



# December 2018 Climate Summary



Snow at the CSU Southwestern Agricultural Research Center in Yellow Jacket, CO. Photo courtesy Peter Goble.

<http://hprcc.unl.edu>

## Wet End to 2018

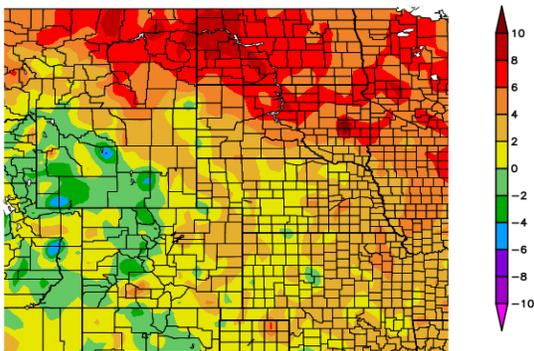
Precipitation conditions varied across the region in December. The eastern High Plains experienced a wet month, producing multiple records in the top 10 of wettest Decembers that included the wettest December on record for Norfolk, Nebraska. The vast majority of the precipitation came from two large storm systems that moved through the region during the early and latter parts of the month. Meanwhile, dry conditions prevailed across Colorado and Wyoming, resulting in a few records in the top 10 of driest Decembers. Ample precipitation continued to improve drought conditions, aiding in the recovery of long-term precipitation deficits in the Dakotas and Colorado.

Temperatures were much milder in December, reversing the pattern of below-normal temperatures that had been in place since October for much of the region. It was particularly warm in the Dakotas during the middle of the month, which melted existing snow on the ground before a strong system came through and dropped more snow just after Christmas. Cooler temperatures over mountainous areas of Wyoming and Colorado helped keep the existing snowpack in place, as it was rather dry in December in these areas, preventing the snowpack from building as quickly as it normally would.

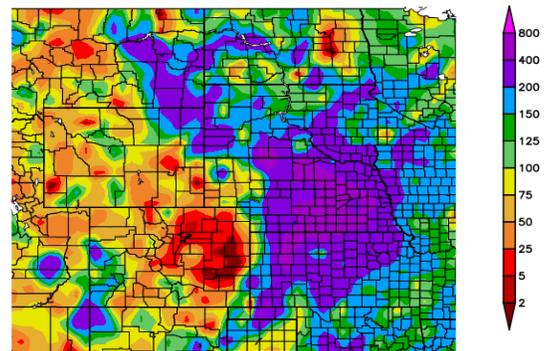
The wet conditions that have been in place across portions of the region since the fall have continued to cause issues for agriculture and livestock. Nationwide, 2018 ended up being the slowest soybean harvest on record (period of record 1995-2018), as major soybean growing areas in the High Plains and Midwest could not dry out long enough for producers to get into the fields. In Nebraska, some soybeans were binned because they were too wet and had quality issues. In fact, some soybean fields were not even harvested. According to the Assistant State Climatologist for Kansas, approximately 65 percent of winter wheat in the state was planted late, and in general, late-planted winter wheat was not doing very well. Cattle and feedlot issues were reported in Nebraska and Kansas, as muddy fields caused livestock producers to have to feed their cattle in barns.

## Temperature and Precipitation Overview

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



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



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

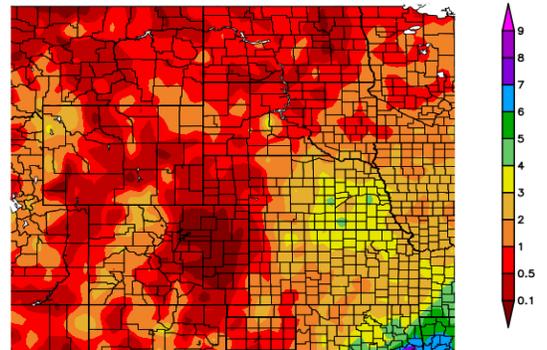
December was characterized by precipitation extremes across the High Plains region. It was a very wet month for portions of Kansas and Nebraska, where precipitation exceeded 200 percent of normal in most places. Numerous locations across the two states ranked among the top 10 of wettest Decembers, with Norfolk, Nebraska having its wettest December on record. December precipitation fell as both rain and snow across these areas. On the other hand, central and eastern Colorado experienced a dry December, receiving less than 25 percent of normal precipitation. For instance, Denver, Colorado tied for its 5th driest and 5th least snowiest December on record.

While the middle of the month was relatively quiet across the eastern High Plains, December was book-ended by two strong storm systems: one that moved through on the 1st-2nd, and the other that crossed the region on the 26th-27th. The first system produced a mix of rain and snow across Kansas and Nebraska, while the second system impacted a larger area, producing snow and blizzard conditions throughout the Dakotas, a rain/snow mix across Nebraska, and mostly rain in Kansas. These two systems were largely responsible for the majority of the precipitation that fell in December across the eastern High Plains. In fact, both systems dropped liquid equivalent precipitation in excess of 1.00 inch (25 mm) in one day. For instance, in Grand Island, Nebraska, 1.51 inches (38 mm) of liquid equivalent precipitation fell on the 1st and 1.42 inches (36 mm) fell on the 26th, which became the 2nd and 3rd highest 1-day total precipitation on record for December in Grand Island, respectively.

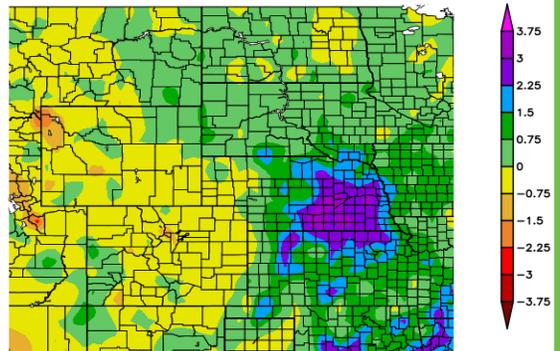
Unlike last season, the current snow season got off to a good start in much of the region. In some areas of Kansas and Nebraska, where last season's snowfall ended below normal, snow totals were already near or had exceeded last year's totals. For instance, Dodge City, Kansas had received 5.6 inches (14 cm) of snowfall through December, which exceeded last season's snowfall total of 3.4 inches (9 cm). Season-to-date snowfall totals in Dodge City were still below normal, however. Lincoln, Nebraska was close to last season's snowfall total of 21.4 inches (54 cm) as of the end of December, having already received 16.3 inches (41 cm). Contrary to Dodge City, season-to-date snowfall totals were well above normal for Lincoln.

### Regional Precipitation

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



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



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for December 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>.

## Snowpack Update

After a good start to the mountain snowpack season, dry conditions in December slowed progress. At the beginning of December, statewide Snow Water Equivalent (SWE) was above normal for Colorado, but it had fallen below normal by the end of the month. In Wyoming, SWE as a percent of median decreased statewide over the course of the month but was still above normal. As for the Upper Missouri Basin, mountain SWE above Fort Peck Reservoir decreased from 89 percent to 80 percent of average by the end of December, while SWE between Fort Peck and Garrison Reservoirs decreased from 99 percent to 83 percent of average, according to the U.S. Army Corps of Engineers. While warm conditions kept large portions of the eastern High Plains snow-free for much of the month, late-December snows blanketed the Dakotas, central Nebraska, and western Kansas by the end of the month.

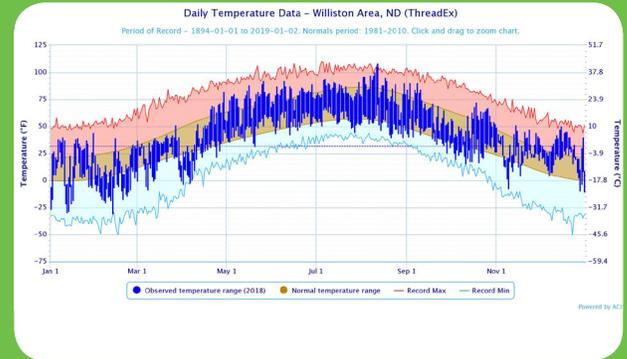
## Temperatures

The cool pattern that dominated in October and November gave way in December, with the majority of the High Plains region experiencing above-normal temperatures for the month as a whole. Other than mountainous areas of Wyoming and Colorado, where December temperatures were slightly below normal, a large portion of the region had temperature departures of 2.0-4.0 degrees F (1.1-2.2 degrees C) above normal. The greatest departures occurred throughout the Dakotas, where temperatures averaged from 5.0-10.0 degrees F (2.8-5.6 degrees C) above normal.

While most locations did not experience departures great enough to break into the top 10 of warmest Decembers, the warm streak that ensued in the middle of the month was impressive. For instance, in the Dakotas, there was a long stretch of above-normal daily average temperatures from approximately December 8th to December 25th. Several locations in North Dakota experienced daily temperature departures exceeding 20.0 degrees F (11.1 degrees C) above normal for several days during that stretch. This warm streak caused snow to disappear quickly, and if not for the late-December snow storm that impacted much of the region, December snowfall totals would likely have been abysmal in some areas.

Below-normal temperatures prevailed in western areas of Wyoming and Colorado in December. The cooler temperatures were helpful for keeping the existing mountain snowpack intact, as mountainous regions of the two states experienced below-normal precipitation in December and building of the snowpack slowed.

### Station Spotlight: Williston, ND

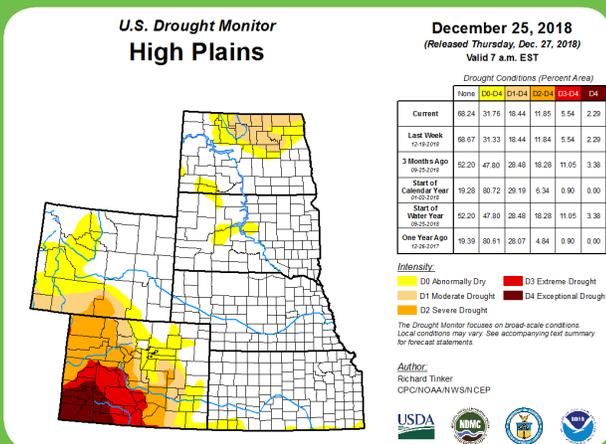


Above: Daily temperatures along with extremes and normals values since January 1, 2018 in Williston, ND.

## Drought Conditions

Drought conditions improved across much of the region during December. According to the U.S. Drought Monitor, the area experiencing abnormal dryness or drought (D0-D4) decreased from approximately 35 percent to 32 percent. Improvements occurred due to excessively wet conditions and ample snowfall.

### 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/>.

The majority of improvements occurred during the first week of December as a strong storm system brought heavy rain and snow to much of the region. For instance, approximately 1.00-2.00 inches (25-51 mm) of liquid equivalent precipitation fell in northeastern Kansas, prompting the removal of moderate drought (D1) and abnormally dry conditions (D0) so that the area was finally drought-free. Late-November and early-December snows in the Dakotas aided in long-term precipitation deficit recovery. As a result, D0 and D1 conditions were trimmed back in north-central North Dakota, and D1 was removed in central South Dakota. Precipitation also helped improve long-term drought conditions in western Colorado, so areas in extreme drought (D3) and exceptional drought (D4) were reduced.

Drought conditions changed very little the rest of the month as soils began to freeze, locking in conditions. The only area that experienced a degradation in drought conditions during December was portions of extreme southern Kansas. D0 was introduced to this area due to 30-60 day precipitation deficits increasing, as well as high winds increasing evaporative demand.

# Climate Outlooks

According to the Climate Prediction Center, ENSO-neutral conditions are present in the Pacific. Equatorial sea surface temperatures are above average across most of the Pacific Ocean. There is a 90 percent chance that El Niño will develop and continue through the winter and a 60 percent chance it will continue into spring. An El Niño Watch is in effect. For more information about ENSO, check out the ENSO blog here: <https://www.climate.gov/news-features/department/enso-blog>. To learn more about how El Niño may affect the Missouri Basin region, see this El Niño briefing: <https://www.drought.gov/drought/documents/el-nino-impacts-and-outlook-missouri-river-basin-october-2018>.

According to the National Weather Service long-range flood outlook, there is a greater than 50 percent chance of minor to moderate flooding for several streams in portions of South Dakota, Nebraska, and Kansas through March. 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 January–March temperature outlook indicates an increased chance of above-normal temperatures for the western U.S., the Northern Plains, the western Great Lakes, and the southern half of Florida. In the High Plains, this includes North Dakota, Wyoming, most of South Dakota and Colorado, and the Nebraska Panhandle. Below-normal temperatures are expected for portions of the Ohio and Tennessee Valley regions, as well as the mid-Atlantic. Elsewhere, there are equal chances for above-, below-, and near-normal temperatures during the January–March period.

## Precipitation

The precipitation outlook for the next three months calls for a higher probability of above-normal precipitation across southern, central, and eastern portions of the contiguous U.S. In the High Plains, this includes most of Colorado, southeastern Wyoming, western and central Kansas, and western Nebraska. Below-normal precipitation is expected in the Pacific Northwest and Ohio Valley regions. Elsewhere, there are equal chances for above-, below-, and near-normal precipitation in the contiguous U.S. during the January–March period.

## Drought

The December 20th U.S. Seasonal Drought Outlook indicates that drought is expected to persist across parts of the West and the Plains. In the High Plains, this includes areas of drought in North Dakota and central and southern Colorado. Drought may improve or be removed in the West and in southeastern Florida, including areas of southern Wyoming and northwestern Colorado. Drought development is likely in portions of the Pacific Northwest and Northern Rockies, but drought development is not anticipated in the High Plains region through March.

### Temperature Outlook

### Precipitation Outlook

### Drought Outlook

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

Author: R. Tinker  
NOAA/NWS/NCEP/Climate Prediction Center

Valid for December 20, 2018 - March 31, 2019  
Released December 20, 2018

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).

- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely

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

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	43.8	18.4	31.1	2.8	60	12/16	2	12/31	0.03	-0.37	8
Alamosa San Luis Airport	38.0	2.2	20.1	2.2	49	12/18+	-14	12/30	0.32	-0.03	91
Colorado Springs Municipal Airport	44.9	17.3	31.1	1.3	61	12/21+	2	12/29	0.09	-0.25	26
Denver International Airport	46.1	18.8	32.5	2.5	63	12/21	0	12/31	0.03	-0.32	9
Grand Junction Walker Field Airport	38.3	21.2	29.8	1.3	50	12/25	12	12/29+	0.94	0.35	159
Pueblo Memorial Airport	49.4	14.9	32.1	2.0	69	12/21	4	12/29	0.09	-0.29	24

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	41.6	23.7	32.7	2.7	55	12/16	10	12/29	2.63	1.78	309
Dodge City Regional Airport	46.8	22.0	34.4	1.6	60	12/18	12	12/29+	1.20	0.36	143
Goodland Renner Field	46.3	19.0	32.6	2.7	63	12/21+	8	12/31+	0.22	-0.24	48
Topeka Municipal Airport	46.0	25.6	35.8	3.8	57	12/18+	15	12/10	3.06	1.71	227
Wichita Mid-Continent Airport	48.1	26.0	37.0	3.2	59	12/11	18	12/30+	1.80	0.60	150

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	38.5	15.9	27.2	2.8	60	12/17	1	12/07+	0.41	-0.11	79
Grand Island Airport	39.5	20.2	29.9	3.2	56	12/16	2	12/29	3.44	2.81	546
Lincoln Municipal Airport	40.9	19.8	30.3	3.5	56	12/16	4	12/29	3.32	2.37	349
Norfolk Karl Stefan Airfield	35.6	16.6	26.1	1.8	50	12/17	-3	12/29	2.89	2.14	385
North Platte Regional Airport	39.4	14.5	27.0	1.6	54	12/18	-4	12/29	1.20	0.79	293
Omaha Eppley Airport	38.1	21.2	29.6	3.6	51	12/27+	8	12/29	2.95	1.91	284
Valentine Miller Field	39.8	14.3	27.1	3.3	57	12/18	-9	12/29+	0.89	0.52	241

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	32.8	14.5	23.6	7.4	53	12/15	-14	12/29	0.67	0.18	137
Fargo International Airport	27.5	12.0	19.8	5.7	44	12/15	-15	12/31	1.13	0.30	136
Grand Forks International Airport	23.5	6.7	15.1	3.6	39	12/15	-19	12/31	0.63	0.02	103
Theodore Roosevelt Airport	34.8	15.3	25.0	7.1	56	12/18	-12	12/31	0.10*	-0.14	42
Williston International Airport	32.3	15.1	23.7	9.8	50	12/15	-11	12/31	0.75	0.13	121

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>.

## December 2018 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	33.1	10.9	22.0	6.3	49	12/14	-21	12/29	1.01	0.49	194
Huron Regional Airport	34.9	13.6	24.2	5.0	50	12/19	-17	12/29	1.18	0.66	227
Pierre Regional Airport	37.6	16.6	27.1	5.4	55	12/15	-9	12/29+	1.05	0.50	191
Rapid City Regional Airport	38.0	15.9	27.0	2.1	61	12/15	-3	12/29	1.14	0.72	271
Sioux Falls Joe Foss Field Airport	34.7	17.5	26.1	6.9	49	12/16	-7	12/29	1.23	0.54	178

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	35.6	14.9	25.3	1.5	51	12/17+	-10	12/31	0.40	-0.09	82
Cheyenne Municipal Airport	39.3	19.1	29.2	1.5	59	12/17	-1	12/31	0.28	-0.21	57
Lander Hunt Field Airport	33.2	11.5	22.3	1.6	48	12/21	-5	12/29	0.58	0.00	100
Laramie Regional Airport	32.5	8.7	20.6	-0.5	50	12/16	-9	12/29	0.09	-0.23	28
Rawlins Municipal Airport	30.3	11.4	20.9	-0.6	45	12/16	-10	12/28	0.18	-0.25	42
Sheridan County Airport	42.3	13.7	28.0	5.1	61	12/17	-13	12/31	0.32	-0.24	57

## December 2018 Highlights

### Monthly Rankings

Precipitation in inches

Wettest	Precipitation / Ranking	Record / Year	Period of Record
Norfolk, NE	2.89 / WETTEST	2.62 / 2006	1893-2019
Grand Island, NE	3.44 / 2nd wettest	5.00 / 1913	1895-2019
Hastings, NE	3.13 / 3rd wettest	4.93 / 1913	1894-2019
Rapid City, SD	1.14 / 3rd wettest	1.65 / 1975	1942-2019
Lincoln, NE	3.32 / 4th wettest	4.42 / 2015	1887-2019
McCook, NE	1.92 / 4th wettest	3.19 / 1913	1894-2019
Omaha, NE	2.95 / 5th wettest	5.26 / 2015	1871-2019
Concordia, KS	2.63 / 6th wettest	3.91 / 1913	1885-2019
North Platte, NE	1.20 / 9th wettest	3.86 / 1877	1874-2019
Salina, KS	2.13 / 9th wettest	3.66 / 2015	1948-2019
Topeka, KS	3.06 / 10th wettest	5.08 / 1944	1887-2019
Driest	Precipitation / Ranking	Record / Year	Period of Record
Denver, CO	0.03 / 5th driest (tie, 1977+)	0.00 / 1881	1872-2019
Akron, CO	0.03 / 8th driest (tie, 2011+)	Trace / 2001+	1937-2019

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](http://www.ksre.ksu.edu/wdl)



## Wet beginning and end

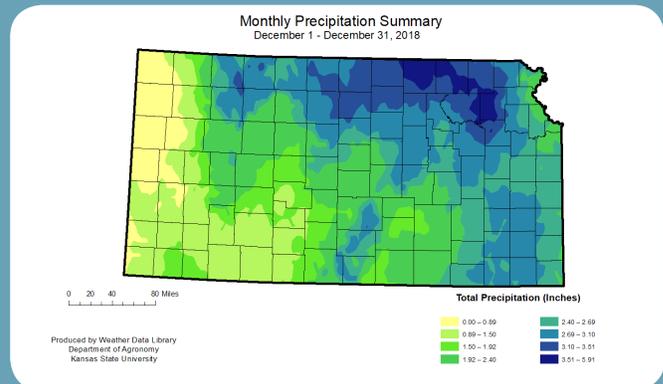
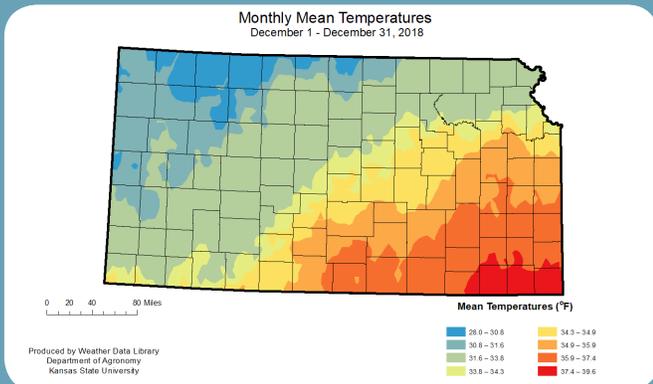
December was wetter than normal across most of the state, but the precipitation fell mostly at the beginning and end of the month. With over 600 reports, the average amount on the 1st of December was 0.69 inches; for the 27th (the second big event), the average amount was 1.26 inches based on 625 reports. State-wide average precipitation for December was 2.22 inches, 232 percent of normal. The Southwest Division was the driest with an average of 1.49 inches. That is a surplus of 0.82 inches, 230 percent of normal. The Northwest Division had the greatest percent of normal at 320 percent and an average precipitation of 1.90 inches. The highest 24-hour rainfall total for a National Weather Service Cooperative station was 2.95 inches at Hugoton, Stevens County, on the 26th. The greatest 24-hour rainfall total for a Community Collaborative Rain, Hail and Snow network station 3.20 inches at Kingman 8.1 SSE, Kingman County, on the 27th. The greatest monthly precipitation totals for December: 5.91 inches at Lenora, Norton County (NWS) and 4.76 inches at Hunter 2.1 NNW, Mitchell County (CoCoRaHS). Not all precipitation was in the form of rainfall. A total of 207 stations reported snowfall in December, with monthly totals ranging from trace amounts in eastern Kansas to 15.5 inches at the CoCoRaHS station of Traer 2.5 NNW, Decatur County.

Despite some cool periods to the month, December temperatures were warmer than normal. State-wide average temperature for the month was 33.7 oF, which is 2.3 degrees warmer than normal. All divisions were warmer than normal. The Northeast Division had the largest departure, with an average of 33.3 oF, or 3.5 degrees warmer than normal. The Southwest Division came closest to normal with an average of 33.8 oF or 1.1 degrees warmer than normal. The variability showed in the range of temperatures. The warmest maximum temperature was 67 oF at Richfield 1NE, Morton County, on the 22nd. The coldest minimum temperature at a NWS station was -1 oF, recorded at Dresden, Norton Dam on the 30th and at Tuttle Creek Lake on 31st. The coldest reading at a Kansas Mesonet station was -3.6 oF recorded at the Grant County station near Ulysses on the 31st.

Severe storm reports were limited in Kansas during December. There were no reports of hail, wind or tornadoes. Severe winter weather was the main feature for the month, with blizzard-conditions across most of the western areas of the state on the 26th and 27th. Sadly, there was one fatality when a stranded motorist died from exposure.

Despite the warmer than normal temperatures, the heavier than normal precipitation resulted in removal of the remaining abnormally dry conditions across the state. The area of the state that was drought free moved to 100 percent at the end of the month. The January precipitation outlook is neutral to the east, with increased chances of above normal precipitation across the west. Given the low normal precipitation at this time of the year, changes in condition are likely to be slow. The temperature outlook is also neutral across the state.

## Temperature and Precipitation Overview



Above: December 2018 departure from normal 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>.



## 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:  
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For an archive:  
[www.hprcc.unl.edu/webinars.php](http://www.hprcc.unl.edu/webinars.php)

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