# July 2017 Climate Summary

A drought-stressed corn field in central South Dakota. - Photo courtesy Tom Young via Twitter.

http://hprcc.unl.edu

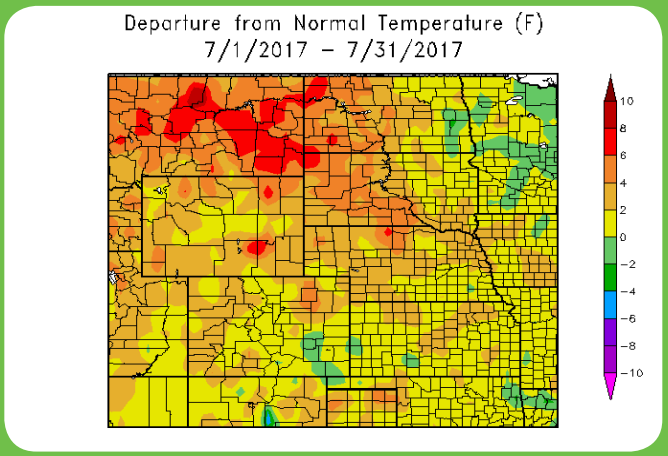
## Drought Continues to Spread and Cause Stress to Crops

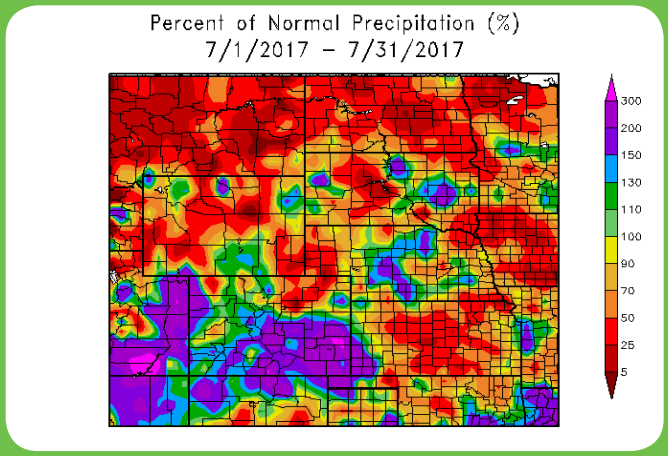
July provided little relief to areas dealing with drought this past spring and summer, as most of the High Plains ended the month with below-normal precipitation and above-normal temperatures. The Northern Plains drought continued to spread and intensify, reaching farther across the Dakotas and southward into northern and central Nebraska. Crop stress increased in severity and became more widespread, as much of the corn and soybean crops in this region did not get adequate moisture when it was needed most. Impacts to livestock and ranching were evident during July as well. Pasture conditions worsened, and by the end of the month more than two-thirds of pastureland in the Dakotas was in poor to very poor condition. Furthermore, the quality of water in livestock ponds declined, causing livestock to become ill and die. The USDA approved additional Conservation Reserve Program (CRP) land for emergency haying and grazing to alleviate drought impacts to livestock.

Despite the widespread dryness, above-normal precipitation occurred throughout portions of eastern Colorado, central and eastern Nebraska, and eastern South Dakota. These conditions favored the development and intensification of corn disease in some areas. For instance, warm nighttime temperatures and high relative humidity caused the spread of southern rust. According to Nebraska CropWatch, bacterial leaf streak has been a significant disease in Nebraska in 2017, and it increased in severity during July as the disease moved into the upper leaves in some corn fields. Diplodia leaf streak, a corn disease that develops and spreads in warm, wet conditions, was discovered in Nebraska for the first time.

Heat was a common feature throughout the High Plains, resulting in several top 10 records for warmest July. Near-record-low relative humidities were reported in areas of drought, especially across portions of Montana, and contributed to the high temperatures as well as exacerbated drought conditions. High temperatures combined with high humidity to create high heat index values and dangerous conditions in the eastern part of the region.

## Temperature and Precipitation Overview



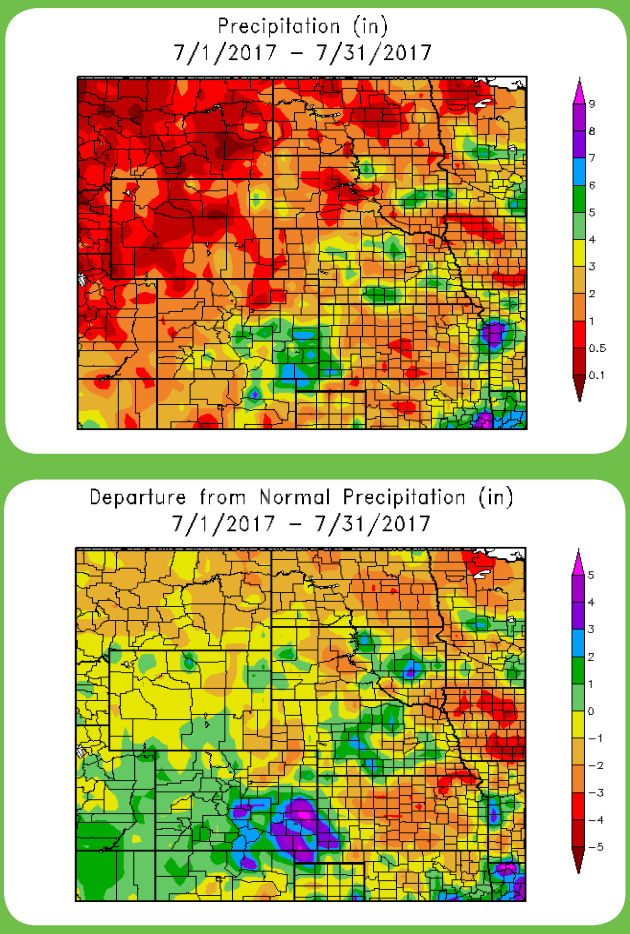

Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for July 2017 in the High Plains region. Maps produced by the High Plains Regional Climate Center and are available at: http://hprcc.unl.edu/maps/current .

# Precipitation

The majority of the High Plains region was dry during July, and little relief was provided to drought-stricken areas. Less than 50 percent of normal precipitation fell across North Dakota, central South Dakota, the Nebraska panhandle, and much of Wyoming and Kansas. The dryness resulted in Pierre, South Dakota having its 2nd driest July on record, while it was the 5th driest for Cheyenne, Wyoming. Meanwhile, a few areas were particularly wet during July. Monsoon conditions brought excessive precipitation to eastern Colorado, which led to Alamosa and Colorado Springs having their wettest and 3rd wettest Julys on record, respectively. Excessive precipitation across central Nebraska and eastern South Dakota helped relieve dryness in these regions.

Despite the overall dryness, it was an active month for severe weather across the High Plains, as there were reports of high winds and large hail nearly every day of the month somewhere in the six-state region. On July 4th, the Galesburg North Dakota Automated Weather Network (NDAWN) station recorded a wind gust of 94 mph (151 km/hr) from a severe thunderstorm. According to the interim director of NDAWN, it was the highest wind speed ever recorded by an NDAWN station since 1990 when the network was established. On the 26th-27th, heavy rain caused major flooding in the Kansas City, Missouri metro area. According to the National Weather Service in Kansas City, many locations experienced more than 3 hours of rainfall rates of 1.00-2.00 inches (25-51 mm) per hour. Local streams rose quickly across Overland Park and Leawood, Kansas, resulting in multiple swift water rescues.

## Regional Precipitation




Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for July 2017. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: http://hprcc.unl.edu/maps/current.

Widespread dryness and above-normal temperatures contributed to the depletion of soil moisture across much of the region in July - a time when moisture is critical for row crops, such as corn and soybeans. Topsoil moisture conditions deteriorated in all six states with Kansas and North Dakota showing the largest increases in percent short to very short. According to the August 1 edition of the USDA Weekly Weather and Crop Bulletin, the percent of topsoil moisture rated short to very short in the High Plains as of July 30th was as follows: South Dakota (79%), North Dakota (73%), Nebraska (62%), Wyoming (60%), Kansas (48%), and Colorado (37%). Consequently, this combination of conditions in July led to crop stress, especially where soil moisture was inadequate.

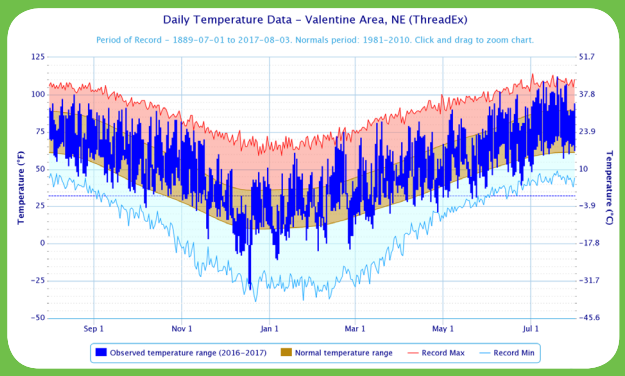
## Streamflow Update

Over the past several months, flooding has been an issue along areas of the Wind River and its tributaries in Wyoming, as well as the North Platte River in Nebraska. Although flood waters have receded and streamflows are returning back to normal along the North Platte River, streamflows continued to be above normal in much of the Wind River Basin. In other areas of the region, heavy monsoonal precipitation across eastern Colorado and western Kansas caused much-above-normal streamflows, while persistent drought conditions in the western Dakotas caused the continuation of much-below-normal streamflows. Low streamflows in southwestern Nebraska throughout the month indicated drought development, which was reflected in the U.S. Drought Monitor's drought depiction of that region by the end of July.

# Temperatures

July temperatures ranged from near normal in the southern High Plains to 4.0-6.0 degrees F (2.2-3.3 degrees C) above normal in the northern part of the region. The greatest departures occurred in the western Dakotas where drought has been present this summer. This warmth resulted in several locations in this area experiencing July temperatures among the top 10 warmest on record: Williston, ND (2nd warmest); Dickinson, ND (tied for 2nd warmest); Bismarck, ND (5th warmest); and Rapid City, SD (7th warmest).

## Station Spotlight: Valentine, NE




Above: Daily temperatures along with extremes and normals values since August 1, 2016 in Valentine, NE.

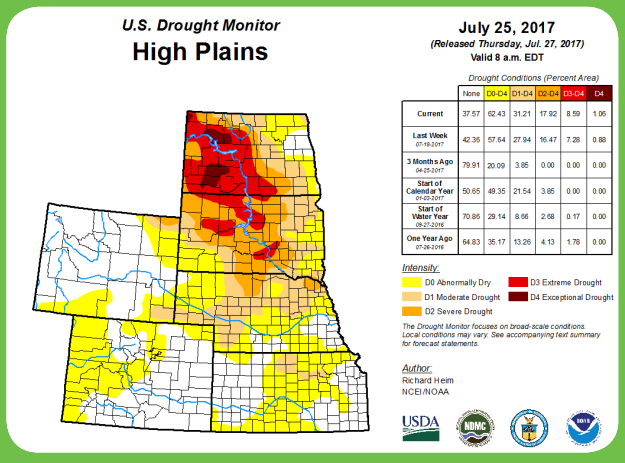
A large contributor to the above-normal temperatures that occurred across parts of the High Plains was a series of heat waves that moved through the region. All six states in the High Plains region had locations that reached 100.0 degrees F (37.8 degrees C) in July. During the first part of the month, a heat wave produced especially high temperatures in Colorado. For instance, Grand Junction had five consecutive days of temperatures in the 100s from the 5th to the 9th, which has not happened since 2010.

Another heat wave impacted the region, particularly throughout the eastern High Plains, from the 19th-22nd. High temperatures combined with high humidity prompted several National Weather Service offices to issue Heat Advisories and Excessive Heat Warnings across portions of Kansas, Nebraska, and the Dakotas. The heat was particularly impressive in Valentine, Nebraska. On the 19th, it reached an astounding 112.0 degrees F (44.4 degrees C), which was the 3rd highest temperature ever recorded at Valentine. The range of temperatures experienced in Valentine has been impressive during the past year; on December 18th, the temperature dipped down to -31.0 degrees F (-35.0 degrees C)!

# Drought Conditions

Drought continued to expand and intensify throughout the High Plains during July, as weather conditions provided little relief. According to the July 25th release of the U.S. Drought Monitor, nearly one-third of the region was experiencing drought conditions, compared to just under 20 percent at the end of June. The Northern Plains drought intensified in the Dakotas and expanded southward into northern Nebraska. Exceptional drought (D4), the highest category of intensity depicted on the U.S. Drought Monitor, was introduced to portions of western North Dakota. While Nebraska was drought-free at the end of June, drought expanded to cover approximately 40 percent of the state by the end of July. Abnormal dryness (D0) and small pockets of moderate drought (D1) slowly spread across parts of Kansas, Colorado, and Wyoming as well.

## 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/.

Agricultural impacts from the drought have become widespread, particularly in the Dakotas. The U.S. spring wheat crop took a big hit this year, as the drought-stricken states of Montana, North Dakota, and South Dakota contain major wheat-growing areas. For the week ending July 29th, the USDA Weekly Weather and Crop Bulletin reported the following percentages of spring wheat in poor to very poor condition: South Dakota (75%), Montana (58%), and North Dakota (44%). Some of the destroyed crop was turned into hay for feed. Corn and soybean conditions also began to deteriorate during July. South Dakota was faring worst as soybeans and corn were rated 35% and 39% poor to very poor, respectively.

# Climate Outlooks

According to the Climate Prediction Center, ENSO-neutral conditions are present in the Pacific. Equatorial sea surface temperatures are near average to above average across the central and east-central Pacific Ocean. ENSO-neutral conditions are favored in the Northern Hemisphere through winter 2017-18. If you are looking for more information about ENSO, check out the ENSO blog here: https://www.climate.gov/news-features/department/8443/all.

According to the National Weather Service, water levels returned to normal in the Wind River and its tributaries in Wyoming and the North Platte River in Nebraska where flooding occurred during the spring and early summer. There is less than a 50 percent chance of long-range flooding throughout most of the High Plains region through September. The National Interagency Fire Center has predicted above-normal wildland fire activity in parts of the western Dakotas through November. 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 August-October temperature outlook indicates an increased chance of above-normal temperatures for the entire contiguous U.S. In the High Plains region, a greater probability for above-normal temperatures exists throughout most of Wyoming and the northwestern tip of Colorado. Elsewhere, there is an equal chance for above-, below-, or near-normal temperatures in the contiguous U.S. during the August-October period.

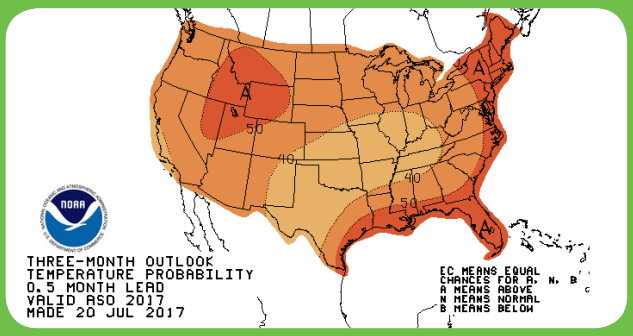
## Precipitation

The precipitation outlook for the next three months calls for a higher probability of above-normal precipitation in the four corners region of the Southwest, as well as parts of the southern Plains. In the High Plains region, this includes southwestern Wyoming, western and central Colorado, and extreme southeastern Kansas. Below-normal precipitation is favored in the Pacific Northwest. The remainder of the contiguous U.S. has equal chances for above-, below-, or near-normal precipitation.

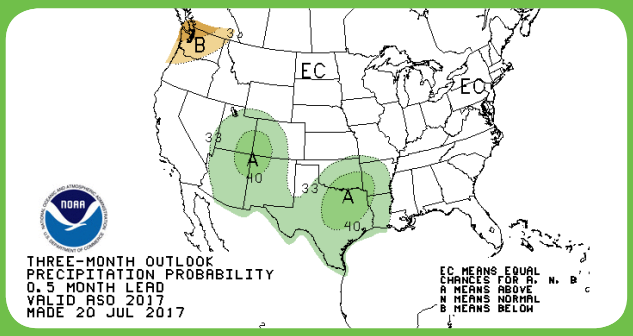
## Drought

The July 20th U.S. Seasonal Drought Outlook shows that drought is expected to persist across small portions of the Southwest and in the Northern Plains region, including eastern Montana and the western half of the Dakotas. Drought may improve or be removed in portions of the Southwest and the Plains. In the High Plains, this includes areas of the eastern Dakotas and pockets of Nebraska and Kansas. Drought development is likely in northwestern Montana, but additional drought development is not expected in the High Plains region through October.

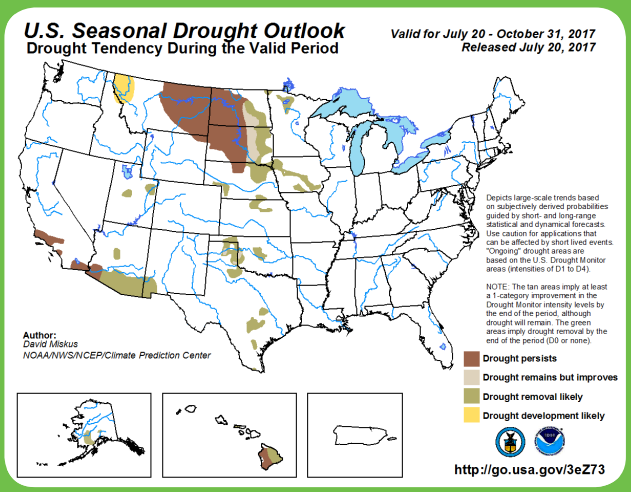
### Temperature Outlook




### Precipitation Outlook




### Drought Outlook




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 | 92.7 | 61.9 | 77.3 | 3.3 | 103 | 07/19 | 56 | 07/13 | 2.15 | -0.40 | 84 |
| Alamosa San Luis Airport | 82.8 | 49.8 | 66.3 | 1.7 | 89 | 07/06 | 40 | 07/04+ | 3.52 | 2.55 | 363 |
| Colorado Springs Municipal Airport | 86.9 | 59.8 | 73.4 | 2.5 | 94 | 07/06 | 49 | 07/01 | 6.23 | 3.39 | 219 |
| Denver International Airport | 91.5 | 61.3 | 76.4 | 2.2 | 100 | 07/19+ | 51 | 07/01 | 0.47 | -1.69 | 22 |
| Grand Junction Walker Field Airport | 95.8 | 66.1 | 81.0 | 2.8 | 102 | 07/09+ | 57 | 07/01 | 0.78 | 0.17 | 128 |
| Pueblo Memorial Airport | 94.2 | 61.3 | 77.7 | 1.9 | 103 | 07/19 | 53 | 07/01 | 3.08 | 1.02 | 150 |

| Kansas | Temperatures (degrees F) | | | | | | | | Precipitation (inches) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Averages | | | | Extremes | | | | Totals | | |
| | Max | Min | Mean | Depart | High | Date | Low | Date | Obs | Depart | % Norm |
| Concordia Municipal Airport | 93.0 | 68.6 | 80.8 | 1.7 | 105 | 07/21 | 58 | 07/01 | 2.34 | -1.58 | 60 |
| Dodge City Regional Airport | 93.6 | 67.4 | 80.5 | 0.9 | 104 | 07/21 | 54 | 07/01 | 2.16 | -0.92 | 70 |
| Goodland Renner Field | 90.3 | 63.6 | 76.9 | 1.2 | 99 | 07/21+ | 56 | 07/04 | 3.38 | -0.09 | 97 |
| Topeka Municipal Airport | 90.7 | 70.2 | 80.4 | 1.4 | 103 | 07/22 | 60 | 07/01 | 4.80 | 0.98 | 126 |
| Wichita Mid-Continent Airport | 93.9 | 71.0 | 82.5 | 1.4 | 107 | 07/22 | 58 | 07/01 | 1.73 | -1.59 | 52 |

| Nebraska | Temperatures (degrees F) | | | | | | | | Precipitation (inches) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Averages | | | | Extremes | | | | Totals | | |
| | Max | Min | Mean | Depart | High | Date | Low | Date | Obs | Depart | % Norm |
| Chadron Municipal Airport | 96.0 | 60.5 | 78.2 | 4.6 | 108 | 07/19 | 43 | 07/01 | 2.55 | 0.44 | 121 |
| Grand Island Airport | 88.9 | 66.6 | 77.8 | 1.6 | 102 | 07/06 | 54 | 07/01 | 3.05 | -0.35 | 90 |
| Lincoln Municipal Airport | 89.5 | 68.0 | 78.8 | 1.2 | 100 | 07/21 | 57 | 07/01 | 5.99 | 2.59 | 176 |
| Norfolk Karl Stefan Airfield | 88.8 | 65.0 | 76.9 | 1.9 | 98 | 07/25 | 51 | 07/01 | 2.10 | -1.22 | 63 |
| North Platte Regional Airport | 93.1 | 63.5 | 78.3 | 4.0 | 106 | 07/19 | 48 | 07/01 | 5.19 | 2.12 | 169 |
| Omaha Eppley Airport | 90.5 | 69.8 | 80.1 | 3.4 | 103 | 07/21 | 60 | 07/24+ | 1.23 | -2.60 | 32 |
| Valentine Miller Field | 97.6 | 64.8 | 81.2 | 6.7 | 112 | 07/19 | 48 | 07/01 | 0.73 | -2.48 | 23 |

| North Dakota | Temperatures (degrees F) | | | | | | | | Precipitation (inches) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Averages | | | | Extremes | | | | Totals | | |
| | Max | Min | Mean | Depart | High | Date | Low | Date | Obs | Depart | % Norm |
| Bismarck Municipal Airport | 91.1 | 60.6 | 75.9 | 4.8 | 103 | 07/05 | 50 | 07/02 | 1.68 | -1.21 | 58 |
| Fargo International Airport | 84.7 | 59.5 | 72.1 | 1.1 | 95 | 07/04 | 46 | 07/02 | 1.06 | -1.73 | 38 |
| Grand Forks International Airport | 84.1 | 58.6 | 71.4 | 2.8 | 94 | 07/04 | 49 | 07/02 | 1.17 | -1.98 | 37 |
| Theodore Roosevelt Airport | 91.8 | 58.1 | 75.0 | 5.8 | 104 | 07/14+ | 48 | 07/13 | 2.12 | -0.32 | 87 |
| Williston International Airport | 92.2 | 61.6 | 76.9 | 6.8 | 103 | 07/16+ | 53 | 07/22 | 0.79 | -1.75 | 31 |

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For more information please contact us: http://www.hprcc.unl.edu/contact.php.

# July 2017 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 | 88.3 | 59.5 | 73.9 | 2.6 | 104 | 07/17 | 46 | 07/01 | 2.05 | -0.97 | 68 |
| Huron Regional Airport | 89.5 | 62.5 | 76.0 | 2.3 | 101 | 07/17 | 46 | 07/01 | 3.40 | 0.48 | 116 |
| Pierre Regional Airport | 94.1 | 63.5 | 78.8 | 3.4 | 106 | 07/09 | 49 | 07/01 | 0.17 | -2.44 | 7 |
| Rapid City Regional Airport | 94.2 | 60.1 | 77.1 | 4.5 | 106 | 07/09 | 46 | 07/01 | 1.07 | -0.78 | 58 |
| Sioux Falls Joe Foss Field Airport | 87.2 | 63.9 | 75.6 | 2.6 | 96 | 07/25+ | 50 | 07/01 | 1.13 | -1.96 | 37 |

| 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 | 92.1 | 54.0 | 73.1 | 2.6 | 98 | 07/14+ | 41 | 07/01 | 0.37 | -1.04 | 26 |
| Cheyenne Municipal Airport | 87.5 | 57.1 | 72.3 | 2.9 | 98 | 07/19 | 46 | 07/01 | 0.53 | -1.66 | 24 |
| Lander Hunt Field Airport | 89.0 | 56.4 | 72.7 | 1.5 | 95 | 07/20+ | 47 | 07/01 | 0.43 | -0.35 | 55 |
| Laramie Regional Airport | 84.3 | 49.7 | 67.0 | 3.0 | 92 | 07/19 | 37 | 07/01 | 1.35 | -0.08 | 94 |
| Rawlins Municipal Airport | 87.6 | 52.1 | 69.9 | 2.9 | 94 | 07/19 | 37 | 07/01 | 1.05 | 0.21 | 125 |
| Sheridan County Airport | 93.2 | 55.2 | 74.2 | 4.2 | 102 | 07/20 | 45 | 07/01 | 0.38 | -0.80 | 32 |

# July 2017 Highlights

## Monthly Rankings

Precipitation in inches, Temperature in degrees F

| **Warmest** | **Temperature / Ranking** | **Record / Year** | **Period of Record** |
|---|---|---|---|
| Williston, ND | 76.9 / 2nd warmest | 80.7 / 1936 | 1894-2017 |
| Dickinson, ND | 75.0 / 2nd warmest (tie, 2007) | 75.1 / 2012 | 1949-2017 |
| Valentine, NE | 81.2 / 3rd warmest | 84.0 / 1936 | 1889-2017 |
| Akron, CO | 77.3 / 4th warmest (tie, 1939) | 78.9 / 2012 | 1937-2017 |
| Scottsbluff, NE | 78.1 / 5th warmest | 79.7 / 2012 | 1893-2017 |
| Bismarck, ND | 75.9 / 5th warmest | 83.3 / 1936 | 1875-2017 |
| Rapid City, SD | 77.1 / 7th warmest | 79.7 / 2007 | 1943-2017 |
| Sheridan, WY | 74.2 / 9th warmest | 77.9 / 1936 | 1907-2017 |
| | | | |
| **Wettest / Driest** | **Precipitation / Ranking** | **Record / Year** | **Period of Record** |
| Alamosa, CO | 3.52 / WETTEST | 3.50 / 1968 | 1906-2017 |
| Colorado Springs, CO | 6.23 / 3rd wettest | 6.59 / 1930 | 1895-2017 |
| Pierre, SD | 0.17 / 2nd driest | 0.10 / 1936 | 1893-2017 |
| Cheyenne, WY | 0.53 / 5th driest | 0.43 / 2008+ | 1871-2017 |

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For more information please contact us: http://www.hprcc.unl.edu/contact.php.

# North Dakota Climate Summary

**Adnan Akyuz - State Climatologist**
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**Precipitation:**

Based on the National Centers for Environmental Information (NCEI), the statewide total July precipitation was 1.28", 3.05" less than the last year, and 1.59" less than the 1981-2010 average, making it the 11th driest July in the 123-year period of record. It was the driest July since 2006. Below-average precipitation was common in most of the state with the exception of a few above normal spots along the Missouri River basin between the SD and ND border and in Steele County in east-central ND (Figure 1). The greatest monthly precipitation accumulation was 3.39" recorded in Cavalier, Pembina County. The greatest 24-hr precipitation was 1.68" recorded in Edgeley, LaMoure County on July 18. Based on historical records, statewide July precipitation showed a positive long-term trend of 0.26" per century since 1895. The highest and the lowest July precipitation for the state ranged from 7.97" in 1993 to 0.64" in 1936.

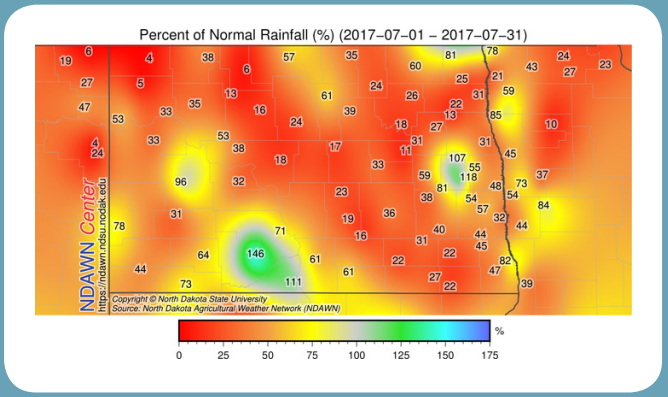
**Temperature:**

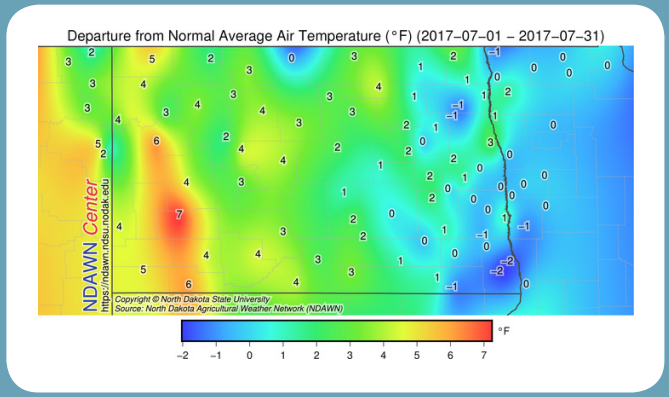
The official state average July temperature was 72.1°F, 2.8° warmer than the last year, and 3° warmer than the 1981-2010 average, making it the 15th warmest July in the 123-year period of record. It was the warmest July since 2012. Above-average temperatures were observed commonly in all drought-stricken parts of the state. Cooler-than-average conditions were limited to the eastern parts of the state where the drought conditions were either non-existent or were not as severe as western ND (Figure 2). The state's highest and lowest daily temperatures ranged from 105° on July 15 in Kildeer, Dunn County to 42° on July 1 in Dickinson Ranch, Dunn County. Based on historical records, the state average July temperature showed a positive trend of 0.11°F per decade since 1895. The highest and the lowest monthly state July average temperatures ranged from 80.1° in 1936 to 61.8° in 1992.

**Drought and other notable impacts:**

Consistently dry conditions in western North Dakota worsened the drought status in these parts of the state. Northeastern parts of the state received some timely and sufficient amounts of rain to improve the conditions there. Warmer than average temperatures in the drought stricken areas exacerbated the drought conditions to the Exceptional Drought category based on a scale developed by the National Drought Monitor (DM). Since the inception of the DM, the second time the state experienced the drought in this category (2006 is the first time of occurrence). Based on the DM map on August 1, 7% of the state was in Exceptional Drought (D4), 36% of the state was in Extreme Drought (D3), 18% of the state was in Severe Drought (D2), 19% of the state was in Moderate Drought (D1), and the rest of the state was in abnormally dry conditions (D0). Persistent dry conditions in the western parts of the state caused the drought to intensify. By the end of the month, more than 43% of the state was under at least Extreme Drought conditions, 8% of which was in the Exceptional Drought category. Historically since the inception of the DM, the state has only been designated as Exceptional Drought category once more in 2006. The ND DOA started taking applications for a hay lottery where eligible applicants register their names. Only one application per operation will be eligible. The deadline for applications is August 31, 2017. Hay will be distributed in semi-load lots with the first drawing in early September. The web site to register for the hay lottery for these 3 states is: https://www.nd.gov/ndda/hay-lottery.

## Temperature and Precipitation Overview




Above: Percent of normal precipitation (left, figure 1) and departure from normal average temperature (right, figure 2) for July 2017 in North Dakota. Both figures produced by NDAWN.

July 2017 Climate Summary

# Kansas Climate Summary

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KANSAS STATE UNIVERSITY

**Dry with spots of flooding**

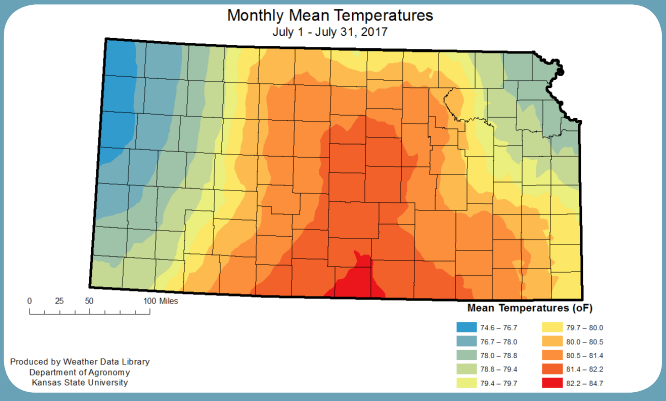
July was drier than normal across much of the state. The statewide average precipitation was 2.32 inches or 65 percent of normal. Only the Southwestern Division was above normal for the month. The average precipitation in that division was 3.37 inches or 125 percent of normal. The Central Division had the least percent of normal with an average of 1.71 inches or 43 percent of normal. The South Central Division had the lowest average at 1.53 inches or 46 percent of normal. Year-to-date averages are still above normal in all except the Northeast and East Central divisions. The greatest monthly precipitation total for a National Weather Service (NWS) Coop station was 7.89 inches at Richfield 1 NE, Morton County. The greatest monthly total for a Community Collaborative Rain, Hail and Snow (CoCoRaHS) station was 11.69 inches at Overland Park 3.3 S, Johnson County. The highest 24hr totals: 6.20 inches at Overland Park S87th, Johnson County, on the 27th (NWS); 6.34 inches at Lenexa 2.0 NE, Johnson County (CoCoRaHS).

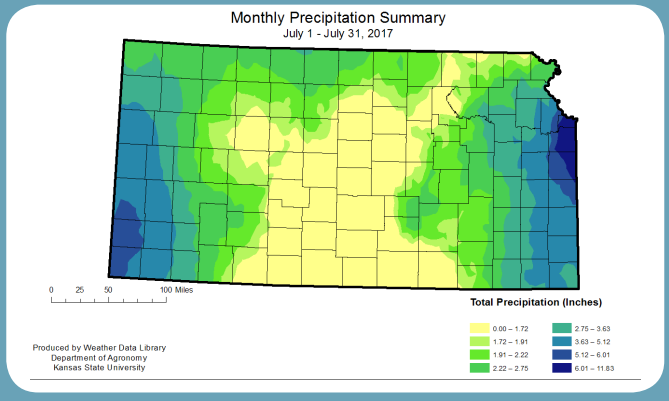
Temperatures were warmer than normal state-wide, with highest temperatures in the middle of the month offset by a cooler than normal start and end to the month. State-wide temperatures averaged 79.8 oF or 1.2 degrees warmer than normal. The West Central Division averaged closest to normal with an average of 78.0 oF, or 0.7 degrees warmer than normal. The North Central Division had the greatest departure with an average of 80.7 oF which was 1.7 degrees warmer than normal. The warmest reading for the month was 111 oF at the Salina Airport, Saline County, on the 22nd. The coldest reading was 48 oF, recorded at Tribune 1W, Greeley County, on the 1st. Despite the warm temperatures, there were no record high maximum temperatures during the month and only 11 record high minimum temperatures. On the cold side, there were 2 new record cold maximum temperature in July and 2 new record low minimum temperatures. None of the temperature records set new records for the month of July. All divisions saw high temperatures reach 100 oF or more.

Severe weather was limited this month, with most of the events in the form of hail and high winds. There was one reported tornado, which is less than the 1950-2016 average of 5 tornadoes in July. In addition to the tornado, there were 17 hail reports, and 38 high wind reports. The most damaging event of the month was the flooding in Johnson County, following the heavy rains on the 27th. Catastrophic flooding was reported along several local streams, including Indian Creek in Overland Park, Kansas and Tomahawk Creek in Leewood, Kansas. Numerous swift water rescues were performed across the city and surrounding areas.

The lower than normal precipitation with warmer than normal temperatures resulted in an expansion of the abnormally dry condition and the return of moderate drought in parts of the state. The August outlook calls for a slightly increased chance of wetter than normal conditions the across the southwest portion of the state, with equal chances of above or below normal precipitation across the remainder of the state. This is coupled with higher chances of below normal temperatures. The much cooler than normal temperatures that have started the month will reduce some of the evaporative demand.

## Temperature and Precipitation Overview




Above: July 2017 monthly mean temperatures (left) and total precipitation (right) in Kansas. Maps produced by Weather Data Library, Department of Agronomy, Kansas State University.

# 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.

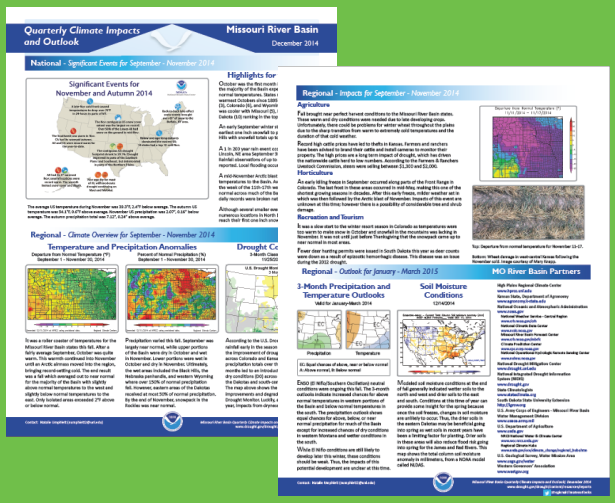
Much of the data and products found throughout this publication were built on the Applied Climate Information System (ACIS) framework. ACIS was designed to manage the complex flow of information from climate data collectors to the end users of climate data information. The main purpose of ACIS is to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

ACIS Applied Climate Information System

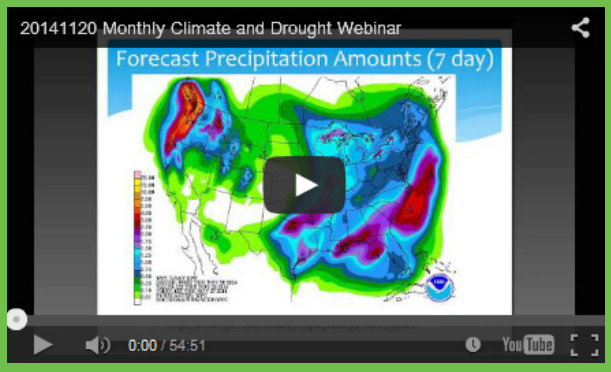
# Additional Summary Information for the High Plains

## 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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