



The Nebraska Mesonet

MARTHA SHULSKI, NEBRASKA STATE CLIMATOLOGIST AND ASSOCIATE PROFESSOR

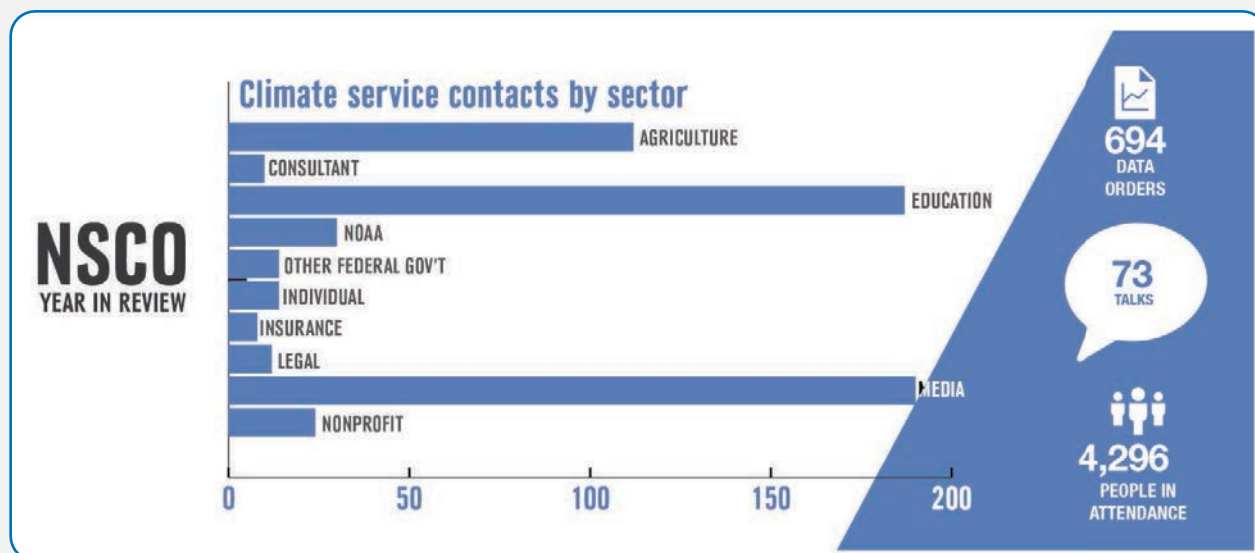
 @mshulski3

MISSION

Deliver science-based weather and climate information for decision-making.

OBJECTIVES

- Provide high quality and timely services.
- Engage stakeholders to understand needs.
- Operate a statewide weather network.





mesonet.unl.edu

The Nebraska Mesonet

MISSION

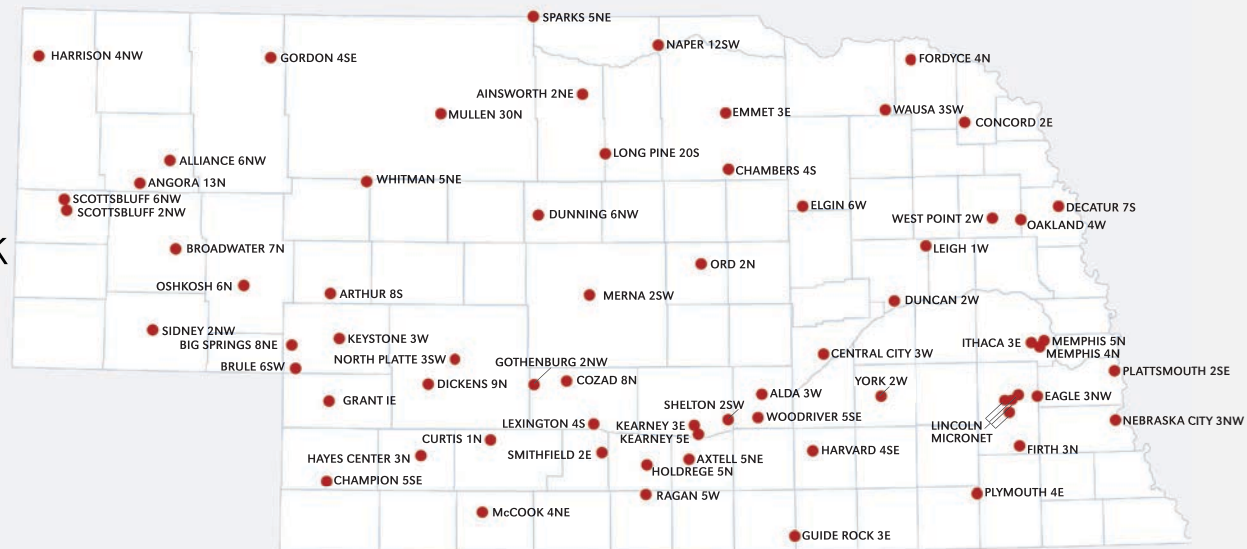
Monitor weather and climate conditions of Nebraska.

History

- Began in 1981 with 5 stations.
- Currently at 69 stations.
- Transition from ag network to long-standing environmental monitoring program.

NEBRASKA MESONET

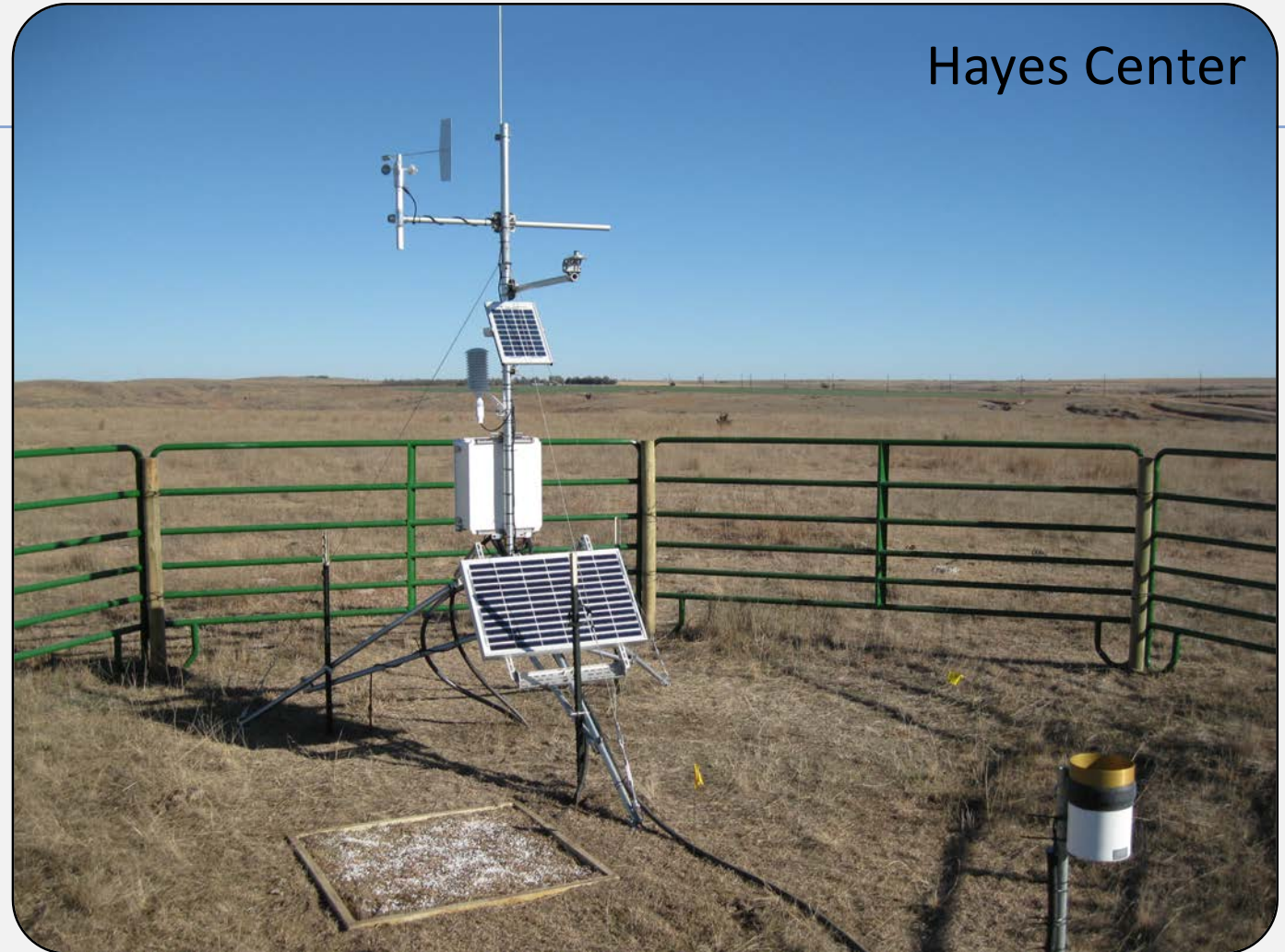
AT THE NEBRASKA STATE CLIMATE OFFICE



NEBRASKA STATE CLIMATE OFFICE

Observations

- Air temperature (2m)
- Humidity (2m)
- Wind speed (3m)
- Wind direction (3m)
- Warm season precipitation
- Solar radiation
- Soil temperature
10cm, bare ground

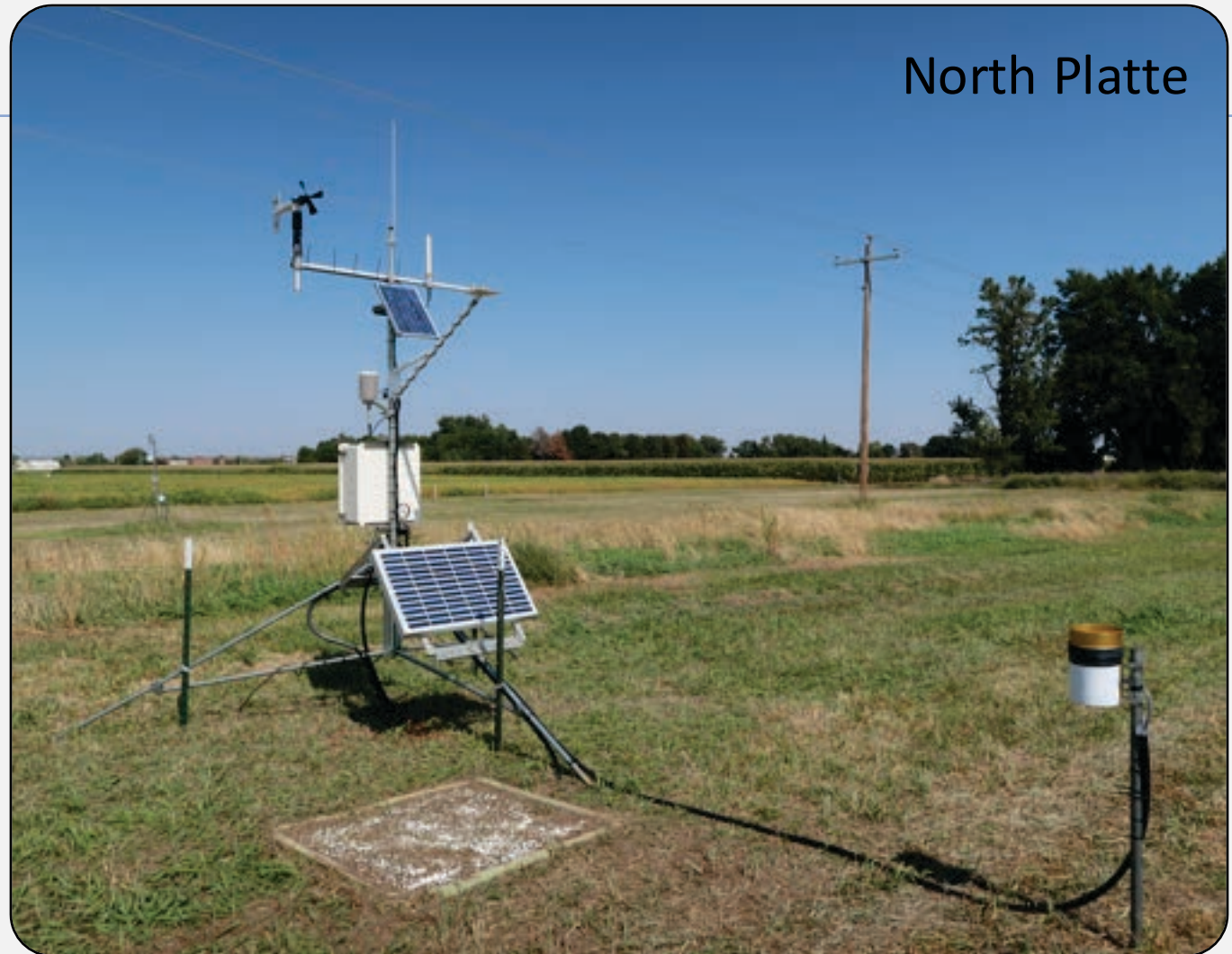


Hayes Center

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Observations

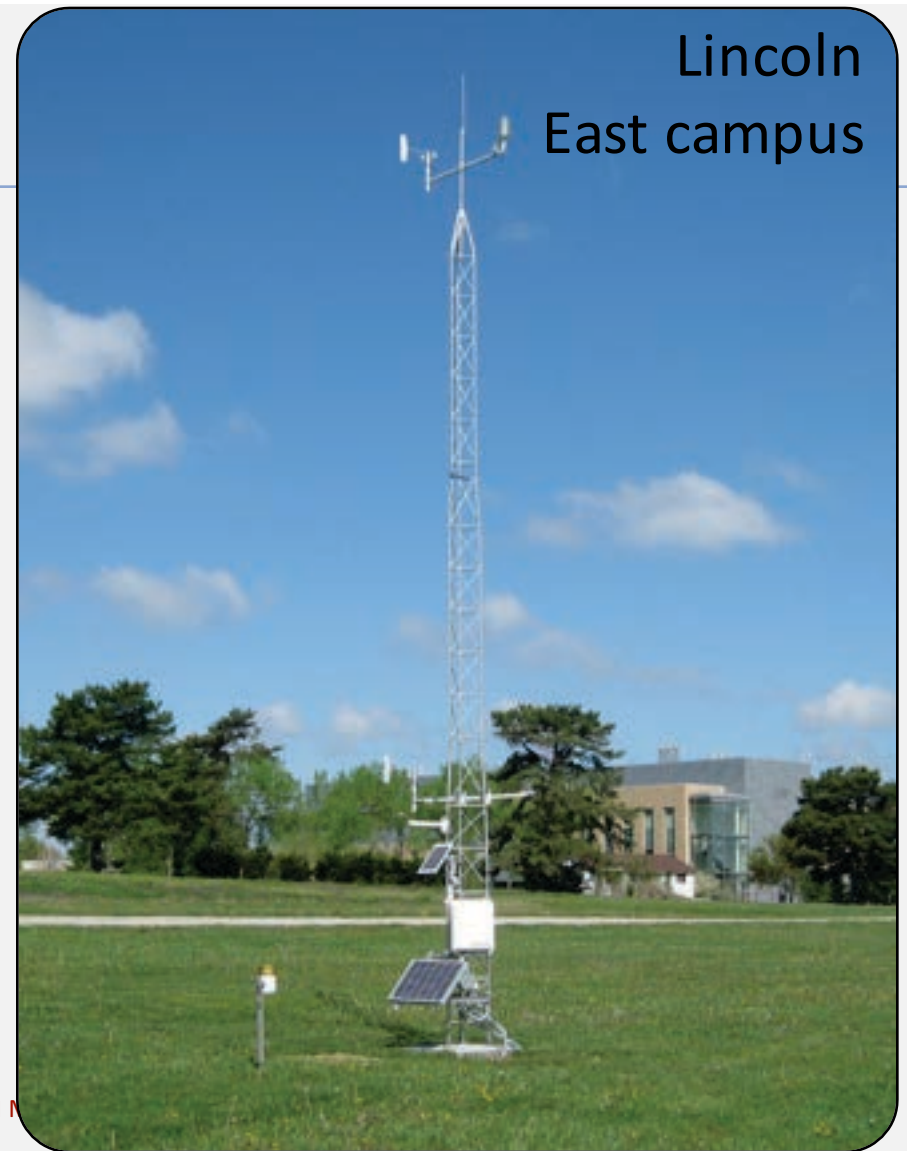
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10cm, bare ground
- Soil moisture
10, 25, 50, 100 cm, grass
- Barometric pressure



Observations

- Air temperature (2m)
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- Wind direction (3m)
- Warm season precipitation
- Solar radiation
- Soil temperature
10cm, bare ground
- Soil moisture, temp
5, 10, 20, 50, 100 cm, grass
- Barometric pressure
- 10-m temperature, humidity, wind

NEBRASKA STATE CLIM



Station siting



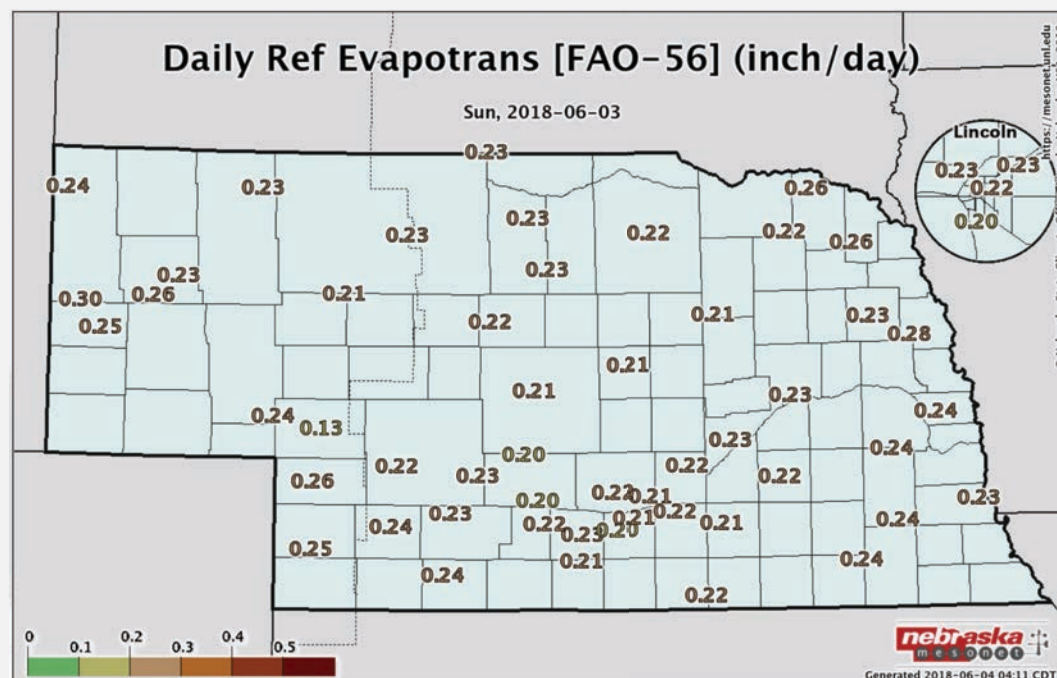
Considerations

- Rural
- Grass cover
- Limited obstructions
- Long-term
- Non-irrigated



Value of a state Mesonet

- ✓ State of the art equipment (Campbell Scientific, Li-Cor, RM Young).
- ✓ Regular calibration services.
- ✓ Annual maintenance. Sensor upgrades as needed.
- ✓ Quality controlled data.
- ✓ Near real-time available (every 5 minutes, transitioning to 1 minute).
- ✓ Data products available.
- ✓ Non-mesonet dataset visualization.

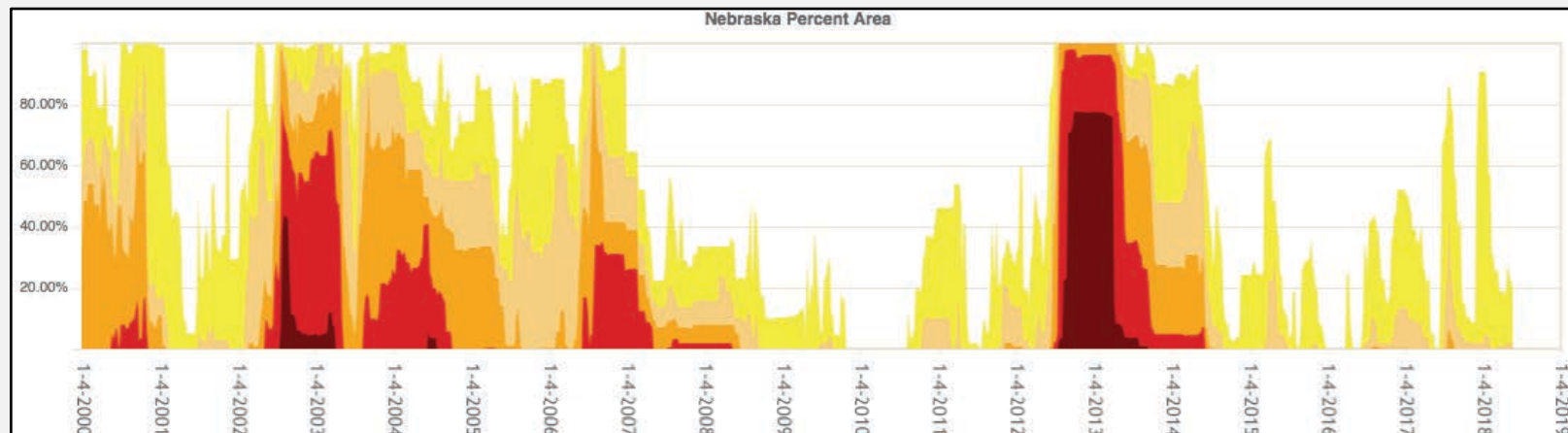


Soil moisture monitoring genesis

Goal: improved water supply monitoring for drought mitigation

- Installation began in 1998 with Stevens-Vitel Hydra-Probe.
- Depths of 10cm, 25cm, 50cm, 100cm.
- U.S. Bureau of Reclamation grant funding.
- Reliability of Vitel sensors became an issue.

Nebraska Drought History, US Drought Monitor



Soil moisture monitoring developments

- Transition to Dynamax ML2x Theta Probes in 2001.
- Many still in place, running successfully for > 10 years.
- To align with federal standards, observing depths for all new installations are: 5cm, 10cm, 20cm, 50cm, 100cm.
- Current sensor is the ML3.



Soil moisture data integrity issues

When bad things happen to good data:

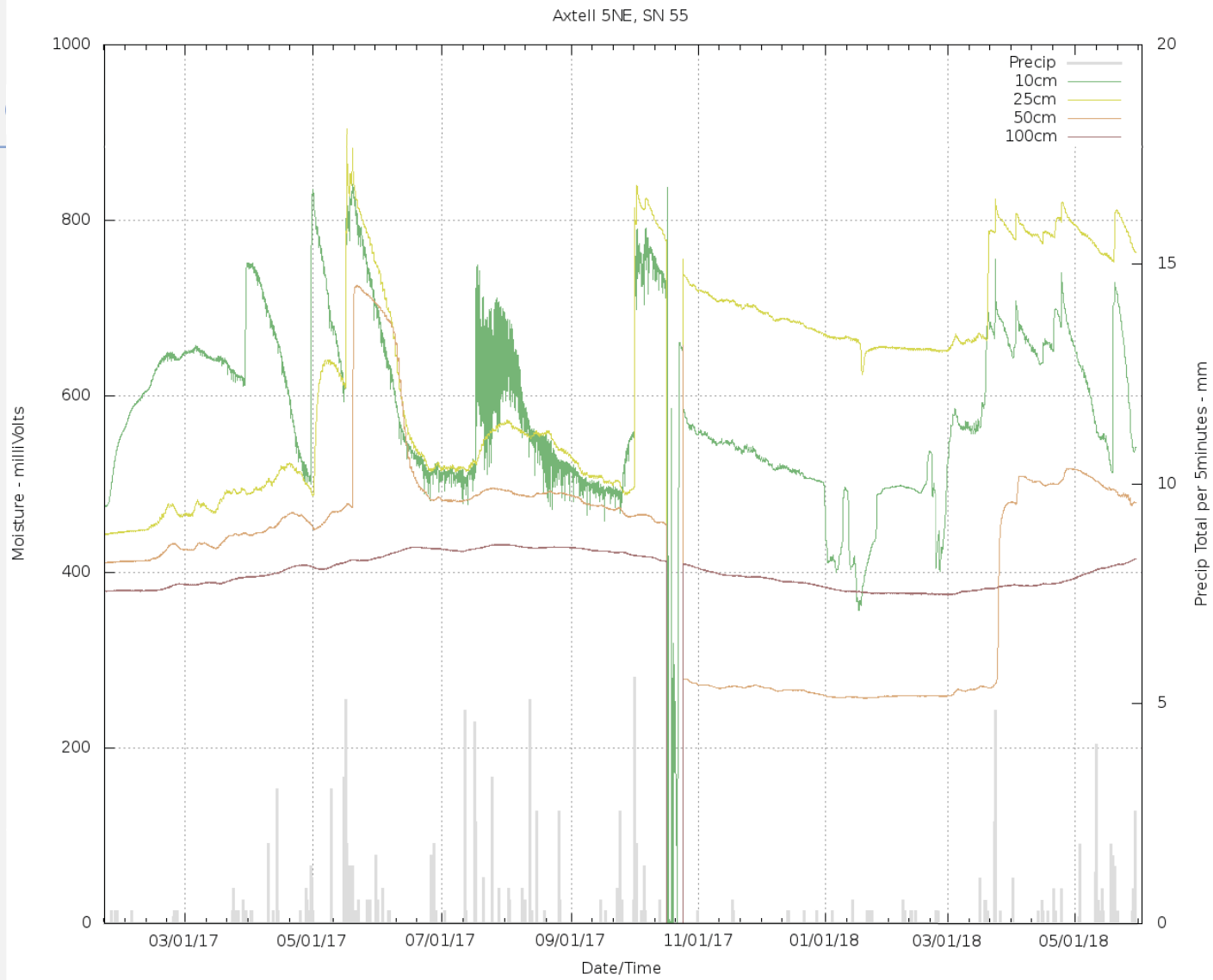
- Sensor goes bad.
- Wire is chewed.
- Crack in the soil column.
- Sensor is dug up.
- Animal burrow.
- Lightning strike.

The two best forms of quality control are:

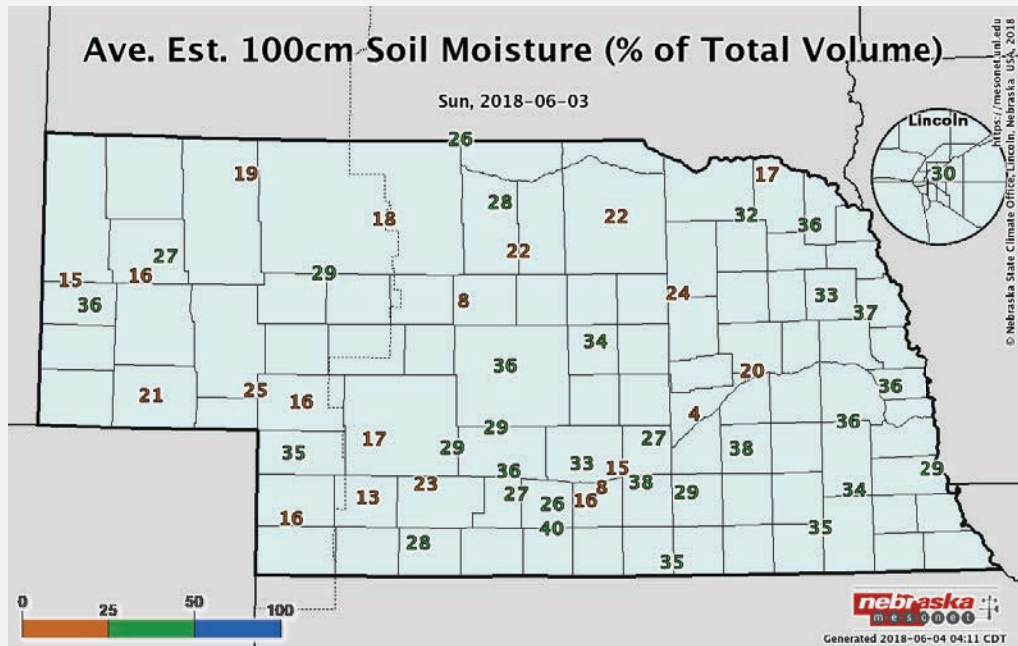
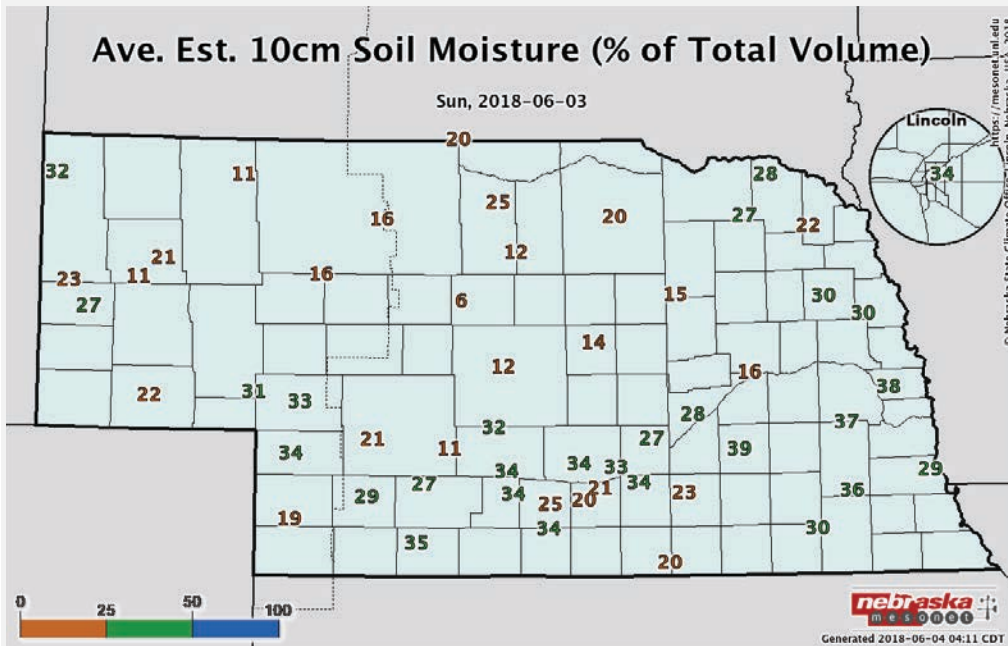
- Regular site visits.
- A person looking at the data.



Soil m

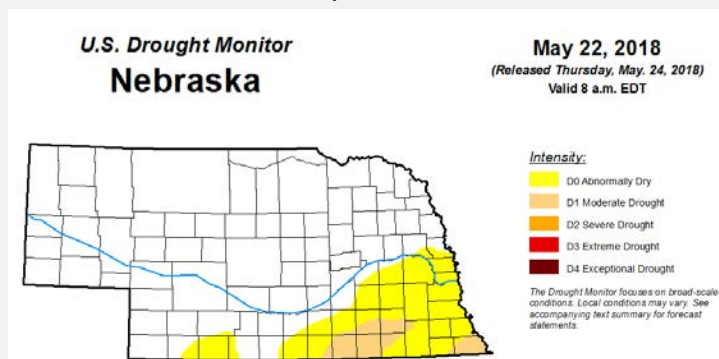


Soil moisture data products

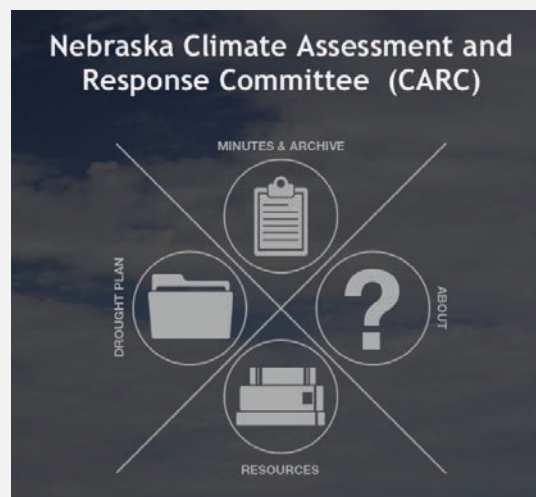


Data utility – applications

- ✓ Assess drought conditions with local input.



- ✓ State agency briefings.



- ✓ Hydrologic support.

Spring Flood Outlook Factors
As of March 3rd

Factor	Contribution to Flood Risk
Snow Pack	Slightly Increased Risk* *Missouri River Only, decreased risk elsewhere
Soil Moisture	Increased Risk
Frost Depth	Decreased Risk
Streamflow/Stream Levels	Slightly Increased Risk
Precipitation Outlook	Decreased Risk

Data utility – research

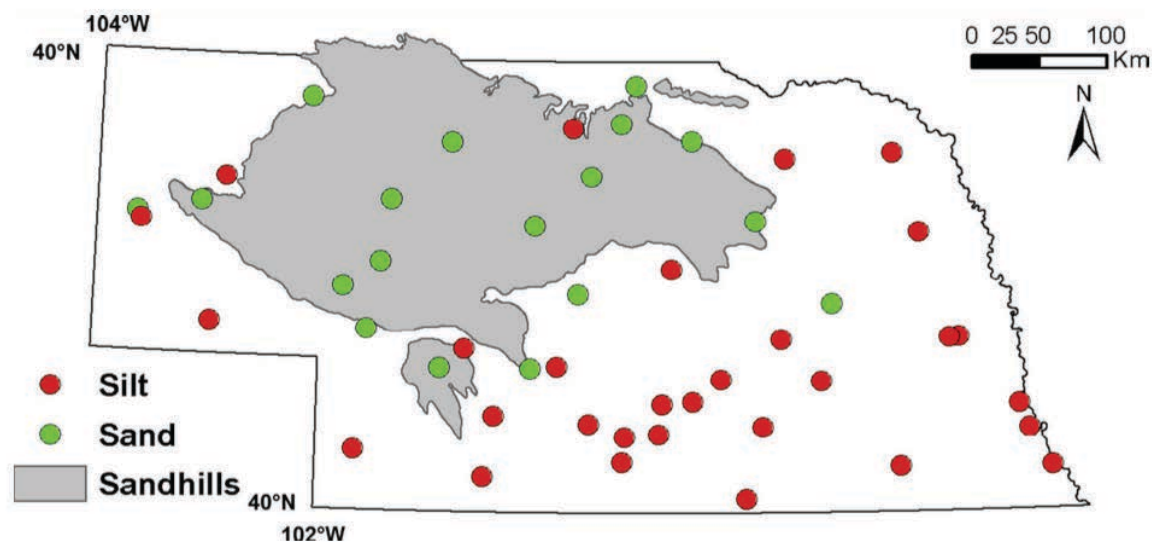
- ✓ Land-surface – atmosphere interactions.
- ✓ Mesoscale weather modeling.
- ✓ Drought assessment.
- ✓ Model and remote sensed verification.
- ✓ Vadose zone hydrology.

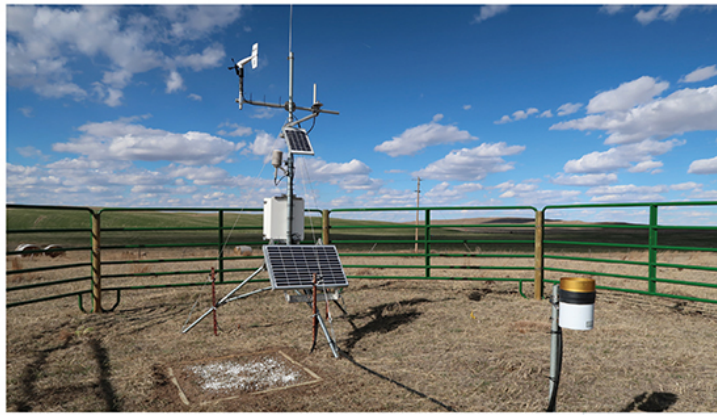
Investigating soil controls on soil moisture spatial variability: Numerical simulations and field observations

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MAINTENANCE ON TRACK FOR MESONET

NEBRASKA STATE CLIMATE OFFICE

Twenty-five stations down. Forty-two stations and hundreds of miles left to go.

Glen Roebke, senior mesonet technician, is in the thick of the Nebraska Mesonet's maintenance schedule. So far, he's completed maintenance and scheduled updates on all stations within 80 to 90 miles of Lincoln.

Each week, he will drive further and further until all stations are up-to-date.

In addition to performing regular maintenance — cutting back vegetation, replacing

instruments with freshly calibrated ones, testing power supplies — Roebke will replace all wind sensors with an updated model, the RM Young anemometer, a more robust instrument that will perform better under potential icing conditions. This update will bring the weather network in line with neighboring states, where identical or similar anemometers already have been installed.

This update means Roebke is spending more time at each station, which likely will lengthen the maintenance schedule by as

Continued on PAGE 2

IN THIS ISSUE

- 2 Farmers should expect above-average precipitation
- 3 Outreach and engagement
- 4 NSCO helps cities plan for climate variability
- 5 Nebraska extremes for spring quarter

TOP: The Arthur RS station had its maintenance check completed in May. Photo by Glen Roebke.

CLIMATE UPDATE

A MONTHLY SUMMARY FROM THE NEBRASKA STATE CLIMATE OFFICE

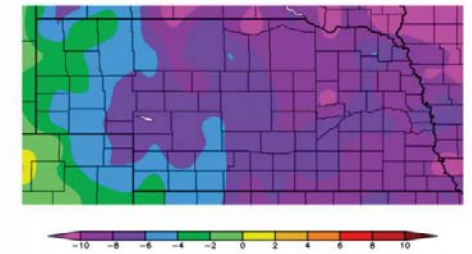
nsco.unl.edu

Spring blizzard, record cold highlight April

A mid-month blizzard marched its way across Nebraska, resulting in a foot or more of snow and sustained high winds. The timing of the storm (April 13 to 14) was such that calving was affected and, in some areas of the state, there was a shortage of shelter equipment. The strongest winds were from an east-northeast direction, which is not common for a blizzard. The Nebraska Mesonet station near Big Springs recorded a wind gust of 66 mph on April 13. Power losses occurred in portions of the state and a significant stretch of I-80 was closed for a time as the storm passed through the state. Snowfall totals were more than 8 inches in a large swath stretching from the southern Panhandle to north-central Nebraska. The highest totals were up to 2 feet of snow, near the South Dakota border. As the blizzard approached southeast Nebraska, the air temperature took a dive from 85 degrees on April 13 to a high of only 32 degrees on the afternoon of April 14.

Another key story was the persistence of cold weather for much of the month, aside from the blizzard. The strongest departures from normal were in the eastern two-thirds of the state. Temperatures averaged up to 10 degrees below normal in the Panhandle. Norfolk (41.3°F), Lincoln (44.4°F), and Grand Island (43.1°F) airports all reported the coldest April on record. Omaha (44.9°F), Hastings (42.3°F) and Columbus (42.9°F) came in at second coldest while Imperial and North Platte were sixth and eighth coldest, respectively. The statewide average temperature of 41.0 ranks as second coldest going back to 1895 and is 7.3 degrees below normal. A warm-up was felt during the last week of the month as temperatures moderated. The statewide high of 88°F was reached across portions of southern Nebraska on April 29 and 30.

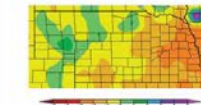
DEPARTURE FROM NORMAL TEMPERATURE (F)



HIGH PLAINS REGIONAL CLIMATE CENTER

All maps generated using April provisional data.

DEPARTURE OF NORMAL PRECIPITATION



HIGH PLAINS REGIONAL CLIMATE CENTER

Precipitation

Precipitation was heaviest in areas of the state that experienced the highest snowfall amounts. Liquid equivalent totals were more than 1.5 inches in these areas. Conditions were relatively dry in the east with less than an inch reported, which is a few inches less than normal for April. In fact, Omaha (0.27 inch), Lincoln (0.67 inch), and Columbus (0.50 inch) ranked as second, third, and seventh driest, respectively. The monthly statewide precipitation

WEEKLY AVERAGE 4-INCH BARE SOIL TEMPERATURE (F)



NEBRASKA STATE CLIMATE OFFICE

of 1.53 inches, which is 0.89 inches below normal and is in the top third driest Aprils.

Soil temperature

Soil temperatures were below freezing at the beginning of the month. It took until late April for temperatures to warm into the 50s. By month's end, the weekly average bare soil temperature was in the mid to high 50s across much of Nebraska. The diurnal temperature cycle is running




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