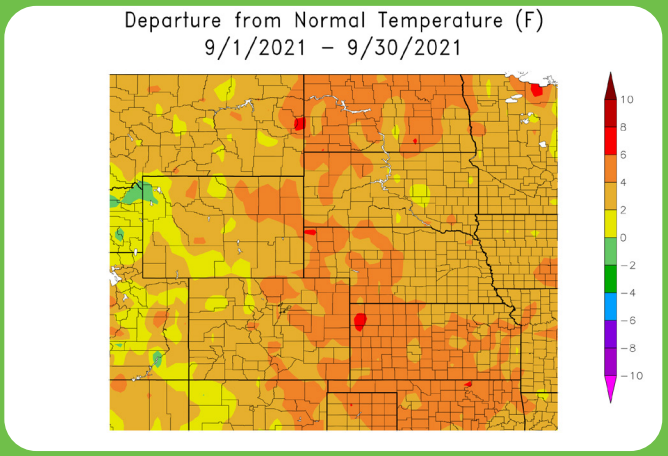
Much Needed Precipitation and Cooler Temperatures

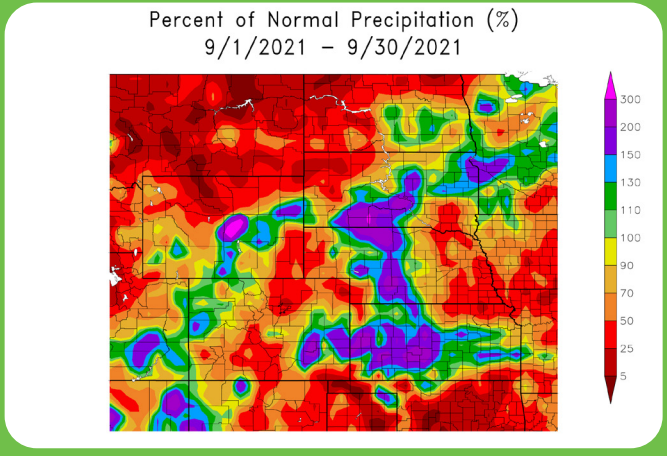
Much needed precipitation in some portions of the region has helped to provide minor relief to drought conditions and restored streamflow. Precipitation in areas of South Dakota, Nebraska, and Kansas were as much as 150 percent above normal for the month. South Dakota, which began the month with 64.69 percent of the state in D3-D4 drought conditions, has observed small improvements and ended the month with 58.62 percent in D3-D4 drought conditions. Despite these improvements, the scope of the drought has been so extreme that it will continue to take a notable amount of precipitation to see any relief in these regions. It is observed that precipitation aided in streamflow conditions in the eastern portion of the region. Streamflow across the Dakotas and lower basin returned to normal and some even observed much above normal streamflow.

Cooler temperatures also helped in bringing relief across part of the region. Firefighters took advantage of the cooler temperatures in September and were able to expand containment of the Crater Ridge Fire in Wyoming from 35 to 52 percent. As a result, air quality across the state has improved compared to earlier in the summer. While these fires continue to be a concern in Wyoming, wildland fire potential will begin to decrease throughout October and return to normal in November.

Higher elevations in Wyoming and Colorado observed their first snow for the season in September. A dusting was observed in Northwest Colorado near Rabbit Ears Pass and Cameron Pass. Light snow was also observed in Rocky Mountain National Park and even resulted in road closures due to whiteout conditions from blowing snow. In Wyoming, a light blanket of snow was observed in Grand Teton and Yellowstone National Park. While neither were measurable events, cooler temperatures are on the way as we continue into fall.

Temperature and Precipitation Overview





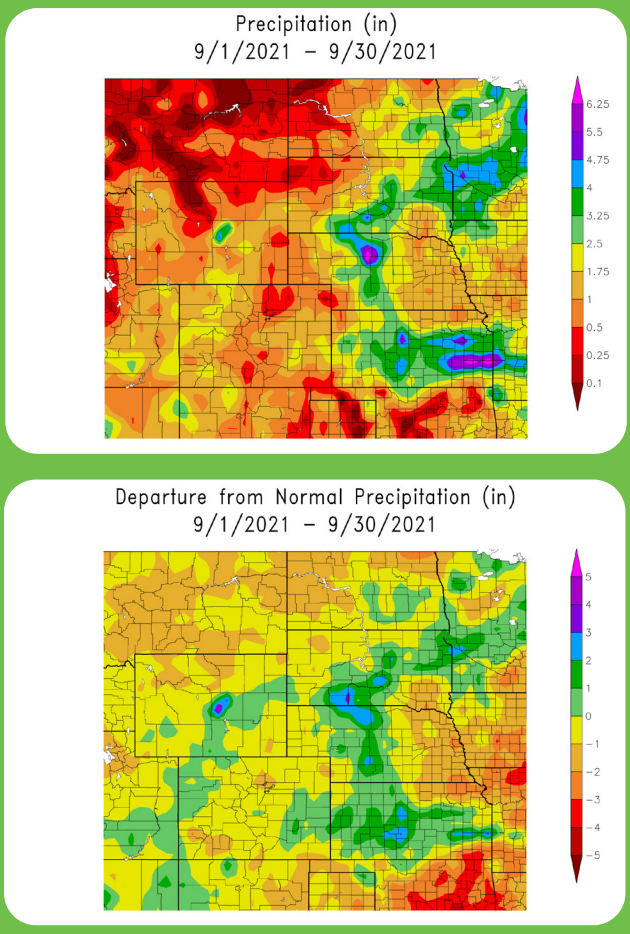
Above: Departure from 1991-2020 normal temperature (left) and percent of normal precipitation (right) for September 2021 in the High Plains region.
Maps produced by the High Plains Regional Climate Center and are available at: http://hprcc.unl.edu/maps/current .

Precipitation

Precipitation varied for September but remained at or near normal across most of the region. With precipitation near-normal, only a few areas ranked in the top 10 wettest or driest on record for September (see page 6 for monthly rankings). Portions of eastern South Dakota, central Nebraska, and Kansas received the greatest departure from normal with total precipitation as much as 2 to 3 inches (50.80 to 76.20 mm) above normal for the month. Valentine, NE observed 4.01 inches (101.85 mm) for the month ranking it the 5th wettest September on record, with the wettest being 5.91 inches (150.11 mm) set in 1973. This was also 233 percent above normal for the month. The above normal precipitation across central Nebraska slowed corn harvest ending the month with 21 percent of the corn being harvested. Corn harvest, which has been impacted due to the drought, began early harvest this year in September. However, this much needed precipitation across the region did help to provide some minor improvements to drought conditions, most of which was observed in South Dakota, and helped return streamflow in most of the region to normal and above normal.

In contrast to the above normal precipitation, portions of Wyoming and North Dakota observed slightly below normal precipitation and ranked in the top 10 driest for the month. Sheridan, WY, which received 13 percent of normal precipitation, ranked the 2nd driest September on record with a total on 0.04 inches (1.02 mm) of precipitation (the driest record being a trace recorded in 2012). Williston, ND also ranked in the top 10. Williston observed 0.10 inches (2.54 mm) for September ranking it as the 7th driest on record (the driest record being 0.01 inches, 0.25mm, recorded in 1899). This lack of precipitation has impacted wetlands in North Dakota. As a result, North Dakota's duck hunters are observing poor wetland conditions which will impact the duck hunting season. The number of duck hunting wetlands are down 44 percent across the state from last fall as a result of the lack of precipitation and drought conditions.

Regional Precipitation



Above: Total precipitation in inches (top) and departure from normal precipitation in inches (bottom) for September 2021. 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

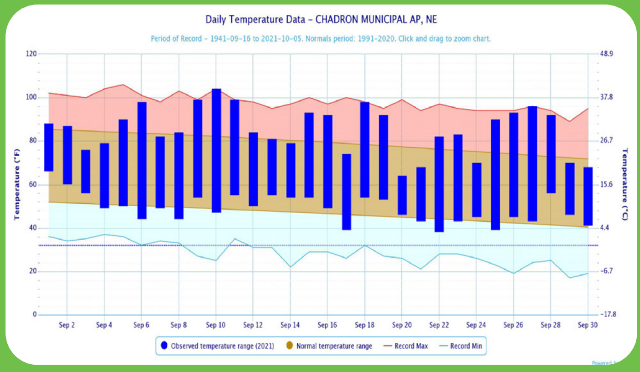
Streamflow across the region continued to vary for September. Precipitation in the eastern portion of the region helped streamflow in the lower half of the basin return to normal. This precipitation also led to areas in Kansas, Nebraska, and North Dakota observing above to much above normal streamflow. In contrast, most of Montana, Wyoming, and the western portions of the Dakotas still remain below to much below average for streamflow, aside from some isolated areas that are seeing normal flows. Multiple streams in Montana and Wyoming have also observed record low flow for the month.

Temperatures

Temperatures remained slightly above normal across the region for September aside from a small area in western Wyoming that observed below normal temperatures. The highest departures from normal were observed in North Dakota, Kansas, western South Dakota and Nebraska, and eastern Wyoming and Colorado. These areas observed temperatures over 4.0 degrees F (2.2 degrees C) above normal for September.

As a result of these above-normal temperatures, many locations ranked in the top 5 warmest September on record. Chadron, NE tied a previous record set in 1969 for the warmest September on record with an average temperature of 67.0 degrees F (19.4 degrees C) which was 4.2 degrees F (2.3 degrees C) above normal. Five other locations in Nebraska, North Dakota, and Colorado, observed the 2nd warmest September on record (see page 6 for monthly rankings).

Station Spotlight: Chadron, NE



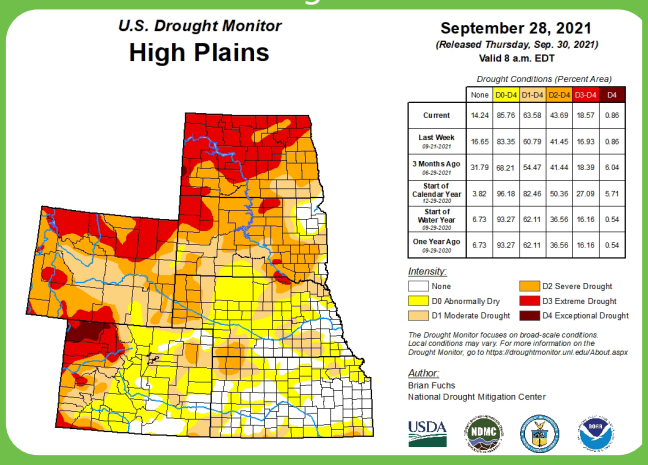
Above: Daily temperatures for September 2021 along with extremes and normals values in Chadron, NE.

Warm temperatures in the region at the end of the month resulted in many areas in North Dakota surpassing daily temperatures records, including Dickinson, ND with a record of 100.0 degrees F (37.8 degrees C) on the 28th of September surpassing a record of 98.0 degrees F (36.7 degrees C) set in 1905. This also is the latest in the year any station in North Dakota has reached 100.0 degrees F (37.8 degrees C) or higher. Bismarck, ND also reached its 50th day this year with a high temperature equal to or above 90.0 degrees F (32.2 degrees C), the record being 53 days set in 1936. Despite these high temperatures, some minor improvements were seen in drought conditions throughout September in North Dakota and other areas within the region.

Drought Conditions

Dry weather across the High Plains led to the continued spread of drought and abnormally dry (D0 – D4) conditions. Areas experiencing D0-D4 conditions increased from 80 to 86 percent over the month of September. Despite the increase, areas experiencing extreme and exceptional drought (D3-D4) conditions decreased 3 percent across the region.

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 drought that has gripped the Dakotas finally saw relief in the month of September. In South Dakota, the areas experiencing D3-D4 were reduced 16 percent during the month. D4 was reduced 5 percent in North Dakota, with only a small portion of the state still under D4 conditions. Despite the improvements in the northern part of the region, the southern portions saw an increase in drought and abnormally dry conditions. Wyoming experienced a 10 percent increase in severe to exceptional drought (D2-D4) conditions. Recent dryness has impacted Colorado, with the state experiencing a 37 percent increase to D0-D4 conditions during the month of September. Over rest of the region, other minor improvements were observed. According to the U.S. Monthly Drought Outlook for October, drought removal is likely across Nebraska.

Climate Outlooks

According to the Climate Prediction Center, ENSO-neutral conditions continued for the month of September. However, a transition to La Niña conditions is possible in the next few months, lasting throughout the winter, and a La Niña watch has been issued. For more information, visit https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

The National Weather Service's long-range flood outlook through December indicates a less than 50 percent chance of river flooding for much of the region with a small area in the lower basin with 50 to 80 percent chance of minor flooding. According to the National Interagency Fire Center (NIFC), above-normal wildland fire potential is expected for most of Wyoming, and a small portion of South Dakota and Colorado through October. The wildland fire potential is expected to return to normal in November.

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 visit http://www.cpc.ncep.noaa.gov.

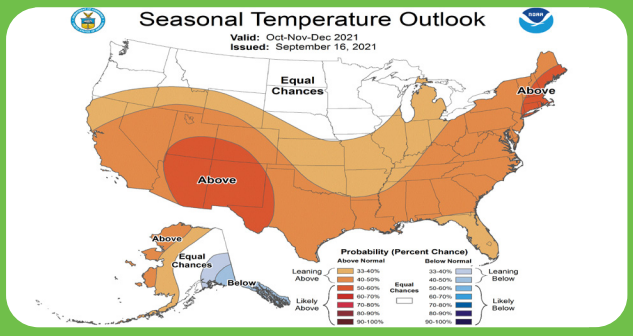
Temperature

The temperature outlook for the next three months shows increased chance for above normal temperatures for most of the contiguous United States. The Southwest and Northeastern portions of the United States have the highest chances for above-normal temperatures. In the southern High Plains, there is a slightly increased chance of above-normal temperatures for the next three months, whereas in the Northern High Plains there are equal chances of above-, below-, and near-normal temperatures.

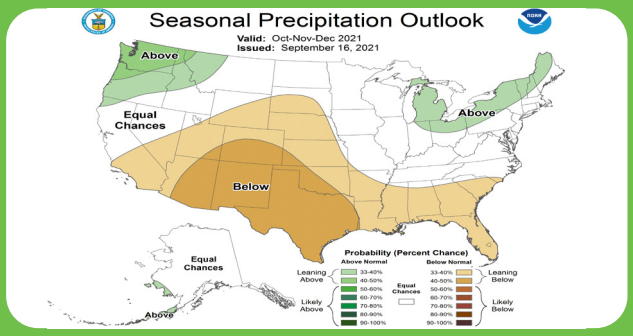
Precipitation

The precipitation outlook for the next three months indicates below-normal precipitation stretching across the southern half of the United States with a portion stretching into the High Plains. The highest chances of below-normal precipitation are present in Texas, New Mexico, and parts of Arizona, Utah, Colorado, Kansas, and Oklahoma. In the High Plains, there is a slightly increased chance of below-normal precipitation, aside from North Dakota and portions of Wyoming and South Dakota that have equal chances of above-, below-, and near-normal precipitation.

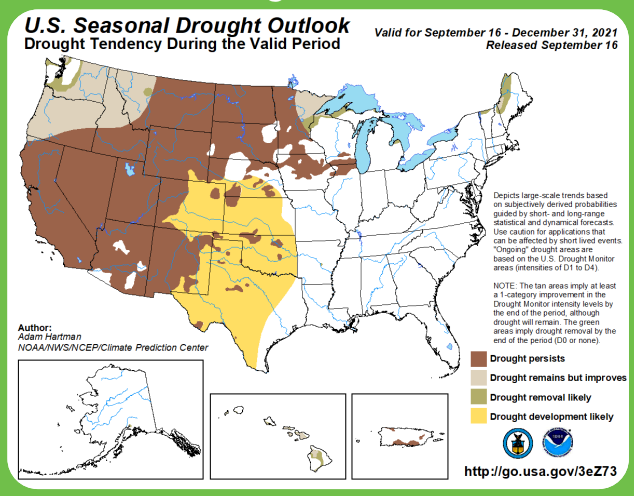
Temperature Outlook



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 U.S Seasonal Drought Outlook released on September 16th indicates drought conditions are expected to persist in the Western U.S and Northern Plains over the next three months. Drought conditions will remain in the Northwest with some minor improvements likely. In portions of southern Nebraska, eastern Colorado, Kansas, Oklahoma, and Texas, drought development is likely.

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	84.3	53.2	68.8	4.7	100	9/10	36	9/21	0.92	-0.32	74
Alamosa San Luis Airport	79.8	36.9	58.4	2.5	89	9/11+	27	9/23+	0.32	-0.66	33
Colorado Springs Municipal Airport	83.2	52.7	68.0	5.0	98	9/11	37	9/22	0.95	-0.40	70
Denver International Airport	83.9	53.6	68.8	4.0	99	9/10	39	9/21	0.28	-1.07	21
Grand Junction Walker Field Airport	83.6	54.5	69.0	1.9	94	9/10+	43	9/22	1.89	0.70	159
Pueblo Memorial Airport	88.2	52.2	70.2	3.6	101	9/11	36	9/22	0.94	0.29	145

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	85.8	60.5	73.2	4.7	99	9/26	45	9/22	1.26	-1.54	45
Dodge City Regional Airport	89.8	59.6	74.7	4.7	105	9/11	44	9/22	2.03	0.72	155
Goodland Renner Field	88.1	54.3	71.2	5.9	103	9/10	42	9/23	0.22	-1.20	16
Topeka Municipal Airport	86.0	60.5	73.3	4.1	95	9/26	44	9/23	3.25	-0.27	92
Wichita Mid-Continent Airport	88.7	62.4	75.6	3.9	100	9/02	47	9/25+	3.04	-0.01	99

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	85.2	48.8	67.0	4.2	104	9/10	38	9/22	1.32	-0.27	83
Grand Island Airport	83.3	55.8	69.5	2.9	99	9/11	41	9/22	1.48	-0.52	74
Lincoln Municipal Airport	83.8	55.9	69.9	2.7	95	9/28+	37	9/25	0.64	-2.26	22
Norfolk Karl Stefan Airfield	82.1	54.9	68.5	4.1	94	9/11	35	9/25	1.78	-0.59	75
North Platte Regional Airport	84.5	52.3	68.4	4.2	99	9/11	34	9/22	2.22	0.61	138
Omaha Eppley Airport	83.1	58.8	71.0	3.4	94	9/28	43	9/22	2.35	-0.61	79
Valentine Miller Field	83.4	53.2	68.3	4.1	96	9/27	40	9/25	4.01	2.29	233

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismarck Municipal Airport	80.6	49.6	65.1	5.4	98	9/28	33	9/25	1.06	-0.66	62
Fargo International Airport	76.6	52.1	64.4	4.4	90	9/28	41	9/25	3.14	0.46	117
Grand Forks International Airport	76.1	49.9	63.0	5.1	92	9/28	40	9/17	1.37	-0.89	61
Theodore Roosevelt Airport	80.4	46.9	63.6	5.1	100	9/28	37	9/24	0.27	-1.35	17
Williston International Airport	78.4	49.2	63.8	5.8	95	9/28	34	9/24	0.10	-1.26	7

All data are preliminary and subject to change. + indicates multiple dates, latest date listed. * indicates some missing data for the period. ** indicates value is under evaluation.
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.

September 2021 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	79.2	50.0	64.6	3.7	93	9/28	31	9/25	2.05	0.06	103
Huron Regional Airport	79.5	52.7	66.1	3.5	92	9/28	35	9/25	3.44	1.01	142
Pierre Regional Airport	79.9	52.9	66.4	2.8	95	9/28	37	9/25	1.88	0.14	108
Rapid City Regional Airport	81.2	48.9	65.1	3.8	96	9/18+	37	9/21+	0.71	-0.51	58
Sioux Falls Joe Foss Field Airport	79.5	54.5	67.0	3.2	93	9/16	39	9/25	3.21	0.48	118

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	80.6	42.8	61.7	2.8	95	9/10+	30	9/17	0.79	-0.16	83
Cheyenne Municipal Airport	79.0	48.0	63.5	3.9	96	9/10	34	9/21	0.28	-1.27	19
Lander Hunt Field Airport	79.1	46.6	62.8	3.2	94	9/09	28	9/30	0.49	-0.49	50
Laramie Regional Airport	74.6	40.5	57.6	3.3	88	9/10	25	9/21	0.72	-0.39	65
Rawlins Municipal Airport	75.6	42.0	58.8	2.3	89	9/10	25	9/21	1.51	0.62	170
Sheridan County Airport	82.4	43.5	62.9	3.8	95	9/10	27	9/30	0.19	-1.28	13

September 2021 Highlights

Monthly Rankings

Temperature in degrees Fahrenheit, Precipitation in inches

Warmest	**Temperature / Ranking**	**Record / Year**	**Period of Record**
Chadron, NE	67.0 / WARMEST (tie, 1969)		1941-2021
Scottsbluff, NE	67.5 / 2nd warmest	68.1 / 1998	1893-2021
Akron, CO	68.8 / 2nd warmest	68.9 / 1998	1937-2021
Bismarck, ND	65.1 / 2nd warmest	67.1 / 1897	1874-2021
Grand Forks, NE	63.0 / 2nd warmest	64.2 / 2009	1893-2021
Colorado Springs, CO	68.0 / 2nd warmest	68.7 / 2019	1894-2021
Dickinson, ND	63.6 / 3rd warmest	64.2 / 1998	1938-2021
Williston, ND	63.8 / 3rd warmest (tied 1940+)	64.3 / 2009	1894-2021
Denver, CO	68.8 / 3rd warmest	68.8 / 69.4	1874-2021
Goodland, KS	71.2 / 3rd warmest	72.7 / 1931	1895-2021
Alamosa, CO	58.4 / 4th warmest (tied with 2015+)	59.0 / 1933	1906-2021
Pueblo, CO	70.2 / 4th warmest	72.8 / 2019	1888-2021
Precipitation	**Precipitation / Rankings**	**Record / Year**	**Period of Record**
Sheridan, WY	0.04 / 2nd driest	Trace / 2012	1907-2021
Valentine, NE	4.01 / 5th wettest	5.91 / 1973	1889-2021
Williston, ND	0.10 / 7th driest	0.01 / 1899	1894-2021

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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.

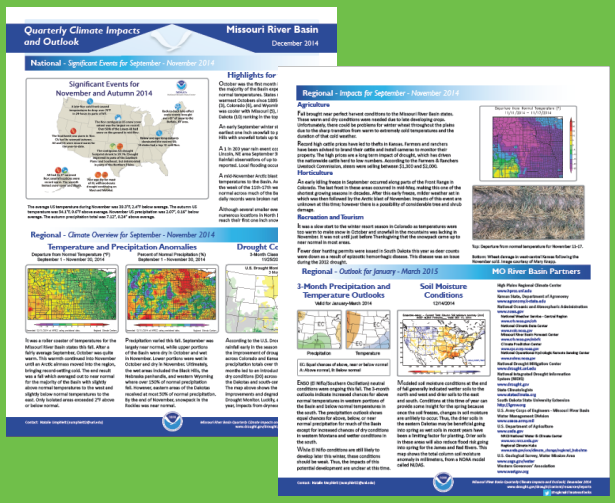
Much of the data and products found throughout this publication were built on the Applied Climate Information System (ACIS) framework. ACIS was designed to manage the complex flow of information from climate data collectors to the end users of climate data information. The main purpose of ACIS is to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

ACIS Applied Climate Information System

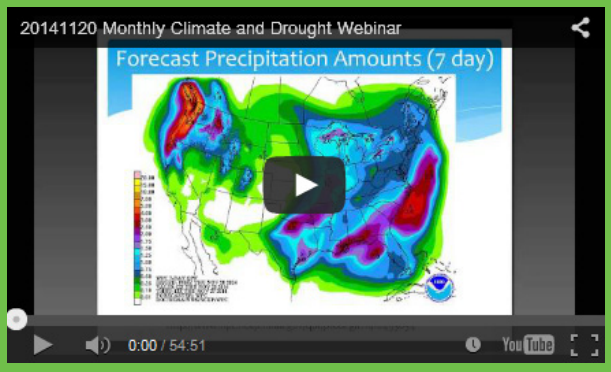
Additional Summary Information for the High Plains

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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For an archive:
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