



BUILDING RESILIENCE TO CLIMATE CHANGE

NEBRASKA STATE CLIMATE OFFICE

Researchers including Martha Shulski, Nebraska State Climate Office director, recently returned from a workshop with indigenous peoples in Alaska as part of a two-year project focusing on managing rapid environmental change.

The project, dubbed Navigating the New Arctic, aims to bring together scientists, experts and

stakeholders from a variety of disciplines to examine climate change and its effects on society.

Their goal? To prompt novel scientific discovery and innovation to help tackle the problem and improve resilience.

During the workshop, 12 stakeholders from indigenous communities joined 14 researchers from eight higher-education and government institutions for brainstorming

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Collaborating researchers on the Navigating the New Arctic project pose for a photo.

Image by Martha Shulski

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sessions around six key themes:

- Assessing resilience of ecosystems and communities;
- Incorporating indigenous traditional knowledge into the project;
- Tracking carbon and nutrients in soils and water;
- Identifying spatial patterns of plants and animals;
- Arctic warming and implications for mid-latitude weather; and
- Developing new tools and approaches to study this complex topic.

Through listening sessions, researchers learned what climate change looks like at the local level in native communities in Alaska.

"Climate change is real," one elder shared. "We're living it." Others pointed to thawing permafrost, drying lakes, thinner moose, and disappearing bear, noting food security has become a major concern. "The changes we see are accelerat-

ing," they added.

Though the impacts were localized to individual communities, the broader themes spoke to rapidly changing landscapes, climate and ecology, with economic, social, psychological and health effects.

In July, the researchers will conduct a similar workshop in Nebraska, meeting with local native populations and invested stakeholders. A third workshop will be hosted in the fall. Outcomes, tools and future research projects will be based on those conversations.

The project, funded by the National Science Foundation, builds on two years of groundwork laid through UArctic, a cooperative network of universities, colleges, research institutes and other organizations concerned with education and research in and about the North. Shulski has served as one of two University of Nebraska-Lincoln representatives, attending the conferences and building a network to examine the ties between climate change in the Arctic and the mid-latitudes, where

Nebraska falls.

"We know warming in the North plays a role in heavier, more frequent rain events; heat waves and persistent drought," Shulski said, "and jet streams can be impacted, which influence weather patterns here in Nebraska, especially having an effect on our crops."

This research and future efforts will more clearly articulate how changes in the Arctic can be managed to support equitable and beneficial outcomes for people and nature, both in the North and at the mid-latitudes.

Related

For more background on this project, read:

- [Husker scientists aim to boost Arctic's resilience](#)
- [Shulski, Birge to represent UNL at UArctic Congress 2016](#)
- [Convergence Research as NSF](#)

— Writer: Shawna Richter-Ryerson

CLIMATE OUTLOOK

Dutcher: Severe weather likely this spring

The calendar says spring is upon us, but it seems the atmosphere forgot to look at the calendar. The jet stream pattern this winter dictated where above- and below-normal temperatures fell. Considering temperatures across Nebraska the first three weeks of December averaged 6 to 8 degrees above normal, the final two months of winter averaged 2 to 4 degrees colder than depicted in Figure 1.

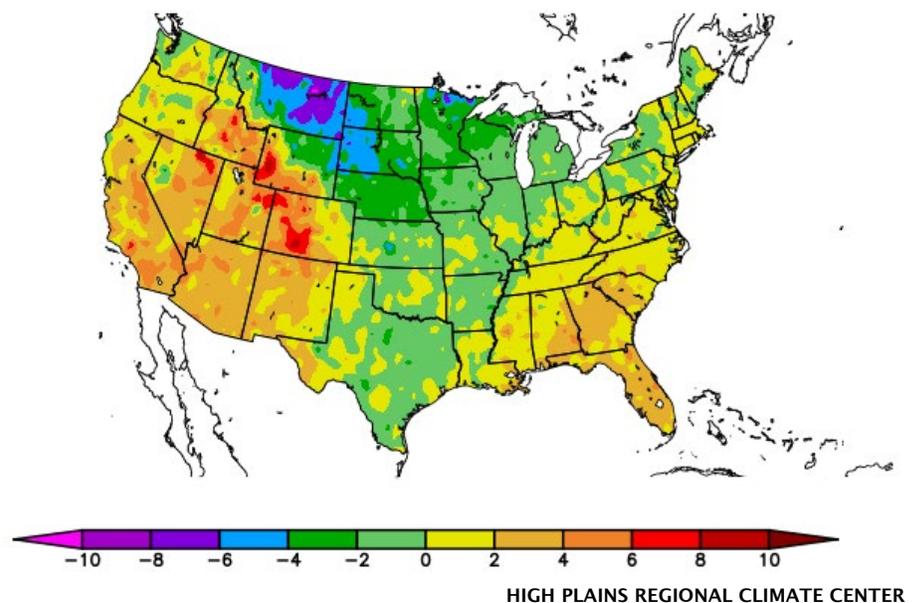
Precipitation across the upper Plains was primarily a function of the position of the northern jet stream. The dominant trend for the atmosphere from the third week of December through mid-February was a deep and expansive trough situated over the eastern half of the country (Figure 2). This led to numerous impulses riding along the backside of the ridge, which led to frequent reinforcements of cold air.

The difference between areas of the state reporting above- and below-nor-

Figure 1

DEPARTURE FROM NORMAL TEMPERATURES (F)

Dec. 1 to Feb. 28



Map generated at HPRCC using provisional data.

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mal moisture can be directly tied to the mid-January storm event that swept in from the southwestern U.S. This was the only major storm system of the winter that had a southwestern U.S. origin and produced significant snowfall across portions of the state. The remainder of the precipitation events for our winter period were light, fluffy events that originated in south-central Canada.

When I put together the winter forecast for Nebraska, two items of concern for how the winter would shape up were the amount of cold air infiltration we would see and the number of storms moving out of the southwestern U.S. Those two items would determine whether precipitation would be above normal. As we move into the spring season, the big question is whether the winter temperature pattern will continue through the spring and how the precipitation pattern will develop.

The La Nina event that developed in the Equatorial Pacific late last summer began to show signs of rapid deterioration during the month of February. At the same time, storms coming into the western U.S. began to take a more southerly track. Several of these systems crossed the southern half of the Rockies, with heavy moisture reported from eastern Oklahoma and Texas, northeastward through the southern Ohio river valley.

Unfortunately, western Oklahoma, Texas, and Kansas missed out on this generous moisture and drought conditions intensified through the winter. A large substantial area of western Oklahoma and Texas received no measurable moisture for 100 to 140 days (location dependent). To make matters worse, the southern third of the Rockies recorded less than 50 percent of normal snowfall through the end of February.

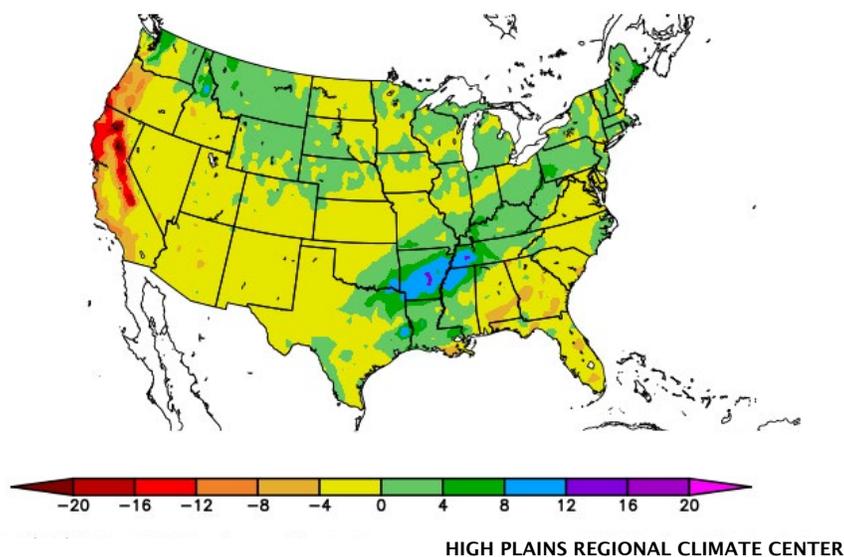
Conditions to our south make this spring forecast rather tricky, particularly the second half. The eastern U.S. upper air trough is still a dominant feature, and the northeastern U.S. has gone through four major winter storms since late February. This trough has shown no signs of abating, but climatologically speaking, it should weaken gradually as we work through the spring months. Therefore, much of the upper Great Lakes region likely will remain cooler than normal.

Further south, above-normal moisture is favored along the mean position of the

Figure 2

DEPARTURE FROM NORMAL PRECIPITATION (IN)

Dec. 1 to Feb. 28



Map generated at HPRCC using provisional data.

southern extent of the eastern U.S. upper air trough. This should lead to planting concerns for southern half of the eastern Corn Belt states (Illinois, Indiana and Ohio). This also would include those areas of eastern Oklahoma and Texas, southern Missouri, Arkansas, Tennessee and Kentucky. This would mirror the type of response typically experienced across the eastern Corn Belt when La Nina conditions are still active.

Further west, the forecast gets more complicated. Areas north and east of a line from central Nebraska eastward through northern Illinois are positioned to receive above-normal moisture, if the current early spring pattern continues unabated. Upper air lows coming into the Pacific Northwest should take a more eastward track, with less energy moving southward along the California coast. With the eastern U.S. upper air trough still in play, energy from these western storms should merge and strengthen over the central and northern Plains. Ranchers are likely to see several more major snow events before April concludes, especially from the northern third of Nebraska northward to the Canadian border.

Further south, I expect a very active severe weather season for the southern two-thirds of Nebraska and the northern third of Kansas. Further south, moisture may be limited due to the ongoing drought. With such a dry atmosphere, it will take a slow-moving or cutoff low pressure system

developing over the southern Rockies to transport enough Gulf of Mexico moisture into the region to produce drought-reducing moisture.

These dry conditions are already beginning to produce well above-normal temperatures across the southwestern High Plains region. With such a deviation in surface temperatures between the southern and northern Plains, conditions are ripe for severe weather as surface lows cross the central Plains.

This type of pattern also can produce significant snow activity in the central and northern Rockies. If this comes to fruition, it may help to temper the spread of heat and dry conditions into the central U.S. as we move into our summer months. If cool conditions persist through the spring period across the Dakota's and eastern Montana, additional drought recovery and issues with excessively wet conditions are likely in areas where soils have a high clay content.

Bottom line, expect a gradual movement toward warmer conditions during April across the central Plains as the eastern U.S. trough releases occasional rounds of Arctic air into the upper Midwest. With the heat to our south, this is the perfect scenario for an active severe weather season that could replicate the planting delay issues experienced last spring, especially across the eastern and northern Corn Belt.

— Writer: Al Dutcher, Extension climatologist

SERVICES

26 talks, 1 senator and a host of Nebraskans

Since Dec. 1, we've crisscrossed the state, meeting with agriculture producers, water managers, trade groups and Nebraska Extension to talk about climate outlooks, climate trends and climate change.

We talked with corn producers about how to use long-lead climate outlooks and tools at an international scale to make local crop decisions. Drought in South America, after all, will have an effect on the local crop market, too.

We talked about temperature inversions with the Nebraska Soybean Board and Nebraska Aviation Trades Association as debate over dicamba herbicide drift and off-target crop damage persist.

And we connected with farmers and water managers at Merrick and Hamilton county extension centers to discuss how changing climate has affected their land — both positively and negatively — so researchers with the University of Nebraska-Lincoln can target their efforts to build tools to support climate resilience.

"Our purpose is to help agricultural producers, businesses and communities

Invite us to speak

We provide talks on a variety of climate topics. Invite us to speak by sending an email to nsco@unl.edu.

increase their resiliency to climate variation and extreme weather events through programs and resources that focus on identifying vulnerabilities and prioritizing actions," said Tyler Williams, climate extension educator affiliated with the Nebraska State Climate Office. "Through our scenario-planning program, we have been able to connect climatologists, agronomists, engineers and other experts with more than 100 crop and livestock producers across Nebraska to discuss climate impacts on their operation.

"These discussions have provided the opportunity to tackle a challenging topic, while building a network of stakeholders related to climate and agriculture across many the eco-regions in Nebraska."

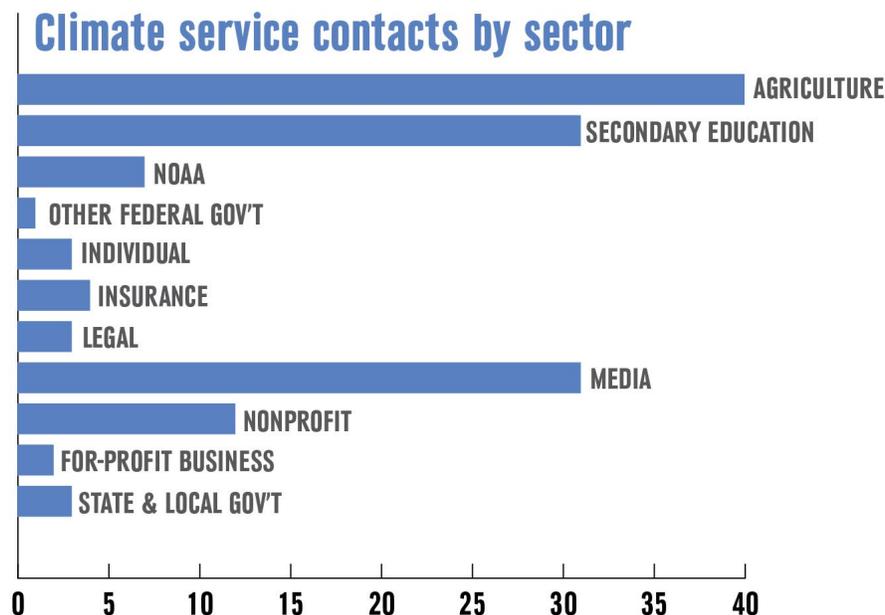
We've been able to have similar discussions with Sen. Deb Fischer and Ginger Willson, Sen. Ben Sasse's ag policy adviser. In February, Martha Shulski, NSCO director, spoke with both about climate change and its effects on agriculture and the state's economy.

In between, we talked with the Oescher Lifelong Learning Group, the Wayne Chamber of Commerce, and dozens of other individuals and groups. We also worked with the National Drought Mitigation Center and High Plains Regional Climate Office, both at the University of Nebraska-Lincoln School of Natural Resources, and the Lower Platte South Natural Resource District to start a drought plan for the district.

In all, we gave 26 talks to more than 1,500 people from a variety of sectors — from the federal government to secondary education classrooms to nonprofit organizations. Our goal is never to give talks just to share information with interested parties. It is to foster understanding so informed decisions can be made.

— Writer: Shawna Richter-Ryerson

NSCO
DEC. 1 TO FEB. 1



26
TALKS

1,539
PEOPLE IN
ATTENDANCE

NEBRASKA MESONET AT NSCO



SHAWNA RICHTER-RYERSON, NSCO

Glen Roebke, senior mesonet technician, works with a data logger during a field maintenance run in early March.

New weather stations to go up across state

As spring starts to thaw Nebraska, we traditionally head into the field to perform our annual maintenance and calibration routine, hitting each of our 64 weather stations across the state.

This year, we'll do just that, inspecting each piece of research-grade equipment and replacing it where necessary to ensure the quality of our data. Those recorded observations feed into our available products, such as the Cattle Comfort Index and real-time maps, but also into regional and national climate data streams.

We'll also be building at least three weather stations to increase our observation coverage across the state.

"Our goal is to provide the best pos-

sible observational representation for all Nebraskans and Nebraska stakeholders, and these new stations provide the ability to record valuable meteorological and agricultural observations in data-sparse regions," said Stonie Cooper, Nebraska Mesonet manager.

Two of the new stations, funded by the North Platte Natural Resource District, will be traditional tripod-configuration towers, gathering automated observations of air temperature; humidity; wind speed and direction; precipitation; barometric pressure; solar radiation; soil temperature; and soil moisture. They will be placed in Garden and Morrill counties. A third tripod will be built in southeast Lincoln.

We also intend to install two 10-meter towers, which gather data at 6 feet, 9 feet and 30 feet, in the northeast part of the state. These towers aid us in calculating flux throughout the atmospheric columns; those calculations are used for climate modeling and research. We are narrowing potential sites for these towers and will report back on their status this summer.

In the meantime, you might just see us in a field near you.

Not sure where we'll be?

Check out the complete map of where our stations are at mesonet.unl.edu.

— Writer: Shawna Richter-Ryerson