



2020 Annual Climate Summary

Sunrise in Lincoln, NE. Photo courtesy Natalie Umphlett, High Plains Regional Climate Center.
<http://hprcc.unl.edu>

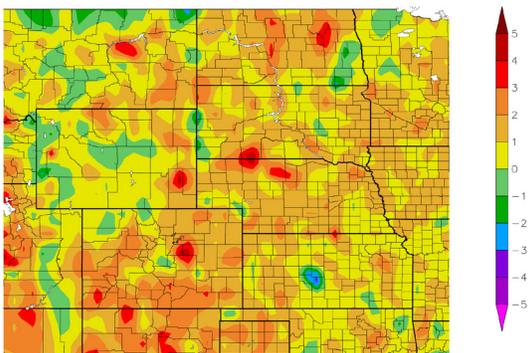
Extreme Wetness Ends as Drought Spreads Across the Region

2020 was a year of transition for the High Plains region, as cool, wet conditions over the past two years gave way to a warmer and drier regime. Hints of this transition began in the fall of 2019, when drought conditions developed across southern Kansas and western and southern Colorado. These conditions improved slightly during the spring, but quickly gave way to further expansion and deterioration, particularly during the summer and fall. Issues with extreme wetness carried over into 2020 in parts of the Northern Plains, however. In some areas, the 2019 fall harvest extended well into 2020, and wet soils and flooding in the spring caused additional impacts to agriculture and infrastructure. Even in these areas, the wetness became a memory as drought developed and expanded in the late summer, fall, and early winter.

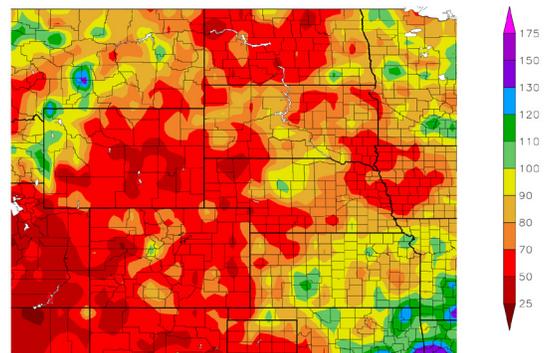
Ultimately, the year ended with over 80 percent of the region in drought (D1-D4), and these conditions caused a number of impacts over the course of the year. Fires were a major issue across Colorado and Wyoming this year, with the three largest fires in Colorado's history burning this summer and fall. These fires burned thousands of acres of forest and rangeland, caused evacuations, closed roads, and impacted air quality. From an agricultural perspective, drought caused many impacts, especially for livestock and winter wheat producers. Range and pastureland conditions were severely impacted this year, particularly in parts of Colorado and Wyoming, where livestock producers were forced to haul water or provide supplemental feed. Some producers sold calves early, too. Winter wheat was also impacted, with at least 15 percent of the crop in poor to very poor condition at the start of 2021 in Colorado (34 percent), Kansas (17 percent), and Nebraska (15 percent), according to the USDA's National Agricultural Statistics Service. Meanwhile, for those looking to get out and enjoy the weather, fires, along with poor air quality from the smoke, impacted a range of recreational activities. Later in the season, a lack of snow cover across the Plains and low snowpack in the central Rockies also impacted skiing and snowmobiling activities.

Temperature and Precipitation Overview

Departure from Normal Temperature (F)
1/1/2020 - 12/31/2020



Percent of Normal Precipitation (%)
1/1/2020 - 12/31/2020



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

After two consecutively wet years, 2020 was an extremely dry year for the majority of the High Plains region. Many locations had precipitation totals that ranked in the top 10 driest on record, rivaling the drought years of 2017, 2012, and the Dust Bowl. This switch from wet to dry was so pronounced that some locations went from having a top 10 wettest year in 2019 to a top 10 driest year in 2020. For instance, Sioux Falls, SD had its second wettest year on record in 2018, its wettest year in 2019, and then its sixth driest in 2020 (period of record 1893-2021). Meanwhile, Bismarck, ND had its second wettest year in 2019, followed by its third driest in 2020 (period of record 1874-2021).

Rocky Mountain snowpack was near normal for most of the 2019-20 season (July-June). Upper Missouri Basin snowpack peaked in mid-April at just above normal above Fort Peck Reservoir and between Fort Peck and Garrison Reservoirs, according to the U.S. Army Corps of Engineers. Plains snowpack was variable throughout the season. This year's snow season (2020-2021) kicked off with several early snowfalls, starting in September. This resulted in many locations ranking among the top 10 snowiest Septembers and Octobers on record. Despite the snowfall, the fall season was dry, overall, and the majority of the region went into winter with dry soils. Soil moisture conditions in the fall and early winter are important for the High Plains region because, as soils freeze, available moisture is locked in place until spring. This could be concerning as spring planting gets underway. Rocky Mountain snowpack was below normal at the time of this writing.

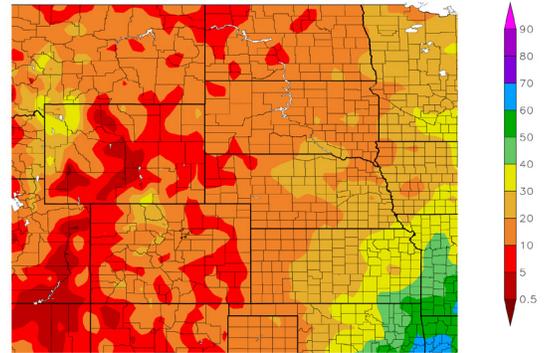
The severe weather season got off to a very slow start this year, with only 10 tornado watches issued nationally during May. The summer was much more active, however, with several notable events occurring, such as the Western U.S. derecho in June (see page 4 for more details) and the Midwestern U.S. derecho in August, which started in the High Plains region. Although the vast majority of the Midwestern derecho impacted areas to the east of the region, it is worth noting that this was an incredibly devastating storm that caused an estimated \$7.5 billion in damage, according to NOAA's U.S. Billion-Dollar Weather and Climate Disasters event database. This year's severe weather season ended below the 5- and 10-year averages for the High Plains region, in terms of tornado, hail, and wind reports, according to the Storm Prediction Center. This year's tornado reports were particularly low, with only 129 reported through October.

The following locations had notable precipitation records during 2020:

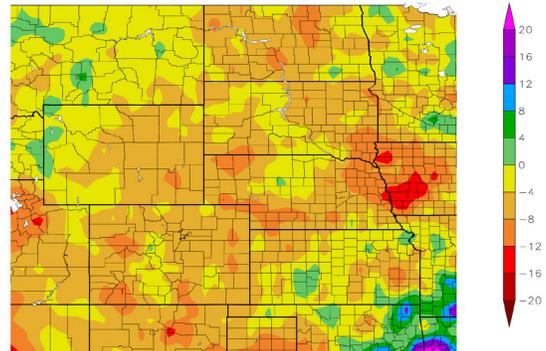
- Boulder, Colorado: Highest seasonal snowfall total on record with 152.0 inches (386 cm) (period of record 1893-2021)
- Grand Forks, North Dakota: Tied for highest 1-day total precipitation of 4.26 inches (108 mm) for the month of June, June 30 (period of record 1893-2021)
- Casper, Wyoming: Earliest autumn snowfall on record with 2.3 inches (6 cm), September 7 (period of record 1939-2021)
- Cheyenne, Wyoming: Highest 1-day total snowfall of 14.0 inches (36 cm) for the month of October, October 25 (period of record 1883-2021)

Regional Precipitation

Precipitation (in)
1/1/2020 - 12/31/2020



Departure from Normal Precipitation (in)
1/1/2020 - 12/31/2020



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

Temperatures

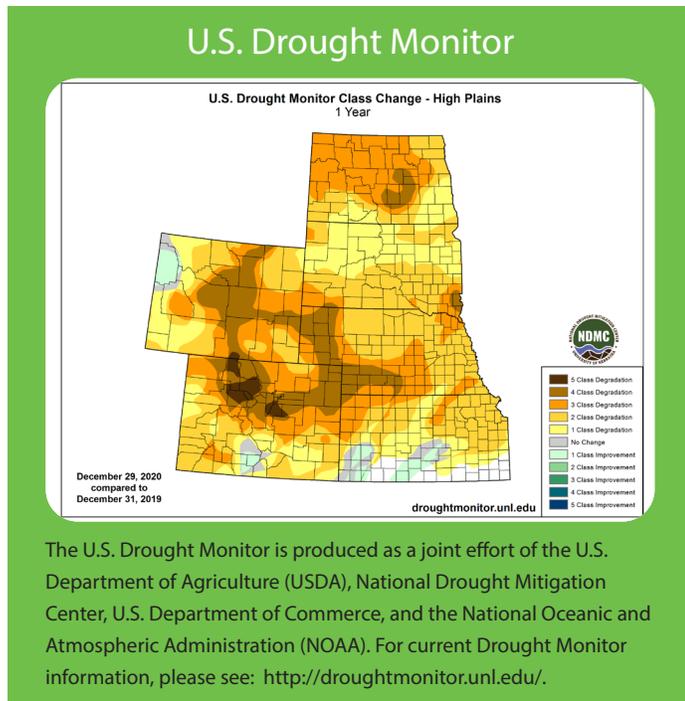
In a break from recent years, average annual temperatures were generally above normal across the High Plains region, with widespread departures of up to 2.0 degrees F (1.1 degrees C). Some areas of the region, especially western and southern Colorado, had departures over 2.0 degrees F (1.1 degrees C), which led to many locations ranking in the top 10 warmest years on record. Like most years, 2020 temperatures were quite variable throughout the year. The year started off on the warm side, with winter temperatures generally above normal, except for western areas of Colorado and Wyoming. Warm conditions continued into March, but, overall, spring temperatures were below normal due to cooler conditions in April and May. Temperatures rebounded in the summer, with most states in the High Plains ranking in the top 15 warmest summers on record. Meanwhile, autumn was characterized by extreme temperature swings, with October ranking in the top 10 coldest and November ranking in the top 10 warmest for some states in the region. The year ended quite warm, with a continuation of much-above-normal temperatures in December for most of the region.

The following locations had notable temperature records during 2020:

- Alamosa, Colorado: New daily records for maximum and minimum temperature set in the same day (92.0 degrees F/33.3 degrees C and 37.0 degrees F/2.8 degrees C), July 10 (period of record 1906-2021)
- Rapid City, South Dakota: Earliest hard freeze (28.0 degrees F/-2.2 degrees C) on record, September 9 (period of record 1942-2021)
- Pueblo, Colorado: Most number of 90.0 degrees F (32.2 degrees C) days on record for a single year, 99 days (period of record 1888-2021)
- Denver, Colorado: Highest September temperature on record at 101.0 degrees F (38.3 degrees F), September 5 (period of record 1872-2021)
- Laramie, Wyoming: Lowest October temperature on record at -26.0 degrees F (-32.2 degrees C), October 27 (period of record 1948-2021)

Drought Conditions

According to the U.S. Drought Monitor, there were substantial changes in drought conditions across the High Plains region over the course of the year. At the beginning of 2020, only 12 percent of the High Plains region was experiencing moderate to exceptional drought (D1-D4), and these conditions were largely confined to western and southern areas of Colorado and Kansas. Conditions improved somewhat over the winter and early spring, but then deteriorated across the region through the summer, fall, and even early winter.



In western areas of the region, drought conditions deteriorated rapidly and caused numerous impacts to agriculture and water resources. During the summer, drought conditions expanded to include over 70 percent of Wyoming and nearly all of Colorado. These dry conditions were coupled with extreme heat, which helped fuel some of the largest wildfires in Colorado's history. Drought conditions continued to worsen across much of the region during the fall as precipitation deficits mounted. Early season snows were promising, but merely slowed the intensification and expansion of drought. Even as the winter started, drought conditions continued to expand, which is highly unusual for the High Plains at this time of the year.

Ultimately, the year ended with 82 percent of the region in drought, which was up 70 percent from the beginning of the year. Although drought has impacted parts of the region in recent years, such as the 2017 Northern Plains drought, this is the most expansive drought in the region since 2012-2013.

Noteworthy Events

Extreme Wetness and Flooding in the Dakotas: Although drought was the main story of 2020, extreme wetness and flooding was still an issue in some areas. In North Dakota, a major disaster was declared due to wet soils and flooding in the spring, which caused an estimated \$40 million in damage to infrastructure. Meanwhile, in South Dakota, flooding along the James River continued through the winter and into the spring and summer, which is highly unusual. The James River at Columbia, SD went 518 consecutive days above flood stage - a new record for the Missouri Basin.

April Freeze Events Impact CO and KS Agriculture: In mid-April, a hard freeze event on Colorado's Western Slope severely impacted the state's peach crop. Early estimates indicated that upwards of 95% of the crop was potentially lost. A USDA Disaster Declaration was requested for the impacted counties. In Kansas, a combination of drought and multiple freeze events caused damage to winter wheat in western and central areas of the state.

Western U.S. Derecho: On June 6th, an extremely rare western U.S. derecho tracked over 750 miles, from Utah to North Dakota. According to the Storm Prediction Center, there were 339 wind reports across Utah, Colorado, Wyoming, Nebraska, South Dakota, Montana, and North Dakota, 44 of which were 75 mph (121 km/hr) or greater. Only two other western U.S. derechos have been documented in the literature.

Historic Wildfires in CO: The three largest wildfires in Colorado's history burned over 500,000 acres this year - the Cameron Peak Fire, the East Troublesome Fire, and the Pine Gulch Fire. These fires caused numerous evacuations of homeowners, recreators, and livestock, and damaged or destroyed over 1,000 structures. Additionally, the Cameron Peak and East Troublesome Fires burned over 30,000 acres of Rocky Mountain National Park.

Early September Record Heat, Cold, and Snow: A strong storm system brought an unusually cold air mass, ushering in some of the earliest freezes and snowfalls on record. This storm came on the heels of record-breaking heat in the west, which set many interesting records. According to the National Weather Service in Boulder, Denver, CO had its warmest day prior to a measurable snowfall (93.0 degrees F/33.9 degrees C) and only went 3 days between its last 100.0 degrees F (37.8 degrees C) day and a measurable snowfall.

Drought Expands across Region: Drought expanded and intensified across the region throughout 2020. Colorado and Wyoming were particularly hit hard, with dry conditions helping to fuel large wildfires. Dry conditions did allow for a quick harvest this fall, but poor pasture and range conditions were an issue for livestock producers who had to haul water and provide supplemental feed.



Top photo: Blue Mesa Reservoir in CO. Photo courtesy Natalie Umphlett, High Plains Regional Climate Center.

Second photo: Smoky sunset in Lincoln, NE in late summer. Photo courtesy Natalie Umphlett, High Plains Regional Climate Center.

Third photo: Sunset on smoke plumes in Berthoud, CO. Photo courtesy Caitlin Shaw.

Bottom photo: Cattle on wheat in eastern Kansas. Photo courtesy Mary Knapp, KSU Weather Data Library.

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	65.8*	37.0*	51.4*	1.8	101	07/12	-5	02/05	8.90*	-7.84	53
Alamosa San Luis Airport	63.3*	24.8	44.0*	2.5	93	07/11	-22	01/01	6.13	-1.18	84
Colorado Springs Municipal Airport	66.5	37.3	51.9	3.0	97	09/06	0	02/05+	9.89	-6.65	60
Denver International Airport	67.1	37.6	52.3	1.9	101	09/05	-5	02/05+	8.74	-5.56	61
Grand Junction Walker Field Airport	68.1	39.9	54.0	1.4	105	07/13	1	12/30	5.11	-4.31	54
Pueblo Memorial Airport	72.1	37.1	54.6	2.7	104	07/13+	-8	10/27	5.33	-7.24	42

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	68.1	45.4	56.8	3.0	101	09/06	4	02/13	26.12	-1.77	94
Dodge City Regional Airport	70.1	43.3	56.7	1.4	103	08/28+	8	12/14+	22.74	1.14	105
Goodland Renner Field	68.0	37.8	52.9	1.6	104	06/29	0	10/27+	16.18	-3.48	82
Topeka Municipal Airport	67.5	45.3	56.4	1.4	97	08/28	1	02/14	35.50	-0.96	97
Wichita Mid-Continent Airport	69.6	46.5	58.1	1.1	100	08/09+	9	02/13	27.97	-4.67	86

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	65.5	33.7	49.6	2.4	107	07/07	-10	10/26+	7.61	-10.44	42
Grand Island Airport	64.8	41.1	53.0	2.2	100	07/18	-5	02/20	22.98	-3.68	86
Lincoln Municipal Airport	64.7	40.4	52.6	1.1	97	09/05	-5	12/31	23.63	-5.32	82
Norfolk Karl Stefan Airfield	63.0	38.9	50.9	1.7	99	07/18	-10	02/20	18.70	-8.71	68
North Platte Regional Airport	67.2	35.7	51.5	2.8	101	09/05	-9	02/20	14.75	-5.48	73
Omaha Eppley Airport	63.8	42.1	53.0	2.0	100	08/24	-4	02/13	17.65	-12.97	58
Valentine Miller Field	65.7	36.5	51.1	3.2	106	09/05	-10	02/13	18.08	-1.94	90

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	58.0	33.3	45.6	2.8	100	08/19	-22	01/16	8.42	-9.43	47
Fargo International Airport	53.3	32.1	42.7	0.4	99	06/07	-24	02/13+	19.38	-3.20	86
Grand Forks International Airport	52.0	29.2	40.6	0.8	97	06/16	-30	01/16	19.35	-1.46	93
Theodore Roosevelt Airport	57.6	31.4	44.5	2.0	99	08/19	-22	02/13	7.83*	-7.94	50
Williston International Airport	55.1	32.0	43.5	2.0	102	08/18	-22	01/15	7.87*	-6.50	55

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>.

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South Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Aberdeen Regional Airport	58.0	33.6	45.8	2.9	98	06/01	-24	01/16	15.20	-6.52	70
Huron Regional Airport	58.1	35.6	46.9	1.0	95	06/07+	-23	02/13	18.21	-4.69	80
Pierre Regional Airport	61.0	35.7	48.3	1.0	106	08/25	-16	02/13	14.18	-5.83	71
Rapid City Regional Airport	61.8	33.6	47.7	0.7	104	09/05	-7	10/26	12.86	-3.43	79
Sioux Falls Joe Foss Field Airport	59.9	37.9	48.9	3.2	98	06/07	-13	02/13+	16.35	-10.03	62

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	60.5	30.8	45.7	0.4	100	07/12	-9	12/28	5.79	-6.73	46
Cheyenne Municipal Airport	61.3	34.5	47.9	1.6	96	07/12+	-9	02/04	10.03	-5.91	63
Lander Hunt Field Airport	59.7	31.9	45.8	0.8	97	08/18	-9	10/26	7.33	-5.33	58
Laramie Regional Airport	57.3*	27.3*	42.3*	1.4	91	09/05+	-26	10/27	5.23*	-5.69	48
Rawlins Municipal Airport	57.2*	29.4*	43.3*	0.9	94	08/23	-13	02/20	3.67	-5.58	40
Sheridan County Airport	62.3	31.6	46.9	1.8	103	09/05+	-10	10/26	10.82	-3.34	76

2020 Highlights

Annual Rankings

Temperature in degrees F / Precipitation in inches

Warmest / Coolest	Temperature / Ranking	Record / Year	Period of Record
Valentine, NE	51.1 / 2nd warmest	52.0 / 2012	1889-2021
Concordia, KS	56.8 / 5th warmest	57.7 / 1934	1885-2021
Scottsbluff, NE	51.2 / 5th warmest	53.0 / 2012	1893-2021
Cheyenne, WY	47.9 / 6th warmest	49.0 / 2012	1872-2021
Colorado Springs, CO	51.9 / 5th warmest	52.9 / 2012	1894-2021
Grand Island, NE	53.0 / 6th warmest	56.0 / 1934	1895-2021
Pueblo, CO	54.6 / 8th warmest	56.5 / 1981+	1888-2021
Wettest / Driest	Precipitation / Ranking	Record / Year	Period of Record
Casper, WY	5.79 / DRIEST	6.56 / 1988	1939-2021
Sisseton, SD	13.59 / 2nd driest	13.03 / 1952	1931-2021
Bismarck, ND	8.42 / 3rd driest	5.97 / 1936	1874-2021
Omaha, NE	17.65 / 3rd driest	14.90 / 1934	1871-2021
Pueblo, CO	5.33 / 3rd driest	3.94 / 2002	1888-2021
Grand Junction, CO	5.11 / 4th driest	4.41 / 1956	1893-2021
Scottsbluff, NE	8.78 / 4th driest	6.99 / 2012	1893-2021
Lander, WY	7.33 / 5th driest	5.38 / 2001	1891-2021
Sioux Falls, SD	16.35 / 6th driest	10.53 / 1894	1893-2021
Denver, CO	8.74 / 8th driest	7.48 / 2002	1872-2021
Norfolk, NE	18.70 / 9th driest	14.50 / 2012	1893-2021

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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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