



727 Hardin Hall
3310 Holdrege Street
Lincoln, NE 68583-0997
402 472-6706
Fax 402 472-8763
<http://hprcc.unl.edu>



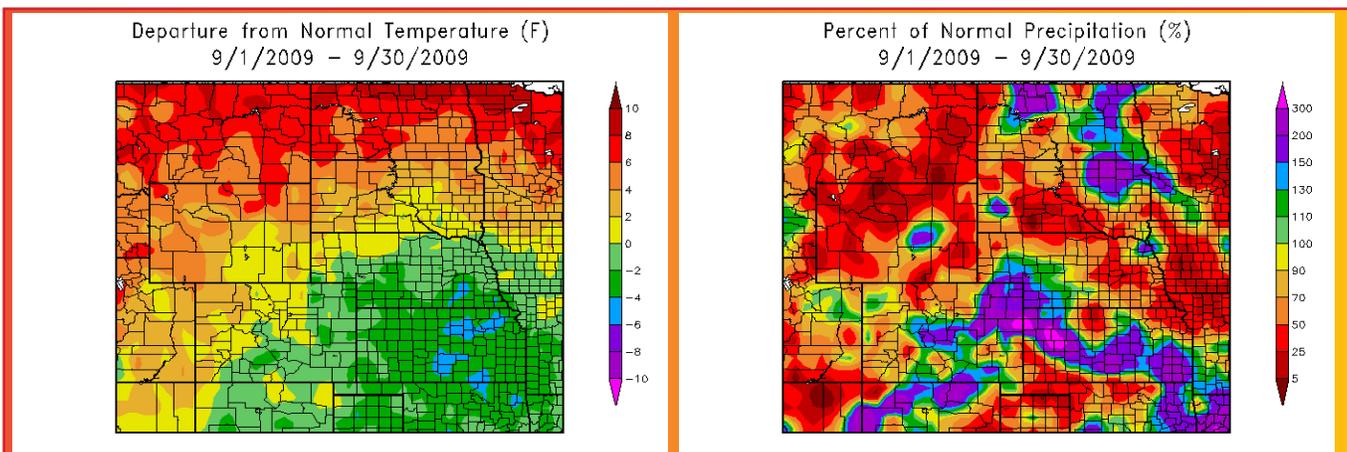
Rocky Mountain National Park - Photo by Bill Sorensen
<http://www.hprcc.unl.edu>

September 2009 Climate Summary

Region Breakdown

Temperature departures varied widely this September as average temperatures generally ranged from 8°F (4.4°C) below normal in the southern portions of the Region to 10°F (5.5°C) above normal in the northern portions of the Region. The warm temperatures in the north helped farmers in their harvesting efforts. According to the USDA, the warm temperatures in the north aided small grain harvest and also helped the maturity of late season crops.

Many locations in North Dakota had average temperatures which ranked in the top 10 warmest Septembers on record. The warm temperatures broke two longstanding records, one of which had been in place in Grand Forks, ND since 1906. The average temperature this month for Grand Forks was 64.2°F (17.9°C) which broke the old record of 62.8°F (17.1°C). Williston, ND also had its warmest September on record. The old record of 64.0°F (17.8°C) was just barely edged out by the new record of 64.3°F (17.9°C). A more thorough list of records is located on page 2.

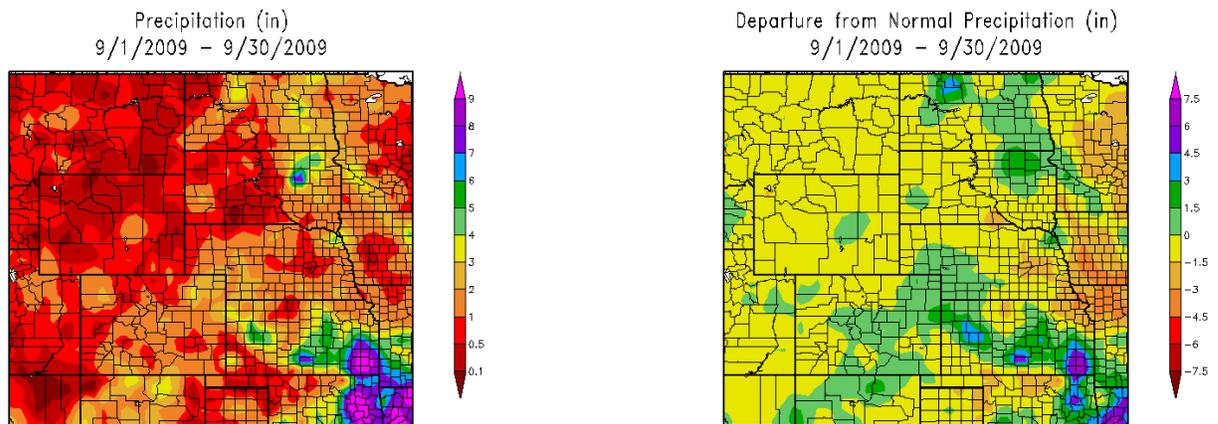


Departure from 1971-2000 Normal Average Temperature (left) and Percent of Normal Precipitation (right) for September 2009 in the High Plains Region. Maps produced by High Plains Regional Climate Center. Available at: <http://hprcc.unl.edu/maps/current>

Precipitation Summary

September 2009 was drier than normal for most of the Region as precipitation departures of 1.50 inches (38.10 mm) below normal were common. Areas of the Region that received more than 200% of normal were isolated to a swath of Kansas and pockets of North Dakota, South Dakota, and Colorado. The rain that fell in North Dakota helped alleviate drought conditions in the east central portion of the state as moderate drought conditions have been downgraded to abnormally dry conditions.

This month's wet spot was Oakley 4 W, KS which received 7.81 inches (198.37 mm) of precipitation. This record breaking amount was 6.47 inches (164.34 mm) above normal, or 583% of normal. The old record of 6.20 inches (157.48 mm) was recorded in 1976. On September 8th, 4.81 inches (122.17 mm) fell breaking the previous record of 2.83 inches (71.88 mm), which occurred in 1935. This rainfall was part of a heavy rain event that occurred in western Kansas and eastern Colorado on the 7th and 8th of September. The heavy rains in the area resulted in rises on creeks and streams and, according to the NWS in Goodland, KS several homes were inundated along the south fork of the Saline River, just north of Oakley.



Above: Total precipitation (in inches) (left) and Departure from Normal Precipitation (in inches) (right) for September 2009 in the High Plains Region. These maps are produced by HPRCC and can be found on the Current Climate Summary Map page at: <http://hprcc.unl.edu/maps/current>.

September 2009 Records - Highlights

Monthly Records			
Temperature in degrees F, Precipitation in inches			
Warmest	New Record	Old Record/Year	Period of Record
Spearfish, SD	66.5	66.0/1990	1962-2009
Grand Forks, ND	64.2	62.8/1906	1893-2009
Langdon Exp Farm, ND	63.0	62.5/1948	1897-2009
Minot, ND	64.8	63.4/1948	1948-2009
Pembina, ND	63.2	62.0/1948	1898-2009
Williston, ND	64.3	64.0/1897	1894-2009
Driest	New Record	Old Record/Year	Period of Record
Boulder Rearing Station, WY	0.08	0.21/1993	1989-2009
Powell Field Station, WY	0.02	tied/1993	1981-2009
Wettest	New Record	Old Record/Year	Period of Record
Oakley 4 W, KS	7.81	6.20/1976	1920-2009

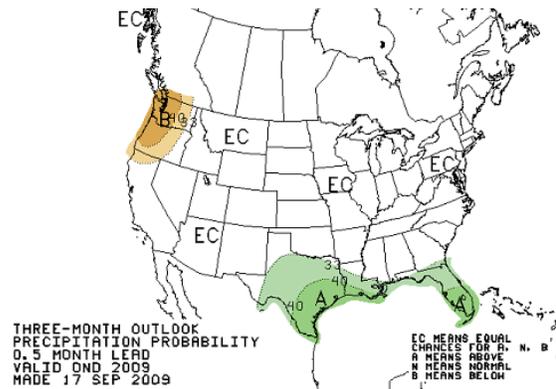
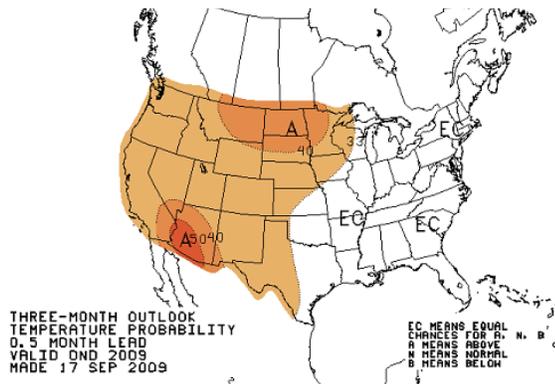
All Data are Preliminary and Subject to Change.
 Source: National Weather Service Cooperative Observation Network Data

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

El Niño conditions are present and will intensify and continue through winter 2009-10 based on current observations and forecasts. The temperature outlook indicates a higher probability of above normal temperatures for the whole region except for the eastern half of Kansas where equal chances of above, near, or below normal temperatures are predicted. The precipitation outlook indicates that there are equal chances of above, near, or below normal precipitation for the entire region. The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when applicable the El Niño Southern Oscillation (ENSO) cycle. 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

Despite lower than normal precipitation in many locations, much of the Region remained drought free this September. Moderate rains in the middle of the month allowed for the elimination of moderate drought conditions (D1) in east central North Dakota. Abnormally dry conditions (D0) are present in a small portion of south central Nebraska, eastern South Dakota, and east central and western North Dakota. However, in southwest Colorado, the Animas and Los Pinos Rivers are flowing below normal and the Lemon Reservoir is 25% full, which places that area into D1. According to the U.S. Seasonal Drought Outlook released September 17, the drought conditions in east central North Dakota are expected to improve through December 2009.

U.S. Drought Monitor September 29, 2009
Valid 7 a.m. EST

High Plains

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	87.9	12.1	0.7	0.0	0.0	0.0
Last Week (09/22/2009 map)	88.6	11.4	0.4	0.0	0.0	0.0
3 Months Ago (07/07/2009 map)	90.0	10.0	0.3	0.0	0.0	0.0
Start of Calendar Year (01/01/2009 map)	65.1	34.9	7.0	0.0	0.0	0.0
Start of Water Year (10/01/2008 map)	60.8	39.2	11.6	3.5	1.6	0.0
One Year Ago (09/30/2008 map)	60.8	39.2	12.6	3.5	1.6	0.0

Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

<http://drought.unl.edu/dm>

Released Thursday, October 1, 2009
Author: D. Miskus, JAWF/CPC/NOAA

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid September 17, 2009 - December 2009
Released September 17, 2009

KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely
- Some improvement
- No Drought Posted/Predicted

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance. Use caution for applications – such as crops – that can be affected by such events. “Ongoing” drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

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	72.7	36.5	54.6	0.1	80	9/27+	24	9/22	1.04	0.15	117
Akron Washington County Airport	75.4	48.5	61.9	-1.2	90	9/01	36	9/28	2.10	1.18	228
Colorado Springs Municipal Airport	72.7	46.7	59.7	-0.1	88	9/01	35	9/22	1.20	-0.03	98
Grand Junction Walker Field Airport	82.5	52.9	67.7	2.3	93	9/03	34	9/22	0.43	-0.48	47
Pueblo Memorial Airport	80.1	47.7	63.9	-0.9	97	9/01	35	9/26	0.95	0.11	113

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	77.0	54.5	65.8	-2.2	87	9/27	38	9/28	3.81	1.31	152
Dodge City Regional Airport	78.0	53.8	65.9	-3.4	93	9/07	42	9/29+	2.52	0.82	148
Goodland Renner Field	75.0	49.6	62.3	-1.7	92	9/07	36	9/28	3.55	2.43	317
Topeka Municipal Airport	76.9	54.6	65.8	-2.3	87	9/27	39	9/29	1.68	-2.03	45
Wichita Mid-Continent Airport	78.1	58.8	68.5	-2.3	91	9/27	42	9/29	5.16	2.20	174

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	80.2	48.7	64.5	2.8	93	9/07+	30	9/28	0.80	-0.64	56
Grand Island Airport	75.0	51.9	63.5	-1.0	84	9/08+	32	9/29	0.96	-1.47	40
Lincoln Municipal Airport	76.8	52.0	64.4	-1.6	85	9/08	34	9/29	1.25	-1.67	43
Omaha Eppley Airfield	76.5	54.5	65.5	0.1	83	9/16+	38	9/29	1.72	-1.45	54
Norfolk Karl Stefan Airport	74.9	51.2	63.0	-0.4	82	9/18+	33	9/29	2.33	0.08	104
North Platte Regional Airport	74.7	46.6	60.6	-1.8	90	9/07	31	9/28	1.17	-0.15	89
Valentine Miller Field	75.8	50.1	63.0	1.5	88	9/08	30	9/29	0.57	-1.04	35

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismark Municipal Airport	78.9	51.0	65.0	7.2	89	9/18+	33	9/29	1.24	-0.37	77
Fargo International Airport	76.3	53.9	65.1	7.1	86	9/19+	33	9/29	2.06	-0.12	94
Grand Forks International Airport	76.7	51.7	64.2	7.2	86	9/19	29	9/29	0.78	-1.18	40
Theodore Roosevelt Airport	77.9	48.4	63.1	5.9	92	9/05	34	9/28	1.51	-0.11	93
Williston International Airport	80.4	48.2	64.3	8.2	94	9/06	31	9/22	0.37	-0.98	27

All Data are Preliminary and Subject to Change.

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>.

September 2009 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	74.3	51.0	62.7	2.9	83	9/18	33	9/29	4.41	2.60	244
Huron Regional Airport	75.0	53.0	64.0	3.0	83	9/18+	31	9/29	2.71	0.91	151
Pierre Regional Airport	77.4	52.3	64.8	1.6	87	9/20+	29	9/29	0.71	-0.84	46
Rapid City Regional Airport	77.6	47.5	62.6	2.0	91	9/05	32	9/28	1.90	0.80	173
Sioux Falls Joe Foss Field Airport	74.6	52.3	63.4	2.5	84	9/18	35	9/29	1.21	-1.37	47

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	78.3	40.3	59.3	1.7	91	9/04	26	9/28	1.62	0.64	165
Cheyenne Municipal Airport	72.8	44.5	58.6	2.0	88	9/01	30	9/28	1.14	-0.29	80
Lander Hunt Field Airport	78.4	46.7	62.6	3.9	87	9/26+	32	9/30	0.71	-0.43	62
Laramie Regional Airport	70.7	37.4	54.1	1.2	81	9/10+	29	9/25	0.90	-0.09	91
Rawlins Municipal Airport	74.7	40.5	57.6	0.7	85	9/04+	28	9/22	0.58	-0.24	71
Sheridan County Airport	81.1	43.4	62.2	5.1	94	9/05	27	9/28	0.58	-0.80	42

All Data are Preliminary and Subject to Change.

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>.

State Spotlight - Nebraska



Al Dutcher - State Climatologist
Nebraska State Climate Office, University of Nebraska - Lincoln

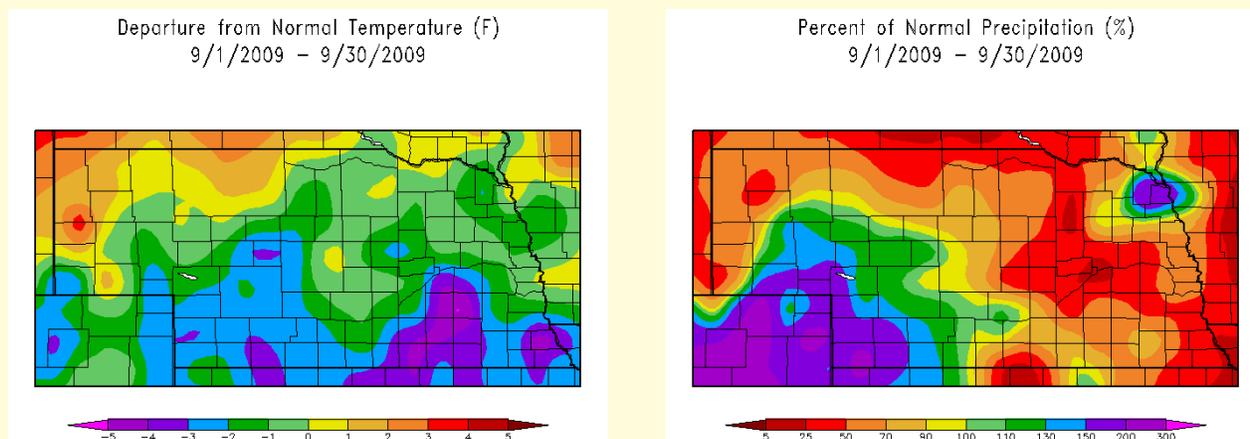
Several upper air low pressure systems impacted Nebraska during the month of September as they crossed the Dakotas or slipped southward into Kansas. Portions of the southwest, southern Panhandle, south central, and northeast Nebraska received above normal moisture. The remainder of the state failed to receive significant moisture and below normal moisture was common across the remainder of the state.

The greatest monthly precipitation recorded was 6.21 inches at Wakefield, with almost half of the total (2.68 inches) received September 10-11 as an upper air low moved southeastward across the Dakotas. Another widespread moisture event hit the southern Panhandle and southwest climate districts during the September 22-23 period, with most locations receiving 1-2 inches of moisture, or between 50 to 75% of their normal monthly precipitation.

Although the rainfall was disappointing with these slow moving upper air systems within such close proximity to the state, they did provide extended periods (3-5 days) of cloud cover. The cloud cover limited maximum temperatures and only 37 locations reached 90 F or higher, with 35 of the locations located in the Panhandle or southwest climate district. The high temperature for the state was 93 F reported at Bridgeport 18 WSW, Chadron, and Scottsbluff on either the 1st or 7th. The state low temperature was 23 F, recorded the morning of the 28th at Agate 3 E.

Below normal temperatures were common across much of the state during the month of September. The northern half of the Panhandle and northwestern Sandhills region experienced temperatures averaging up to 2 F above normal. Areas south of I-80 and south central sections of the north central climate district experienced temperatures ranging from 2 to 4 F below normal. All remaining areas of the state averaged normal to 2 F below normal.

It appears that September 28th and 29th were the statistically coldest days of the month as hard freeze conditions were reported across portions of the central and northern Panhandle, as well as isolated spots in north central Nebraska. Some crop damage was likely, but estimated losses haven't been made available. Scattered light frosts (30-32 F) were observed from the southwest through northeast climate districts, particularly in lower lying areas.



Above: Departure from 1971-2000 Normal Average Temperature (left) and Percent of Normal Precipitation (right) for September 2009 for Nebraska (HPRCC).

State Spotlight - North Dakota

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



Precipitation:

The majority of the September daily rainfall fell on the 8th through the 11th and on the 21st. The North Dakota Agricultural Weather Network (NDAWN) total September rainfall ranged from 5.68 inches at Britton SD to 0.07 inches at Crosby. Areas with above normal precipitation included the central northwest and the eastern part of the State. Most of the above normal values were between 150% and 300% of normal precipitation (Figure 1. High Plains Regional Climate Center). The majority of the below normal precipitation areas had less than 50% with the driest areas falling in the northwest corner.

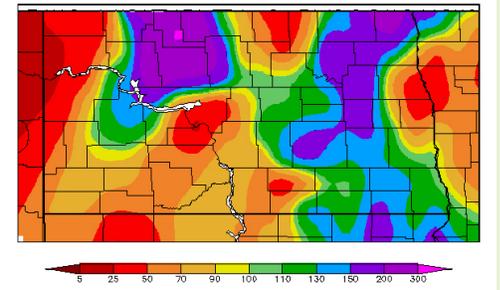


Figure 1. Precipitation Percent of Normal in September 2009 for North Dakota (High Plains Regional Climate Center)

Temperature:

The monthly departure from normal air temperatures were above normal across the State with a range of 2 to 10°F (Figure 2. High Plains Regional Climate Center). The daily average temperatures were above normal for the majority of the month and primarily ranged from approximately 60 to 80°F. Daily temperatures did drop to below normal during the last three days of September. Other than January 2009, when the southwest corner had above normal monthly average air temperatures, the last time there was State wide above normal air temperatures was November 2008. September's monthly average temperatures were some of the warmest or near warmest on record at several locations across the State. Williston with 64.3°F and Minot with 64.8°F ranked 1st of the past 62 years. Bismarck with 65.0°F ranked 2nd in the past 136 years. Fargo with 65.1°F also ranked 2nd in the past 129 years.

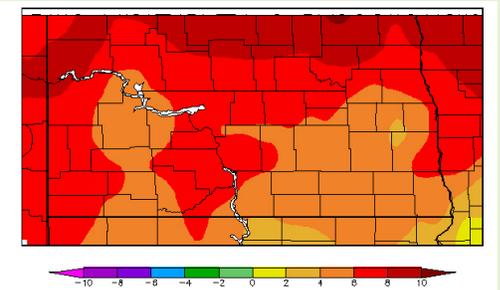


Figure 2. Temperature Departure from Normal in September 2009 for North Dakota (High Plains Regional Climate Center)

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).

State Spotlight - South Dakota

Dennis Todey - State Climatologist
Chirag Shukla
 South Dakota State Climate Office, South Dakota State University

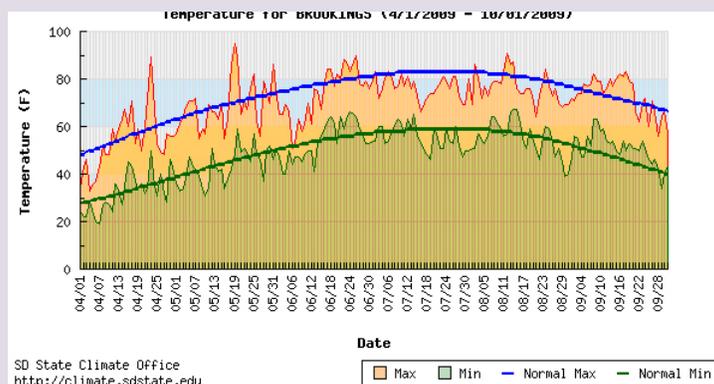


September shifted in contrast to the rest of the summer and became warmer than average over nearly the whole state. The warm temperatures particularly in the middle of the month were very welcome to row crop producers who needed additional warm air and a lack of freeze for crops to reach maturity. Most of the state received these conditions and escaped freeze for the most part. Only a few locations went below freezing during the month. Most of these were outside the main row crop area. Precipitation was lacking over most of the state. Only the northeast corner and a small area around Rapid City had above average precipitation. Much of the southern part of the state was quite dry during the month.

Temperatures

September averaged warmer than average for nearly the whole state. Only a few stations along the Nebraska border fell below average for the month. Average temperatures were in the low to mid 60s F except for the Black Hills which averaged around 60 F. The departures from average were most impressive across the northern third of the state where temperatures were 4 – 8 F above average.

What these temperatures meant are illustrated in the figure below. While temperatures were cooler throughout the summer, the warmer temperatures in September extended the growing season as temperatures maintained a fairly steady level until later in the month. See the following example from Brookings.



Agricultural Impacts

Corn and many crops entered the month well behind development, in many cases as much as three weeks behind. But the warmer temperatures for the month and the lack of freeze have pushed along development and allowed for some harvesting to begin by the end of the month according to the South Dakota Agricultural Statistics Service. Many crops still need more time to mature and dry down in the field. But the overall concern is much lower at this point. Corn as of the last NASS report was 34% mature across the state compared to the 5 year average of 59%. Soybeans were 26% mature compared to the 5 year average of 49%. Sorghum and sunflowers reported similar delays in development.

Because of the delayed development, even a near average freeze would have caused problems. Fortunately, freezing conditions have only reached the western and central parts of the state. And the hard freeze (sub-28 F) conditions have been confined generally outside row crop areas in Rapid Valley, the far northwest corner of the state and in the Black Hills. The lack of a frost puts most of the state later than the 30 year average for frost. The state is later than average for a hard freeze in many locations, also. A cold pool of air moved across the state on the 27th and 28th bringing the only sub-freezing temperatures of the month.

For more information about the South Dakota State Climate Office: <http://climate.sdstate.edu>

The SDSU's AWDN is a part of the High Plains Automated Weather Data Network (AWDN). Data are available through SDSU or the High Plains Regional Climate Center.

State Spotlight - South Dakota

Dennis Todey - State Climatologist
Chirag Shukla
 South Dakota State Climate Office, South Dakota State University



Precipitation and Drought

Most locations west of the Missouri reported less than an inch of precipitation for the month. Eastern locations were in the 1-3” range with areas around Aberdeen exceeded 4” for the month. Areas north of a Eureka-Huron-DeSmet-Milbank line were above average for the month. Stations around Rapid City were also well above average. The rest of the state was drier than average. Much of the southern half of the state was below 50% of average for the month.

Combined with the cool conditions, again there were fairly limited impacts of the dryness. The US Drought Monitor map included only small areas of east central and northwest South Dakota in D0 (Abnormally Dry) areas. Even the driest areas reported few if any impacts. Another reason for the lack of impacts was the dry areas occurred at locations that were wet in the last couple months.

The dry conditions in the south and west part of the state did allow for good progress on winter wheat planting. As of the last report, 66% had been planted compared to the 5 year average of 64%.

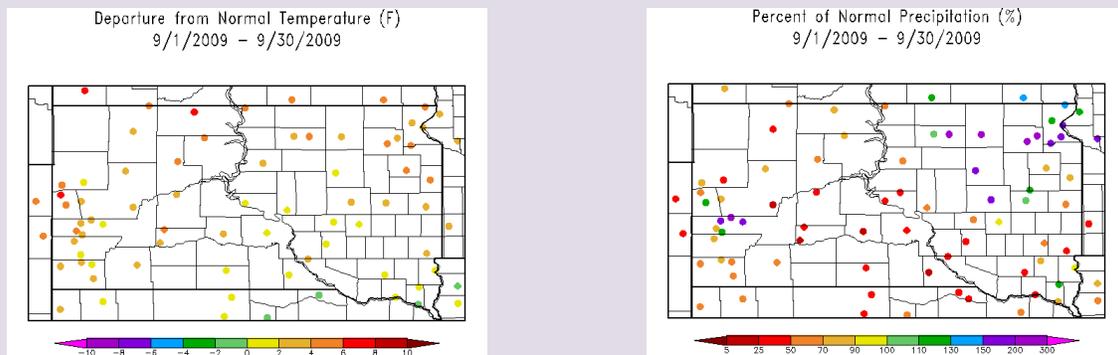
Severe Weather

Some severe weather did occur in a few locations during the first 10 days of the month. Large hail was the primary culprit with 19 scattered reports. A single tornado event was reported in Brule County on the 2nd, near Kimball. Heavy rains were reported in Kingsbury County on the 2nd and Edmunds and Faulk Counties on the 8th.

Records

Despite the very warm temperatures, only seven stations were in the top 15 warmest Septembers based on preliminary data (Bison, Webster, Roscoe, Timber Lake, Sisseton, Milesville, 5 NE). One other station, Spearfish, reported the warmest September on record based on a shorter period of record (50 years). For precipitation, five stations in the northeast were in the top 5 wettest, Aberdeen, Webster, Wilmot, Ipswich and Redfield. Aberdeen had the highest total at 4.41” coming in 6th all time. Two Rapid City stations and Pactola Dam were in the top 15 wettest based on less than 60 years of data for them.

Murdo had its 15th driest September at 0.25”.



Above: Departure from 1971-2000 Normal Temperature (left) and Percent of 1971-2000 Normal Precipitation (right) for September 2009 for South Dakota (HPRCC).

For more information about the South Dakota State Climate Office: <http://climate.sdstate.edu>

The SDSU's AWDN is a part of the High Plains Automated Weather Data Network (AWDN). Data are available through SDSU or the High Plains Regional Climate Center.

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

Author Information

For questions, comments, or suggestions, please contact:

Natalie Umphlett - Regional Climatologist - High Plains Regional Climate Center

(402) 472-6764 - numphlett2@unl.edu

714 Hardin Hall

3310 Holdrege Street

Lincoln, NE 68583-0997

