September 2020 Climate Summary

Wildflowers near Lincoln, NE. Photo courtesy Natalie Umphlett.

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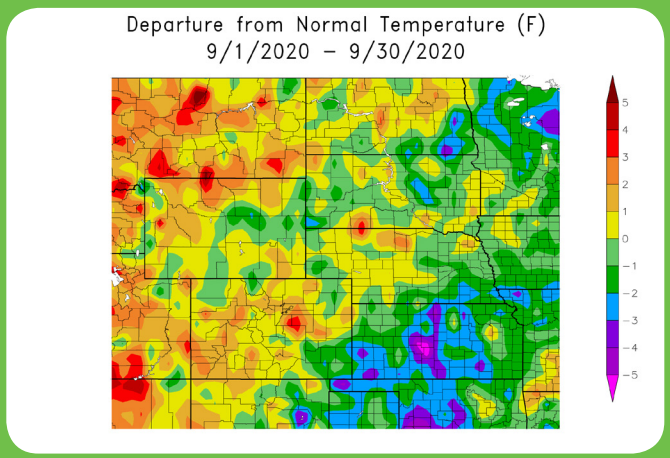
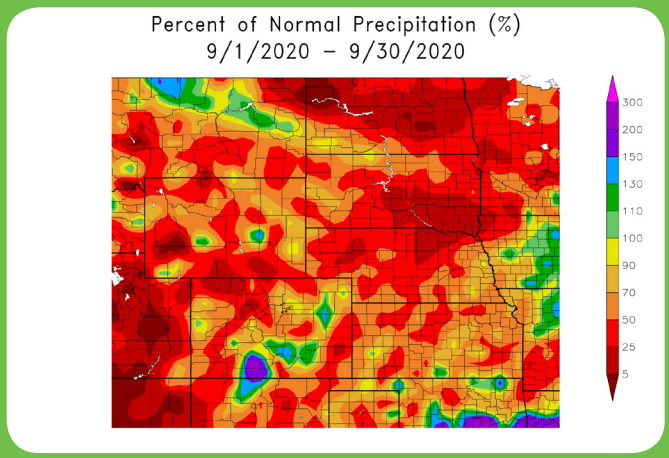
A Month of Extremes

The month of September brought a variety of extreme weather to the High Plains region. Record high temperatures occurred in many locations during the first week of the month; however, a large storm system and accompanying cold front brought about a drastic temperature change on the 8th-9th. Temperatures dropped rapidly, falling over 50.0 degrees F (27.8 degrees C) in many locations over a 24-hour period. For instance, Denver, CO had a high temperature of 93.0 degrees F (33.9 degrees C) on the 7th, but the high temperature only reached 43.0 degrees F (6.1 degrees C) on the 8th. This storm system also brought snowfall to parts of the region, which was the earliest on record for some locations. Alamosa, Colorado experienced a record daily high, then a record daily low and earliest snowfall on record just two days later. Some parts of the region set daily records for lowest maximum temperature as well. See page 2 for more details.

Unfortunately, the rest of the month was rather dry, resulting in further development and intensification of drought conditions throughout the High Plains. Pasture conditions continued to worsen across areas of Colorado, Wyoming, Kansas, and Nebraska, which has had a significant impact to livestock. According to the Drought Condition Monitoring Observer Reports, many pastures in these states had little to no green grass, which has left livestock with little to eat and is forcing ranchers to use supplemental feed. In western Nebraska, "catastrophic" crop losses were reported, with one agricultural producer reporting that crop production in 2020 was less than 10 percent of what it was in 2019. The continuation of dry conditions also exacerbated wildfires in Colorado and Wyoming. The Cameron Peak Fire, which became Colorado's third largest wildfire in recorded history, continued to burn across the northern part of the state and was only 42 percent contained by October 1st. In Wyoming, the Mullen Fire quickly grew in size at the end of the month, with more than 151,000 acres burned as of October 5th. The smoke from these fires, combined with smoke from the wildfires along the West Coast, plagued the region with hazy skies and poor air quality throughout the month.

Temperature and Precipitation Overview





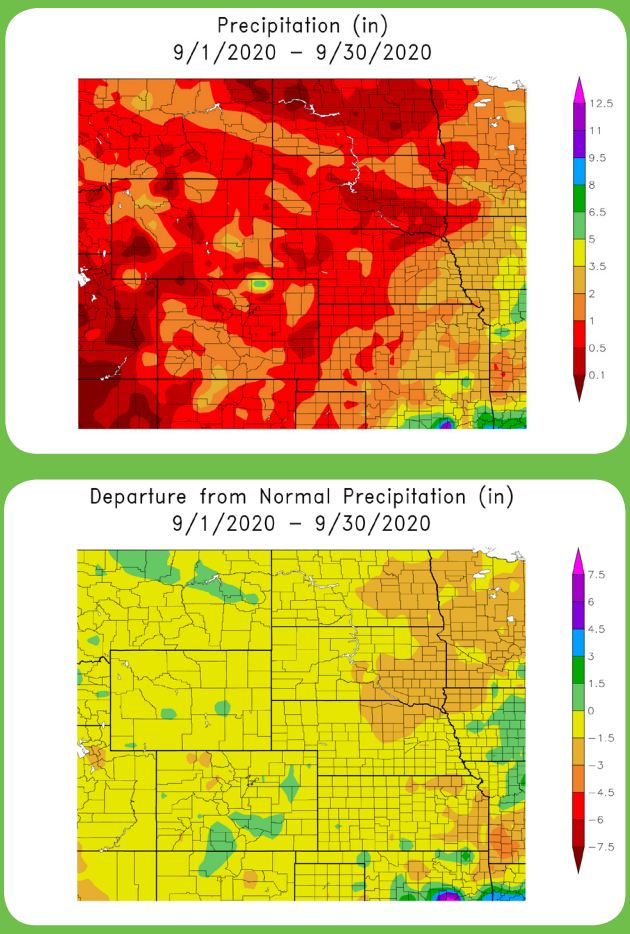
Above: Departure from 1981-2010 normal temperature (left) and percent of normal precipitation (right) for September 2020 in the High Plains region. Maps produced by the High Plains Regional Climate Center and are available at: http://hprcc.unl.edu/maps/current .

Precipitation

September was a dry month once again for much of the High Plains. The majority of the region had below-normal precipitation, with only a few isolated areas observing above-normal precipitation. The driest areas of the region, which primarily included portions of the Dakotas and Nebraska, had less than 25 percent of normal precipitation. The persistent dryness, combined with above-normal temperatures, led to increasing and worsening drought conditions for portions of the High Plains. By the end of September, over 60 percent of the High Plains region was experiencing drought. Some locations ranked in the top 10 driest Septembers on record, including Sioux Falls, SD (4th driest); Laramie, WY (6th driest); and Grand Forks, ND (7th driest). Precipitation deficits had also become quite impressive in some locations. For instance, by the end of September, Omaha, Nebraska had a year-to-date precipitation deficit of 12.19 inches (310 mm).

There were several locations that picked up early-season snowfall toward the beginning of the month. On September 8-9, a large storm system tracked across portions of Wyoming and Colorado and interacted with an unusually cold air mass. Alamosa, Colorado received 15.3 inches (39 cm) of snowfall from the storm. Not only was this the earliest measurable snowfall on record for Alamosa, but this one storm produced Alamosa's snowiest September on record. The previous record was 10.0 inches (25 cm) in September 1936 (period of record 1906-2020). Another location that ranked in the top 10 snowiest Septembers on record was Boulder, Colorado, with a total of 5.7 inches (14 cm). This ranked as the 9th snowiest September on record for Boulder. The snowiest was in September 1971, with a total of 21.0 inches (53 cm) (period of record 1893-2020). There were several locations in Wyoming that ranked in the top 5 earliest snowfalls on record as well. Some of those locations include: Casper, WY (earliest); Cheyenne, WY (tied for earliest); and Lander, WY (3rd earliest). The wet and heavy nature of the snow, combined with trees that were still fully leafed out, led to some tree damage and power outages in Wyoming and Colorado.

Regional Precipitation



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

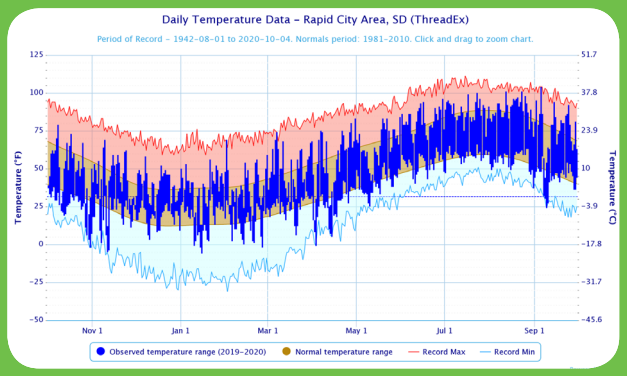
Streamflow Update

According to USGS WaterWatch, both above-normal and below-normal streamflows were present across the High Plains in September. Streamflows remained below normal at many locations across Colorado, Wyoming, northern North Dakota, and southwestern Nebraska as persistent dryness continued in these areas. Lake and reservoir levels were also quite low in some areas due to worsening drought conditions, which was impacting agricultural and recreational activities. For instance, some irrigation districts in northeastern Colorado and western Nebraska have begun to run out of water. Recent dryness in eastern South Dakota provided some benefit, however. On September 30, the James River near Stratford finally fell below flood stage. The river had been above flood stage for 546 consecutive days at this location. This was an unprecedented event for a river in the Lower 48 in modern times of flood control.

Temperatures

Temperatures varied across the High Plains in September. Across western and northern portions of the region, temperature departures were generally 1.0-3.0 degrees F (0.6-1.7 degrees C) above normal. Meanwhile, in southern and eastern areas of the High Plains, departures ranged from 1.0-3.0 degrees F (0.6-1.7 degrees C) below normal.

Station Spotlight: Rapid City, SD



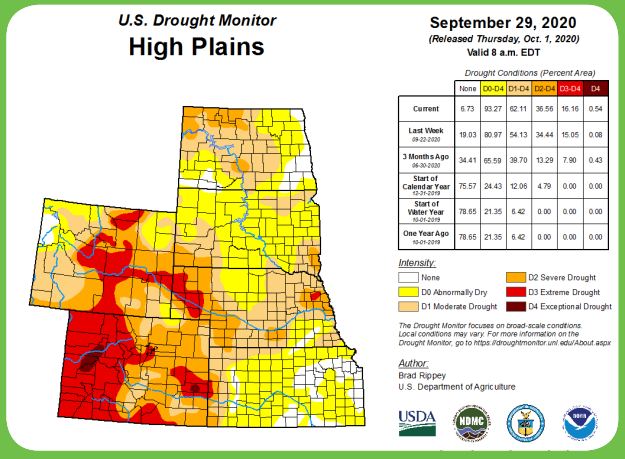
Above: Daily temperatures along with extremes and normals values since October 1, 2019 in Rapid City, SD.

Extreme temperature swings produced both daily record highs and daily record lows in some areas in September. The month started off warm across the region, with many locations having record high temperatures. For instance, Denver, Colorado hit 101.0 degrees F (38.3 degrees C) on the 5th, which was the latest 100.0 degrees F (37.8 degrees C) day on record (period of record 1872-2020). Interestingly, the previous record was set just last year on September 2nd. Then, during the second week of the month, a strong cold front ushered in much colder temperatures. On the 8th, 9th, and 10th, multiple locations had low temperatures at or below freezing. In fact, several places, such as Rapid City, South Dakota and Williston, North Dakota, had their earliest hard freeze (defined as 28.0 degrees F (-2.2 degrees C)) on record. There were many other locations that had a freeze (32.0 degrees F (0.0 degrees C)) that ranked in the top 10 earliest on record. Some of those locations include: Akron, CO (tied for earliest); Denver, CO (2nd earliest); Pueblo, CO (2nd earliest); Chadron, NE (5th earliest); and Casper, WY (6th earliest). These cold temperatures only added to the issues that farmers have been having this year, as some crops that were already struggling from the dry conditions were also damaged from the freeze, which occurred only weeks away from fall harvest.

Drought Conditions

Drought conditions expanded and intensified in portions of the High Plains through September. According to the U.S. Drought Monitor, the area experiencing drought (D1-D4) in the region increased by approximately 12.5 percent between August 25th and September 29th.

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/.

A continuation of below-normal precipitation led to worsening conditions throughout much of the High Plains. While precipitation that fell early in the month looked promising, it did little to improve drought conditions across the region. Exceptional drought conditions (D4) developed in a small area of western Colorado, and remained in place over a pocket of eastern Colorado. Extreme drought conditions (D3) expanded over parts of Colorado and Wyoming, with D3 conditions being introduced in portions of Nebraska and western Kansas as well. Severe drought (D2) persisted over parts of all High Plains states, and new areas of D2 developed in northern North Dakota and southeastern South Dakota. Areas of moderate drought (D1) conditions expanded significantly across Nebraska and North Dakota, with some expansion across northwestern Kansas. Abnormally dry conditions (D0) increased in coverage across large swaths of the High Plains region, filling in areas of South Dakota, Nebraska, and Kansas.

Meanwhile, conditions improved in southeastern Kansas in September, as heavy rains led to the removal of D1.

Climate Outlooks

According to the Climate Prediction Center, La Niña conditions are now present in the Pacific and a La Niña Advisory has been issued. There is about a 75 percent chance of La Niña conditions continuing through the winter. 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 are no areas with greater than a 50 percent chance of flooding through December. Persistent dryness has allowed rivers to fall below flood stage across the region. Above-normal wildland fire potential is expected across portions of Colorado and Wyoming through October. However, wildland fire potential is expected to be normal throughout the region November-January.

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 October-December temperature outlook indicates an increased probability of above-normal temperatures for all of the contiguous U.S. This also includes the entire High Plains region. The highest probability of above-normal temperatures in the High Plains is across much of Colorado and southwestern Kansas.

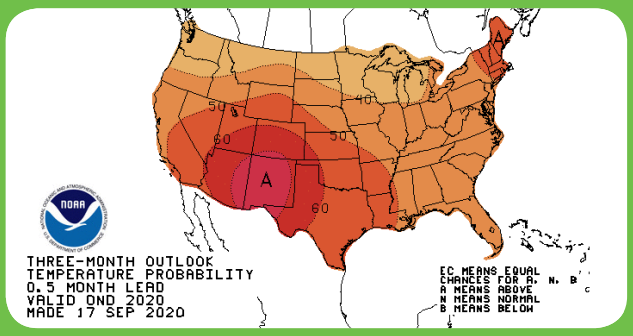
Precipitation

The October-December precipitation outlook indicates a higher chance of above-normal precipitation across northwestern portions of the contiguous U.S. In the High Plains, this includes northwestern Wyoming. Meanwhile, there is an increased chance of below-normal precipitation across much of the southern tier of the U.S., including an area stretching from southern California through western Georgia. In the High Plains, this includes much of Colorado and Kansas. The highest probability of below-normal precipitation in the High Plains is across southern Colorado and southwestern Kansas. Elsewhere, there are equal chances for above-, below-, and near-normal precipitation through December.

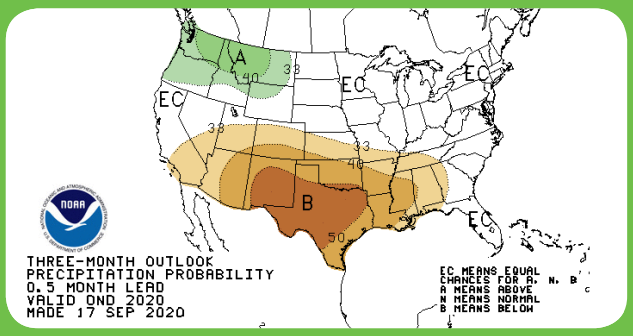
Drought

The September 17th Seasonal Drought Outlook indicates that, over the next three months, drought is expected to persist or develop in parts of the West, South, Midwest, and Plains. Drought may improve or be removed across portions of the Northeast and Northwest. In the High Plains, current drought conditions may persist across portions of each state, with development likely in southern and western Kansas, southwestern Nebraska, and small areas of Colorado and Wyoming. Drought conditions are likely to improve or be removed across portions of northern Wyoming over the next three months.

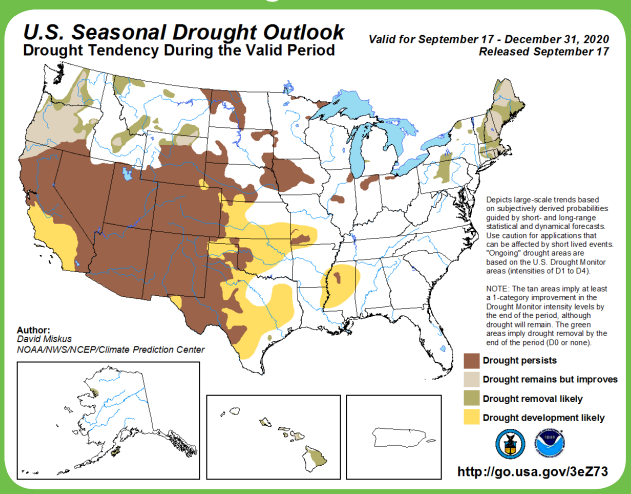
Temperature Outlook



Precipitation Outlook



Drought Outlook



Above: The three-month temperature probability outlook (top), the three-month precipitation probability outlook (middle), and the U.S. Seasonal Drought Outlook (bottom). For more information on these outlooks, produced by the Climate Prediction Center, see: http://www.cpc.ncep.noaa.gov.

Station Summaries: By the Numbers

Colorado	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Akron Washington County Airport	78.3	48.1	63.2	0.2	100	09/05	28	09/28	1.32	0.16	114
Alamosa San Luis Airport	75.0	34.3	54.7	-0.3	89	09/06+	21	09/29	1.53	0.62	168
Colorado Springs Municipal Airport	78.7	48.7	63.7	2.8	97	09/06	30	09/09+	0.35	-0.84	29
Denver International Airport	80.7	50.2	65.4	2.0	101	09/05	31	09/09+	0.93	-0.03	97
Grand Junction Walker Field Airport	82.9	51.0	66.9	0.8	99	09/06+	39	09/08	1.13	-0.06	95
Pueblo Memorial Airport	84.0	47.7	65.8	1.1	103	09/06	32	09/09	0.71	-0.06	92

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	82.2	57.1	69.7	1.7	101	09/06	42	09/29	1.71	-1.20	59
Dodge City Regional Airport	83.6	53.2	68.4	-0.8	102	09/25	37	09/29	0.62	-1.05	37
Goodland Renner Field	81.1	47.9	64.5	-0.1	100	09/06	32	09/09	0.66	-0.56	54
Topeka Municipal Airport	79.3	55.5	67.4	-0.9	96	09/07+	44	09/29	2.57	-1.09	70
Wichita Mid-Continent Airport	80.6	56.7	68.7	-2.3	98	09/07	41	09/29	1.58	-1.56	50

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	80.1	42.9	61.5	0.5	106	09/05	30	09/10	0.88	-0.85	51
Grand Island Airport	78.7	51.6	65.2	0.1	98	09/05	36	09/29	1.24	-0.99	56
Lincoln Municipal Airport	78.1	51.0	64.6	-1.4	97	09/05	40	09/29	1.62	-1.40	54
Norfolk Karl Stefan Airfield	77.2	50.8	64.0	0.2	96	09/05	36	09/29	1.61	-1.08	60
North Platte Regional Airport	81.2	46.2	63.7	1.4	101	09/05	30	09/29	0.59	-0.82	42
Omaha Eppley Airport	77.2	54.1	65.7	0.0	96	09/06	43	09/29	1.70	-0.98	63
Valentine Miller Field	81.3	47.2	64.3	2.0	106	09/05	34	09/29+	0.63	-1.01	38

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	74.1	45.9	60.0	1.5	93	09/02	26	09/09	0.50	-1.09	31
Fargo International Airport	70.0	46.4	58.2	-0.9	86	09/22	30	09/09	1.13	-1.44	44
Grand Forks International Airport	69.8	44.0	56.9	0.0	86	09/22	31	09/09+	0.30	-1.75	15
Theodore Roosevelt Airport	72.8	43.8	58.3	1.1	90	09/02	29	09/09	0.95	-0.52	65
Williston International Airport	72.4	44.6	58.5	1.8	89	09/05	28	09/08	0.18	-0.88	17

All data are preliminary and subject to change. + indicates multiple dates, latest date listed. * indicates some missing data for the period.
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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	74.0	46.4	60.2	1.3	87	09/22+	32	09/10+	1.54	-0.65	70
Huron Regional Airport	74.1	48.9	61.5	-0.2	88	09/02	34	09/10	0.65	-1.81	26
Pierre Regional Airport	77.8	48.1	63.0	0.1	97	09/14	32	09/10	0.29	-1.58	16
Rapid City Regional Airport	76.2	43.6	59.9	-0.9	104	09/05	24	09/09	1.11	-0.18	86
Sioux Falls Joe Foss Field Airport	76.1	51.3	63.7	2.4	91	09/06	41	09/17	0.42	-2.35	15

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	75.5	40.0	57.8	-0.1	98	09/05	24	09/09	0.54	-0.54	50
Cheyenne Municipal Airport	74.6	44.9	59.8	1.6	94	09/05	27	09/09+	0.60	-0.88	41
Lander Hunt Field Airport	76.1	44.1	60.1	1.5	96	09/05	21	09/09	0.66	-0.39	63
Laramie Regional Airport	71.5	36.0*	53.7*	0.4	91	09/05	18	09/28	0.11	-1.00	10
Rawlins Municipal Airport	73.4	38.0	55.7	0.3	93	09/05	23	09/28	0.42	-0.55	43
Sheridan County Airport	79.5	42.4	61.0	3.1	103	09/05	25	09/09	1.37	-0.06	96

September 2020 Highlights

Monthly Rankings

Precipitation and Snowfall in inches

Driest	**Precipitation / Ranking**	**Record / Year**	**Period of Record**
Sioux Falls, SD	0.42 / 4th driest	0.20 / 2011	1893-2020
Laramie, WY	0.11 / 6th driest	T / 1956	1948-2020
Grand Forks, ND	0.30 / 7th driest	0.10 / 1897	1893-2020
Snowiest	**Snowfall / Ranking**	**Record / Year**	**Period of Record**
Alamosa, CO	15.3 / SNOWIEST	10.0 / 1936	1906-2020
Casper, WY	7.5 / 4th snowiest	11.5 / 2000	1939-2020
Goodland, KS	0.5 / 6th snowiest (tied w/2000)	5.8 / 1995	1895-2020
Colorado Springs, CO	2.6 / 8th snowiest	27.9 / 1959	1894-2020
Pueblo, CO	0.8 / 8th snowiest (tied w/1996)	14.0 / 1959	1888-2020
Boulder, CO	5.7 / 9th snowiest	21.0 / 1971	1893-2020

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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.

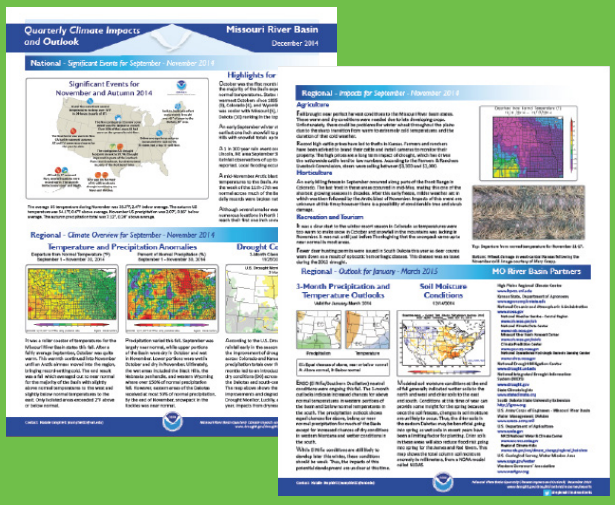
Much of the data and products found throughout this publication were built on the Applied Climate Information System (ACIS) framework. ACIS was designed to manage the complex flow of information from climate data collectors to the end users of climate data information. The main purpose of ACIS is to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

ACIS Applied Climate Information System

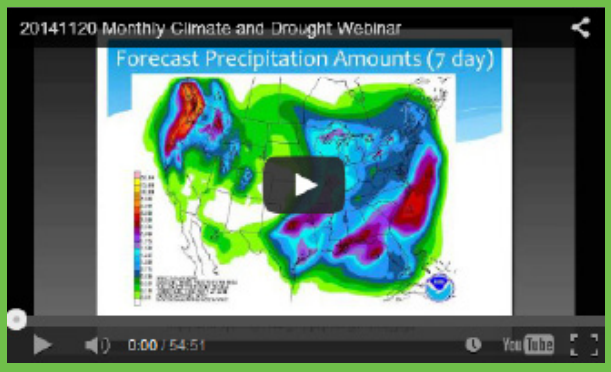
Additional Summary Information for the High Plains

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



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Author Information

For questions, comments, or suggestions, please contact:
Logan Winters, Service Climatologist
(402) 472-3471 - lwinters2@unl.edu
701 Hardin Hall, 3310 Holdrege Street
Lincoln, NE 68583-0997
http://hprcc.unl.edu

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