



2018 Annual Climate Summary

Sugar beets remain unharvested as early snowfall arrives in eastern North Dakota. - Photo courtesy Chad Wheeler.

<http://hprcc.unl.edu>

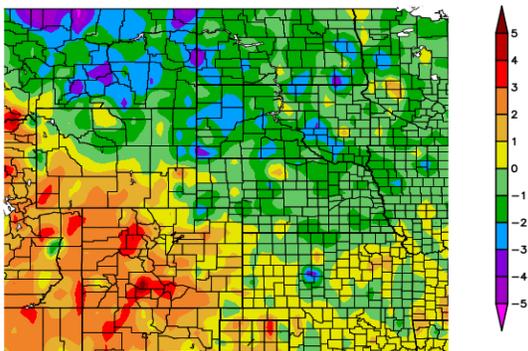
Cool, Wet Conditions in the East, Warm and Dry in the West

2018 was a tale of extremes across the High Plains, as the region experienced both sides of the temperature and precipitation spectrums. In northern and eastern areas of the High Plains, it was cool and wet, which brought a variety of positive and negative impacts. For instance, this pattern was welcome in the Northern Plains where long-term drought conditions improved dramatically, but the constant wetness brought flooding and challenges to agriculture. In western areas of the High Plains, drought persisted throughout the year, causing a devastating fire season, low water supplies, recreation and tourism revenue loss, and damage to crops and pastures. Thankfully, winter came early this year in this part of the region, and mountain snowpack got off to a promising start. Winter conditions in 2018 were partially influenced by a weak La Niña, which contributed to the cold conditions in the Northern Plains, as well as the high snowpack in the Northern Rockies and the low snowpack in the Southern Rockies.

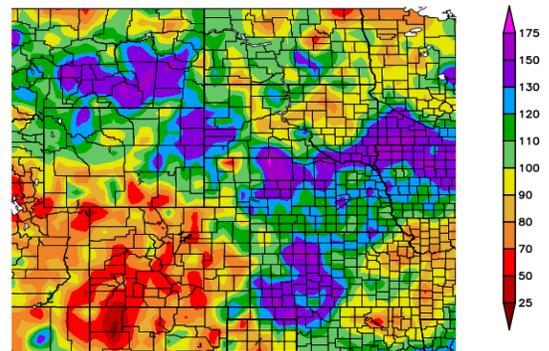
Despite unfavorable conditions for agriculture in the region, row crops did especially well. For instance, Nebraska and South Dakota had record-high corn and soybean yields. Although cold and wet conditions brought about a late start to the growing season, the warmth of May and June helped Growing Degree Days (GDDs) accumulate very quickly, allowing for rapid progress in crop growth. Corn matured early and was less impacted than soybeans by the unfavorable harvest conditions during the fall. Additionally, early crop maturation reduced the risk for damaging fall freezes. Soybean harvest was very slow in the High Plains; in fact, it was the slowest soybean harvest on record nationwide, a record that goes back to 1995. The winter wheat crop struggled in Kansas and Colorado during winter 2017-18 due to a number of factors, including the presence of drought conditions and the lack of snow cover during cold air outbreaks. As of the end of the year, this season's crop was faring much better in Colorado, thanks to timely precipitation. However, approximately 65 percent of the winter wheat crop in Kansas was planted late due to wet conditions, and it was not faring well.

Temperature and Precipitation Overview

Departure from Normal Temperature (F)
1/1/2018 - 12/31/2018



Percent of Normal Precipitation (%)
1/1/2018 - 12/31/2018



Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for 2018 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

It was a wet year for a large part of the High Plains, especially throughout southern South Dakota, Nebraska, and Kansas. The excessive wetness resulted in the wettest year on record for several locations, creating flooding issues and delays during the growing season. On the contrary, it was a dry year for Colorado and southern Wyoming, where drought was present throughout most of the year. While precipitation varied across the region each month, October and December were most notable for being wet, particularly in Nebraska and Kansas. While it was consistently dry across Colorado and areas of Wyoming throughout the year, there were no months that were particularly notable for widespread dryness.

The snowpack was plentiful in the Upper Missouri Basin during the 2017-18 season, which contributed to high runoff and streamflows in the spring. However, Colorado snowpack was abysmal, causing a shortened ski season and concerns over water supply. As for Plains snowpack, snowfall was plentiful in the Northern Plains, particularly in South Dakota and Nebraska. The following locations ranked in the top 10 for snowiest season (July 2017-June 2018): North Platte, NE (5th snowiest), Sioux Falls, SD (5th snowiest), Pierre, SD (10th snowiest), and Rapid City, SD (10th snowiest). Snowfall was scarce throughout Colorado and parts of Kansas, however. Locations ranking in the top 10 for least snowiest season included: Alamosa, CO (least snowiest), Dodge City, KS (3rd least snowiest), Pueblo, CO (4th least snowiest), Denver, CO (5th least snowiest), and Grand Junction, CO (tied for 5th least snowiest). This season's snowpack started off quite well across the High Plains, thanks to cool temperatures and early-season snowfall.

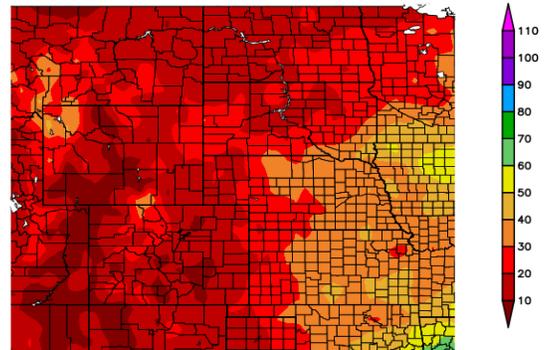
Due to a cold and snowy start to spring, the severe weather season got off to a slow start but ramped up after the late-spring warmup. Numerous hail events damaged crops throughout the region, and some unusual events occurred as well. For instance, in June, a tornado touched down near Gillette, Wyoming and destroyed numerous structures, snapped trees and utility poles, and caused two injuries. This tornado was rated an EF-3 on the Enhanced Fujita Scale. According to records from the National Centers for Environmental Information (NCEI), the last time a tornado of this strength was reported in Wyoming was 1987. Also in June, strong winds kicked up dirt and dust over dry areas of northeastern South Dakota and produced a dust storm, reducing visibilities and causing traffic issues and damage to vegetation.

The following locations had notable precipitation records during 2018:

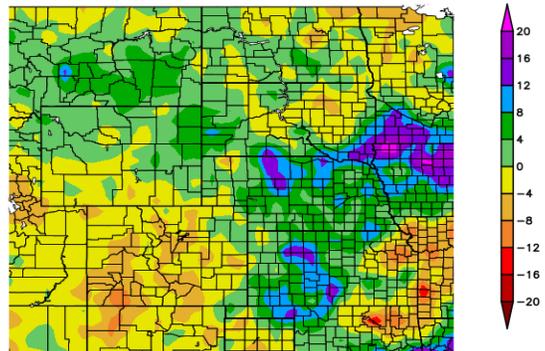
- Wichita, Kansas: Longest streak of no measurable snow at 393 days, ended January 14 (period of record 1888-2019)
- Brookings 2 NE, South Dakota: Highest 1-day total precipitation of 6.83 inches (173 mm) in any month, July 19 (period of record 1893-2019)
- Omaha, Nebraska: 2nd highest 2-day total precipitation of 8.33 inches (212 mm) in any month, August 14-15 (period of record 1871-2019)
- Wichita, Kansas: Earliest measurable snow of 0.7 inches (2 cm), October 14 (period of record 1888-2019)

Regional Precipitation

Precipitation (in)
1/1/2018 – 12/31/2018



Departure from Normal Precipitation (in)
1/1/2018 – 12/31/2018



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for 2018. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: <http://hprcc.unl.edu/maps/current>.

Temperatures

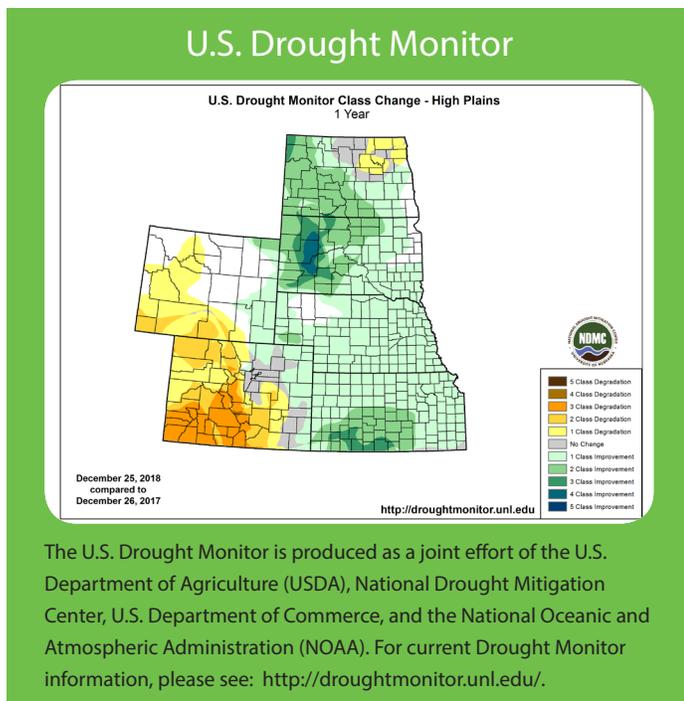
Temperatures were below normal for the year across the northern part of the High Plains region, while temperatures were above normal in Colorado and southern Wyoming. The period January–April was very cold for the Northern Plains. However, temperatures turned around dramatically in May, as May and June were especially warm. The warmth was beneficial for crop progress because the cold start to the growing season caused crop growth to fall behind, while the warmth of May and June allowed crop growth to progress quickly. In fact, it was so warm in May and June that corn matured early in some places. Below-normal temperatures returned in July, and in the Northern Plains, cooler temperatures stuck around until December. On the other hand, above-normal temperatures dominated the year throughout Colorado and southern Wyoming until October.

The following locations had notable temperature records during 2018:

- Aberdeen, South Dakota: Lowest April temperature on record at -6.0 degrees F (-21.1 degrees C), April 4 (period of record 1893-2019)
- Pierre, South Dakota: Lowest April temperature on record at 0.0 degrees F (-17.8 degrees C), April 4 (period of record 1933-2019)
- Concordia, Kansas: Lowest April temperature on record at 12.0 degrees F (-11.1 degrees C), April 7 (period of record 1885-2019)
- Dodge City, Kansas: Most number of days with temperatures reaching 90.0 degrees F (32.2 degrees C) in May (15) (period of record 1874-2019)
- Salina, Kansas: Most number of days with temperatures reaching 90.0 degrees F (32.2 degrees C) in May (15) (period of record 1948-2019)
- Denver, Colorado: Tied for highest June temperature on record at 105.0 degrees F (40.6 degrees C), June 28 (period of record 1872-2019)

Drought Conditions

The big story regarding drought in the region in 2018 was the improvement of conditions in the Northern Plains and the development and intensification of drought in Colorado, Wyoming, and Kansas. According to the U.S. Drought Monitor, over the course of the year the area in the High Plains experiencing drought or abnormal dryness (D0-D4) decreased from approximately 81 percent to 32 percent. However, areas experiencing moderate to exceptional drought (D1-D4) only decreased from 28 percent to 18 percent.



The Northern Plains drought, which plagued the region in 2017, improved significantly during 2018 thanks to the wet conditions that dominated for much of the year. By the end of December, the only drought that remained was moderate drought (D1) in north-central North Dakota.

On the other hand, drought intensified in Colorado, southern Wyoming, and portions of Kansas during the first three-quarters of the year. In Kansas, drought developed in southwestern and northeastern areas of the state, prompting the governor to make drought declarations in multiple counties. Fortunately, heavy rainfall provided drought relief during the summer to southwestern Kansas and southeastern Colorado, and heavy rains in the fall alleviated drought in northeastern Kansas. Drought remained in Colorado, however, despite some improvements due to a good start to the water year and the mountain snowpack season. While the drought caused many impacts, perhaps the most notable was the devastating fire season across Colorado.

Noteworthy Events

Cold Start to the Year: The High Plains had a very cold start to the year, with monthly temperatures averaging below normal for a large portion of the region through April. The early spring cold delayed planting, particularly in the Northern Plains, as soils remained frozen. Ultimately, the High Plains was the only region in the U.S. with below-normal temperatures for the year.

Heavy Rainfall: It was a wet year for much of the High Plains, with several locations in South Dakota, Nebraska, and Kansas having their wettest or near-wettest year on record. Locations such as Brookings, South Dakota and Manhattan, Kansas experienced impactful urban flooding events, and melting snow caused flooding along the Big Sioux River in eastern South Dakota, impacting the Flandreau Indian Reservation. However, heavy rains helped improve long-term drought conditions throughout the Northern Plains.

High Runoff in the Upper Missouri Basin: A strong snowpack year followed by heavy spring rains and a rapid warmup in May ultimately led to the 3rd highest runoff ever recorded in the Upper Missouri Basin, according to the U.S. Army Corps of Engineers. High runoff prompted the Corps to slowly evacuate stored floodwaters throughout the summer and fall, causing flows downstream to run high, especially in South Dakota and Nebraska.

Colorado/Kansas Drought: Drought developed and intensified rapidly during the year throughout Colorado and portions of Kansas, damaging crops and compromising water supplies. While wet conditions during the summer and fall alleviated the drought in Kansas, drought remained in Colorado, which had its warmest and 2nd driest water year on record (October 2017-September 2018). It was a devastating fire season across the state, with the most notable being the Spring Creek Fire, which burned 100,000+ acres and was the 3rd largest wildfire in Colorado history.

Crop Damage from Hailstorms: The cold temperatures at the beginning of spring brought about a slow start to the severe weather season. However, by June, severe weather ramped up across the region, mostly in the form of damaging hail events. For instance, during the last week of June, two hailstorms decimated corn and soybean fields in South Dakota between Rapid City and Pierre, leaving hail scars on the landscape.

Unfavorable Conditions for Planting/Harvesting: Cold conditions in the spring and wet conditions throughout the growing season created unfavorable conditions for planting and harvesting. April brought frigid temperatures and snowstorms, delaying planting. Wet conditions in the fall, including early snowstorms in October, significantly slowed harvest progress. Nationwide, it was the slowest soybean harvest on record, dating back to 1995.



Top photo: Flooding along the Big Sioux River near Flandreau, SD. Photo courtesy Flandreau Santee Sioux Tribe Emergency Management Drone Team.

Second photo: Spring Creek Fire in south-central CO. Photo courtesy Colorado Climate Center via @brit_a22 on Twitter.

Third photo: MODIS satellite imagery of a hail scar near Pierre, SD.

Bottom photo: October snowstorm halting harvest progress in eastern ND. Photo courtesy Vince Godon.

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	64.3*	36.6*	50.5*	0.9	101	06/28	-12	02/20	16.11*	-0.63	96
Alamosa San Luis Airport	63.1	25.0	44.0	2.5	91	07/22	-14	12/30	5.77	-1.54	79
Colorado Springs Municipal Airport	65.3	37.1	51.2	2.3	100	06/28	-1	01/16	15.41	-1.13	93
Denver International Airport	66.5	37.5	52.0	1.6	105	06/28	-7	02/21	8.53	-5.77	60
Grand Junction Walker Field Airport	68.1	41.6	54.9	2.3	102	07/19	7	01/22	8.21	-1.21	87
Pueblo Memorial Airport	71.4	37.6	54.5	2.6	106	06/27	-3	02/11	7.72	-4.85	61

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	64.7	42.0	53.4	-0.4	101	06/14	-10	01/01	33.84	5.95	121
Dodge City Regional Airport	69.8	41.9	55.8	0.5	104	06/10	-9	01/01	27.97	6.37	129
Goodland Renner Field	66.3	37.4	51.8	0.5	101	06/28	-7	01/16	20.01	0.35	102
Topeka Municipal Airport	67.3	44.4	55.9	0.9	101	08/05	-9	01/01	30.03	-6.43	82
Wichita Mid-Continent Airport	69.6	46.3	58.0	1.0	101	08/31	-2	01/01	30.81	-1.83	94

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	61.0*	32.7*	46.8*	-0.4	103	06/28	-21	02/21	11.70*	-6.35	65
Grand Island Airport	61.3	39.4	50.4	-0.4	103	06/15	-16	01/01	29.69	3.03	111
Lincoln Municipal Airport	62.8	39.7	51.2	-0.3	101	06/15	-19	01/01	35.64	6.69	123
Norfolk Karl Stefan Airfield	58.4	37.3	47.8	-1.4	97	05/27	-26	01/01	33.39	5.98	122
North Platte Regional Airport	62.6	35.3	48.9	0.2	100	06/14	-12	01/02	24.51	4.28	121
Omaha Eppley Airport	61.5	41.6	51.5	0.5	101	05/27	-20	01/01	36.82	6.20	120
Valentine Miller Field	61.1	35.4	48.2	0.3	102	07/11	-24	01/01	29.42	9.4	147

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	53.8	30.7	42.3	-0.5	104	08/12	-29	01/13	18.48	0.63	104
Fargo International Airport	51.2	31.2	41.2	-1.1	94	09/16	-23	01/05	21.63	-0.95	96
Grand Forks International Airport	49.7	28.2	38.9	-0.9	98	08/12	-25	01/13	21.13	0.32	102
Theodore Roosevelt Airport	53.4	29.2	41.3	-1.2	104	08/12	-31	01/01	15.62*	-0.15	99
Williston International Airport	52.7	28.6	40.7	-0.8	108	08/12	-31	02/12	14.90	0.53	104

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>.

2018 Annual 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	55.0	30.8	42.9	0.0	101	06/05	-32	01/01	17.94	-3.78	83
Huron Regional Airport	55.8	33.8	44.8	-1.1	99	07/11	-30	01/01	19.64	-3.26	86
Pierre Regional Airport	57.1	34.3	45.7	-1.6	103	08/11	-22	01/01	17.83	-2.18	89
Rapid City Regional Airport	57.4	32.0	44.7	-2.3	105	06/14	-19	01/01	25.64	9.35	157
Sioux Falls Joe Foss Field Airport	55.5	36.0	45.8	0.1	95	07/12	-25	01/02	39.19	12.81	149

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	60.1	30.8*	45.5*	0.2	100	08/12	-21	02/20	13.08	0.56	104
Cheyenne Municipal Airport	60.3	34.1	47.2	0.9	99	06/28	-14	02/20	15.58	-0.36	98
Lander Hunt Field Airport	58.5	31.9	45.2	0.2	98	08/11	-15	02/20	13.42	0.76	106
Laramie Regional Airport	57.1	27.5	42.3	1.4	93	07/10	-22	02/20	6.98	-3.94	64
Rawlins Municipal Airport	58.1*	30.4*	44.3*	1.9	96	07/08	-15	02/20	5.10*	-4.15	55
Sheridan County Airport	58.5	30.3	44.4	-0.7	104	08/12	-22	02/20	17.05	2.89	120

2018 Highlights

Annual Rankings

Temperature in degrees F / Precipitation in inches

Warmest / Coolest	Temperature / Ranking	Record / Year	Period of Record
Alamosa, CO	44.0 / 4th warmest	44.7 / 2017	1906-2019
Colorado Springs, CO	51.2 / 8th warmest (tie, 2015)	52.9 / 2012	1895-2019
Grand Junction, CO	54.9 / 8th warmest (tie, 1983)	57.4 / 1934	1893-2019
Laramie, WY	42.3 / 8th warmest	44.2 / 2012	1948-2019
Pueblo, CO	54.5 / 9th warmest (tie, 1933)	56.5 / 1981+	1888-2019
Rapid City, SD	44.7 / 8th coolest	43.4 / 1951	1942-2019
Wettest / Driest	Precipitation / Ranking	Record / Year	Period of Record
Sioux Falls, SD	39.19 / WETTEST	38.26 / 2010	1893-2019
Yankton 2 E, SD	43.10 / WETTEST	39.20 / 2010	1932-2019
Kingsley Dam, NE	26.80 / WETTEST	26.76 / 2015	1938-2019
Valentine, NE	29.42 / 2nd wettest	32.68 / 1977	1889-2019
Rapid City, SD	25.64 / 3rd wettest	27.70 / 1946	1942-2019
Hays 1 S, KS	37.55 / 3rd wettest	43.34 / 1951	1892-2019
Liberal, KS	30.10 / 7th wettest	49.06 / 2015	1893-2019
Denver, CO	8.53 / 6th driest	7.48 / 2002	1872-2019
Laramie, WY	6.98 / 6th driest	5.40 / 2002	1948-2019

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>.

Kansas Climate Summary

Mary Knapp - Service Climatologist
 Kansas Weather Data Library, Kansas State University
 For more information: www.ksre.ksu.edu/wdl

KANSAS STATE
UNIVERSITY

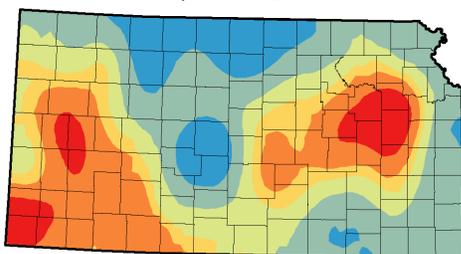
Dry to wet

The dry pattern that dominated the Fall of 2017 continued through the first part of 2018. Drought conditions from abnormal dry to severe drought covered the entire state as of the 2nd of January. By the first of May, pockets of drought free conditions were present at the Northwest and Southeast corners of the state, but the drought had intensified in the remainder of the state. Just over 8 percent of the state, particularly in the Southwest and South Central divisions, were in exceptional drought. More abundant rainfall was seen in the western third of the state in June, with improving conditions in those areas. By the first of July, drought free conditions were at 27 percent, mainly in the Northwest and North Central divisions. Exceptional drought had been erased. State-wide average precipitation was less than 50 percent of normal for the first 4 months of the year, and ranks as the 5th driest start since 1895. In May, precipitation began to return, from west to east. October had the largest surplus, with a statewide average of 5.88 inches, 258 percent of normal. However, parts of eastern Kansas never recovered the deficit, and remained below normal for the year. The greatest annual total for the year at a National Weather Service Cooperative station was 52.04 inches at Willowdale 1SW, Kingman County. The greatest annual total for a CoCoRaHS station 50.43 inches at Latham 0.2 W, Butler County. The driest reporting station was Elkhart, in Morton County, with 16.11 inches. The greatest 24hr precipitation total reported at a CoCoRaHS station was 11.00 inches at Manhattan 9.8 NW, Riley County, on September 3rd. The greatest 24hr precipitation total reported at a NWS station was 8.37 inches at Independence, Montgomery County, on August 15th.

Temperatures averaged almost exactly normal, although there were wide swings between above average and below average temperatures. State-wide average temperature in 2018 was 54.0 oF, which places it as the 63rd warmest, almost exactly in the middle of the 124-year distribution. April set a new record as the coldest since 1895. The state-wide average temperature for the month was 46.7 oF, 6.5 degrees cooler than normal. May represented the other side of the pendulum, with an average temperature of 70.6 oF. This was 7.2 degrees warmer than normal, and ranked as the second warmest. The swing from the cold of April to the warmth of May was the largest change on record at 23.7 degrees, and created a lot of difficulty for crops. Extremes ranged from the coldest reading of -15 oF at Bailyville, Nemaha County, on January 1st to the highest temperature of 112 oF at Ashland, Clark County, on July 21st. The earliest start to the growing season was a last freeze on April 16th at various locations. The latest freezing temperatures were reported at multiple locations on April 28th. The first fall freeze was mostly seasonal state-wide. The average date was October 14th. The earliest first frost was reported on October 10th at multiple locations, with Goodland, in Sherman County, dropping to 27 oF. The latest first frost was reported at Independence, Montgomery County, on November 9th. The average length of the growing season was 176 days. The shortest growing season was at Atwood, Rawlins County, with 164 days. The station with the longest growing season was the Coffeyville Municipal Airport, Montgomery County, with a growing season of 206 days.

Temperature and Precipitation Overview

Departure from Normal Annual Mean Temperatures
 January 1 - December 31, 2018

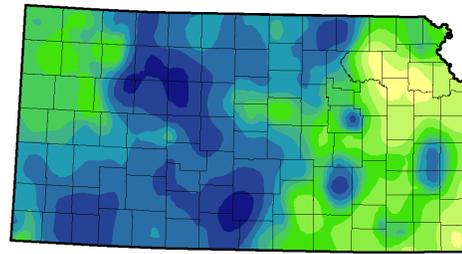


Departure from Normal Mean Temperatures (°F)



Produced by Weather Data Library
 Department of Agronomy
 Kansas State University

Departure from Normal Annual Precipitation
 January 1 - December 31, 2018



Departure from Normal Precipitation (Inches)



Produced by Weather Data Library
 Department of Agronomy
 Kansas State University

Above: 2018 departure from normal annual mean temperatures (left) and departure from normal annual 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>.



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>

