



June 2019 Climate Summary



Grand Teton National Park, Wyoming. Photo courtesy James Rattling Leaf.
<http://hprcc.unl.edu>

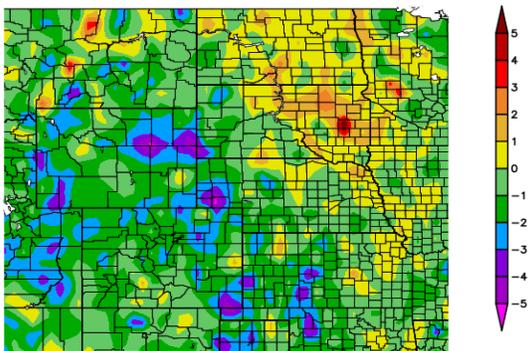
Recent Conditions Continue to Delay Crop Progress

Following a spring full of extremes, the summer season began more quietly across the High Plains. Temperatures and precipitation varied throughout the region during June but did not deviate very far from normal. However, impacts from the spring flooding, as well as ongoing cool and wet conditions, were evident. For instance, many roads remained closed from the extensive flooding that occurred across eastern portions of the region. Mold and sewage problems in flooded homes on the Yankton Sioux Reservation in South Dakota caused concerns over public health. A farmer near Schuyler, Nebraska reported that it would cost over \$1 million to remove sand and debris from his 80-acre pasture left behind by floodwaters. The flooding issues stretch well beyond the High Plains region, as several states in the Midwest and the South contended with spring flooding as well. In fact, the first half of 2019 yielded a record number of flood disasters in the U.S., with Nebraska, Iowa, and South Dakota topping the list, according to E&E News. These disasters are expected to place a strain on the Federal Emergency Management Agency's disaster relief fund, which is currently paying out funds for losses from hurricanes that hit the U.S. and its territories in 2017.

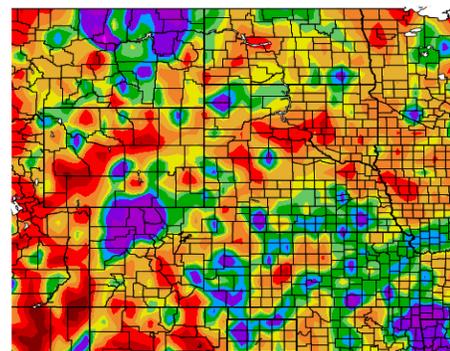
Agriculture continued to be negatively impacted by spring and early summer conditions. The percent of corn and soybeans that emerged had nearly caught up to the 5-year average throughout the region by the end of June. However, only about half of the corn and soybean crop in South Dakota and Kansas was in good to excellent condition, according to the July 2nd USDA Weekly Weather and Crop Bulletin. Wet conditions have contributed to increased disease issues, the prevalence of weeds due to the delayed application of spring weed control, and the likely need for additional drying. Late-planted crops will be at risk for a damaging freeze in the fall if they have not yet reached maturity. Unfortunately, the most recent seasonal outlooks continue to indicate below-normal temperatures and above-normal precipitation for the eastern High Plains, which could slow crop development and exacerbate current issues.

Temperature and Precipitation Overview

Departure from Normal Temperature (F)
6/1/2019 – 6/30/2019



Percent of Normal Precipitation (%)
6/1/2019 – 6/30/2019



Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for June 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

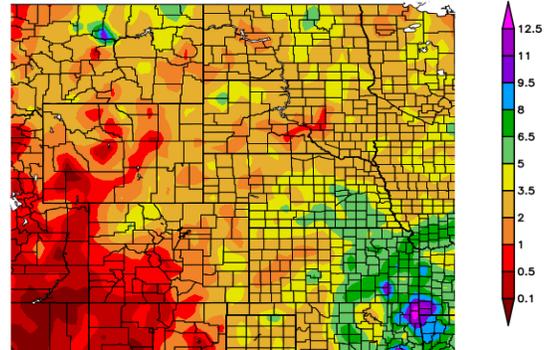
Precipitation was variable across the High Plains during June. Most places experienced dryness, which was welcomed after a very wet May and ongoing flooding issues. However, wet pockets existed in Colorado, as well as Nebraska and Kansas where excessive rainfall was not needed. It was not a month for precipitation extremes across the region though. In fact, the only noteworthy precipitation record came from Dickinson, North Dakota, which had its 7th driest June.

Severe weather was prevalent throughout the region in June, with several reports of tornadoes, high winds, large hail, and flash flooding. For instance, on the 15th, a tornado touched down briefly near Estelline, South Dakota. It caused minimal damage and was rated an EF-0 on the Enhanced Fujita scale. What made this tornado particularly noteworthy was that it was anticyclonic, which means it rotated in a clockwise direction. It is extremely rare to get anticyclonic tornadoes in the Northern Hemisphere. In fact, estimates indicate that approximately one percent of tornadoes that form in the Northern Hemisphere are anticyclonic. On the 18th, severe storms with torrential rainfall went through Wichita, Kansas, causing flash flooding that led to road closures and water rescues. According to the Community Collaborative Rain, Hail, and Snow (CoCoRaHS) network, rainfall totals exceeded 3.00 inches (76 mm) in eastern portions of the city. Four days later, a severe storm with high winds produced an impressive wind gust of 111 miles per hour (179 km/hr) near the city of Derby, Kansas, a suburb of Wichita.

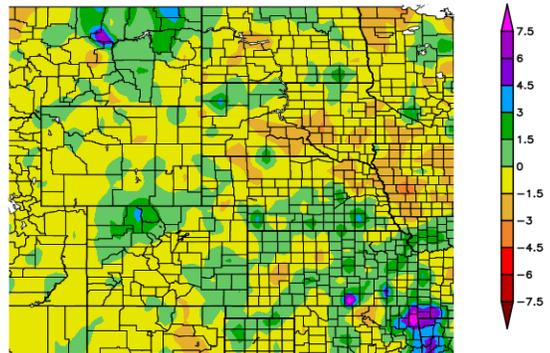
While most people are not thinking about snow this time of year, the official snow season ended on June 30th and it was an impressive one for the High Plains. For many, snowfall came both early and late this season, causing positive and negative impacts. For instance, abundant snowfall was welcomed in Colorado after enduring drought conditions during the previous year that strained water supplies and disrupted the tourism season. On the other hand, early snows last fall brought an early end to the growing season and created issues during harvest for eastern parts of the region, while late snows during the spring delayed planting and contributed to flooding issues. Mobridge, South Dakota, Sisseton, South Dakota, and Lincoln, Nebraska had their snowiest season (July-June) on record. This season ranked among the top 10 of snowiest seasons for several other locations around the region as well (see page 6 for additional records).

Regional Precipitation

Precipitation (in)
6/1/2019 – 6/30/2019



Departure from Normal Precipitation (in)
6/1/2019 – 6/30/2019



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for June 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

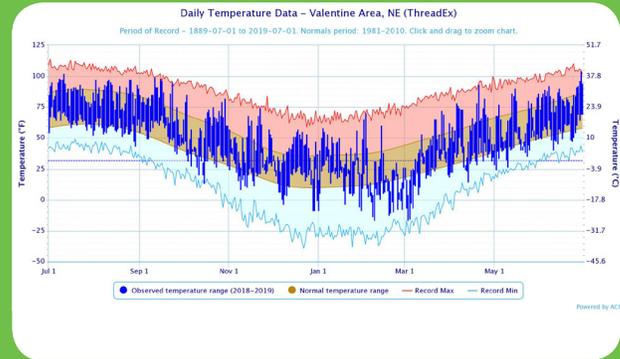
Mountain snowpack in the Upper Missouri Basin had nearly melted out by the end of June. Less than 1 percent of this year's peak remained above Fort Peck Reservoir, while approximately 2 percent of this year's peak remained between Fort Peck and Garrison Reservoirs. As of July 1, the only area reporting mountain snowpack in Wyoming or Colorado was the Snake River Basin in western Wyoming. A late meltout of mountain snowpack in Colorado caused streamflows to be above normal in the western portion of the state. Streamflows continued to be above normal throughout the eastern High Plains in June. However, drier conditions in June helped flooding in these areas begin to subside, and in general, flows were lower than in May. The primary exception to above-normal streamflows throughout the region was northern and western North Dakota, where persistent dryness caused streamflows to run below normal.

Temperatures

Temperatures were near normal throughout the High Plains in June. For the most part, temperatures ranged within 2.0 degrees F (1.1 degrees C) of normal, with cooler conditions in western and southern portions of the region and warmer conditions across the Dakotas. Due to the modest temperature departures, there were no noteworthy monthly temperature records. However, there was a large temperature swing toward the end of the month across the region. While the first three weeks of June were on the cool side, an impressive warmup occurred during the last week, with temperatures ranging from 4.0-8.0 degrees F (2.2-4.4 degrees C) above normal in the eastern High Plains. The combination of heat and high humidity prompted the issuance of heat advisories across these areas during the last two days of June.

Despite near-normal temperatures for the month, temperature extremes were evident across the region in June, with some areas climbing above 100.0 degrees F (37.8 degrees C) and others dipping below freezing. For example, Valentine, Nebraska reached 104.0 degrees F (40.0 degrees C) on the 29th, which was 14.5 degrees F (8.1 degrees C) above normal for that day. Yet, Valentine was far from reaching its highest June temperature of 110.0 degrees F (43.3 degrees C), set in 1988. On the contrary, several locations in Wyoming had minimum temperatures that ranked in the top 10 lowest on record. For instance, Casper recorded its two lowest temperatures for June. On the 9th, Casper set its record lowest temperature at 27.0 degrees F (-2.8 degrees C), then set a new record low the very next day at 25.0 degrees F (-3.9 degrees C). The previous record low temperature for June was 28.0 degrees F (-2.2 degrees C), set on June 13, 1969 (period of record 1939-2019).

Station Spotlight: Valentine, NE

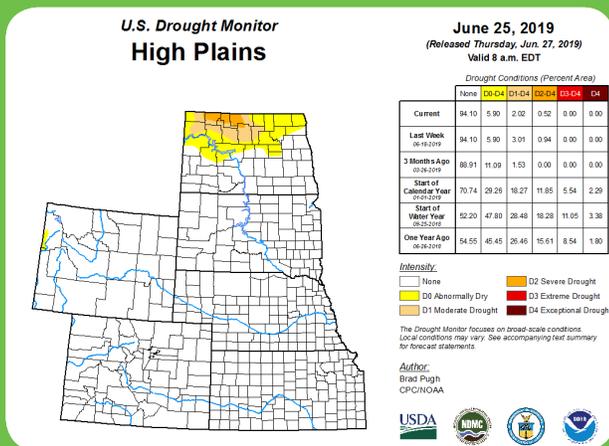


Above: Daily temperatures along with extremes and normals values since July 1, 2018 in Valentine, NE.

Drought Conditions

Despite much of the region remaining free of drought and dryness during June, drought developed and intensified in North Dakota. According to the U.S. Drought Monitor, the area in the High Plains experiencing drought or abnormal dryness (D0-D4) increased from four percent to six percent over the course of the month. While no areas were experiencing drought (D1-D4) at the end of May, about two percent of the region was in drought by the end of June, which was down from three percent around the middle of the month.

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/>.

Northern North Dakota had a dry spring, receiving less than 50 percent of normal precipitation from March-May, causing impacts to agriculture. As a result, moderate drought (D1) spread across the region, and severe drought (D2) was introduced as well. Only recently did this area receive some relief, as the latter half of June brought beneficial precipitation to the area, improving drought conditions. Impacts that have been reported included curling corn leaves, distressed wheat and pastureland, replanting issues due to deficits in subsoil moisture, culling herds, and low water supplies. It is worth noting that this is the third consecutive summer that this region has experienced drought, which has taken a toll on agriculture in the area.

As for improvements, several pockets of D0 were removed from Wyoming due to a favorably wet pattern in May and June. The only pocket of D0 that remained was along the western border. Elsewhere, abundant moisture kept the rest of the region free of drought and dryness.

Climate Outlooks

According to the Climate Prediction Center, El Niño conditions are present in the Pacific and an El Niño Advisory is in effect. El Niño is expected to continue through the summer, with lower odds of continuing through the 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 flooding is expected to continue in eastern areas of the Missouri River Basin through September. In the High Plains, this includes eastern portions of South Dakota, Nebraska, and Kansas, particularly along the James and Missouri Rivers. Minor flooding is also expected along the Arkansas River in Colorado. Due to wet conditions, below-normal wildland fire potential is expected for a large portion of the High Plains during July.

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 July-September temperature outlook indicates an increased chance of above-normal temperatures for western, southern, and eastern portions of the contiguous U.S. In the High Plains, this includes northwestern North Dakota and western areas of Wyoming and Colorado. Below-normal temperatures are expected throughout the Plains and parts of the Midwest. In the High Plains, this includes Kansas, much of Nebraska, southeastern South Dakota, and extreme eastern Colorado. Elsewhere, there are equal chances for above-, below-, and near-normal temperatures during the July-September period.

Precipitation

The precipitation outlook for the next three months calls for a higher probability of above-normal precipitation across central and western portions of the contiguous U.S. In the High Plains, this includes Colorado, Wyoming, Kansas, Nebraska, South Dakota, and southwestern North 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 July-September period.

Drought

The June 20th U.S. Seasonal Drought Outlook indicates that drought is expected to persist across portions of the Carolinas, with persistence and further development anticipated in the Southern Plains, the Northern Plains, and the Pacific Northwest. In the High Plains, this includes northern North Dakota. Meanwhile, drought may improve or be removed in the Southeast and in western New Mexico.

Temperature Outlook

Temperature Outlook

Precipitation Outlook

Precipitation Outlook

Drought Outlook

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for June 20 - September 30, 2019
Released June 20

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short-lived events. *Ongoing* drought areas are based on the U.S. Drought Monitor areas (percentages of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author: Rich Tinker
NOAA/NWS/NCEP/Climate Prediction Center

<http://go.usa.gov/3eZ73>

EC MEANS EQUAL CHANCES FOR A, B, C
A MEANS ABOVE
B MEANS BELOW

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	80.2	51.6	65.9	-1.3	98	06/29	44	06/12+	3.02	0.56	123
Alamosa San Luis Airport	77.5	41.0	59.3	-0.3	87	06/30	33	06/24	0.43	-0.06	88
Colorado Springs Municipal Airport	79.1	49.7	64.4	-0.7	95	06/28	41	06/24	1.97	-0.53	79
Denver International Airport	80.1	51.2	65.6	-1.8	96	06/29+	42	06/10+	2.24	0.26	113
Grand Junction Walker Field Airport	86.1	55.2	70.6	-1.4	97	06/28	41	06/23	0.76	0.30	165
Pueblo Memorial Airport	86.7	51.6	69.1	-0.9	101	06/28	43	06/10	2.25	0.89	165

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	86.9	64.0	75.5	2.1	100	06/28	51	06/10	4.48	0.43	111
Dodge City Regional Airport	85.2	60.2	72.7	-1.2	98	06/29	45	06/10	3.76	0.52	116
Goodland Renner Field	83.3	54.1	68.7	-1.0	100	06/29	42	06/10	2.26	-0.99	70
Topeka Municipal Airport	86.1	64.4	75.2	1.0	96	06/29+	50	06/13	5.56	0.16	103
Wichita Mid-Continent Airport	86.8	64.9	75.9	0.1	98	06/21	51	06/13	6.19	0.99	119

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	79.0	50.4	64.7	-1.2	94	06/29	35	06/10	2.18	-1.06	67
Grand Island Airport	83.2	60.5	71.8	0.5	100	06/29	47	06/10	4.10	-0.20	95
Lincoln Municipal Airport	84.5	61.7	73.1	0.5	99	06/29	46	06/13	4.38	0.03	101
Norfolk Karl Stefan Airfield	81.6	58.7	70.1	-0.1	96	06/29	45	06/02	2.57	-1.69	60
North Platte Regional Airport	82.6	54.4	68.5	0.6	100	06/29	40	06/10	3.59	0.17	105
Omaha Eppley Airport	83.5	64.9	74.2	2.1	98	06/29	53	06/13+	2.80	-1.38	67
Valentine Miller Field	83.7	55.3	69.5	2.0	104	06/29	40	06/10	2.93	-0.63	82

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	79.5	54.9	67.2	2.5	93	06/07	43	06/01	2.82	-0.35	89
Fargo International Airport	78.6	55.6	67.1	0.9	96	06/07	43	06/01	3.37	-0.53	86
Grand Forks International Airport	78.6	52.6	65.6	1.6	96	06/07	36	06/02	1.67	-1.81	48
Theodore Roosevelt Airport	75.9	49.5	62.7	0.5	88	06/03	39	06/01	1.49	-1.71	47
Williston International Airport	79.0	50.2	64.6	1.4	93	06/03	34	06/01	2.66	0.14	106

All data are preliminary and subject to change. + indicates multiple dates, latest date listed. * indicates some missing data for the period. Data are retrieved through the Applied Climate Information System (ACIS) and are available online through the CLIMOD system. For more information please contact us: <http://www.hprcc.unl.edu/contact.php>.

June 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	80.9	55.8	68.4	2.8	94	06/29	44	06/10	4.70	1.00	127
Huron Regional Airport	80.8	57.5	69.1	1.3	99	06/29	47	06/18	3.39	-0.54	86
Pierre Regional Airport	80.0	54.6	67.3	-0.4	100	06/29	43	06/10	2.25	-1.32	63
Rapid City Regional Airport	75.4	49.1	62.3	-2.2	86	06/07	34	06/10	2.11	-0.42	83
Sioux Falls Joe Foss Field Airport	81.8	59.0	70.4	2.6	96	06/29	44	06/13	3.06	-0.86	78

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	77.1	43.3	60.2	-2.0	93	06/29+	25	06/10	0.96	-0.65	60
Cheyenne Municipal Airport	73.7	47.1	60.4	-1.7	90	06/29	38	06/10	2.74	0.40	117
Lander Hunt Field Airport	75.5	46.3	60.9	-2.1	90	06/28	30	06/09	0.19	-1.08	15
Laramie Regional Airport	70.9*	40.1*	55.4*	-1.8*	86	06/29	30	06/10	1.41*	-0.13*	92*
Rawlins Municipal Airport	73.5	43.9	58.7	-0.6	88	06/29	28	06/10	0.63*	-0.40*	61*
Sheridan County Airport	76.4	45.9	61.2	-0.4	95	06/27	32	06/09	1.35	-0.77	64

June 2019 and Snow Season Highlights

Monthly / Snow Season Rankings

Precipitation and snowfall in inches

Driest (June)	Precipitation / Ranking	Record / Year	Period of Record
Dickinson, ND	1.49 / 7th driest	0.54 / 2006	1938-2019
Snowiest Season (July-June)	Snowfall / Ranking	Record / Year	Period of Record
Mobridge, SD	86.8 / SNOWIEST	75.9 / 1997	1911-2019
Sisseton, SD	88.4 / SNOWIEST	83.8 / 2011	1931-2019
Lincoln, NE	55.5 / SNOWIEST	54.3 / 1960	1948-2019
Aberdeen, SD	81.1 / 3rd snowiest	109.8 / 1937	1893-2019
Concordia, KS	48.2 / 3rd snowiest	59.1 / 1960	1893-2019
Alamosa, CO	54.9 / 4th snowiest	97.5 / 1973	1906-2019
Pierre, SD	66.3 / 4th snowiest	82.0 / 1952	1893-2019
Scottsbluff, NE	71.5 / 4th snowiest	81.9 / 2010	1893-2019
Grand Forks, ND	69.6 / 5th snowiest	96.4 / 1997	1893-2019
Omaha, NE	52.7 / 7th snowiest	67.5 / 1912	1881-2019
Huron, SD	64.4 / 8th snowiest	89.6 / 2001	1888-2019

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North Dakota Climate Summary

Adnan Akyuz - State Climatologist
North Dakota State Climate Office, North Dakota State University
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 June precipitation was 2.79 inches, which was 0.5 inch more than last month, but 1.77 inches less than in June 2018 and 0.55 inch less than the 1981-2010 average, making it the 37th driest June in the 125-year period of record. It was the driest June since 2017. 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 June. The greatest monthly precipitation accumulation was 6.32 inches, recorded in Rolette, Rolette County. The greatest 24-hour precipitation was 2.95 inches, recorded in Belcourt, Rolette County, on June 22. The greatest monthly snowfall accumulation was a trace, recorded in Grassy Butte, McKenzie County. The greatest 24-hour snowfall was a trace, recorded also in Grassy Butte, McKenzie County, on June 1, 9, 24 and again on June 30. Based on historical records, statewide June precipitation showed a negative long-term trend of 0.18 inch per century since 1895. The highest and lowest June precipitation for the state ranged from 7.01 inches in 2005 to 1.11 inches in 1974.

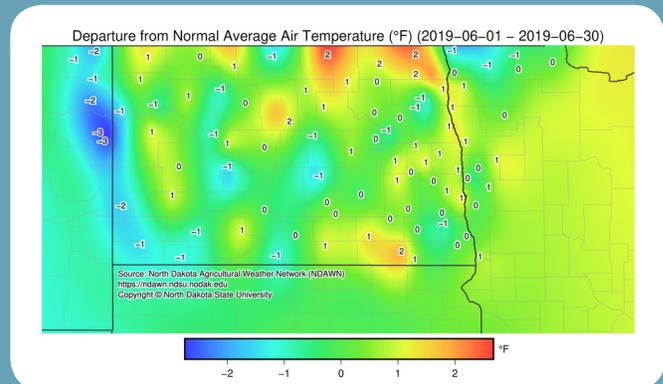
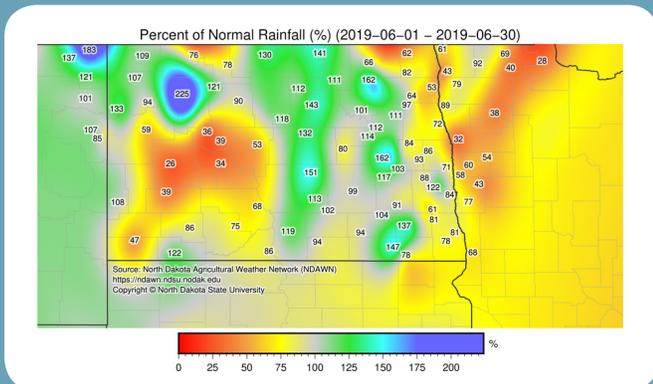
Temperature:

The official state average June temperature was 63.9 F, which is 14.4 F warmer than last month but 3.5 F cooler than in June 2018. The average June temperature was 0.6 F warmer than the 1981-2010 average, which made it the 45th warmest June in the 125-year period of record. It was the warmest June since 2018. It also halts the five consecutive cooler-than-average run started since January 2019. The negative numbers in Figure 2 are shaded in green and blue to depict the region with cooler-than-average temperatures in June. In contrast, the positive numbers in the same figure are shaded in red and orange to depict the region with warmer-than-average temperatures in June. The state's highest and lowest daily temperatures ranged from 98 F on June 8 in Pembina, Pembina County, to 32 F on June 9 in Williston, Williams County. Based on the historical records, the state average June temperature showed a slight positive long-term trend of 0.1 F per decade since 1895. The highest and lowest monthly state June average temperatures ranged from 74.1 F in 1988 to 56.8 F in 1915.

Drought and other notable impacts:

The NOAA Storm Report showed 56 significant storm events in June. Across the observation network of weather stations with at least 30 years of history, 17 daily high- and eight daily low-temperature-related records were set or tied. A total of three 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 June 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

Author Information

For questions, comments, or suggestions, please contact:
Crystal Stiles, Applied Climatologist
(402) 202-3320 - cstiles3@unl.edu
713 Hardin Hall, 3310 Holdrege Street
Lincoln, NE 68583-0997
<http://hprcc.unl.edu>

