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Newsletter editor:  
Natalie Umphlett

Contributors:  
Crystal Stiles, Rezaul Mahmood,  
Logan Winters, Paul Flanagan,  
Natalie Umphlett

## Message from the Director

*By Dr. Rezaul Mahmood*

Hello from Lincoln. As I write, it is a bit windy, but the leaves are turning and the colors are quite spectacular. Despite these nice fall colors, I also recognize historic and ongoing flooding and associated difficulties experienced by the entire population of our region. In this context, HPRCC staff have been busy engaging with stakeholders and communicating relevant climate information to local, state, and federal stakeholders and decision-makers.

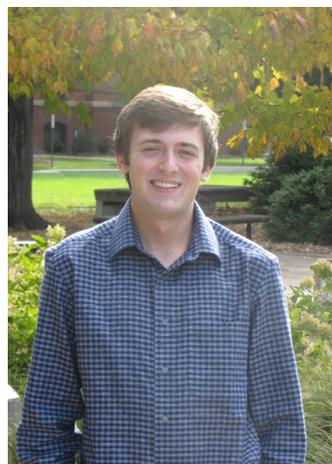
There is good news to share, here on the local level at the HPRCC. First, I would like to welcome the arrival of Thomas Gale Stiles to our HPRCC family. Congratulations to Crystal Stiles, a new mom! In my mind this is probably the most exciting event of the year for the Center. Congratulations are also in order for Warren Pettee, who was recently married to his new bride, Heleena. Additionally, I am pleased to announce that Mr. Logan Winters has joined the HPRCC as our new Service Climatologist (learn more about Logan below).

This quarter, our staff helped to organize and lead two big events - the Regional Climate Services Workshop and Kansas Climate Services Summit, both in Manhattan, Kansas (more information can be found on page 2). Staff also attended the NIDIS Missouri River Basin DEWS Annual Meeting in Billings, Montana, among other events and workshops (see page 6). In addition, HPRCC staff published peer-reviewed papers this quarter, two of which are featured on page 3.

I hope that your summer and early fall have been both productive and restful. I also wish you wonderful fall festivities over the coming weeks and months.



## Meet our Service Climatologist, Logan Winters



This summer, Logan Winters joined the HPRCC team as our new service climatologist. Logan is a recent graduate of the University of Nebraska-Lincoln. He has a bachelor's degree in Environmental Studies with an emphasis in Applied Climate Science.

Logan grew up in Illinois and Indiana, and was able to observe a variety of interesting and extreme weather throughout his childhood, including the infamous Groundhog Day blizzard of 2011, the tornado outbreak in November of 2013, and many flooding events. Logan's fascination with severe storms, extreme weather, and climate change led him to the University of Nebraska-Lincoln where he continued his schooling to pursue a degree. Logan enjoys storm chasing during the spring and summer months, and always appreciates interesting cloud structures. Weather aside, he enjoys watching Husker football and basketball, and doing outdoor activities with friends.



## Workshops Focus on Climate Services in Kansas

HPRCC staff co-lead two special events at Kansas State University in Manhattan, KS during the week of September 9th - the Kansas Climate Services Summit and the Regional Climate Services Workshop.

### Kansas Climate Services Summit

The Kansas Climate Services Summit brought together a number of organizations from around the state that have an interest in climate-related events, impacts, and issues. In total, 45 people attended the 1.5-day Summit, which focused on current climate information, tools, and services specifically for Kansas. Representatives from the National Centers for Environmental Information, National Drought Mitigation Center, High Plains Regional Climate Center, and the State Climate Office of Kansas shared some of the many services that are available across the state of Kansas. In addition to these formal presentations, dedicated discussion sessions allowed for current needs to be explored, as well as opportunities for collaboration and coordination.



Group photo at the International Grains Program Conference Center at Kansas State University. (Photo courtesy Kansas State University.)

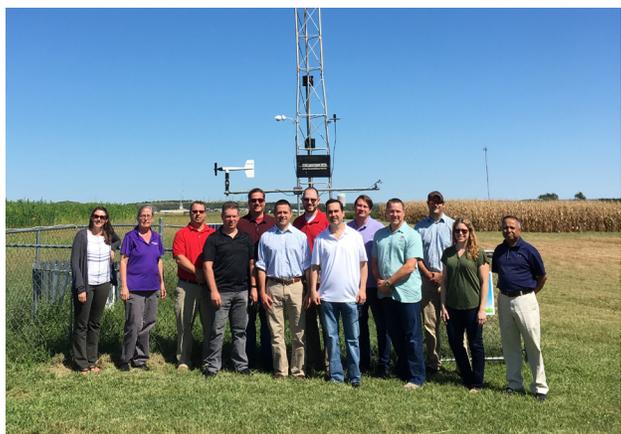
Ultimately, the goal of the Kansas Climate Services Summit was to create an opportunity for providers and users of climate services to:

- Build increased awareness of existing climate tools, data, individuals, and expertise
- Identify climate services needs or gaps within the state
- Improve coordination and collaboration among climate service providers and users at the local, state, regional, and national levels
- Identify opportunities to seek out additional resources

Many next steps were identified and the HPRCC looks forward to continuing to work in the state of Kansas to meet these needs. The Kansas Climate Services Summit was hosted by the State Climate Office of Kansas, the HPRCC, the National Oceanic and Atmospheric Administration, and the USDA Midwest Climate Hub.



### Regional Climate Services Workshop

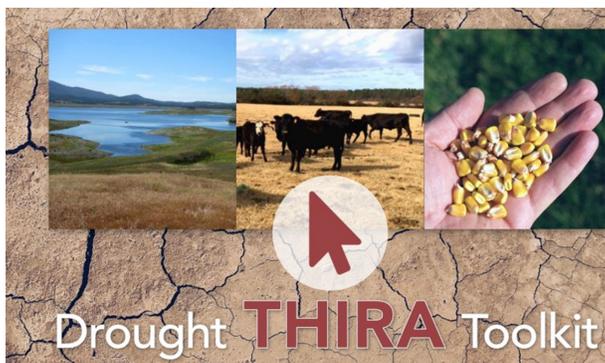


Workshop participants took a field trip to the Manhattan Kansas Mesonet station. <https://mesonet.k-state.edu/>

Since 2015, Regional Climate Services Workshops have been bringing together National Weather Service (NWS) Climate Focal Points with regional climate services partners to build and strengthen partnerships, as well as practice skills and learn about the newest climate products and tools. The most recent workshop focused on NWS Weather Forecast Offices in and around the state of Kansas. Drought monitoring was a major topic at this year's workshop and partners are now working together for better coordination across the state.

This Regional Climate Services Workshop was hosted by the HPRCC and the NOAA Central Region Collaboration Team. A total of 39 NWS Weather Forecast Offices and 3 River Forecast Centers in and around NOAA's Central and Great Lakes Regions have participated in these workshops from 2015-2019. Planning for the next Regional Climate Services Workshop in 2020 is currently underway. Stay tuned!

## Research Highlights



### Team Publishes Research from Drought THIRA Project

Research conducted by the drought Threat and Hazard Identification and Risk Assessment (THIRA) project team was recently published in the *International Journal of Disaster Risk Reduction*. Funded by the NOAA Sectoral Applications Research Program (SARP), this project examined how to apply the Federal Emergency Management Agency (FEMA) THIRA process to a drought scenario to improve planning and coordination among stakeholders. Crystal was a co-Principal Investigator for this project and a co-author on the publication.

Wickham, E.D., D. Bathke, T. Abdel-Monem, T. Bernadt, D. Bulling, L. Pytlik-Zillig, C. Stiles, and N. Wall, 2019: Conducting a

drought-specific THIRA (Threat and Hazard Identification and Risk Assessment): A powerful tool for integrating all-hazard mitigation and drought planning efforts to increase drought mitigation quality. *International Journal of Disaster Risk Reduction*, **39**.

### New Publication Featured in *Journal of Climate*

Research conducted by Dr. Paul Flanagan, a Post-Doctoral Research Associate at the HPRCC, was recently published in the *Journal of Climate*. Funded by the National Science Foundation (NSF) and United States Department of Agriculture (USDA), this work investigated the impact of Atlantic and Pacific sea surface temperature changes on the atmospheric drivers of precipitation over the United States Great Plains. Paul was the primary author of the publication and completed the work while a doctoral graduate student in the Climate, Hydrology, Ecosystem, Weather (CHEWe) research group at the University of Oklahoma.

Flanagan, P.X., J.B. Basara, J.C. Furtado, E.R. Martin, and X. Xiao, 2019: Role of Sea Surface Temperatures in Forcing Circulation Anomalies Driving United States Great Plains Pluvial Years. *Journal of Climate*, **32**, 7081-7100, <https://doi.org/10.1175/JCLI-D-18-0726.1>

## Preview: 100th AMS Annual Meeting

In January, several HPRCC faculty and students will be attending and presenting at the American Meteorological Society's 100th Annual Meeting in Boston, MA. If you are attending, please stop by to hear about the latest HPRCC research and outreach activities. Here is a preview of what to expect:

Modeling Irrigation Impacts on Atmospheric Conditions during the 2012 Historic Drought

**Blomberg, K.R., P.X. Flanagan, R. Mahmood, C.M. Rowe, and M.J. Hayes**

A Hydrometeorological Assessment of the Historic 2019 Flood of Nebraska and Iowa

**Flanagan, P.X., R. Mahmood, N. Umphlett, E. Haacker, C. Ray, W. Sorensen, C.J. Stiles, D. Pearson, and P. Fajman**

Impacts of Future Land-Use Land-Cover on Boundary Layer Development in the North-Central United States

**Flanagan, P.X., R. Mahmood, T. Sohl, M.D. Svoboda, B. Wardlow, and M.J. Hayes**

Primary Atmospheric Drivers of Dry and Wet Periods over the United States Great Plains within CMIP5 Models

**Flanagan, P.X., J.B. Basara, E.R. Martin, R. Mahmood, and J.C. Furtado**

The Impacts of Irrigated and Rainfed Agriculture on Near Surface Atmosphere: Preliminary Results from GRAINEX

**Lachenmeier, E., R. Mahmood, T. Franz, E. Rappin, U.S. Nair, R. Pielke Sr., A. Kaulfus, C. Phillips, W.O.J. Brown, and S.P. Oncley**

Building Indigenous Resilience to Drought through Regional Collaborations in the Missouri River Basin

**Stiles, C.J., N.A. Umphlett, J. Rattling Leaf Sr., and D.R. Kluck**

Climate4Cities: City Data Explorer Tools Demonstrations

**Umphlett, N.A., M. Shulski, T. Abdel-Monem, Z. Tang, and F. Uhlarik**



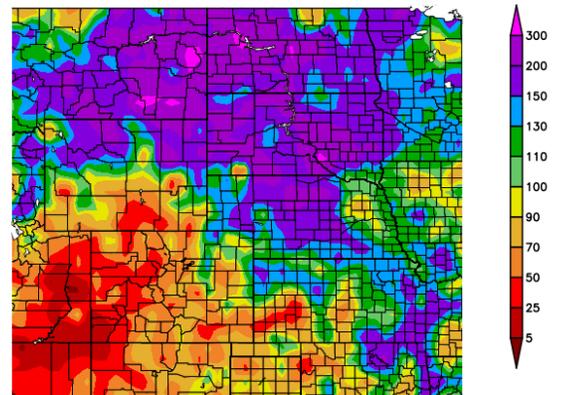
## High Plains Region Impacted by Flooding and Drought

The past three months have been quite eventful across the High Plains region, with extremes on both ends of the spectrum. For much of the region, the wet pattern continued, with areas of the Dakotas, northern Wyoming, central Nebraska, and eastern Kansas receiving at least 150 percent of normal precipitation. Flooding continued to be an issue in many areas, impacting not only transportation, but other sectors such as agriculture.

Meanwhile, above-normal temperatures coupled with little to no precipitation caused drought to develop and expand in parts of Colorado and southwestern Kansas at the end of summer and beginning of fall. The most recent U.S. Drought Monitor map, released on October 24, 2019, indicated that approximately 14 percent of the region was in drought (D1-D4).

More details about the impacts of recent climate conditions in the High Plains can be found in our monthly, quarterly, and annual climate summaries, which can be accessed at the following link: <https://hprcc.unl.edu/climatesummaries.php>.

Percent of Normal Precipitation (%)  
7/1/2019 - 9/30/2019



Generated 10/20/2019 at HPRCC using provisional data.

NOAA Regional Climate Centers

## Winter Outlook: Wet Conditions Expected to Continue Across the North

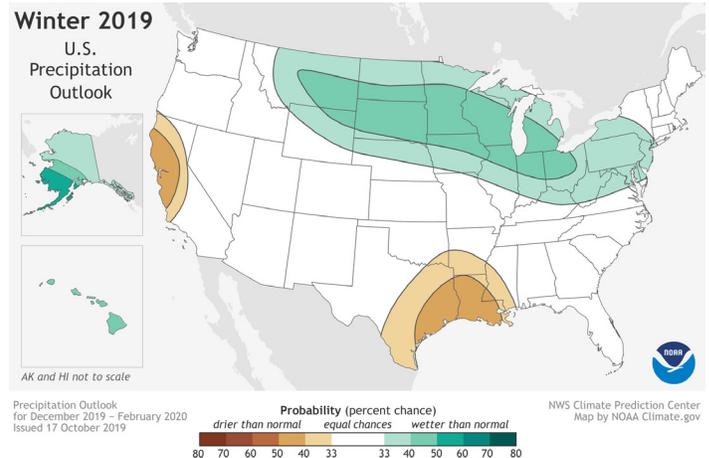
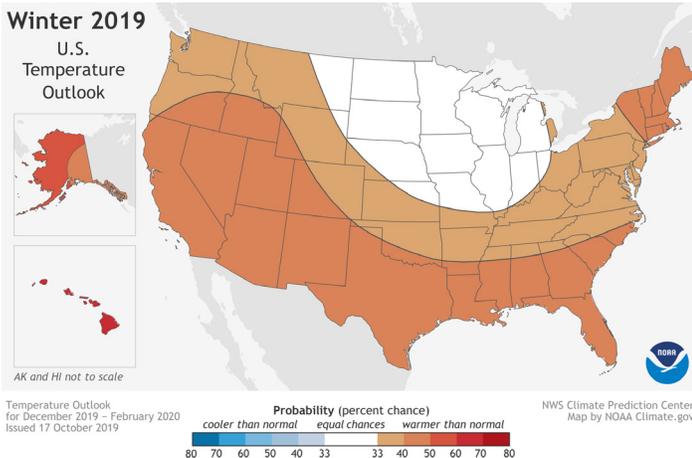
NOAA's Climate Prediction Center released the 2019-20 U.S. Winter Outlook\* on Thursday, October 17, 2019. Above-normal temperatures are favored for the majority of the contiguous U.S. for this three-month time period (December, January, and February), except for portions of the Midwest and High Plains, where there are equal chances for above-, below-, or near-normal temperatures. Meanwhile, above-normal precipitation is favored across the northern tier of the country, which includes North Dakota, South Dakota, the northeastern half of Wyoming, and much of Nebraska. Below-normal precipitation is favored for parts of the West Coast, Southern Plains, and Southeast. Elsewhere, there are equal chances for above-, below-, or near-normal precipitation.

According to a recent NOAA briefing, in combination with current conditions across much of the Missouri River Basin, such as unusually wet soils and much above normal to record high streamflows, there are a number of potential implications\*\* for the winter and spring:

- Rivers freezing above flood stage
- Freezing of overland flooding
- Long-term soil damage
- Widespread ice jams, including on some rivers that are not usually affected by ice jams
- Widespread record flooding again next spring
- Delay or prevention of crop planting

\*Current outlooks may be found here: [www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov).

\*\*Learn more potential implications in the Missouri River Basin here: [www.weather.gov/media/crh/Fall\\_Flood\\_2019\\_Outlook.pdf](http://www.weather.gov/media/crh/Fall_Flood_2019_Outlook.pdf).

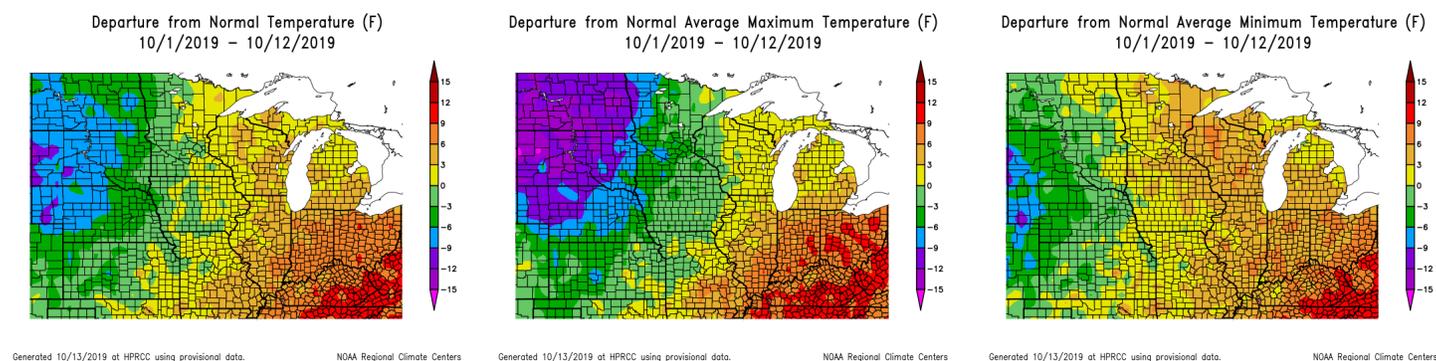


## New ACIS Climate Summary Maps Available

The HPRCC continues to expand and make improvements to our suite of ACIS Climate Summary Maps, which can be accessed at <https://hprcc.unl.edu/ACISClimateMaps>. This summer, four new maps were added to the website, including:

- Average Maximum Temperature
- Average Minimum Temperature
- Departure from Normal Average Maximum Temperature
- Departure from Normal Average Minimum Temperature

These additional maps, when used alongside the average temperature maps, can help provide a more thorough understanding of temperatures for a given time period. The maps below show the departure from normal average (left), maximum (middle), and minimum (right) temperatures in the Corn Belt. In this example, below-normal average temperatures in the western side of the region are being driven primarily by the well below-normal maximum temperatures.



Generated 10/13/2019 at HPRCC using provisional data. NOAA Regional Climate Centers

## Track Year-to-Date Precipitation with CLIMOD

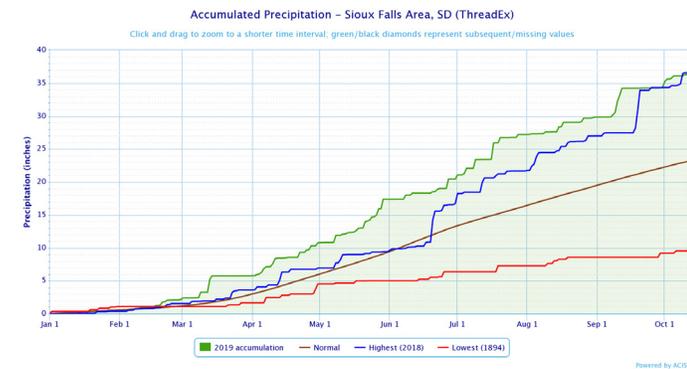
This year's heavy precipitation has left many people wondering how 2019 compares to other years. While there are many ways to access precipitation data, tools like CLIMOD (<http://climod.unl.edu>) makes it easier to understand just how wet a location has been. Two CLIMOD features that HPRCC faculty and staff use regularly are shown below, with Sioux Falls, South Dakota as an example.

### Accumulation Graph

The Accumulation Graph tool allows you to track precipitation for a specified time period. This is particularly useful for tracking year-to-date, water year-to-date, or month-to-date precipitation. In addition to plotting the accumulated precipitation for the specified time period, the tool will automatically show accumulations for the normal, highest year, and lowest year. Snowfall can also be tracked with this tool.

### Seasonal Ranking

The Seasonal Ranking tool is one of the most robust options available within CLIMOD. It allows users to obtain graphs and tables of various summaries (sum, mean, extremes, number of days, or percent of days) for temperature, precipitation, snowfall, and degree days. When results are shown as a table, like the one below, users can easily sort the data from highest to lowest, or lowest to highest, so that a ranking may be determined.



### Time Series Summary for Sioux Falls Area, SD (ThreadEx)

[Click column heading to sort ascending, click again to sort descending.](#)

Rank	Ending Date	Total Precipitation Jan 1 to Oct 11	Missing Count
1	2018-10-11	36.56	0
2	2019-10-11	36.30	0
3	2010-10-11	35.36	0
4	1993-10-11	34.15	0
5	1929-10-11	31.73	0
6	1909-10-11	31.47	0
7	1944-10-11	30.35	0
8	1905-10-11	30.25	0
9	1992-10-11	30.08	0

## Recent and Upcoming Travel and Activities



Natalie provides a presentation at the Mayor's Environmental Task Force Meeting in Lincoln, NE. (Photo courtesy Martha Shulski.)

### Mayor's Environmental Task Force Meeting, Lincoln, NE (August 8)

Natalie was invited to present at the monthly Mayor's Environmental Task Force Meeting in Lincoln, NE. She provided a brief presentation on the latest temperature and precipitation trends for the city, as well as an overview of potential future climate impacts from the Fourth National Climate Assessment.

### NIDIS Missouri River Basin Drought Early Warning System Annual Meeting, Billings, MT (August 28-29)

At the end of August, Rezaul and Natalie attended the NIDIS Missouri River Basin Drought Early Warning System Annual Meeting in Billings, MT. This meeting brought together partners and stakeholders from across the Basin to discuss and prioritize drought-related activities for the next few years.

### CPC Stakeholders Meeting, College Park, Maryland (September 24-26)

Rezaul remotely attended the Climate Prediction Center's (CPC) Stakeholders Meeting, which took place at the end of September. During the meeting, he learned about the variety of ways in which the CPC outlooks are used by the stakeholders around the country.

### Climate Featured in Natural Resources Orientation Class, Lincoln, NE (September 25-26)

In September, two groups of University of Nebraska-Lincoln (UNL) students visited Nine-Mile Prairie and were given an overview of the School of Natural Resources. At this meeting, Logan and Emilee discussed the role of the HPRCC and provided some basic information on local weather stations, such as different instruments that are used at each station to record weather data.

### Rural Communities and Extreme Climate Events Seminar, Kearney, NE (October 1)

In early October, Natalie participated in a forum that focused on the opportunities and challenges that rural communities face when adapting to climate-related extreme events. Other speakers included Bob Dixson, former Mayor of Greensburg, KS; David Vail, historian from the University of Nebraska-Kearney; and Martha Shulski, Nebraska State Climatologist and associate professor at the University of Nebraska-Lincoln. The event was a part of the Thomas C. Sorensen Public Policy Seminar Series and was held at the Kearney Public Library. For more information, please see: <http://ppc.unl.edu/projects/thomas-c-sorensen-policy-seminar-series/>.

### Nebraska Wellhead Protection Network Workshop, Valley, NE (October 2)

Natalie was invited by The Groundwater Foundation to present at a Nebraska Wellhead Protection Network Workshop, which had the theme of "Emergency Management and Contingency Planning to Protect Nebraska's Water Supply." She provided an overview of climate trends for the state of Nebraska.

### Osher Lifelong Learning Institute (OLLI) Course, Lincoln, NE (October 2)

Each year, the Osher Lifelong Learning Institute at UNL provides numerous opportunities for people aged 50 years and older to take courses, participate in events, and travel. Natalie provided a presentation about the Climate4Cities tools for a session of the Changing the Climate on Climate Change OLLI Course led by Dr. Don Wilhite. To learn more about OLLI, please see: <https://olli.unl.edu/about-olli>.

### HPRCC Hosts Scientists from Bangladesh (October 14)

In October, the HPRCC hosted faculty from the newly formed Department of Meteorology at the University of Dhaka in Bangladesh. The visitors, Dr. Towhida Rashid and Dr. Dewan Quadir, had a chance to meet with several faculty members in the School of Natural Resources and learn about current climate-related research and outreach projects.

### Upcoming: High Plains Region State Climatologists Meeting, Lincoln, NE (November)

In November, the HPRCC will be hosting State Climatologists from in and around the High Plains region for a 2-day meeting in Lincoln, NE. The goal of the meeting is to discuss and prioritize areas for collaboration in climate services and research.



Natalie discusses HPRCC's drought-related projects and activities at the NIDIS meeting in Billings, MT. (Photo courtesy Bethany Perry.)