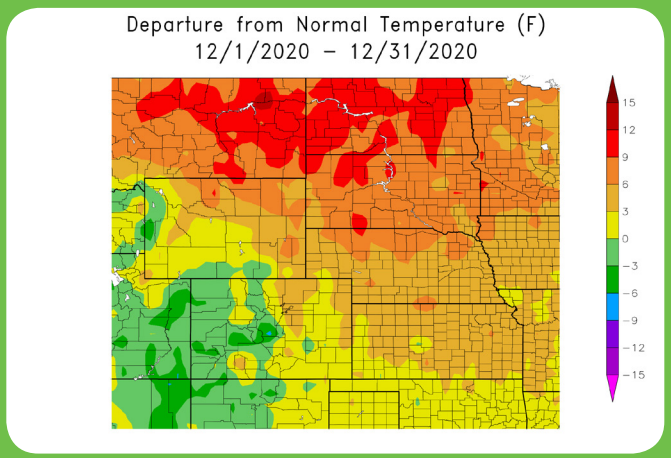
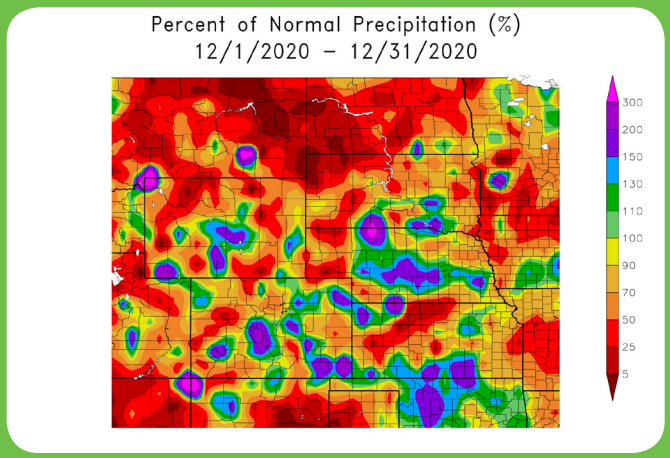
Warmth and Dryness Continues for Much of the Region

The winter season began on a warm note, a pattern that was evident throughout the High Plains in November. A few locations that broke into the top 10 of warmest Novembers last month also reached the top 10 of warmest Decembers on record. One example is Valentine, Nebraska, which had its 4th warmest November and 5th warmest December (period of record 1889-present). A few snowstorms traversed the region, but large portions of the High Plains were left dry. The dryness led to a lack of snowfall, and without a snowpack, temperatures were much higher than normal. As a result, drought intensified across these areas, and given that it is difficult to get widespread improvements in conditions during the winter, much of the region will likely begin the spring planting season with dry soils.

The intensifying drought and depleted soil moisture continued to cause impacts across the region. Ski resorts in Colorado were still in desperate need of snow. While fire activity dwindled in Colorado and Wyoming, two fires ignited in the Black Hills on the 23rd. One of these fires, named the American Center Fire, burned approximately 50 acres. According to the South Dakota State Fire Meteorologist, it became the second largest December wildfire in the Black Hills since record-keeping began in 1987. Fire weather conditions were ideal at the time of ignition, as above-normal temperatures occurred ahead of a strong cold front that brought extremely gusty winds. As for agriculture, winter wheat was not faring very well in Colorado. According to the latest USDA Colorado Crop Progress Report, 34 percent of the winter wheat crop was in poor or very poor condition. Dry soils and the lack of snow cover contributed to these conditions. However, winter wheat was faring better in Nebraska and Kansas, with only 15 percent and 17 percent of the crop in poor or very poor condition, respectively. Nationwide, the U.S. winter wheat condition index was the lowest since 2012 at the beginning of December. Livestock producers throughout the region were also being negatively impacted by conditions, as feed and water supplies were limited.

Temperature and Precipitation Overview





Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for December 2020 in the High Plains region. Maps produced by the High Plains Regional Climate Center and are available at: http://hprcc.unl.edu/maps/current .

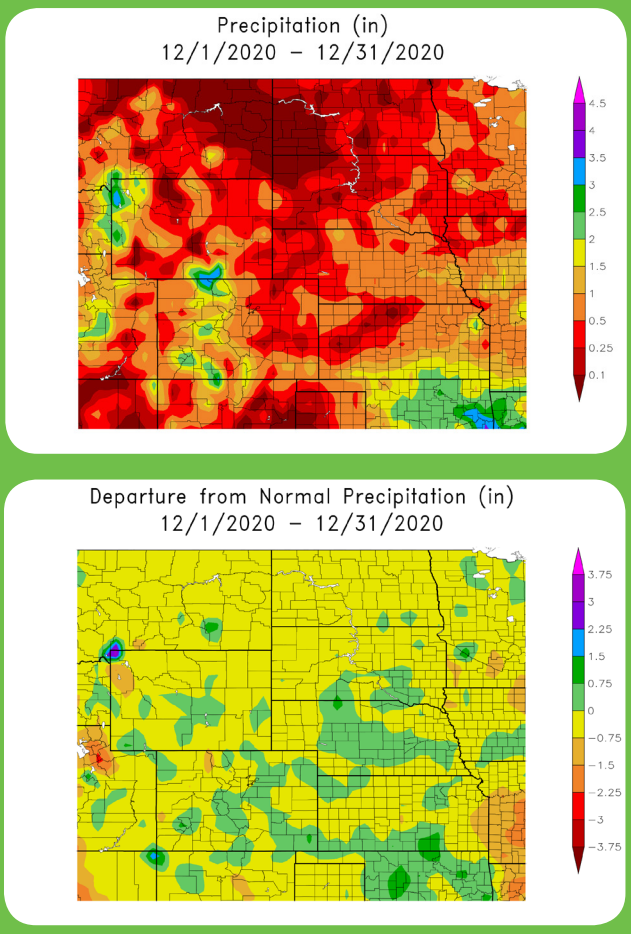
Precipitation

Much of the region remained dry during December, with many areas receiving less than 70 percent of normal precipitation. The driest areas included western North Dakota, northwestern South Dakota, and north-central Kansas where precipitation was less than 25 percent of normal. However, there were very few locations that had record-breaking dryness. Chadron, Nebraska tied for its 10th driest December on record (period of record 1941-present). This is not too surprising though given that winter is the driest time of the year in the Plains.

Due to the lack of precipitation, many locations in the High Plains region contended with a lack of snowfall in December. Notable areas that did not get much snow included western North Dakota, northern and western South Dakota, and northern Wyoming. While it is not uncommon for some areas of the High Plains to receive little snowfall in December, there were a couple noteworthy records. For instance, the Newell COOP station in South Dakota received only a trace amount of snowfall, tying for its 2nd least snowiest December on record (period of record 1920-present). Meanwhile, the Bowman COOP station in North Dakota had its 7th least snowiest December, receiving only 0.2 inch (1 cm) (period of record 1915-present).

On the other hand, pockets of wetness existed in central Nebraska, southern Kansas, and central and eastern Colorado where precipitation exceeded 150 percent of normal. Snowstorms moving across the region were primarily responsible for above-normal precipitation in these areas. A couple of systems moved through southern Kansas during the first half of the month, bringing impressive snow totals. For instance, the Ashland COOP station in Kansas received 7.0 inches (18 cm) of snow from a storm on the 3rd, then got 8.0 inches (20 cm) of snow from a different storm on the 13th. By the end of the month, Ashland had received 17.0 inches (43 cm), which was its 2nd snowiest December on record (period of record 1900-present). Several CoCoRaHS stations in southern Kansas reported more than 20.0 inches (51 cm) of snow in December. On the 29th, a storm system brought snowfall to much of Nebraska and southeastern South Dakota. Many locations in eastern Nebraska received at least 6.0 inches (15 cm) of snow. Roads became covered with ice and snow, and some roads were closed, including Interstate 80 in the Nebraska Panhandle.

Regional Precipitation



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for December 2020. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: http://hprcc.unl.edu/maps/current.

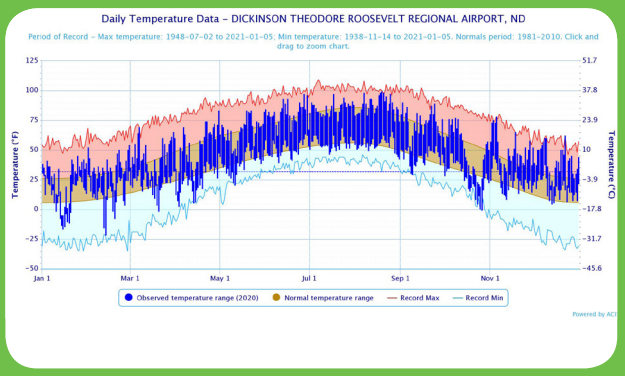
Snowpack Update

Dry conditions caused the Upper Missouri Basin mountain snowpack to get behind in December. According to the U.S. Army Corps of Engineers, as of January 3rd, Snow Water Equivalent (SWE) above Fort Peck Reservoir was 81 percent of average, while the reach between Fort Peck and Garrison Reservoirs was 82 percent of average. Other than a few basins in northwestern Wyoming and south-central Colorado, snowpack was below normal throughout these two states. However, it is still very early in the mountain snowpack season, and there is plenty of time for these areas to catch up. In the Plains, areas with snow on the ground at the end of December were mostly confined to the eastern Dakotas and eastern Nebraska. Warm and dry conditions resulted in snow-free areas across the western Dakotas, western Nebraska, much of Kansas, and the plains of Colorado and Wyoming.

Temperatures

The pattern of above-normal temperatures that began in November continued into December for the majority of the High Plains region. With the exception of western Colorado, where temperatures were slightly below normal, departures ranged from 3.0-9.0 degrees F (1.7-5.0 degrees C) above normal across the region. It was especially warm in North Dakota, as departures of 9.0-12.0 degrees F (5.0-6.7 degrees C) above normal were common. Numerous locations throughout the High Plains ranked among the top 10 warmest Decembers. For instance, Dickinson, ND, Mobridge, SD, and Sheridan, WY all had their 3rd warmest December on record (Dickinson period of record 1938-present, Mobridge period of record 1911-present, Sheridan period of record 1907-present). Please see page 6 for additional rankings.

Station Spotlight: Dickinson, ND



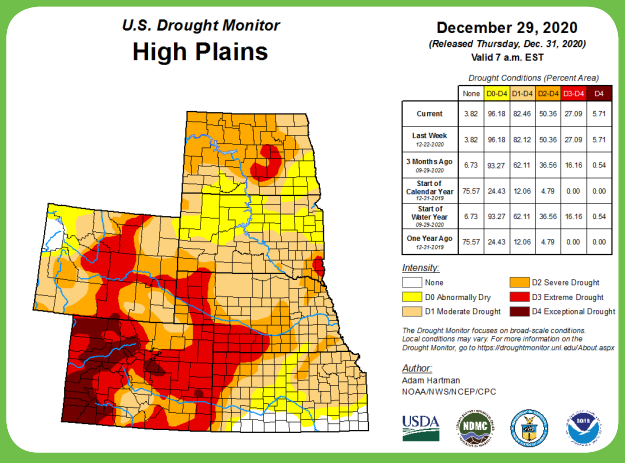
Above: Daily temperatures along with extremes and normals values since January 1, 2020 in Dickinson, ND.

For most of the region, the greatest temperature departures came in the first week of December, exceeding 25.0 degrees F (13.9 degrees C) above normal in some places. Several locations throughout the Dakotas, Nebraska, and eastern Wyoming set new daily records for maximum temperature on the 8th, with areas of South Dakota, Nebraska, and Kansas setting similar records on the 9th. Sheridan, Wyoming reached 72.0 degrees F (22.2 degrees C) on the 8th, which was not only a daily record maximum temperature, but Sheridan's 3rd highest December temperature on record. Dickinson, North Dakota also had its 3rd highest December temperature on record when it reached 62.0 degrees F (16.7 degrees C) on the 22nd. The lack of snowpack across these areas was likely the primary cause for unusually warm December temperatures, as snowpack tends to keep temperatures down.

Drought Conditions

Overall, drought conditions worsened throughout the High Plains in December. According to the U.S. Drought Monitor, the area experiencing drought (D1-D4) increased from approximately 76 percent to 82 percent over the course of the month. However, the area experiencing abnormal dryness and drought (D0-D4) remained the same at 96 percent.

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 changes in drought conditions occurred early in the month, which is reflected on the December 1st U.S. Drought Monitor map. Many areas experienced degradations in drought conditions due to mounting precipitation deficits and depleted soil moisture. For instance, extreme drought (D3) was introduced to central North Dakota, while moderate drought (D1) spread across southern South Dakota and northern Nebraska. However, beneficial precipitation fell in late November in areas of Kansas and Nebraska, resulting in improvements in drought conditions. Severe drought (D2) was reduced in northeastern Kansas and southeastern Nebraska, while D1 was trimmed in central Kansas.

While there were some minor adjustments to drought conditions in other areas of the High Plains states throughout December, the drought depiction changed very little after the first week of the month. Now that winter is setting in, soil moisture will likely be "locked in" until spring, making it very difficult for conditions to change drastically throughout the next few months. Timely precipitation in the spring will be critical for easing drought conditions across the region.

Climate Outlooks

According to the Climate Prediction Center, La Niña conditions are present in the Pacific and a La Niña Advisory is in effect. La Niña is expected to continue through the winter, with about a 50 percent chance of a transition to neutral occurring during the spring. Learn about how La Niña is expected to impact the Missouri Basin region from the 2020 briefing on our ENSO page: https://hprcc.unl.edu/enso_reports.php. 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, there is less than a 50 percent chance of long-range flooding across the High Plains through March. Normal wildland fire potential is expected through February across the region, while above-normal wildland fire potential is favored for southern Kansas and southeastern Colorado from March-April. 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.

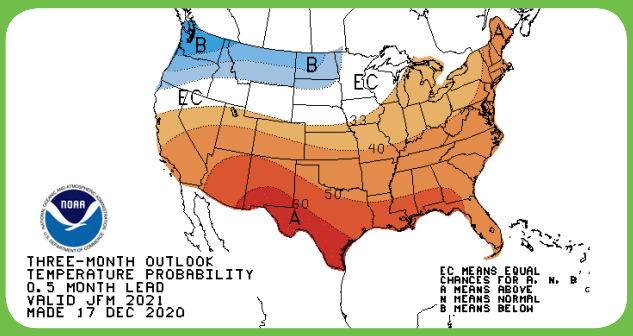
Temperature

The January-March temperature outlook indicates an increased chance of above-normal temperatures for western, southern, central, and eastern portions of the contiguous U.S. In the High Plains, this includes Colorado, Kansas, southwestern Wyoming, and southern Nebraska. Below-normal temperatures are anticipated in the Pacific Northwest and the Northern Plains, including North Dakota and northern South Dakota. Elsewhere, there are equal chances for above-, below-, and near-normal temperatures during the January-March period.

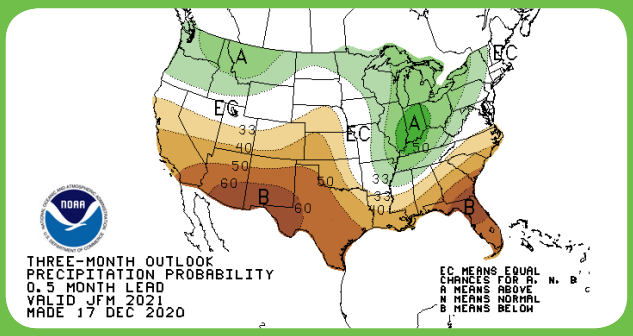
Precipitation

The precipitation outlook for the next three months calls for a higher probability of above-normal precipitation across northern portions of the contiguous U.S., as well as the Ohio Valley. In the High Plains, this includes northern and central North Dakota and northwestern Wyoming. Below-normal precipitation is anticipated across the southern U.S., as well as the Central Plains. In the High Plains, this includes large portions of Colorado, Nebraska, and Kansas. Elsewhere, there are equal chances for above-, below-, and near-normal precipitation during the January-March period.

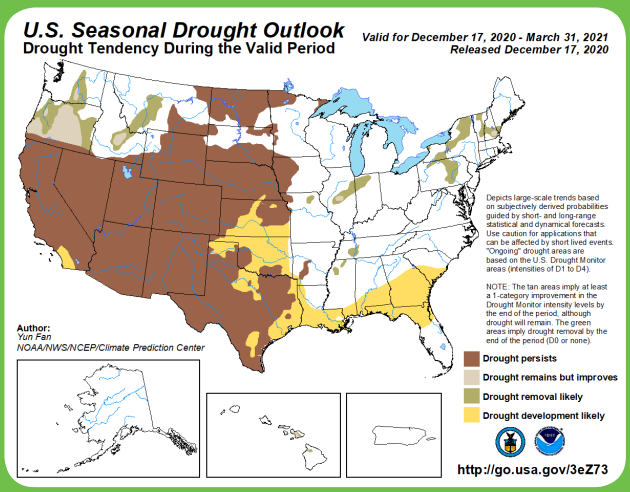
Temperature Outlook



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.

Drought

The December 17th U.S. Seasonal Drought Outlook indicates that drought is expected to persist or develop throughout much of the West, the Plains, and the Southeast. In the High Plains, drought persistence is likely, with further development possible in southern and eastern Kansas, as well as a small part of southern Nebraska. Drought may improve or be removed in the Pacific Northwest, the Midwest, and the Northeast. Improvement in drought conditions is not expected in the High Plains through March.

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	41.8	19.3	30.5	2.2	66	12/09	5	12/13	0.10	-0.30	25
Alamosa San Luis Airport	36.2	-1.5	17.3	-0.6	52	12/08+	-15	12/30	0.36	0.01	103
Colorado Springs Municipal Airport	46.7	20.4	33.5	3.7	63	12/22+	3	12/30	0.52	0.18	153
Denver International Airport	45.5	20.7	33.1	3.1	68	12/09	5	12/14	0.57	0.22	163
Grand Junction Walker Field Airport	39.2	14.5	26.9	-1.6	50	12/08+	1	12/30	0.32	-0.27	54
Pueblo Memorial Airport	49.4	16.2	32.8	2.7	67	12/22+	4	12/14	0.15	-0.23	39

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	47.2	25.4	36.3	6.3	70	12/09	13	12/14	0.72	-0.13	85
Dodge City Regional Airport	48.7	24.6	36.7	3.9	70	12/09	8	12/14	1.10	0.26	131
Goodland Renner Field	45.5	20.2	32.8	2.9	67	12/09+	8	12/16+	0.77	0.31	167
Topeka Municipal Airport	48.7	24.2	36.5	4.5	69	12/09	10	12/25	1.30	-0.05	96
Wichita Mid-Continent Airport	50.1	25.6	37.8	4.0	67	12/09	15	12/25+	1.70	0.50	142

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	46.3	16.2	31.2	6.8	68	12/09	6	12/30+	0.11	-0.41	21
Grand Island Airport	43.5	21.1	32.3	5.6	69	12/09	4	12/14	1.20	0.57	190
Lincoln Municipal Airport	42.7	17.4	30.1	3.3	66	12/09	-5	12/31	1.20	0.25	126
Norfolk Karl Stefan Airfield	42.8	19.1	31.0	6.7	62	12/08	1	12/31+	0.50	-0.25	67
North Platte Regional Airport	47.5	14.9	31.2	5.8	70	12/09	-1	12/31	0.72	0.31	176
Omaha Eppley Airport	40.2	19.2	29.7	3.7	61	12/09	3	12/25+	1.15	0.11	111
Valentine Miller Field	46.5	18.1	32.3	8.5	71	12/09	5	12/31+	0.43	0.06	116

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	37.7	14.0	25.8	9.6	59	12/06	0	12/31+	0.27	-0.22	55
Fargo International Airport	31.7	12.3	22.0	7.9	53	12/08	-9	12/24	0.67	-0.16	81
Grand Forks International Airport	31.2	10.9	21.0	9.5	50	12/08	-12	12/24	0.40	-0.21	66
Theodore Roosevelt Airport	40.5	16.8	28.7	10.8	62	12/22	4	12/13	T*	-0.24	0
Williston International Airport	35.7	16.3	26.0	12.1	55	12/08	-4	12/14	0.12	-0.50	19

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 2020 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	38.8	12.5	25.6	9.9	62	12/08	-7	12/24	0.37	-0.15	71
Huron Regional Airport	37.8	14.1	25.9	6.7	60	12/22	-9	12/24	0.52	0.00	100
Pierre Regional Airport	41.5	17.5	29.5	7.8	68	12/22	4	12/14	0.26	-0.29	47
Rapid City Regional Airport	45.6	19.0	32.3	7.4	70	12/09	6	12/30	0.29	-0.13	69
Sioux Falls Joe Foss Field Airport	38.5	16.5	27.5	8.3	59	12/22	-4	12/24	0.54	-0.15	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	35.7	16.8	26.3	2.5	53	12/09	-9	12/28	0.68	0.19	139
Cheyenne Municipal Airport	42.5	18.8	30.6	2.9	64	12/08	1	12/13	0.48	-0.01	98
Lander Hunt Field Airport	34.5	12.5	23.5	2.8	53	12/21	2	12/13	0.59	0.01	102
Laramie Regional Airport	34.5	7.7	21.1	0.0	56	12/09	-17	12/13	T*	-0.32	0
Rawlins Municipal Airport	32.8	10.6	21.7	0.2	52	12/09	-5	12/03	0.20	-0.23	47
Sheridan County Airport	45.7	18.5	32.1	9.2	72	12/08	6	12/29	0.28	-0.28	50

December 2020 Highlights

Monthly Rankings

Temperature in degrees Fahrenheit, Precipitation in inches

Warmest	**Temperature / Ranking**	**Record / Year**	**Period of Record**
Dickinson, ND	28.7 / 3rd warmest	29.6 / 1979	1938-2021
Mobridge, SD	28.3 / 3rd warmest	30.2 / 1939	1911-2021
Sheridan, WY	32.1 / 3rd warmest	35.0 / 1957	1907-2021
Aberdeen, SD	25.6 / 4th warmest (tie, 1997+)	27.4 / 1959	1893-2021
Williston, ND	26.0 / 5th warmest	28.4 / 1939	1894-2021
Valentine, NE	32.3 / 5th warmest	35.6 / 1889	1889-2021
Bismarck, ND	25.8 / 6th warmest	29.5 / 1877	1874-2021
Grand Forks, ND	21.0 / 6th warmest	22.5 / 2006+	1893-2021
Rapid City, SD	32.3 / 7th warmest (tie, 1954)	34.9 / 1957	1942-2021
Chadron, NE	31.2 / 7th warmest	33.9 / 1957	1941-2021
Norfolk, NE	31.0 / 8th warmest (tie, 1979)	32.4 / 1957	1893-2021
Driest	**Precipitation / Ranking**	**Record / Year**	**Period of Record**
Chadron, NE	0.11 / 10th driest (tie, 1979)	Trace / 2010+	1941-2021

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.

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 December precipitation was 0.23 inch, which was 0.12 inch more than last month but 0.53 inch less than in December 2019. It was also 0.29 inch less than the 1981-2010 average, making it the 15th driest December in the 126-year period of record. It was the driest December since 2014. The values 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 values 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 December. The greatest monthly precipitation accumulation was 1.31 inches, recorded in Kindred, Cass County. The greatest monthly snowfall accumulation, on the other hand, was 11.6 inches, recorded in Fargo, Cass County. Based on historical records, statewide December precipitation showed a slight positive long-term trend of 0.05 inch during the last century. The lowest and highest December precipitation for the state during this period ranged from 0.05 inch in 1944 to 1.3 inches in 2016.

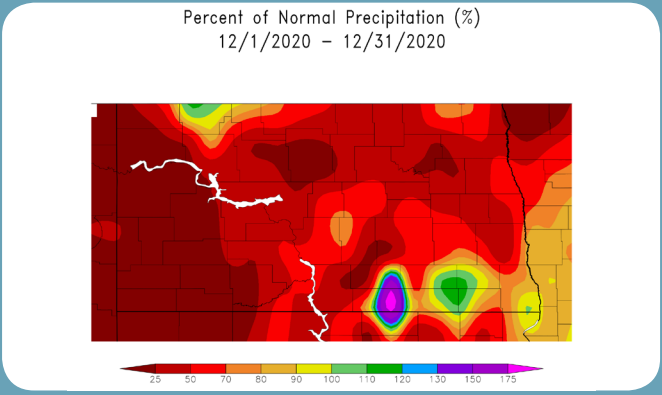
Temperature:

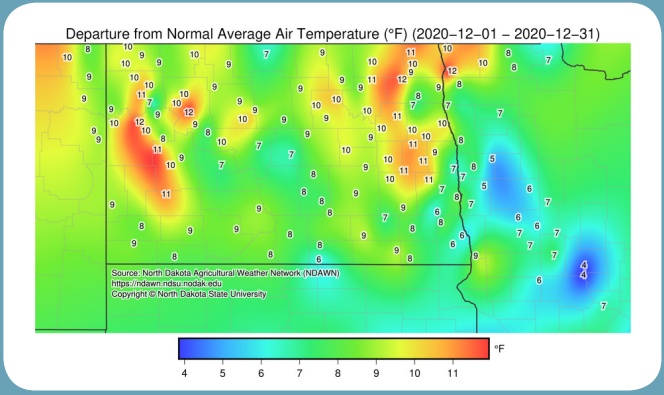
The official state average December temperature was 23.4 F, which is 8.7 degrees cooler than last month, but 7.3 degrees warmer than in December 2019. The average December temperature also was 9.4 degrees warmer than the 1981-2010 average, making it the fourth warmest December in the 126 years of record. The positive numbers in Figure 2 are shaded in green, yellow and red to depict the areas with warmer-than-average temperatures. The state's lowest and highest daily temperatures ranged from minus 27 F on Dec. 25 at Lake Metigoshe State Park, Bottineau County, to 63 F on Dec. 9 at Sand Creek, Slope County. Based on the historical records, the state average December temperature showed a positive long-term trend of 2.9 degrees during the last century. The lowest and highest monthly state December average temperatures during this period ranged from minus 3.2 F in 1927 to 25.4 F in 1939.

Drought and other notable impacts:

Across the observation network of weather stations with at least 30 years of history, 57 daily high-temperature records were set or tied. Only 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 December 2020 in North Dakota. Figure 1 produced by the HPRCC; Figure 2 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.

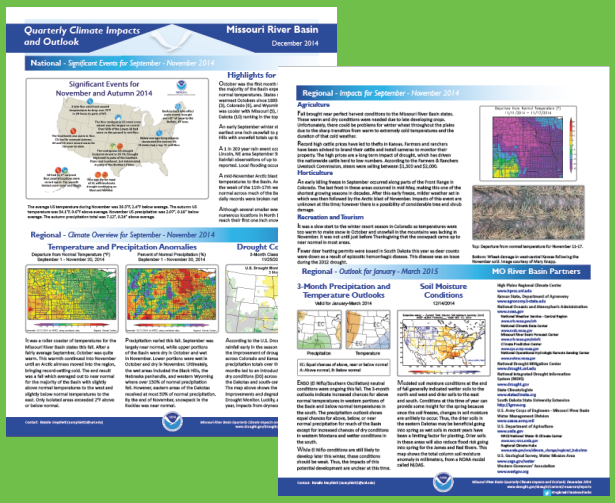
Much of the data and products found throughout this publication were built on the Applied Climate Information System (ACIS) framework. ACIS was designed to manage the complex flow of information from climate data collectors to the end users of climate data information. The main purpose of ACIS is to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

ACIS Applied Climate Information System

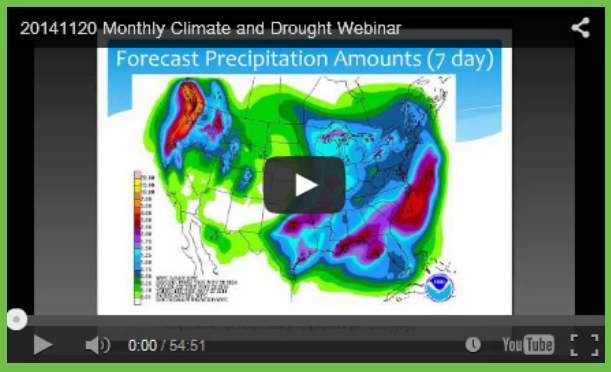
Additional Summary Information for the High Plains

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

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

Follow @HPClimateCenter

HPRCC

NOAA National Oceanic and Atmospheric Administration — US Department of Commerce