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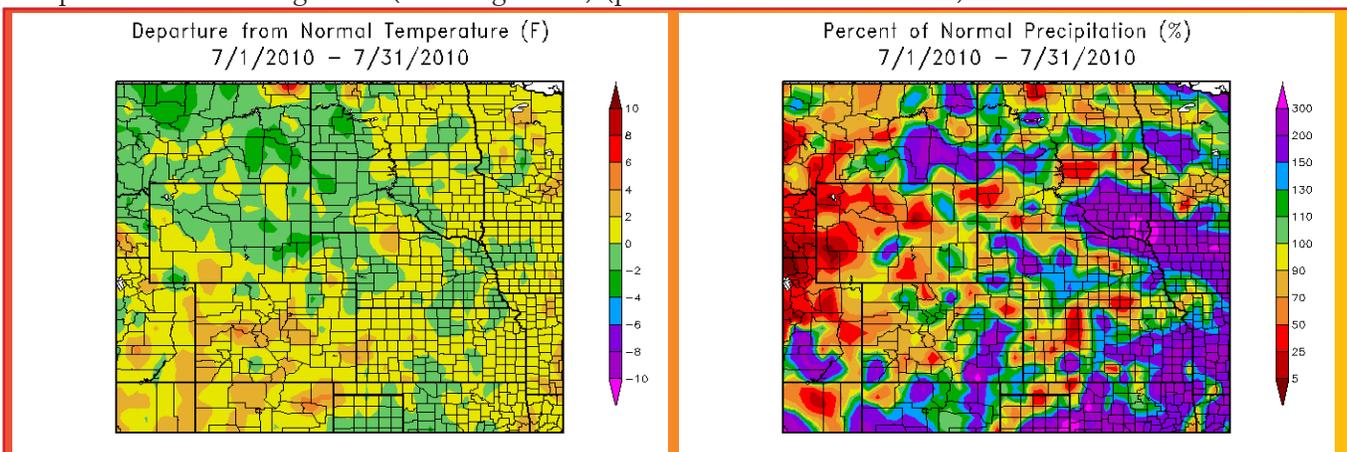
American Association of State Climatologists Annual Meeting 2010 - Lake Tahoe, CA - Photo by Natalie Umphlett
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July 2010 Climate Summary

Region Breakdown

July 2010 was an active month for the High Plains Region. In addition to a new United States hail record which was set in South Dakota, numerous daily and monthly precipitation records were set across Colorado, Kansas, Nebraska, and South Dakota (for more details and photos see page 2). Temperatures across the Region, on the other hand, were near normal with temperature departures ranging from 2 degrees F (1.1 degrees C) below normal to 2 degrees F (1.1 degrees C) above normal. Some areas of Colorado and a few other locations scattered through the Region were 2-4 degrees F (1.1-2.2 degrees C) above normal.

While most locations were near normal, one location made it into the top 10 warmest Julys on record. Crested Butte, Colorado, which is located in the west central part of the state, tied for its 4th warmest July. The average temperature in Crested Butte was 60.4 degrees F (15.8 degrees C) which was 4.4 degrees F (2.4 degrees C) above normal. This was close to, but could not beat out the warmest July on record which occurred in 1966 with an average temperature of 61.0 degrees F (16.1 degrees C) (period of record 1910-2010).



Departure from 1971-2000 Normal Average Temperature (left) and Percent of Normal Precipitation (right) for July 2010 in the High Plains Region. Maps produced by High Plains Regional Climate Center. Available at: <http://hprcc.unl.edu/maps/current>

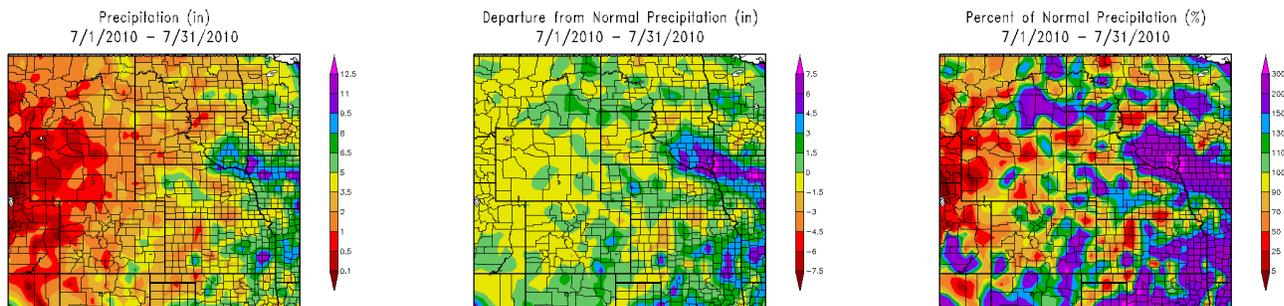
Precipitation Summary

July 2010 was a wet month for portions of Colorado, Kansas, Nebraska, and South Dakota. Southeastern South Dakota and northeastern Nebraska, where precipitation was 200-300 percent of normal, were hit particularly hard and flooding along many rivers continued into August. The abundance of moisture this month led numerous locations to be ranked in the top 10 wettest Julys on record and at least 5 of these locations recorded their wettest July (see table below).

Within the first week of July locations in Kansas, Colorado, and Nebraska were already ranked in the top 10 wettest Julys on record. Heavy rain in the panhandle of Nebraska caused flooding and evacuations in the town of Lodgepole. Dodge City, Kansas set a new record for the greatest 24-hour precipitation when 6.95 inches (176.53 mm) of precipitation fell in less than 24 hours on July 4-5. Dodge City went on to record its second wettest July with 8.40 inches (213.36 mm) of precipitation. This total was just shy of the record 9.13 inches (231.90 mm) which fell in 1962 (period of record 1875-2010). July 23rd was an active day in South Dakota. Storms produced high winds, flooding, tornadoes and record breaking hail. According to the National Weather Service in Aberdeen, South Dakota, a record breaking hailstone fell in Vivian, South Dakota that measured 8 inches in diameter, weighed 1.9375 pounds, and had a circumference of 18.62 inches (see above). The previous record hailstone, by weight, fell in Coffeyville, Kansas September 3, 1970 and weighed 1.67 pounds. The previous record hailstone, by diameter, was the 7 inch Aurora, Nebraska hailstone which fell June 22, 2003. The Aurora hailstone retains the record for largest circumference at 18.75 inches. Later in the month, due abundant monsoonal moisture, the Trinidad Perry Stokes Airport, Colorado recorded its wettest July with 6.84 inches (173.74 mm) of precipitation. This beat out the old record of 6.55 inches (166.37 mm) received in 1981 (period of record 1948-2010). Interestingly, earlier this year this location also recorded its wettest February and wettest March. Through July 31st, the year-to-date precipitation total at the Trinidad Perry Stokes Airport was 16.51 inches (419.35 mm), which makes 2010 already the *10th wettest year* on record.



Above: Record hailstone. Photo courtesy NWS Aberdeen, SD.



Above: Total precipitation (inches) (left), Departure from Normal Precipitation (inches) (center), and Percent of Normal Precipitation (right) for July 2010 in the High Plains Region. These maps are produced by HPRCC and can be found on the Current Climate Summary Maps page at: <http://hprcc.unl.edu/maps/current>.

July 2010 Records - Highlights

Monthly Records			
Precipitation in inches			
Wettest	New Record	Old Record	Period of Record
Arthur, NE	4.45	7.14/1958	1929-2010
Marion, SD	10.17	9.47/1915	1901-2010
Trinidad Perry Stokes AP, CO	6.84	6.55/1981	1948-2010
Vermillion 2 SE, SD	11.99	9.63/1907	1893-2010
Wessington Springs, SD	10.78	7.55/1907	1893-2010
Yankton 2E, SD	10.21	8.86/1972	1932-2010

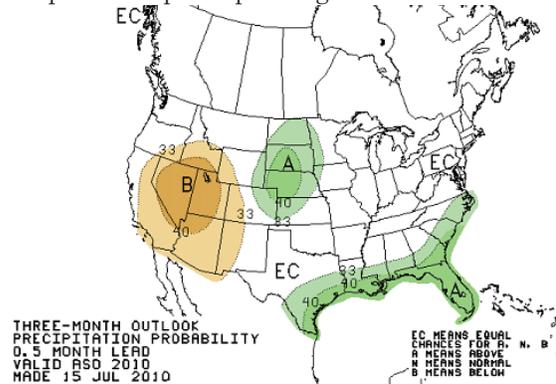
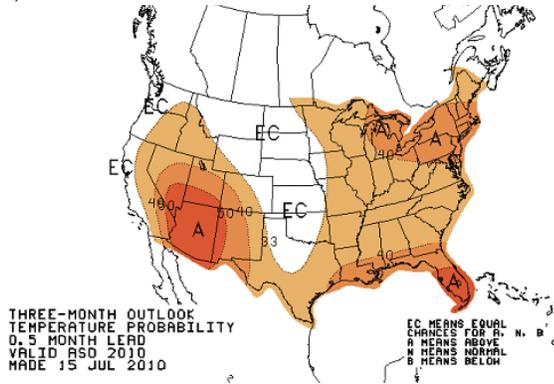
All Data are Preliminary and Subject to Change.
 Source: National Weather Service Cooperative Observation Network Data

The High Plains Regional Climate Center is one of the NOAA Regional Climate Centers, and is involved in the Applied Climate Information System (ACIS) development and management effort. Data found throughout this publication were derived using products built on the ACIS framework.



Climate Outlook

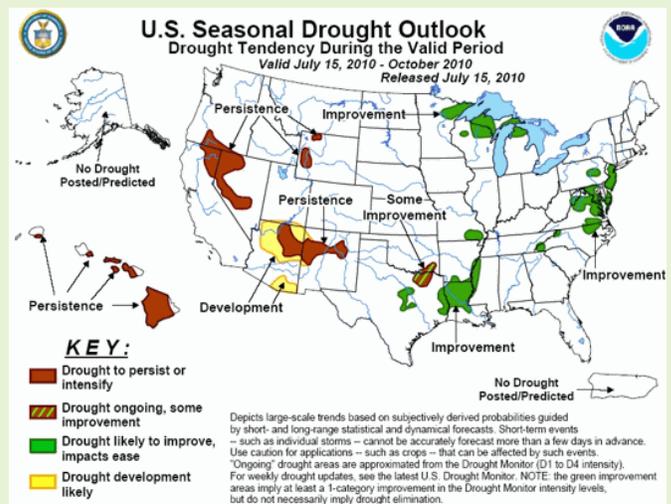
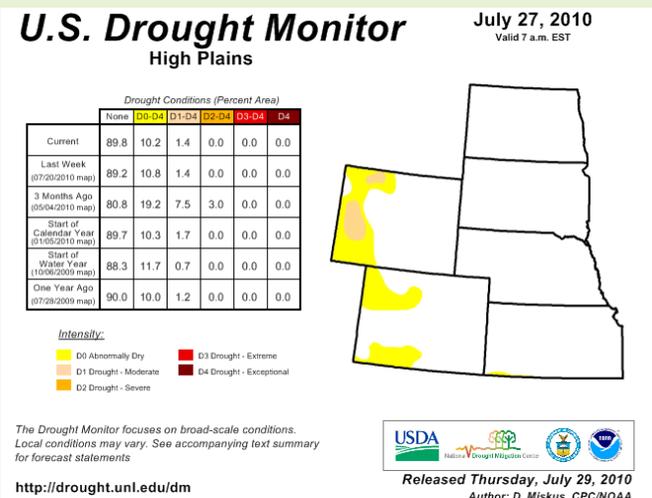
As negative sea surface temperature anomalies continued to strengthen, La Niña conditions were developing across the equatorial Pacific this month. The temperature outlook indicates a higher probability of above normal temperatures for most of Colorado, the southwest corner of Wyoming, and far northeastern North Dakota. Equal chances of above, near, or below normal temperatures are predicted elsewhere. The precipitation outlook indicates a higher probability of above normal precipitation for South Dakota, all but the northwest corner of North Dakota, Nebraska, the eastern half of Colorado, the western half of Kansas, and eastern Wyoming. Southwestern Wyoming and western Colorado both have a higher probability of below normal precipitation. Equal chances of above, near, or below normal precipitation are predicted elsewhere in the Region. The seasonal outlooks combine the effects of long-term trends, soil moisture, and when applicable, the El Niño Southern Oscillation cycle (ENSO). More information about these forecasts can be found here: <http://www.cpc.ncep.noaa.gov/>.



Above: 3-Month Outlook Maps Courtesy the NOAA Climate Prediction Center - <http://www.cpc.ncep.noaa.gov>
 (left) The Three-Month Temperature Probability Outlook, (right) The Three-Month Precipitation Probability Outlook

Drought Watch

While some areas of the High Plains Region received record setting precipitation, other areas were still experiencing either abnormally dry or drought conditions. Abnormally dry conditions (D0) in Colorado were unchanged in the north and trimmed down in the south, while D0 were expanded north from Oklahoma into Kansas. Large changes occurred this month in western Wyoming as a reassessment of conditions caused the severe drought conditions (D2) to be downgraded to moderate drought conditions (D1). The remaining D1 areas were downgraded to D0. North Dakota, South Dakota, and Nebraska remained drought free. According to the U.S. Seasonal Drought Outlook released July 15th, the drought conditions in western Wyoming were expected to persist through October 2010.



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). Real-time data provided through ACIS from the NOAA Regional Climate Centers are often used by the agencies involved in the U.S. Drought Monitor when determining the area and intensity of drought conditions, although the product itself is not produced by HPRCC. For current Drought Monitor information, please see: <http://www.ndmc.unl.edu/dm/monitor.html>
 Portions of this Drought Watch are courtesy the Drought Monitor Text Discussion found on the Drought Monitor webpage.

State Summaries

Colorado	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Alamosa San Luis Airport	83.9	48.9	66.4	2.3	92	7/16	38	7/06	1.03	0.09	110
Akron Washington County Airport	89.0	59.7	74.3	0.6	103	7/17	51	7/09	2.14	-0.79	73
Colorado Springs Municipal Airport	86.7	58.7	72.7	3.1	96	7/17	50	7/09	2.67	-0.18	94
Grand Junction Walker Field Airport	95.1	65.2	80.2	3.4	105	7/19	48	7/05	0.46	-0.20	70
Pueblo Memorial Airport	92.9	60.3	76.6	1.1	103	7/19	50	7/06	2.28	0.24	112

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	90.5	69.1	79.8	0.7	100	7/19	61	7/01	5.12	0.92	122
Dodge City Regional Airport	91.9	67.8	79.9	0.1	100	7/13	61	7/09	8.40	5.23	265
Goodland Renner Field	90.1	63.0	76.6	1.5	102	7/17+	56	7/05	3.86	0.32	109
Topeka Municipal Airport	91.0	72.3	81.6	3.2	99	7/30	63	7/01	4.60	0.77	120
Wichita Mid-Continent Airport	93.0	72.4	82.7	1.7	102	7/24	67	7/10+	2.77	-0.54	84

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	89.1	58.5	73.8	-0.3	99	7/13	47	7/08	1.82	-0.29	86
Grand Island Airport	86.0	66.2	76.1	0.3	96	7/14	57	7/09	4.10	0.96	131
Lincoln Municipal Airport	87.2	68.4	77.8	0.0	96	7/14	59	7/09	5.83	2.29	165
Omaha Eppley Airfield	87.3	69.0	78.1	1.4	96	7/14	64	7/25+	6.32	2.46	164
Norfolk Karl Stefan Airport	85.8	65.0	75.4	0.6	93	7/27	57	7/09	3.42	-0.32	91
North Platte Regional Airport	86.5	63.3	74.9	0.6	97	7/13	54	7/09	3.98	0.81	126
Valentine Miller Field	90.5	62.4	76.4	2.7	105	7/17	49	7/15	2.25	-1.12	67

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismark Municipal Airport	83.9	57.5	70.7	0.3	96	7/26	49	7/06	3.01	0.43	117
Fargo International Airport	82.9	61.1	72.0	1.4	94	7/01	49	7/12	4.23	1.35	147
Grand Forks International Airport	82.9	59.5	71.2	1.8	94	7/01	51	7/12	2.16	-0.90	71
Theodore Roosevelt Airport	80.8	53.1	67.0	-2.4	94	7/26	44	7/07	1.68	-0.43	80
Williston International Airport	83.2	55.8	69.5	0.2	96	7/26	49	7/18	3.91	1.63	171

All Data are Preliminary and Subject to Change. + indicates multiple dates, latest date listed.

Source: National Weather Service Cooperative Observation Network Data

Data are retrieved through the Applied Climate Information System (ACIS).

These data are available for the entire period of record through the CLIMOD system. For more information please see <http://hprcc.unl.edu/services>.

South Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Aberdeen Regional Airport	84.0	61.1	72.6	0.4	96	7/17	55	7/25	3.24	0.32	111
Huron Regional Airport	85.2	64.0	74.6	1.2	100	7/17	59	7/08	6.43	3.57	225
Pierre Regional Airport	87.7	61.5	74.6	-0.9	106	7/17	56	7/09+	2.95	0.20	107
Rapid City Regional Airport	84.5	56.4	70.4	-1.3	98	7/31	46	7/07	1.66	-0.37	82
Sioux Falls Joe Foss Field Airport	83.6	63.4	73.5	0.5	94	7/27	55	7/21	8.55	5.62	292

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	86.8	51.8	69.3	-0.7	91	7/26+	46	7/09	1.06	-0.23	82
Cheyenne Municipal Airport	83.0	54.0	68.5	0.8	91	7/26+	46	7/09	2.11	-0.15	93
Lander Hunt Field Airport	86.1	55.3	70.7	-0.2	97	7/26	41	7/07	0.63	-0.21	75
Laramie Regional Airport	80.8	48.4	64.6	1.4	89	7/26+	37	7/05	0.78	-0.78	50
Rawlins Municipal Airport	84.4	52.1	68.2	0.3	92	7/26	42	7/09	0.42	-0.48	47
Sheridan County Airport	84.7	52.7	68.7	-0.1	98	7/26	42	7/07	1.54	0.43	139

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State Spotlight - North Dakota

F. Adnan Akyüz - State Climatologist, Barb Mullins
North Dakota State Climate Office, North Dakota State University



Precipitation:

Monthly precipitation totals ranged from about 1 to 7 inches. The highest amounts of 4 to 7 inches fell primarily in the southeast with 1 to 4 inches elsewhere. Percent of normal precipitation ranged from approximately 40% to 200%. Areas of the east, southeast, southwest and the far northeast corner had greater than 100% of normal precipitation with less than 100% elsewhere (Figure 1. North Dakota State Climate Office). Daily rainfall events were scattered throughout the month. Most of the Storm Prediction Center's (SPC) reports of high winds, hail, and tornadoes fell on the 13th, 20th, and 26th. The SPC had 87 reported hail events in July. A record setting hailstone was recorded near Vivan, SD on the 23rd. The hailstone was 8 inches in diameter with a circumference of 18.625 inches and weighed 1.9375 lbs.

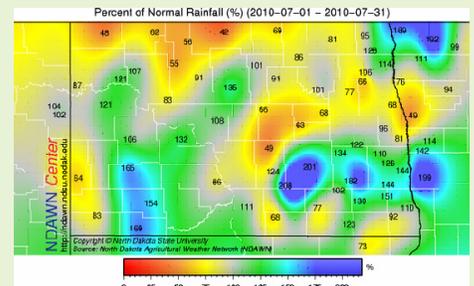


Figure 1. Precipitation Percent of Normal in July 2010 for North Dakota (NDSCO)

Temperature:

July average air temperatures ranged from 65°F to 73°F with the lower temperatures in the north and higher temperatures in the southeast. July average temperatures were close to normal across the state with the western region being slightly below normal and the eastern regions being slightly above normal. Departure from normal average air temperatures ranged from -2.2°F to 3.4°F (Figure 2. North Dakota State Climate Office). July's warm temperatures promoted good crop development throughout most of the month according to the USDA, National Agricultural Statistics Service, North Dakota Field Office.

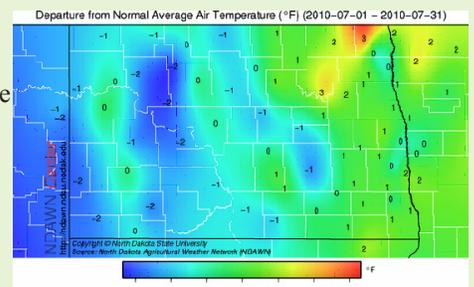


Figure 2. Temperature Departure from Normal in July 2010 for North Dakota (NDSCO)

For more information about the North Dakota State Climate Office: <http://www.ndsu.edu/ndsco>

For more information on the North Dakota Agricultural Network: <http://www.ndawn.ndsu.nodak.edu>

The North Dakota Agricultural Network is a part of the Automated Weather Data Network (AWDN).

About the High Plains Regional Climate Center

The High Plains Regional Climate Center (HPRCC) operates out of the University of Nebraska - Lincoln (UNL) in Lincoln, Nebraska. As one of 6 regional climate centers operated under the National Oceanic and Atmospheric Administration (NOAA), HPRCC works closely with other organizations such as the National Climatic Data Center (NCDC), Local and Regional National Weather Service (NWS) Offices, and other climate services organizations such as the National Drought Mitigation Center (also located at UNL) to provide climate data services and specialized climate products.

For More Information Online

High Plains Regional Climate Center: <http://hprcc.unl.edu>

High Plains Regional Climate Services: <http://hprcc.unl.edu/services>

CLIMOD: <http://climod.unl.edu>

NOAA Regional Climate Centers and ACIS: <http://www.rcc-acis.org>

National Weather Service: <http://www.weather.gov>

National Climatic Data Center: <http://ncdc.noaa.gov>

University of Nebraska - Lincoln: <http://www.unl.edu>

National Drought Mitigation Center: <http://drought.unl.edu>

Climate Prediction Center: <http://www.cpc.noaa.gov>

NOAA Storm Prediction Center: <http://www.spc.noaa.gov>



Photo of the Nebraska Sandhills by Bill Sorensen - Senior Programmer - HPRCC

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