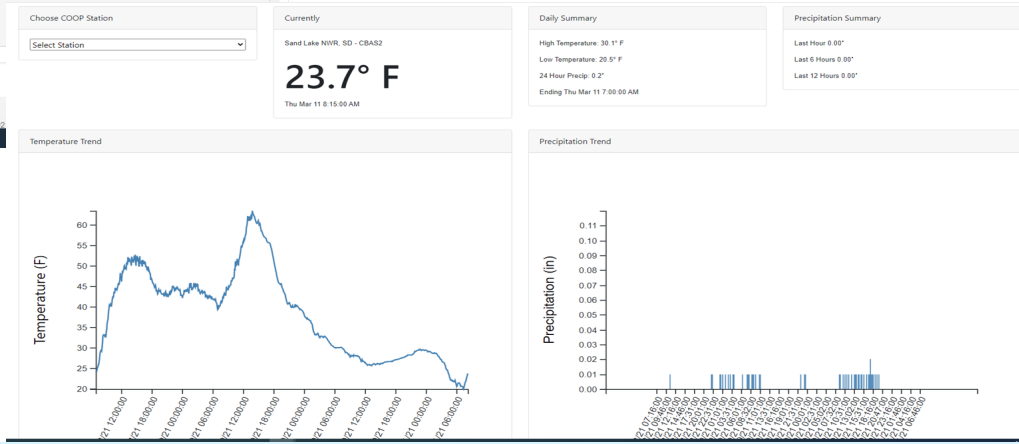




# CCOOP and IEM COW Websites



Iowa Environmental Mesonet:  
<https://mesonet.agron.iastate.edu/wx/afos/#RR8ABR-1000>



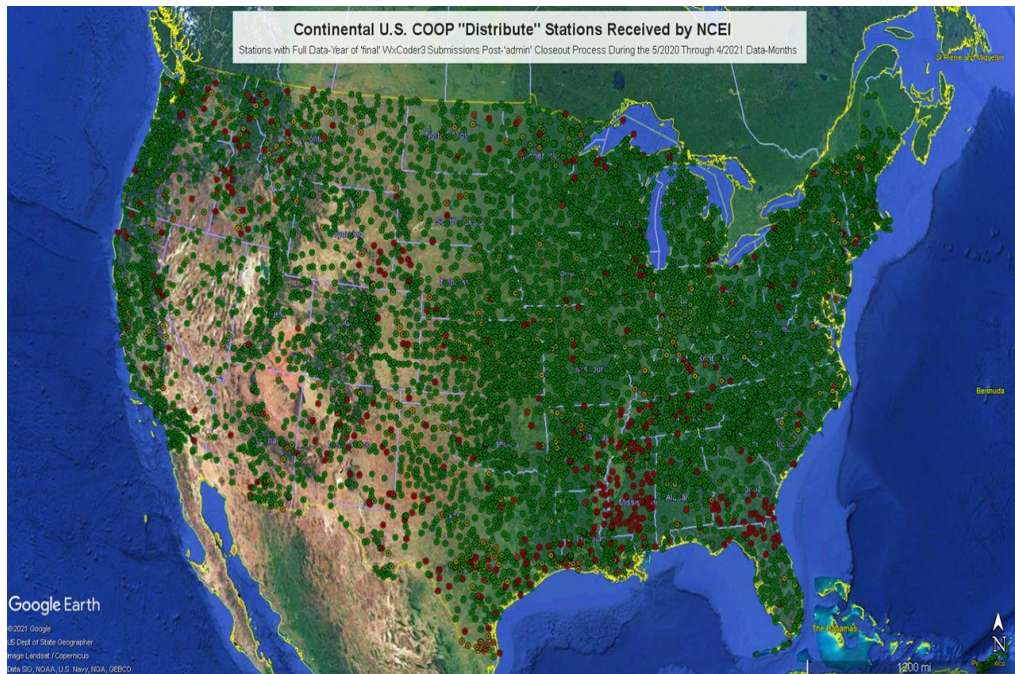
[weather.gov/crh/ccoop](http://weather.gov/crh/ccoop)





# NCEI QC and Data Archive

- CCOOP Data received via normal submission channels
  - COOP (SHEF, WxCoder3)
  - HPD Data (Log Files)
- Data QC'd/Archived similar to non-Cellular COOP Sites
  - COOP (via GHCN-Daily's QC)
  - HPD (via Automated QC)
- Data made available to the Data User Community
  - Data Download (PDF, CSV)
  - Products (ACIS, NIDIS, Publications, Normals, FEMA)







# Deployment



## Priority!!! Historical Climate Network (HCN):



Maintain historical data locations to ensuring climate & weather records continue at these excellent data points.



## Long Term Record Sites:

Not HCN; however, sites are excellent data points with over 70 years of records.



## NWS WFO Critical Stations



## NCEI Critical Stations



# Current CCOOP deployment

CCOOP Locations

Legend



FY22: 20-25 in current spend plan requested  
(expanding into Pacific Region; possibly Alaska Region)





# Cost



-One time CCOOP unit cost - \$800



-Assembly costs being researched ~\$200-\$300



-Monthly recurring cost (comms) - \$6





# Possible Future Sensor



- Wind
- Pressure
- Relative Humidity
- Soil Moisture/Temp
- All-in-one weather sensors



Note: Images shown are for example only. They are not an endorsement of a vendor or product.



# Cellular Cooperative Observation Program



Stopping the loss of certified data points and increasing data output through COOP modernization.

