



August 2019 Climate Summary

Wind farm near Matheson, Colorado. Photo courtesy Joe Mascaro.
<http://hprcc.unl.edu>

Extremes in Precipitation Continue

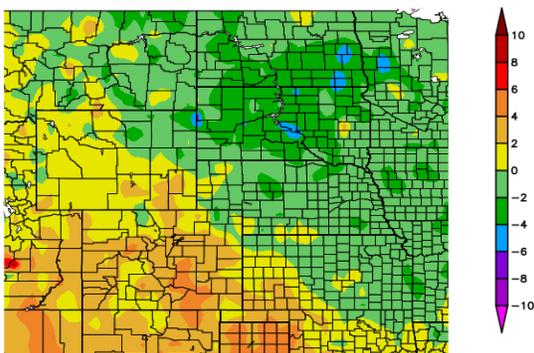
This month, the High Plains region was split down a line running from north-central Wyoming through south-central Kansas. Generally, east of the line, cool, wet conditions dominated, while west of the line, warm, dry conditions prevailed. While this led to precipitation extremes on both ends of the spectrum, precipitation records on the wet side were much more widespread. Numerous locations ranked in the top 10 wettest Augusts on record, with a few setting new monthly records, including Goodland, Kansas, Grand Island, Nebraska, and Huron, South Dakota. This continued wet pattern had various impacts on infrastructure, agriculture, and even the Nebraska State Fair (see page 2 for more details).

By the end of the month, crops were generally in good condition. However, due to a combination of late planting and cool, wet conditions, many crops were behind. This has led to concerns that some crops may not reach maturity before the first freeze; however, there are no indications of an early freeze at this time. The average first hard freeze (28 degrees F / -2.2 degrees C) generally ranges from about late September in northern areas of the region to mid/late October in southern areas. The wet conditions have also created some concern that some areas could see a delayed harvest as well. To learn about your local freeze risk and how that relates to corn development, please see: <https://hprcc.unl.edu/gdd.php>

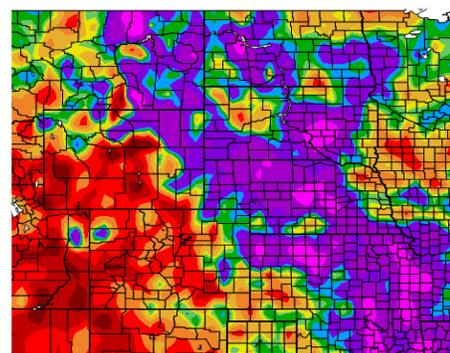
It should also be noted that, on August 13th, a hailstone measuring 4.83 inches (12 cm) in diameter fell near Bethune, Colorado. If verified, this would be a record-breaking hailstone for the state of Colorado. This potential record is currently under consideration by the State Climate Extremes Committee. A potential maximum temperature record, observed in the month of July, is also under consideration. To see other state-wide extremes for Colorado, or any other state, please see: <https://www.ncdc.noaa.gov/extremes/scec/records>.

Temperature and Precipitation Overview

Departure from Normal Temperature (F)
8/1/2019 – 8/31/2019



Percent of Normal Precipitation (%)
8/1/2019 – 8/31/2019



Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for August 2019 in the High Plains region. Maps produced by the High Plains Regional Climate Center and are available at: <http://hprcc.unl.edu/maps/current>.

Precipitation

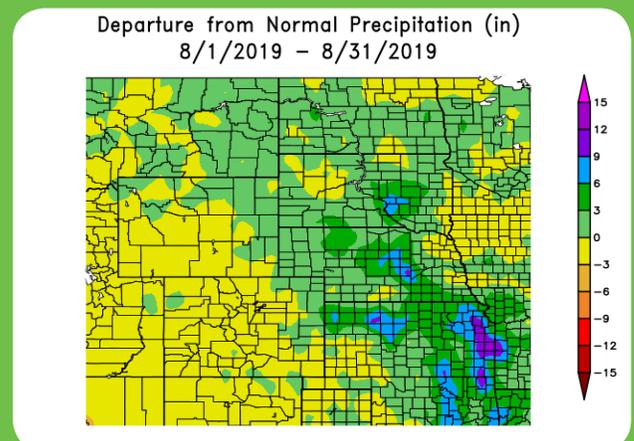
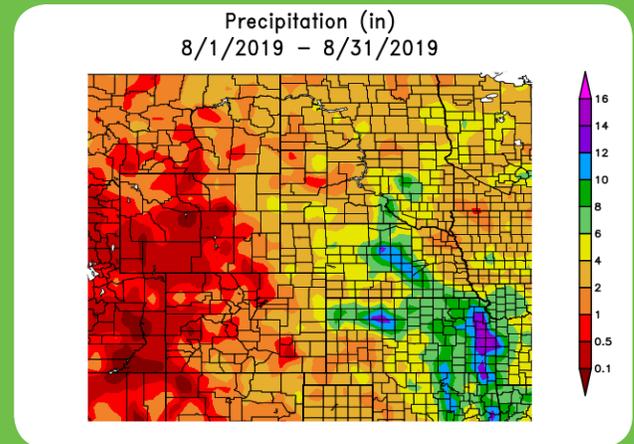
For much of the High Plains region, the ongoing wet pattern continued into August. A large area of Kansas, Nebraska, and South Dakota received at least 150-200 percent of normal precipitation this month, with some locations receiving over 300 percent of normal. As a result, many areas ranked among the top 10 wettest Augusts on record, including: Grand Island, NE (wettest); Goodland, KS (wettest); Huron, SD (wettest); Topeka, KS (2nd wettest); North Platte, NE (6th wettest); and Valentine, NE (8th wettest).

Like last month, parts of Nebraska were affected yet again by flooding. This time, the Nebraska State Fair, held in Grand Island, Nebraska, was impacted. During the early morning hours of the 26th, an area of strong, slow moving thunderstorms developed and moved over areas of central Nebraska, producing a swath of 1.00-3.00 inches (25-76 mm) of rain. This rainfall occurred over already saturated soils, resulting in abrupt rises on small creeks and streams, while also creating large areas of ponding water. The flooding that occurred at the Nebraska State Fair caused disruptions and delays as the main area designated for parking became submerged and was no longer usable. Multiple carnival rides and other booths also became temporarily inundated.

Although wet conditions prevailed across much of the region, drier conditions were present throughout a large part of Colorado, Wyoming, and far southwest Kansas. In some of these areas, precipitation was less than 50 percent of normal for the month. For instance, Grand Junction, Colorado had its 3rd driest August on record, with only 0.04 inches (1 mm) of precipitation (period of record 1983-present).

The summer, as a whole, was quite wet for much of the High Plains region and this ample moisture caused many impacts. For instance, wet conditions were a contributing factor to a collapse in the Goshen/Gering-Fort Laramie irrigation canal in eastern Wyoming in mid-July. As crews made repairs, water did not flow through the canal for several weeks. It was not until the end of August that water was able to flow through the canal again. This impacted more than 100,000 acres of irrigated cropland in both Nebraska and Wyoming at a crucial time of the year. This area receives less than 20 inches (508 mm) of precipitation per year, on average, and is quite drier than areas to the east.

Regional Precipitation



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for August 2019. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: <http://hprcc.unl.edu/maps/current>.

Streamflow Update

Heavy precipitation continued to impact streamflows this month. According to the USGS WaterWatch, monthly streamflows were much above normal across portions of South Dakota, Nebraska, southern North Dakota, central Colorado, and eastern Kansas. Some of these areas also experienced record high streamflows for the month. The rest of the region had normal to above normal streamflows, with only a few isolated areas indicating below-normal streamflows.

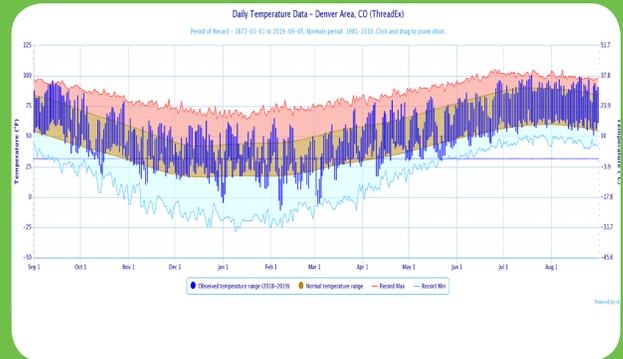
Although streamflows remained above normal in many places, construction crews have continued to make progress repairing and reopening many bridges and roads that were impacted by flooding earlier in the year.

Temperatures

Mild temperatures and a lack of extreme heat were the general rule across much of the High Plains. Overall, monthly temperatures were split along a line from north-central Wyoming through south-central Kansas, with areas to the east having below-normal temperatures and areas to the west having above-normal temperatures. Temperature departures were greatest in areas of North and South Dakota where departures approached 4.0 degrees F (2.2 degrees C) below normal. A few isolated areas had greater departures. Meanwhile, monthly temperatures were above-normal for much of Colorado, Wyoming, and southwest Kansas. In some areas of central and southeastern Colorado, temperature departures reached upwards of 4.0 degrees F (2.2 degrees C) above normal.

This month, there were relatively few temperature records broken, both on monthly and daily time scales. A few locations did rank among the coolest Augusts on record in South Dakota, however, such as Sisseton (5th) and Rapid City (10th). One noteworthy daily record occurred on the 19th, when the temperature in Denver, Colorado hit 99 degrees F (37.2 degrees C). This easily beat the old record of 97 degrees F (36.1 degrees C), which was set in 1986 (period of record 1872-present).

Station Spotlight: Denver, CO



Above: Daily temperatures along with extremes and normals values since September 1, 2018 in Denver, CO.

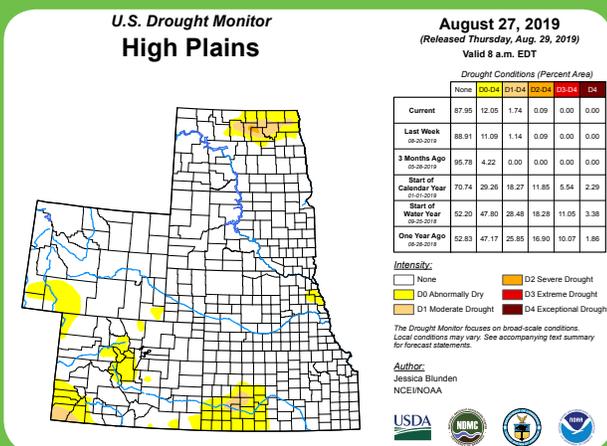
Drought Conditions

Heavy rains staved off the development of drought conditions for the majority of the High Plains region this month. Drought conditions (D1-D4) developed or expanded in small areas of Colorado, Kansas, and North Dakota, however. According to the U.S. Drought Monitor, the area experiencing drought or abnormally dry conditions (D0-D4) increased slightly over the past month, from approximately 9 percent to 12 percent.

Shower and thunderstorm activity was abundant over much of the High Plains region, with a swath of above-normal precipitation stretching from eastern Montana to the southeast through central Oklahoma and Arkansas. Many locations within this area had their wettest August on record. Despite this precipitation, some areas missed out, and abnormally dry conditions (D0) persisted over parts of southwestern Kansas. A small area of moderate drought (D1) developed in that area as well.

To the west, D0 developed and expanded in parts of Colorado and Wyoming. D1 also spread into the southwest corner of Colorado, with drought now encompassing a larger area of the Four Corners region. The combination of ongoing below-normal precipitation and recent above-normal temperatures was a contributing factor to these changes in the U.S. Drought Monitor map in the western part of the High Plains region.

U.S. Drought Monitor



The U.S. Drought Monitor is produced as a joint effort of the U.S. Department of Agriculture (USDA), National Drought Mitigation Center, U.S. Department of Commerce, and the National Oceanic and Atmospheric Administration (NOAA). For current Drought Monitor information, please see: <http://droughtmonitor.unl.edu/>.

Climate Outlooks

According to the Climate Prediction Center, ENSO-neutral conditions are present in the Pacific and the El Niño Advisory is no longer in effect. ENSO-neutral conditions are likely to continue through fall and winter. For more information about ENSO, check out the ENSO blog here: <https://www.climate.gov/news-features/department/enso-blog>.

According to the National Weather Service’s long-range flood outlook, minor to moderate flooding is expected to continue in eastern areas of the Missouri River Basin through October. In the High Plains, this includes eastern portions of South Dakota, Nebraska, and Kansas, particularly along the James, Missouri, and Marais Des Cygnes Rivers. Normal wildland fire potential is expected for the entire High Plains region in September, with normal conditions expected to continue in the High Plains through October.

The seasonal temperature and precipitation outlooks below combine the effects of long-term trends, soil moisture, and when applicable, the El Niño Southern Oscillation cycle (ENSO). To learn more about these outlooks, please see: <http://www.cpc.ncep.noaa.gov>.

Temperature

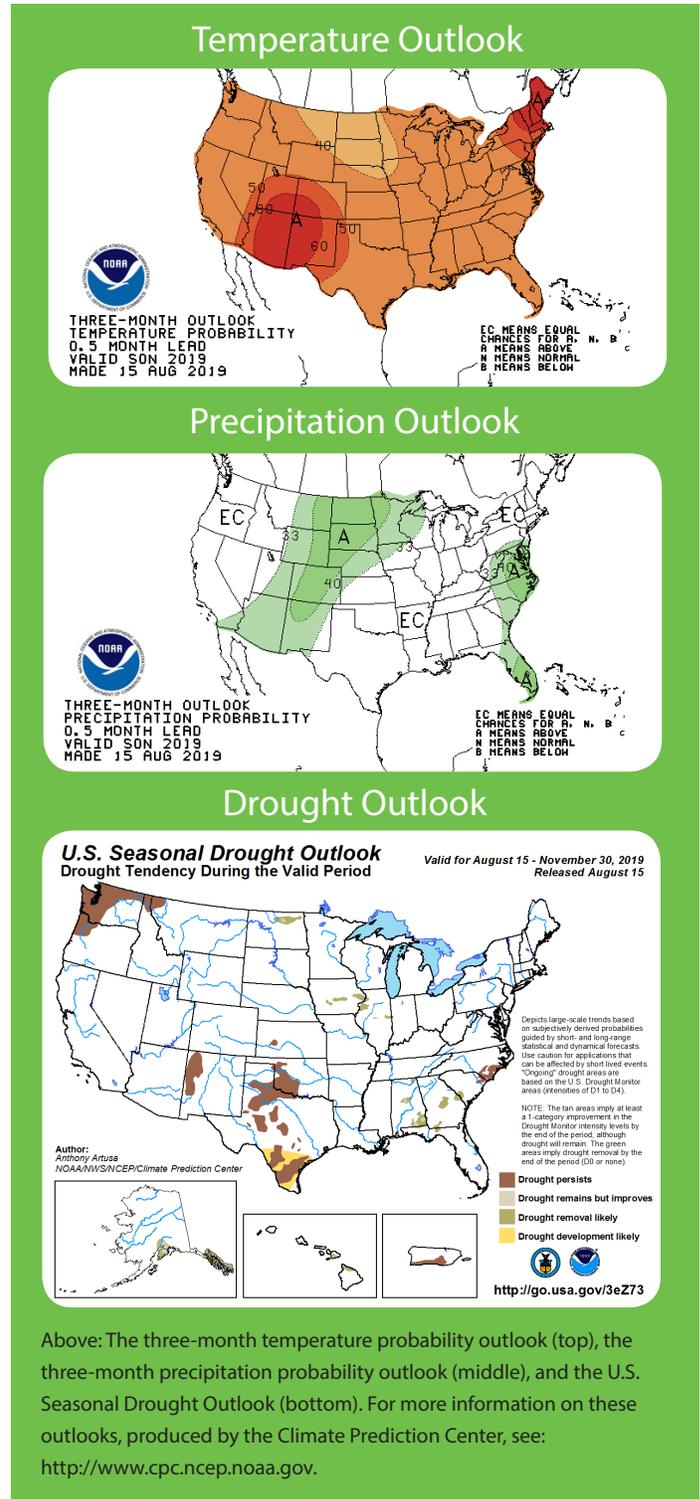
The September-November temperature outlook indicates an increased chance of above-normal temperatures for all of the contiguous U.S., which includes the entire High Plains region. There are no areas that have an increased chance of below-normal temperatures in the contiguous U.S. during the fall months.

Precipitation

The precipitation outlook for the next three months calls for a higher probability of above-normal precipitation across portions of the Rocky Mountain region, the Southwest, and the Central and Northern Plains, as well as the Southeast and Mid-Atlantic regions. In the High Plains, this includes Colorado, Wyoming, northwest Kansas, the northwestern two thirds of Nebraska, and both North and South Dakota. Below-normal precipitation is not anticipated in the contiguous U.S. Elsewhere, there are equal chances for above-, below-, and near-normal precipitation during the September-November period.

Drought

The August 15th U.S. Seasonal Drought Outlook indicates that drought is expected to persist across parts of the Pacific Northwest, southern Plains, and coastal Carolinas. Drought may improve or be removed in small areas of the High Plains, Midwest, and South. Through the end of November, for the High Plains region, drought conditions may improve or be removed in northern North Dakota, while drought is expected to persist in southwestern Kansas. Widespread drought development is not anticipated through November; however, development could occur in portions of southern Texas.



Above: The three-month temperature probability outlook (top), the three-month precipitation probability outlook (middle), and the U.S. Seasonal Drought Outlook (bottom). For more information on these outlooks, produced by the Climate Prediction Center, see: <http://www.cpc.ncep.noaa.gov>.

Station Summaries: By the Numbers

Colorado	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Akron Washington County Airport	87.1	59.3	73.2	1.1	97	08/19	52	08/28	3.40	1.10	148
Alamosa San Luis Airport	83.0	45.4	64.2	1.5	87	08/29+	38	08/29+	0.85	-0.42	67
Colorado Springs Municipal Airport	88.3	58.0	73.1	4.4	96	08/25+	51	08/24	0.71	-2.63	21
Denver International Airport	90.5	60.2	75.4	2.9	99	08/19	51	08/28	0.58	-1.11	34
Grand Junction Walker Field Airport	95.1	62.6	78.9	3.4	100	08/06	56	08/28	0.14	-0.81	15
Pueblo Memorial Airport	94.9	61.3	78.1	4.7	103	08/20	55	08/29	1.05	-1.27	45

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	85.0	68.5	76.8	-0.3	96	08/20	56	08/28	6.61	3.47	211
Dodge City Regional Airport	93.7	66.8	80.3	2.2	104	08/20	57	08/28	2.83	0.08	103
Goodland Renner Field	86.8	61.1	73.9	0.2	99	08/20	53	08/30+	9.47	6.77	351
Topeka Municipal Airport	85.6	67.6	76.6	-0.8	96	08/12	55	08/28	12.03	7.79	284
Wichita Mid-Continent Airport	89.4	70.3	79.8	-0.2	104	08/20	61	08/28	8.32	4.61	224

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	86.9	57.6	72.3	0.1	99	8/19	39	8/28	3.29	1.71	208
Grand Island Airport	81.3	63.9	72.6	-1.4	90	08/20	52	08/28	11.94	8.82	383
Lincoln Municipal Airport	84.1	65.3	74.7	-0.6	95	08/20	51	08/28	2.79	-0.70	80
Norfolk Karl Stefan Airfield	81.6	62.1	71.8	-1.0	92	08/20	47	08/28	3.77	0.52	116
North Platte Regional Airport	83.5	61.7	72.6	0.5	92	08/05	48	08/28	5.38	3.09	235
Omaha Eppley Airport	83.7	67.2	75.4	0.8	96	08/20	56	08/28	5.31	1.49	139
Valentine Miller Field	84.9	60.8	72.9	0.1	98	08/04	43	08/28	4.58	2.40	210

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	78.1	56.8	67.5	-2.0	94	08/06	45	08/30	5.32	3.04	233
Fargo International Airport	76.6	56.5	66.5	-2.8	87	08/06	44	08/30	4.02	1.46	157
Grand Forks International Airport	78.0	54.9	66.5	-0.6	89	08/06+	44	08/30	2.66	-0.22	92
Theodore Roosevelt Airport	80.2	52.8	66.5	-1.9	94	08/06	42	08/30+	1.25	-0.29	81
Williston International Airport	81.5	54.5	68.0	-0.9	96	08/03	42	08/30	1.96	0.51	135

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August 2019 Climate Summary

South Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Aberdeen Regional Airport	78.6	57.5	68.1	-0.9	88	08/06	43	08/30	2.33	-0.10	96
Huron Regional Airport	78.2	60.6	69.4	-2.2	86	08/06	50	08/30	6.77	4.34	279
Pierre Regional Airport	79.5	59.2	69.3	-4.4	94	08/06	47	08/30	3.73	1.93	207
Rapid City Regional Airport	79.8	55.7	67.8	-3.7	91	08/06	41	08/28	2.88	1.32	185
Sioux Falls Joe Foss Field Airport	80.1	60.5	70.3	-0.3	90	08/04	49	08/30	2.65	-0.40	87

Wyoming	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Casper Natrona County International AP	89.1	50.2	69.7	0.7	97	08/19+	39	08/28+	0.17	-0.68	20
Cheyenne Municipal Airport	85.1	55.8	70.5	2.9	95	08/19	50	08/28+	0.45	-1.50	23
Lander Hunt Field Airport	87.4	54.4	70.9	1.3	94	08/20+	46	08/27	0.46	-0.15	75
Laramie Regional Airport	82.4	47.8	65.1	2.8	89	08/20+	38	08/27	0.32	-0.91	26
Rawlins Municipal Airport	85.7	49.4	67.5	2.3	91	08/22+	41	08/28	0.02	-0.74	3
Sheridan County Airport	86.3	52.3	69.3	0.3	98	08/22	43	08/28	0.62	-0.10	86

August 2019 Highlights

Monthly Rankings

Precipitation in inches

Wettest	Precipitation / Ranking	Record / Year	Period of Record
Grand Island, NE	11.94 / WETTEST	8.73 / 1977	1896-2019
Goodland, KS	9.47 / WETTEST	9.29 / 1993	1895-2019
Huron, SD	6.77 / WETTEST	6.66 / 1900	1881-2019
Topeka, KS	12.03 / 2nd wettest	12.69 / 1903	1887-2019
Salina, KS	8.87 / 2nd wettest	13.75 / 1977	1948-2019
Wichita, KS	8.32 / 4th wettest	11.96 / 2005	1888-2019
Bismark, ND	5.32 / 5th wettest	9.29 / 1998	1874-2019
North Platte, NE	5.38 / 6th wettest	6.30 / 1992	1874-2019
Valentine, NE	4.58 / 8th wettest	6.71 / 1966	1889-2019
Sisseton, SD	4.94 / 9th wettest	6.91 / 1964	1931-2019
Scottsbluff, NE	2.92 / 9th wettest	5.66 / 1915	1893-2019
Rapid City, SD	2.88 / 10th wettest	4.83 / 1982	1942-2019
Driest	Precipitation / Ranking	Record / Year	Period of Record
Grand Junction, CO	0.14 / 3rd driest	0.04 / 1956	1893-2019
Colorado Springs, CO	0.71 / 9th driest	0.12 / 2012	1894-2019

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North Dakota Climate Summary

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For more information: www.ndsu.edu/ndsco or www.ndawn.ndsu.nodak.edu



Precipitation:

Based on the National Centers for Environmental Information (NCEI), the statewide average August precipitation was 2.93 inches, which was 0.31 inch less than last month, 1.48 inches more than in August 2018 and 0.84 inch more than the 1981-2010 average, making it the 21st wettest August in the 125-year period of record. It was the wettest August since 2014 (Table 1). The numbers less than 100 in Figure 1 below are shaded in yellow, orange and red to depict the region with below-average rainfall. In contrast, the numbers that are greater than 100 in the same figure are shaded in green, blue and purple to depict the region with above-average rainfall in August. The greatest monthly precipitation accumulation was 6.36 inches, recorded in Mayville, Traill County. The greatest 24-hour precipitation was 2.85 inches, recorded in New England, Hettinger County, on Aug. 11. The greatest monthly snowfall accumulation was a trace, recorded in Bismarck, Burleigh County. The greatest 24-hour snowfall was a trace, recorded also in Bismarck on Aug. 25. Based on historical records, statewide August precipitation showed a positive long-term trend of 0.08 inch per century since 1895. The highest and lowest August precipitation for the state ranged from 4.54 inches in 1900 to 0.73 inch in 1929 and 1933 (Figure 2).

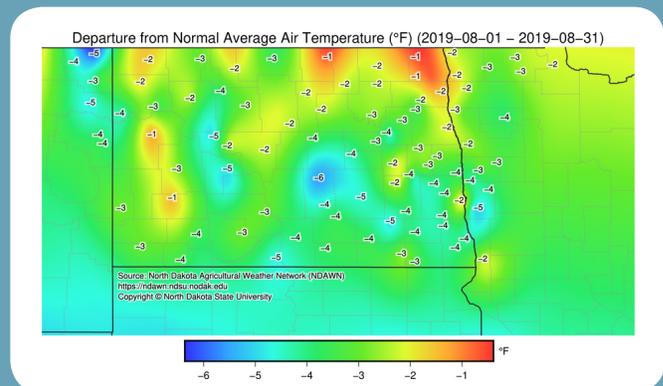
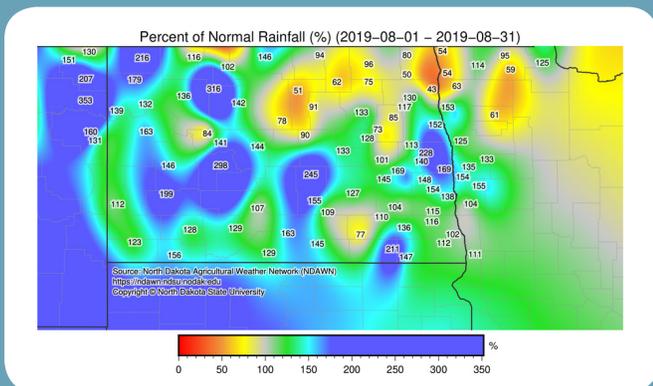
Temperature:

The official state average August temperature was 65.8 F, which is 3.6 F cooler than last month and 1.8 F cooler than in August 2018. The average August temperature was 1.8 F cooler than the 1981-2010 average, which made it the 43rd coolest August in the 125-year period of record. It was the coolest August since 2017 (Table 2). The negative numbers in Figure 3 are shaded in green and blue to depict the region with cooler-than-average temperatures in August. In contrast, the less negative numbers in the same figure are shaded in red and orange to depict the region with warmer-than-average temperatures in August. The state's highest and lowest daily temperatures ranged from 98 F on Aug. 4 in Watford City, McKenzie County, to 33 F on Aug. 28 in Hettinger, Adams County. Based on the historical records, the state average August temperature showed a slight positive long-term trend of 0.2 F per decade since 1895. The highest and lowest monthly state August average temperatures ranged from 73.8 F in 1983 to 61.2 F in 1977 (Figure 4).

Drought and other notable impacts:

Across the observation network of weather stations with at least 30 years of history, two daily high- and 26 daily low-temperature records were set or tied. A total of 20 highest daily precipitation-related records were set or tied.

Temperature and Precipitation Overview



Above: Percent of normal precipitation (left, figure 1) and departure from normal average temperature (right, figure 2) for August 2019 in North Dakota. Both figures produced by NDAWN.

About the High Plains Regional Climate Center

The High Plains Regional Climate Center (HPRCC) is one of six NOAA Regional Climate Centers (RCCs) that has been providing timely climate data and information to the public for cost effective decision-making since 1987. The HPRCC primarily serves the six-state region of Colorado, Kansas, Nebraska, North Dakota, South Dakota, and Wyoming, but has also served people from all across the country and even throughout the world. HPRCC operates under a three-tiered structure of climate services and works closely with other organizations on the local, regional, and national levels. HPRCC staff engage with a wide range of stakeholders including K-20 education, the public, media, private industry, research, and state/tribal/federal entities, among others.

Much of the data and products found throughout this publication were built on the Applied Climate Information System (ACIS) framework. ACIS was designed to manage the complex flow of information from climate data collectors to the end users of climate data information. The main purpose of ACIS is to alleviate the burden of climate information management for people who use climate information to make management decisions.

HPRCC is involved in the ongoing development and management of ACIS. In the spring of 2014, the RCCs released a new website for ACIS. This new and improved website not only contains descriptions of ACIS and the sources of data found within, but also features real-world examples of how RCCs and external groups are using ACIS for their particular climate data needs. In addition to these examples, there is extensive documentation and tutorials on how ACIS can be used and accessed by external clients using Web Services. For more information see: <http://rcc-acis.org>.



Additional Summary Information for the High Plains

Missouri River Basin Quarterly Climate Impacts and Outlook

For more information:
<https://www.drought.gov/drought/dews/missouri-river-basin/reports-assessments-and-outlooks>

Midwest and Great Plains Monthly Climate and Drought Webinar

To sign up for future webinars:
<https://www.drought.gov/drought/calendar/webinars>

For an archive:
www.hprcc.unl.edu/webinars.php

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