



2019 TRYING YEAR FOR AG INDUSTRY

NEBRASKA STATE CLIMATE OFFICE

Producers across the Corn Belt faced one struggle after another as harvest drew to a close this fall. Throughout 2019, they have fought brutally cold conditions in February; a major blizzard followed by significant flooding in February; cold and wet conditions from mid-April through early June; mid-season dryness

across the eastern Corn Belt; a return to wet conditions during the fall harvest period; freezing temperatures to late maturing crops; and two intense storm systems during October that brought high winds, wind, and significant snows to portions of the northern and western Corn Belt.

The open-ended question after such a trying year is whether we

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Photo of Holmes Lake during a cold spell in Lincoln, Nebraska.



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will see a repeat performance of last winter. From a pure statistical standpoint, it is uncommon for two consecutive winters to mirror each other. Subtle changes in jet stream patterns and ocean surface temperatures will ultimately determine who gets to experience winters wicked ways.

The primary jet stream pattern across the continental U.S. last fall featured a trough in the west and a ridge over the southeast. This pattern is typical during El Niño events. At the end of January 2019, a cold pocket started to materialize in the eastern Equatorial Pacific, just prior to the onset of bitter cold temperatures that dominated the Corn Belt.

As we enter our climatological winter (December to February), the Equatorial Pacific is displaying an identical pattern to the one that developed rapidly this past February. The eastern Equatorial Pacific sea surface temperatures continue to be cooler than normal, while above-normal sea surface temperatures are concentrated in the central Equatorial Pacific. The primary difference between this fall and February is that the colder-than-normal conditions in the eastern Equatorial Pacific have expanded westward and have almost doubled in areal extent.

Global models are indicating the Equatorial Pacific will likely remain in neutral conditions throughout this upcoming winter. However, if the eastern Equatorial cold pool builds westward during the winter, then we will need to pay close attention to the Gulf of Alaska to see if recent storm activity will result in a cool pocket developing due to upwelling from storm activity.

If the Gulf of Alaska does turn cooler than normal this winter and holds through next spring, coupled with the expansion of cooler-than-normal seas surface temperatures in the eastern Equatorial Pacific, then La Nina conditions will likely develop during the second half of 2020. Typically, Nebraska experiences a drier and warmer fall under these circumstances and development during the late spring or early summer fa-

vors dry conditions over the southern Plains and Rockies, with Nebraska positioned on the northern periphery of this anomaly.

So what does all of this mean to Nebraskans? In October, we experienced two distinct storm tracks, one from the southwest and one from the northwest. Looking at the temperature deviations between October 2018 and 2019, it is apparent that anomalous warmth and cold has virtually flipped 180 degrees for most of the Plains region from North Dakota southward through Texas.

“ *I place the greatest likelihood of significant snow events for Nebraska on the first half of this winter, followed by a colder pattern the second half of the winter.* ”

Therefore, I fully expect this winter will be starkly different than last winter. The best odds for wet and heavy snowfall will likely occur during the first half of winter. Energy continues to ride underneath of the Gulf of Alaska upper air ridge and moving that energy into the northern and central Rocky mountain region. However, these systems have yet to show signs of regularly moving into the southern Rockies like last fall. At that time, the lows that made it into the southern Rockies then ejected surface lows northeastward and were able to tap Pacific and Gulf of Mexico moisture leading to widespread heavy precipitation, including widespread heavy snowfall events across southern Nebraska. This fall, systems moving into the western U.S. were ejecting surface lows farther northward into the central Plains and we have seen a much stronger push of cold air into the northern Plains.

Therefore, the best opportunity for significant snowstorm activity will likely fall across the central and northern Plains this fall. Pacific and Gulf of Mexico moisture will be available to systems building into the central and southern Rockies, just not to the extent we experienced last fall. We are also dealing with a much stronger northern jet entering this winter than we saw last year, which should result in more precipitation falling in the form of snow than rain.

If the cool Equatorial Pacific conditions

continue to expand and the Gulf of Alaska also cools, the second half of the winter will most likely be dominated by the northern jet stream. Although we may not reach La Nina conditions, the polar vortex should strengthen leading to more frequent Alberta Clippers riding down the backside of the eastern U.S. through the second half of this winter.

I place the greatest likelihood of significant snow events for Nebraska on the first half of this winter, followed by a

colder pattern the second half of the winter. Snowfall events during February and March are difficult to predict.

If there is a positive note in this forecast, it is that La Nina or La Nina-like conditions are biased toward warmer and drier conditions during the spring planting window across Nebraska, so a rapid movement toward cool central Equatorial Pacific temperatures will be needed for increase our odds of more favorable spring planting weather. Otherwise, we will likely face renewed flooding concerns next spring due to the carryover of extensive soil moisture from a very wet growing season across much of northern U.S. east of the Rockies.



WE'RE ON YOUTUBE

Catch Al's weekly climate forecast, filmed by Market Journal at the University of Nebraska-Lincoln, our [YouTube channel](#).



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The Nebraska Mesonet station north of Alliance, sponsored by the Upper White Niobrara Natural Resource District.

Mesonet data used to improve services

Every minute of every day of every year, the Nebraska Mesonet collects data on the state's weather conditions, cataloging it, analyzing it, and sending it to regional and national climate groups for use by meteorologists, climatologists, and state and federal agencies that use the information to make practitioner decisions.

The Nebraska Natural Resource Districts are one user of that data, and this past summer, the Upper Niobrara White NRD — which started sponsoring the Alliance weather station at the beginning of 2019 — started using mesonet data for the first time to help give crop water-use advice.

"Each growing season the UNWNRD provides weekly crop water use reports to help producers gauge how much water a variety of crops will use every week," said Maria Baglieri, a natural resource technician with the Upper Niobrara-White NRD. Typically, the NRD calculates the crop water-use report using the average growth stage for each crop and the evapotranspiration gauge readings from the district,

which is situated in the northwestern part of the panhandle. This year, instead of just doing an average for the whole district, Baglieri tailored the information to each subarea of the district, so she could account for different water-use changes from location to location. She also offered information on water use for up to three growth stages of each crop, rather than one as was done in the past.

"I had been using the data Stonie (Cooper, Mesonet manager) provided for Alliance, Harrison, and Gordon weather stations to compare the accuracy of our ET gauges that landowners were reading in the field each week," Baglieri said.

"During the growing season I would add the daily ET totals from each Mesonet station, for a weekly total, and compare them to the same gauges our landowners were reading in that part of our district. For the most part, both sets of numbers matched during this past year."

This accuracy check of the equipment helped her verify that the information the

NRD provided was reliable for landowners who needed it to make decisions.

"We had a producer testimonial for crop water use ... stating that (the crop report) helped him with applying irrigation as needed, depending on the ET reading each week," Baglieri said. "I believe our users found the more tailored crop water-use information quite valuable."

The NRD manager Pat O'Brien also used Mesonet data in the form of soil temperature maps to see just how much ground temperature influenced the spring 2019 flooding. In the future, the NRD foresees finding other uses for Mesonet data as well.

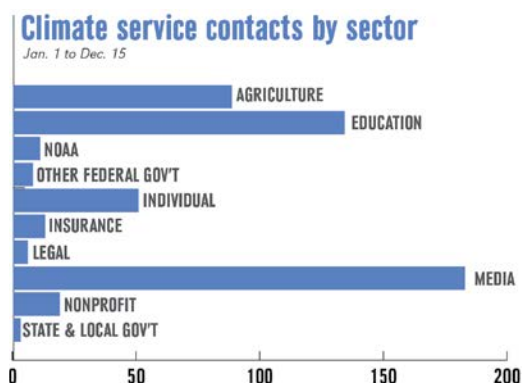
"I may also be able to use that data to track precipitation in certain areas of the district," Baglieri said, but bare minimum, she's considering adding the three Mesonet sites individually to the crop water use reports in 2020, instead of just using them for accuracy checks. Because at the end of the day, the more local the data, the better the decision-making capability.

Flooding, climate talks top requests

Since Jan. 1, we've met with more than 4,000 people, given more than 65 talks, and fulfilled nearly 150 data orders.

Our No. 1 request has been information on climate change and the March 2019 flooding that struck portions of north-central and central Nebraska. In a time when extreme weather strikes, affecting lives of Nebraskans, we get questions: How often does this happen? Is this usual? Is it related to climate change? With each call, each presentation, each media interview, we provided an answer based on science and rooted in nearly 125 years of climate record-keeping.

In October, we met with Nebraska Legislators to talk about the historic 2019 flooding; we also presented on climate change at the Youth Climate Summit and to the REASON group. In November, we



provided an analysis of the 2019 spring bomb cyclone to the Nebraska Water Resources Association, and we talked climate trends with attendees of the Beef Scholars Climate Summit.

As we move into the end of the year,

we're continuing to provide agriculture weather outlooks to a variety of stakeholders across the state, and we'll continue to give them into the new year.

To keep tabs on where we'll be, visit nsco.unl.edu/events.

IN CASE YOU MISSED IT

NSCO releases mobile-friendly site

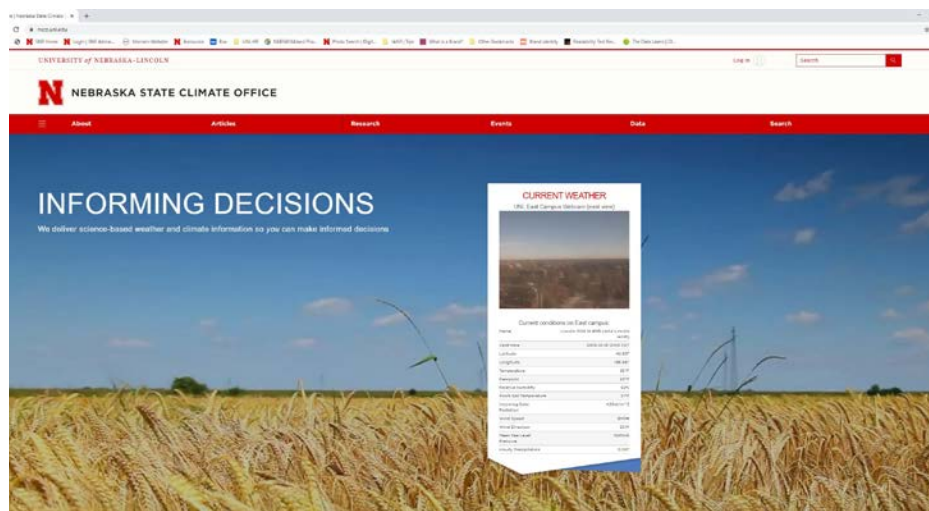
In September, we [released our updated website](#), a new mobile-friendly one intent on improving users web experience.

The site includes new features, including the ability to sort written content into [news](#), [climate summaries](#), and [quarterly reports \(such as this one\)](#). Another added feature is the [events page](#), a list of our upcoming talks with Nebraska stakeholders like you. Want us to come speak at an event your hosting? Fill out our [Request a Speaker form here](#).

We're also excited to point out our [projects page](#), a place where we will continue to highlight new or exciting projects and related research. A few current partnerships include those with the City of Lincoln and the Nebraska Public Power District.

And finally, our new site is searchable, meaning our old content should be easier to find.

In the coming months, you can expect two new things: our Mesonet website,



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The updates website, nsco.unl.edu, is mobile-friendly and searchable.

mesonet.unl.edu, also will get a facelift, and the long-awaited Climate Trends interactive site should be released on the

state climate office website. We'll keep you posted via email and on social media as both of those develop.



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The Nebraska Mesonet site located on University of Nebraska-Lincoln's East Campus. The Keystone, Nebraska, station will look like this one.

Mesonet shifts to calibration season

With the end of the year rapidly approaching, the Nebraska Mesonet crew has wrapped up their fourth visit to every weather station in the state and will be shifting to calibrate equipment pulled from the field this season.

Once per year, the solar, temperature and humidity, and pressure sensors are replaced with freshly calibrated sensors, and those are calibrated in-house during the cold months.

Site visits this year included installing new humidity sensors for improved collection across the state and updating 20 sites to 1-minute data-collection intervals. The crew also installed two new

sites at Indianola 8SW (for a site improvement) and at Dickens 1NE.

Up next is the installation of a 30-foot weather station near Keystone, Nebraska, and the Cedar Point Biological Station, where University of Nebraska-Lincoln students get practical, applied training for natural resources professions.

"We'll be replacing the Keystone 3S short tower with a 3-meter one," said Glen Roebke, senior Mesonet technician. Three-meter towers enhance data collection capabilities for the program, and help bring the organization in line with federal monitoring agencies across the United States.



MEET THE MESONET

Station: PLATTSMOUTH 2SE

Birth date: APRIL 17, 2018

Location: CASS COUNTY

Elevation: 370 METERS

Sponsor: NEBRASKA FOREST SERVICE