



ADDRESSING CROP INDUSTRY NEEDS

NEBRASKA STATE CLIMATE OFFICE

Farmers participating in the Climate and Crop Scenario Planning Project noted snowstorms, tornadoes, floods and hail aren't unusual weather events – having occurred on their land for years. But the uptick in flooding events and abnormally warm temperatures in the winter and spring are.

For the past two years, Nebraska and South Dakota Extension

and corn system stakeholders have come together to discuss key climate and crop growing scenarios most relevant to the industry. Their goal has been to determine important scenarios and impacts to the crop industry due to changes in climate; management options that address key scenario drivers; and develop Extension programming that addresses educational needs.

Continued on **PAGE 2**

IN THIS ISSUE

- 3 | Share your opinion on Nebraska Mesonet
- 4 | Is El Niño weather here?
- 5 | Maintenance season ends
- 6 | Researchers see common threads in climate change response

Image of interactive scenario planning graphics courtesy Lemony, LLC.

Continued from PAGE 1

About 85 producers and cropping systems stakeholders, including farmers, agriculture business professionals and government agency professionals, attended four workshops in Sioux Falls, South Dakota, and Mead, Sidney, and Hastings, Nebraska.

"The half-day sessions started with whole-group discussion on weather events that have affected their operations throughout the year," said Tyler Williams, educator and climatologist with University of Nebraska Extension and the Nebraska State Climate Office. "Discussions during these events generated hundreds of crop and climate scenario-impacts and potential management strategies."

The NSCO was a key piece in providing the climate trends, projections and scientific information to each discussion, Williams said. "The ability of the NSCO to make the connection between climate and agriculture was a key linkage that is often hard to find."

Workshop discussions centered around temperature and precipitation, with a focus on four scenarios — hot and dry; hot and wet; cold and dry; and cold and wet — for each of the four seasons. Small groups of four to six farmers and university experts discussed which scenarios have the greatest impact on farm operations. Through these discussions, a large list of on-farm impacts was created.

"The impact list is not a comprehensive list," Williams said, "but is a list of common and mostly region-wide impacts from these scenarios."

Discussions also targeted management strategies to deal with those impacts, which often boiled down to risk management through planning and diversification and the sequence of weather events. Individual scenarios are often not too challenging, Williams noted; it is the sequence of events or combination seasonal conditions that lead to larger problems.

Interactive graphics are being created to help illustrate the discussed impacts of plausible temperature and precipitation scenarios on the cropping systems industry. These graphics were designed by the climate issue team and developed by Lem-only, LLC, of Sioux Falls, South Dakota. The graphics are designed to be interactive,



ASHLEY MUELLER, NEBRASKA EXTENSION

A workshop garners feedback from area farmers and crop industry experts on how climate is affecting their production.

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— Tyler Williams,
Extension educator

so users can easily find research-based information to manage each impact.

Once completed, the interactive graphics will be at weather-ready.unl.edu.

"We plan to utilize the graphics to help illustrate typical impacts from current or expected conditions during certain seasons," Williams said. "For example, we can utilize the upcoming seasonal forecast and these graphics to help producers better prepare for predicted conditions. We expect to develop more specific information, such as a general fact sheet, for each seasonal condition."

In addition to the discussions and graphics, the project supported the Alternative Crops Field Day in June in Mead. The event was attended by more than 100 producers, who had the opportunity to learn about alternative crops to grow in their operation to diversify and reduce their risk climate and weather scenarios.

The scenario planning project also was featured at many conferences and programs around the country. Team members presented about the project at professional conferences in Fargo, North Dakota; Chattanooga, Tennessee; Lincoln; and Indianapolis, Indiana.

The crop and climate scenario planning project is a joint project between the Northern Plains Climate Hub, South Dakota State University Extension and Nebraska Extension. The team members are:

- Tyler Williams, Nebraska Extension Educator
- Laura Edwards, South Dakota State Climatologist
- Karen DeBoer, Nebraska Extension Educator
- Al Dutcher, Extension Ag Climatologist, Nebraska State Climate Office
- Keith Glewen, Nebraska Extension Educator
- Justin McMechan, Nebraska Extension Specialist
- Ashley Mueller, Nebraska Extension Educator
- Nathan Mueller, Nebraska Extension Educator
- Crystal Powers, Nebraska Water Center
- Anthony Bly, South Dakota State University Extension Specialist
- Natalie Umphlett, Climatologist, High Plains Regional Climate Center

— Tyler Williams and
Shawna Richter-Ryerson, NSCO



NEBRASKA STATE CLIMATE OFFICE

Scottsbluff 6NW station

SURVEY SEEKS YOUR INPUT

The Nebraska State Climate Office is conducting a survey of Nebraska Mesonet users through October.

“Weather impacts us all, and we want Nebraska’s network to meet or exceed the needs of our users,” said Martha Shulski, NSCO director. “We want this survey to answer the question: ‘Why do you care about Nebraska’s ever-changing weather?’”

The [survey available online](#) seeks to understand who uses the weather station data collected across the state, and as well as how they use it and the value they place on having access to the information. The survey is just 19 questions long and takes about five minutes to complete.

“With people’s input, we will be able to

improve the Nebraska Mesonet program,” Shulski said. “People’s answers will help guide the direction of future products, so we know where to focus our limited resources.”

Understanding how people use weather station data, which includes air temperature, humidity, precipitation, and wind speed, among other variables, will inform the office’s long-term planning. Precipitation rates, for example, have so far been one of the most utilized observations, but the current rain gauge sensor is subject to environmental factors, such as spider webs. If desire for that rain data holds true, Nebraska Mesonet would look to install a second rain gauge at each weather station, as weather networks in

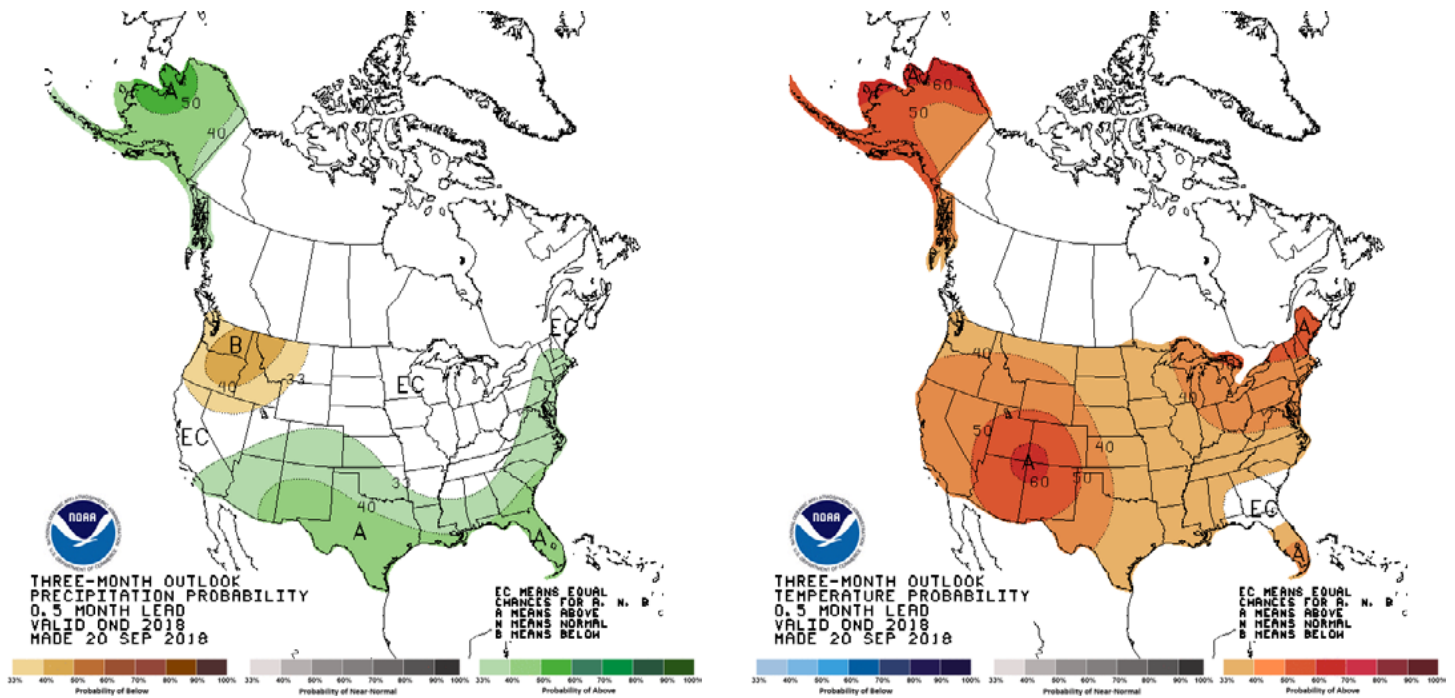
neighboring states do.

The survey also will inform what data is made available on the Nebraska Mesonet website. The mesonet site currently makes available real-time data for each of its 69 stations, which are funded by 24 private, corporation or state agency investors.

“We want to make sure that, first and foremost, the entities who fund the stations are getting what they want and need out of our service. But we do have a broad spectrum of users,” Shulski said. “Weather and climate information is important for many applications, and we want to hear from all of our customers on data utility.”

To participate in the survey, [click here](#).

— Shawna Richter-Ryerson, NSCO



NOAA

Figure 1

IS EL NIÑO WEATHER COMING?

The past three months have brought a host of weather conditions to the Central Plains, including drought, excessive moisture, and distinct periods of above- and below-normal temperatures. The growing season started out exceptionally hot, followed by cooler-than-normal conditions during the second half of the growing season.

Precipitation followed a similar pattern of extremes across the state. The northern half of the state dealt with persistent wetness mid-April through early July, while southeast and portions of south-central Nebraska suffered from dryness conditions that affected much of eastern Kansas and most of Missouri. Drought expansion was limited by periodic periods of heavy precipitation during the late June and early July, as well as the final two weeks of August.

Will these type of conditions continue this fall? It is entirely possible that these extreme oscillations continue through at least the first half of this fall due to the

slow evolution of currently predicted El Niño event that is expected to reach peak intensity by the end of 2018. As this transition progresses, there will likely be distinct periods where the jet stream may resemble El Niño conditions, while at other times the jet stream will resemble what we would expect during the fall season.

Sea surface conditions in the Equatorial Pacific continue to exhibit above-normal temperatures, with a large pool of anomalously warm water underneath the surface that extends from South America to Indonesia. The strongest area of warmth below the surface is just west of central Equatorial Pacific. Therefore, there is ample warmth underneath of the Pacific to maintain the surface warm pool.

Current outlooks by the Climate Prediction Center call for this warm pool to continue through the winter period. Although CPC indicates that this event will end by next spring, the warm pocket underneath of the surface has yet to show signs of any cold pool development in the western

Equatorial Pacific. Their official fall three-month precipitation and temperature outlook for the continental United States can be found in Figure 1.

Until evidence of a cold pocket develops below the surface, anomalous warm water will continue to work eastward and reinforce surface warming in the eastern Equatorial Pacific. The western Equatorial Pacific will be watched over the next three months for the development of a cold pocket. If this region fails to see development before the end of the year, then odds would favor El Niño conditions lasting through next summer, with a high probability that a second year event will unfold during the fall of 2019.

In addition to the warm equatorial Pacific, the Gulf of Alaska and the northern half of the Pacific have both turned warmer than normal. The interaction of these two regions can give us an idea of where the most likely areas of below normal moisture will develop. Under a

Continued on PAGE 5

Continued from PAGE 4

warm Atlantic and warm Pacific, dryness issues are most pronounced across the northern third of the continental U.S., with above normal favored across the southern third of the U.S. from New Mexico through Georgia.

Under an El Niño, the northern jet begins to relax in the late summer and early fall period. Above-normal precipitation usually develops from the southwestern desert through the southern Mississippi River Valley region. At the same time, dryness begins to develop across the Pacific Northwest through the western Dakota's as the eastern Gulf of Alaska upper air ridge begins to push eastward and the western Gulf of Alaska upper air low slides into the eastern half of the Gulf of Alaska.

As this process unfolds, the northern jet stream begins to weaken as more energy begins to strengthen the variable Pacific jet (subtropical jet). Pieces of energy from the Gulf of Alaska upper air low will slide underneath the upper air high pressure to the east of this low. This helps

pull subtropical moisture northeastward out of the Equatorial Pacific and into the southern west coast of North American.

In late September, this process showed signs of unfolding, as dryness began expanding eastward from the Pacific Northwest. Most of the western Dakota's, Montana, Wyoming, and the northwestern third of Nebraska showed well-below normal precipitation. Just to the east of this area, excessive moisture is continuing to be a problem across the northern Mississippi River Valley.

As we move through the fall harvest period, most of the Corn Belt likely will deal with periods of heavy rainfall, interspersed with warm and dry weather. Although weak El Niño conditions are developing, the northern jet stream is still strong enough to bring upper air troughs over the northwestern U.S. upper air ridge, then driving it southeastward over the northern High Plains. If we are in a true El Niño pattern, there should be a weakening of this process as the fall progresses.

However, if we look back at the last El

Niño event, heavy snow storm activity hit the eastern Dakota's and northern Minnesota during the second half of the 2016 fall season. El Niño conditions were exhibited off and on during the late summer and early fall, but were not dominant enough to weaken the northern jet. As the event strengthened during the first half of the winter, milder conditions developed across the northern Great Plains due to a weakened northern jet leaving this area well south of the mean northern jet position.

What happens if the subtropical jet fails to form as expected during El Niño conditions? Actually, approximately three of 10 El Niño events will fail to conform to typical patterns. Under these circumstances, fall and winter temperatures can be exceptionally brutal and stormy. Arctic air infiltration occurs regularly because the northern jet failed to weaken and the primary steering currents favors the northern half of the country east of the Rocky Mountains. In other words, a typical winter pattern.

— Al Dutcher, NSCO

STATION MAINTENANCE WRAPS UP



NEBRASKA STATE CLIMATE OFFICE

St. Michael Station, Lincoln, Nebraska.

As the temperature dropped and rain entered the picture, the Nebraska Mesonet crew finished their annual maintenance schedule for all but two of the state's stations.

The annual maintenance run ensures all weather station equipment is working correctly and accurately according to scientific standards.

The crew also installed an eighth new weather station, bringing the state total to 69. New station sponsors included the Papio-Missouri Natural Resources District, North Platte NRD, and Nebraska Forest Service.

Mesonet Manager Stonie Cooper said the team hopes to install a ninth station in the southeast corner of Nebraska near Rulo this year.

They also expect upgrades to available data online at mesonet.unl.edu. Weather observations currently are updated hourly,

but are shifting to every 20 minutes.

Direct users, including natural resource districts and Nebraska Extension, utilize the frequent updates for irrigation scheduling and wind speed verification, among other things.

The Mesonet also was a feature at a range of events last quarter, all of which built understanding and awareness of what a weather station network is and why it's important for Nebraska to have one. Included in that list were:

- Nebraska Extension open house at Haskell Agricultural Laboratory on Aug. 14 in Concord, Nebraska
- High Plains American Meteorological Society conference on Aug. 8 in Hastings, Nebraska
- Soil Moisture Workshop on June 5 at the School of Natural Resources in Lincoln

— Shawna Richter-Ryerson, NSCO



JEFF WILKERSON, OFFICE OF RESEARCH & ECONOMIC DEVELOPMENT

Researchers listen as Bob Wilhelm, vice chancellor of research and economic development at University of Nebraska-Lincoln, opens the Climate Resilience Workshop in July at Nebraska Innovation Campus in Lincoln.

FINDING COMMON THREADS

Two heads are better than one. And dozens working together toward a common goal are better than two.

For the past year, researchers with the Nebraska State Climate Office and the University of Nebraska-Lincoln, have partnered with nonprofit, tribal, state and federal agencies and individuals to potentially shape future response to a rapidly changing climate. The two-year project, Navigating the New Arctic, recognizes that climate around the globe is intricately connected through jet streams that dip and swirl and bounce off one another ([view a visualization from NASA here](#)).

The group most recently brought together scientists to discuss applications of climate resilience centered around four themes: tribes, agriculture, water and communities. In each theme they

wanted to know: Are patterns emerging that bring climate change into focus but which still preserve the threads of knowledge unique to the stakeholders? Is anyone missing from the discussion? Is there anything limiting a shared understanding of climate change? What are groups already doing to adapt to changes in climate or to mitigate its effects?

“We’ve seen unifying threads through all four themes,” said Martha Shulski, NSCO director and co-lead on the project. “Again and again we heard about the importance of building a relationship and gaining trust with the end users; about incorporating local knowledge of climate impacts; that building a usable tool is an iterative and participatory process; and that different communities have different capabilities in handling changes in climate.”

Each of these plays a role in a community’s ability to reduce its risk to current weather events — such ice storms, severe weather or high-rain events — and to future climate conditions, which are expected to bring more extreme weather. Those affected by changes in climate already are seeing extremes: They have either too much water or not enough. There is a lack of biodiversity and smaller, more specialized areas of habitat.

But factors that also play a role include economics; government policy; conservation tactics; and humans themselves.

Through this analysis, the scientists have recognized experts in economics, environmental quality, ecosystem services, social science and environmental

Continued on **PAGE 6**



JEFF WILKERSON, OFFICE OF RESEARCH & ECONOMIC DEVELOPMENT

Researchers and collaborators pose for a photo during the Climate Resilience Workshop in July at Nebraska Innovation Campus in Lincoln.

Continued from PAGE 5

quality need to be at the table. Training in how to communicate about the complex issue or being able to turn large datasets into usable tools also is a must, and better communication across expertise areas needs to take priority.

The livelihoods of the Arctic’s 4 million residents and food production at the mid-latitude locations like Nebraska are dependent upon it.

The project, led by Nebraska researcher Craig Allen, is among the initial 23 awards funded by the National Science

Foundation’s Growing Convergence Research program, which focuses on merging knowledge from disparate areas to solve major challenges. Though NSF has long supported cross-disciplinary collaboration, convergence goes a step further.

“Convergence is a deeper, more intentional approach to the integration of knowledge, techniques and expertise from multiple disciplines in order to address the most compelling scientific and social challenges,” said NSF Director France Córdova.

A third workshop in the project will

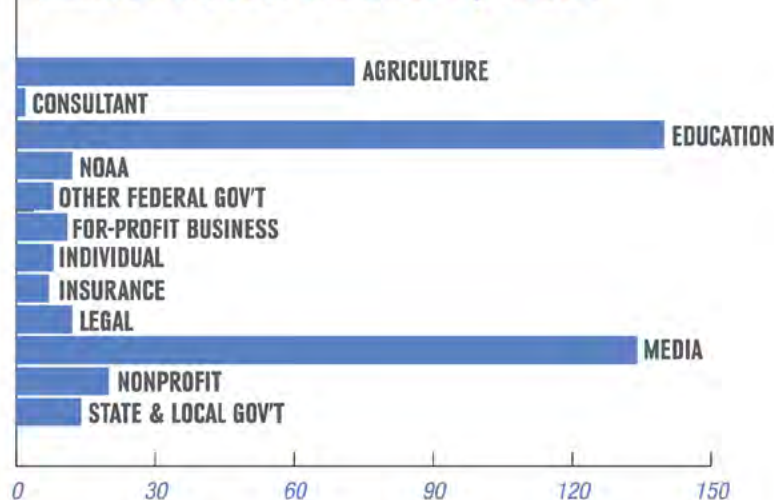
be Oct. 15 to 17 in Anchorage, Alaska. The workshops are expected to lead to additional high-impact research and to influence future policymaking.

For more on the project

Read “[Husker scientists aim to boost Arctic’s resilience](#)” and “[Arctic workshop builds foundation for resilience to climate change](#)”.

— Shawna Richter-Ryerson, NSCO; Tiffany Lee, with UNL Research and Economic Development contributed to this report.

Climate service contacts by sector



NSCO
Jan. 1 to Sept. 30

39
TALKS

2,971
PEOPLE IN ATTENDANCE