



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



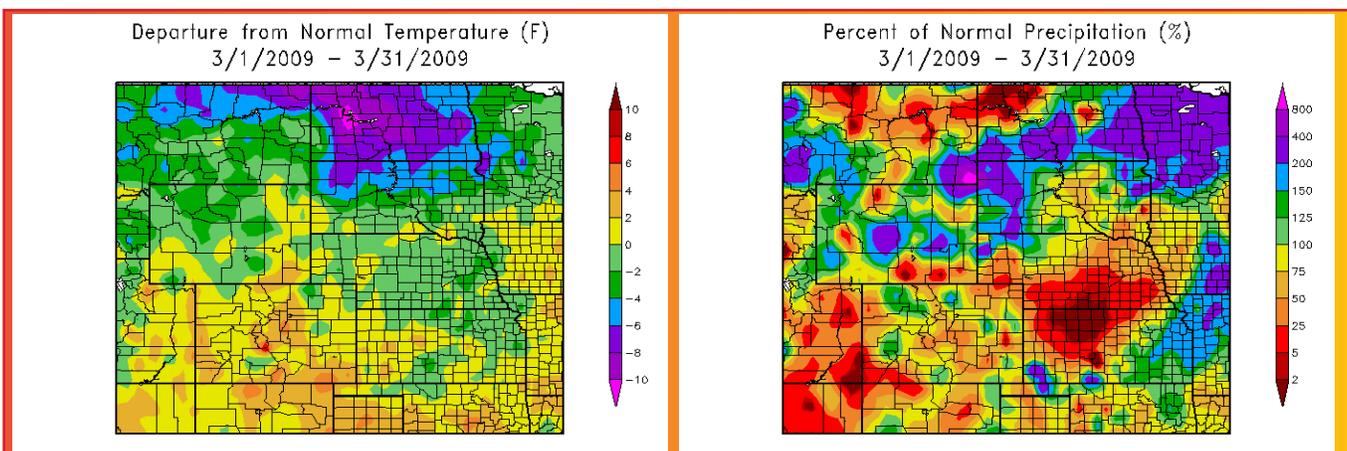
Rural Eastern Nebraska - Photo by Ken Dewey  
<http://www.nebraskaweatherphotos.org>

# March 2009 Climate Summary

## Region Breakdown

In March the majority of the High Plains region was near normal with the monthly average temperature departures ranging from 2°F (1.1°C) below normal to 2°F (1.1°C) above normal. Warmer pockets of the region were in western, central, and southern Colorado, southern Wyoming, and western Kansas where monthly temperature departures ranged from 2°F to 6°F (1.1°C to 3.3°C) above normal. North Dakota and northern South Dakota were the cold areas in the region with average temperatures that were well below normal. Most of North Dakota recorded average temperatures that ranged from 4°F to 10°F (2.2°C to 5.5°C) below normal, however this cold weather was not record breaking.

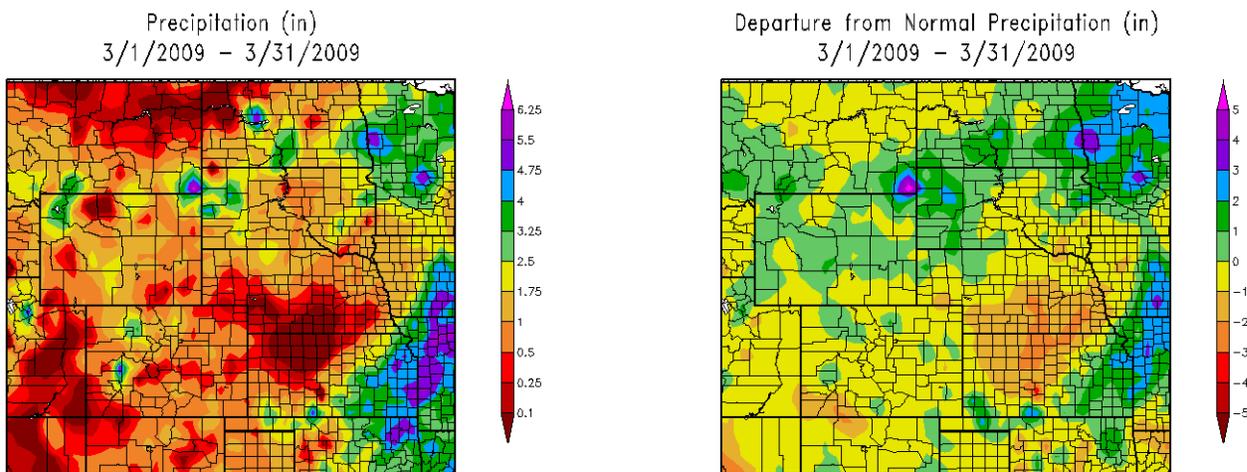
March 2009 was an active month with several intense low pressure systems crossing the region. Interesting events include record flooding on the Red River in North Dakota, tornadoes in eastern Nebraska, and numerous blizzards which affected each state in the region.



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

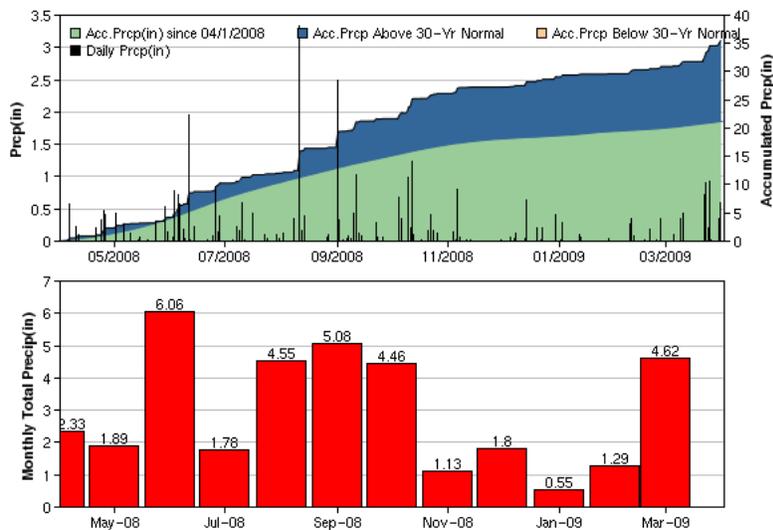
# Precipitation Summary

The big story this month was in eastern North Dakota, where record precipitation coupled with warm temperatures led to record breaking flooding along the Red River. On March 28, the Red River at Fargo crested at 40.82 feet. This breaks the old record of 40.1 feet recorded April 7, 1897. Contributing to the flooding is the record precipitation that occurred across eastern North Dakota. Fargo, ND is this month's "extreme" location which recorded both the wettest and snowiest March on record. The Hector International Airport in Fargo received 4.62 inches (117.35 mm) of liquid equivalent precipitation, or 395% of normal precipitation. This shattered the previous record of 2.83 inches (71.88 mm) recorded in 1882. A record snowfall of 28.1 inches (71.37 cm) fell at the Fargo Hector International Airport which broke the old record of 26.2 inches (66.55 cm) set in 1997. The graph below (bottom) shows just how wet Fargo has been over the past year with the accumulated precipitation above normal (in the blue shading) from April 1, 2008 to March 31, 2009. More information about the flood may be found in the State Spotlight for North Dakota on page 5.



Above: Total precipitation (in inches) (left) and Departure from Normal Precipitation (in inches) (right) for March 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>.

## FARGO HECTOR INTL AP, ND



Normals based up 1971-2000 Normals, if available  
 Grey Shading indicates where data are flagged as "Missing"  
 Accumulated Precip (where available) may not reflect actual deviations from normal if data are missing <http://hprcc.unl.edu>

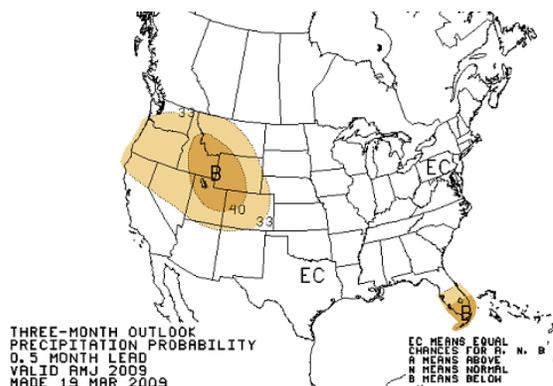
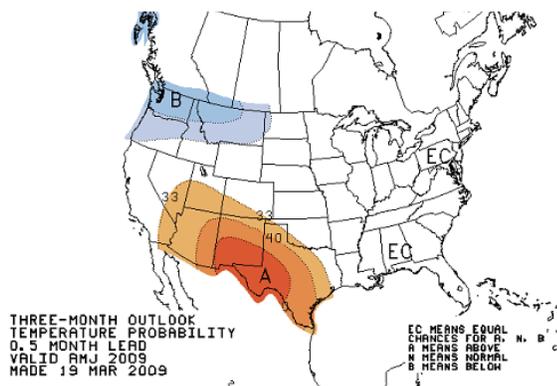
"Experimental" May Contain Preliminary Data  
 High Plains Regional Climate Center

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

This month La Niña conditions continued, but have recently weakened and are expected to continue to weaken through Spring 2009. NOAA forecasters at the Climate Prediction Center are predicting chances of above normal temperatures for south-western Colorado and below normal temperatures for the extreme western portion of North Dakota. Equal chances of above, near, or below normal temperatures are predicted for the remainder of the region. Below normal precipitation is predicted for Wyoming, most of Colorado, and the panhandle of Nebraska. Elsewhere in the region, equal chances of above, near, or below normal precipitation are predicted. 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 showing a higher probability of above normal temperatures for southwestern Colorado and below normal temperatures for extreme western North Dakota. Equal chances of above, near, or below normal precipitation are predicted for the remainder of the High Plains region.

(right) The Three-Month Precipitation Probability Outlook showing a higher probability of below normal precipitation for Wyoming, most of Colorado, and the panhandle of Nebraska. Equal chances of above, near, or below normal precipitation are predicted for the remainder of the High Plains region.

# Drought Watch

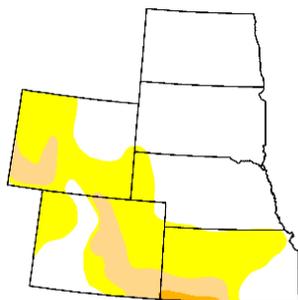
Drought conditions remain largely unchanged in South Dakota, Wyoming, and Nebraska, however drought conditions across Colorado and Kansas have worsened. Abnormally dry conditions (D0) now extend across the northern half of Kansas, moderate drought conditions (D1) extend through the central portion of Colorado and severe drought conditions (D2) have developed along the Kansas/Oklahoma border. Drought conditions are forecasted to persist with little or no improvement through June 2009, according to the U.S. Seasonal Drought Outlook released March 19.

## U.S. Drought Monitor High Plains

March 24, 2009  
Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	58.4	41.6	10.2	0.7	0.0	0.0
Last Week (03/17/2009 map)	59.0	41.0	9.5	0.1	0.0	0.0
3 Months Ago (12/30/2008 map)	64.3	35.7	7.0	0.0	0.0	0.0
Start of Calendar Year (01/06/2009 map)	65.1	34.9	7.0	0.0	0.0	0.0
Start of Water Year (10/07/2008 map)	60.8	39.2	11.6	3.5	1.6	0.0
One Year Ago (03/25/2008 map)	40.1	59.9	30.9	14.5	1.1	0.0

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

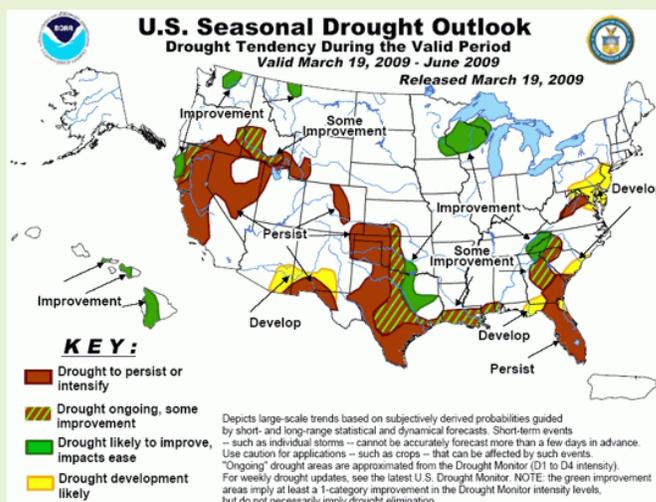


The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

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



Released Thursday, March 26, 2009  
Author: Brad Rippey, U.S. Department of Agriculture



**KEY:**  
 Drought to persist or intensify  
 Drought ongoing, some improvement  
 Drought likely to improve, impacts ease  
 Drought development likely

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	53.5	16.7	35.1	2.4	67	3/21+	3	3/28+	0.53	0.07	115
Akron Washington County Airport	54.6	24.5	39.5	0.5	77	3/22	5	3/11	0.33	-0.71	32
Colorado Springs Municipal Airport	56.5	25.5	41.0	3.2	73	3/22	10	3/11	0.33	-0.73	31
Grand Junction Walker Field Airport	58.5	30.6	44.6	1.2	75	3/21+	17	3/30	0.48	-0.52	48
Pueblo Memorial Airport	62.6	23.9	43.2	1.4	80	3/22+	8	3/28	0.72	-0.25	74

Kansas	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Concordia Municipal Airport	56.2	29.7	42.9	0.4	81	3/17+	6	3/01	0.43	-1.92	18
Dodge City Regional Airport	59.8	30.1	45.0	0.7	86	3/04	8	3/11+	0.68	-1.16	37
Goodland Renner Field	57.1	24.2	40.6	0.8	79	3/04	3	3/11	0.39	-0.81	33
Topeka Municipal Airport	57.6	34.2	45.9	1.7	86	3/05	9	3/02+	4.79	2.23	187
Wichita Mid-Continent Airport	60.0	35.5	47.8	1.9	85	3/05	14	3/01	2.04	-0.67	75

Nebraska	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Chadron Municipal Airport	53.7	20.7	37.2	1.0	79	3/22	-6	3/11	0.77	-0.14	85
Grand Island Airport	51.8	25.1	38.5	0.2	80	3/16	-1	3/01	0.14	-1.90	7
Lincoln Municipal Airport	53.3	26.7	40.0	0.6	79	3/16	-1	3/01	0.18	-2.03	8
Omaha Eppley International Airport	50.4	28.4	39.4	0.1	76	3/16	-1	3/01	1.05	-1.08	49
Norfolk Karl Stefan Airport	48.4	24.6	36.5	-0.5	78	3/16	-11	3/01	1.18	-0.79	60
North Platte Regional Airport	53.5	21.0	37.2	-0.8	77	3/04	4	3/11	0.32	-0.92	26
Valentine Miller Field	49.9	20.6	35.3	0.0	76	3/04	-14	3/01	0.91	-0.20	82

North Dakota	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	% Norm
Bismark Municipal Airport	30.9	12.2	21.5	-8.2	54	3/20	-18	3/12+	2.73	1.88	321
Dickinson Municipal Airport	31.8	12.8	22.3	-8.1	58	3/22+	-21	3/11	1.18	0.49	171
Fargo International Airport	31.5	16.6	24.0	-3.1	53	3/22	-17	3/12	4.62	3.45	395
Grand Forks International Airport	29.2	13.4	21.3	-4.5	51	3/22	-17	3/01	2.17	1.28	244
Williston International Airport	31.6	9.6	20.6	-8.1	49	3/22	-21	3/11	0.06	-0.68	8

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>.

## March 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	36.9	16.4	26.6	-4.1	63	3/21	-19	3/01	1.30	-0.04	97
Huron Regional Airport	42.1	19.9	31.0	-1.6	70	3/21	-20	3/01	1.68	0.01	101
Rapid City Regional Airport	46.3	19.0	32.6	-2.3	77	3/22	-12	3/11+	1.36	0.33	132
Sioux Falls Joe Foss Field Airport	44.0	22.9	33.5	0.8	70	3/16	-7	3/01	1.31	-0.50	72

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	47.7	18.6	33.2	-1.8	72	3/21	-9	3/10	1.00	0.10	111
Cheyenne Municipal Airport	50.1	23.2	36.7	2.5	69	3/22+	-1	3/10	0.72	-0.33	69
Lander Hunt Field Airport	45.7	20.8	33.2	-2.3	70	3/21	-8	3/10	2.03	0.79	164
Laramie Regional Airport	46.0	18.3	32.1	2.1	66	3/21	-3	3/27	0.06	-0.73	8
Rawlins Municipal Airport	44.6	19.8	32.2	-1.6	66	3/21	-10	3/27	0.09	-0.56	14
Sheridan County Airport	45.8	17.3	31.5	-3.7	76	3/21	-14	3/11	1.41	0.41	141

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).

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## State Spotlight - North Dakota



**F. Adnan Akyüz - State Climatologist**

**Barb Mullins**

**North Dakota State Climate Office, North Dakota State University**

### Flood:

Major flooding occurred in Fargo, Grand Forks, and Drayton along the Red River of the North; in Abercrombie on the Wild Rice River; in West Fargo, and Harwood on the Sheyenne River. The Federal Emergency Management Agency (FEMA) announced that federal disaster aid has been made available for 34 counties of North Dakota beginning on March 13, 2009 (<http://www.fema.gov/news/newsrelease.fema?id=47796>). Red River at the Fargo location reached a record high stage of 40.82 feet on Saturday, March 28 at around 00:15 AM. The previous record was 40.1' and set on April 7, 1897. The second highest crest occurred almost exactly 100 years after the 1897 flood on April 17, 1997 and was 39.57 feet. Any stage above 18 feet is considered as flood stage in Red River at Fargo location.

Among the several conditions that led to major flooding, 2.79" of rain fell in a 5-day period from March 22 through 26 with daily maximum temperatures as high as 53° is the most significant impact in this particular flood. Other factors were as significant and worth mentioning below:

- March 2009 was the wettest March in history since 1881 almost doubling the previous record that was set in March 1882.
- March 2009 was the snowiest March in history since 1881 topping March 1997 by 2" (The most memorable flood in Fargo and Grand Forks occurred in 1997).
- September through March period was the wettest September-March periods ever.

As of April 3, there is still a 7-inch snow depth on the ground in Fargo. Red River at Fargo is expected to have a secondary crest in April after the entire snow melts. The magnitude of the secondary crest will depend on the rate of melt and additional storm event.

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 - North Dakota, cont.



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

### Precipitation:

March precipitation ranged from 0.1 inches to 4.5 inches plus. Amounts of less than a quarter inch were recorded in the northwest corner. Precipitation totals of greater than 3 inches were measured in the central, south central, and eastern regions. Percent of normal precipitation ranged from less than 25% to 300% plus. The areas with less than normal precipitation were the west, northwest, and north central regions. The areas with primarily 200% plus percent of normal precipitation were the southwest, central, south central, and eastern regions (Figure 1, High Plains Regional Climate Center). There were three major precipitation events that occurred in March. The first was March 9-10 in which heavy snow fell mainly in the southeastern regions. The National Weather Service (NWS) recorded a two day total snowfall (9th – 10th) at Jamestown of 14.0 inches, Fargo of 10.1 inches, Fort Yates of 10.0 inches, and Linton of 10.0 inches. The second major precipitation event was March 22-26 in which heavy snow fell in the southwest, central, and eastern regions. During the second precipitation event, some of the higher amounts recorded by the NWS were 22.5 inches of snow at Marmarth, 18.0 inches at Dickinson, and 15.3 inches at Beulah. The third major precipitation event was March 29-31 in which heavy snow fell in the south central and eastern areas. The NWS recorded record breaking amounts of snowfall on the 30th at Bismarck of 11.8 inches and Fargo of 5.8 inches. Fargo also had record breaking snowfall on the 31st of 4.6 inches. NWS recorded Fargo as having a record breaking total March snowfall of 28.1 inches.

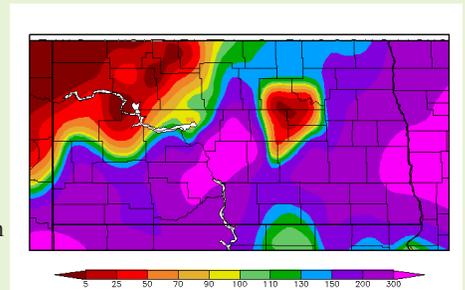


Figure 1. Precipitation Percent of Normal in March 2009 for North Dakota (HPRCC)

### Temperature:

The March average air temperatures ranged from 16°F primarily in the north to 27°F along the western central edge. The central regions had air temperatures of 18 to 20°F. The southwest, southeast, and eastern central regions had average air temperatures of 21 to 25°F. March had below normal temperatures across the State and ranged from -2 to -10 degrees. (Figure 2, North Dakota State Climate Office). The daily temperatures for the first half of March were far below normal with extreme low temperatures from 9th through the 12th of March. The daily temperatures for the second half of March were primarily below normal with a few days of above normal temperatures. The National Weather Service (NWS) recorded record low maximum temperatures at Bismarck and Williston on March 10th. NWS also recorded a record low maximum temperature at Bismarck on the 11th. A record low minimum temperature was recorded at Jamestown on the 12th.

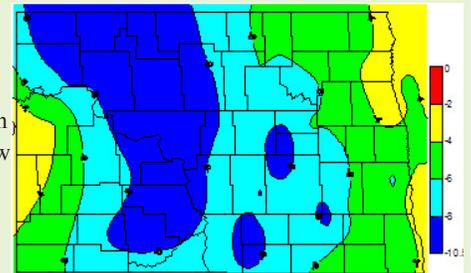


Figure 2. Temperature Departure from Normal in March 2009 for North Dakota (NDSCO)

## State Spotlight - Nebraska

**Al Dutcher - State Climatologist**

**Nebraska State Climate Office, University of Nebraska - Lincoln**

### Overview

A large percentage of Nebraska experienced drier than normal conditions coupled with below normal temperatures. Several intense low pressure systems crossing the central United States brought blizzard conditions to northwest and north central sections of the state. Although snowfall was virtually non-existent across the southern half of Nebraska, the first severe weather outbreak of the season on March 23 resulted in 6 confirmed tornado touchdowns.

The trend of below normal moisture this March did not come as a surprise. For the second consecutive winter, La Nina conditions developed across the equatorial Pacific. Of the ten La Nina episodes since the 1950's, seven were multi-year events. Statistical analysis of past second year events indicate a strong tendency for Nebraska to experience below normal moisture during the month of March. There is also a weak tendency for eastern Nebraska to experience below normal temperatures, while western sections of the state trend toward above normal temperatures.

### Precipitation

Six precipitation events were observed during the month of March, with the strongest event occurring during the March 22-24 time frame. An intense area of low pressure moved through the region resulting in blizzard conditions and snowfall accumulations approaching eight inches across the northern half of the Panhandle and the Sandhills region of north central Nebraska.

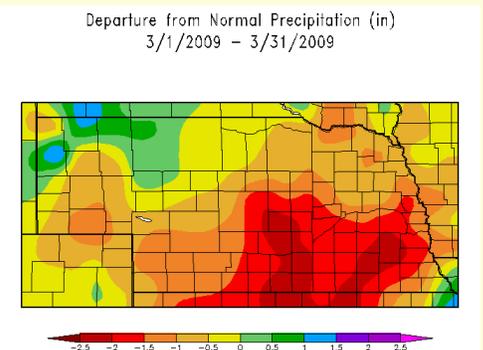
In the warm sector of the storm, six tornado touchdowns were confirmed by the National Weather Service. An F2 tornado was reported in Holt county causing light damage to one farmstead and the complete destruction of an abandoned school. Two F1 tornadoes and one F2 tornado were confirmed in Lancaster county, resulting in minor injuries from flying debris to five people. Two additional F1 tornadoes were confirmed in Cass county. Preliminary damage estimates for the six tornadoes stands at less than \$100,000.

Two additional snow events occurred during March. The first occurred during the March 7-8 time frame with unofficial reports of 2-12 inches of snow from the southeastern corner of the Panhandle northeastward to the eastern Sandhills region. The second storm system during the March 29-31 time frame resulted in 2-8 inches of snow from the northern Panhandle eastward through northeastern Nebraska.

Three light precipitation events occurred on March 10th, 19th, and 26th. On March 10, less than 0.25 inches of moisture fell across Richardson county in extreme southeastern Nebraska. On March 19, 0.10 to 0.25 inches of moisture was reported in north central sections of the Panhandle. On March 26, 0.10 to 0.25 inches of moisture fell from Holdrege northward into the southern Sandhill region.

Very few geographical areas of the state experienced above normal moisture during the month of March. Much of the northern 1/3 of the Panhandle and western 1/3 of the Sandhills region experienced above normal moisture. Much of this moisture fell in the form of snow and the moisture should promote good early season forage for cattle producers. Unfortunately the storms came during the heart of calving season and some light losses have been reported.

Of the 102 observation sites in Nebraska having at least 80% of their March data available for analysis, only 10 sites reported above normal moisture. Seven locations were in the northern Panhandle, with the remaining locations scattered across eastern Nebraska. These eastern stations recorded most of their moisture during the March 23 severe weather outbreak.



Above: Departure from Normal Precipitation (using 1971-2000 Normals) for March 2009 for Nebraska. These maps are produced by HPRCC and can be found on the Current Climate Summary Map page at: <http://hprcc.unl.edu/maps/current>.

## State Spotlight - Nebraska, cont.

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

Salem 5 SW recorded the greatest March monthly precipitation total of 3.13 inches and the largest 24-hour total of 1.57 inches. The largest monthly snowfall from stations having at least 50% of their data available for analysis was 13.5 inches recorded at Chadron 3 SW. The largest 24-hour total was 10.0 inches at Arthur. Of special note was the complete lack of measurable snowfall for most locations south and east of a line from McCook to Omaha.

### Temperatures

When strong low pressure systems impact the central United States on a frequent basis during the spring months, large temperature swings should be expected. This March was no exception. It was not uncommon to see average temperatures swing from 10-25 F above normal to 10-20 F below normal after the passage of a low pressure system.

Cold temperatures were observed during the first three days of March with average temperature departures running 5-30 F below normal. During the March 4-9 time frame, above normal average temperature departures approaching 20 F were observed. Another cool down occurred during the March 10-12 period, with average temperature departures running 15-25 F below normal. An extended warm period during the March 13-23 time frame saw average temperatures range from normal to 20 F above normal. The remainder of the month saw average temperature departures range from 5-15 F below normal.

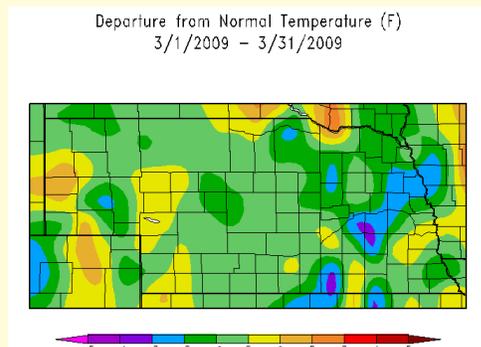
Of the 141 temperature sites having at least 90% of their data available for analysis, only 40 locations saw above normal average temperatures. Average temperature approached 3 F below normal across sections of east central and south central Nebraska. Small pockets of above normal temperatures running 0.50-2.0 F above normal were isolated to the west central and south central Panhandle, as well as, southwestern, north central, and southeast Nebraska.

The highest temperature reported during March was 83 F at Rulo 2 W on the 18th, while the coldest temperature reported was -18 F on the 1st at Higgins Ranch and Newport. The difference between the highest and lowest recorded temperature was 101 F. At least 76 locations recorded at least one sub-zero reading during the month, while 23 sites reached or exceeded 80 F. Only one location out of the 142 reporting sites failed to reach 70 F.

### A Windy Month

March in the central Plains is notorious for high wind events and this March was no exception to the rule. Of the 23 Automated Surface Observation sites across the state, 22 reported a peak gust in excess of 50 mph. The strongest gust of 68 mph was reported at Omaha on the 23rd, while the weakest peak gust was 48 mph at North Platte on the 31st. Seventeen of the 23 locations reported their peak gust on the 23rd. There was an average of four days with gusts over 40 mph across the eastern 1/3 of the state, six across central Nebraska, and eight across the Panhandle and western Sandhills.

Monthly average wind speeds ranged from 10.7 mph at Chadron, North Platte, and Scottsbluff to 13.5 mph at Sidney. In general, much of eastern Nebraska experienced average wind speeds 0.5 to 1.5 mph greater than the historical mean, while western Nebraska was 0.5 to -0.5 mph below normal. Blowing dust reduced visibilities to less than two miles across areas of central and eastern Nebraska on March 23rd prior to the onset of the severe weather event.



Above: Departure from Normal Temperature (using 1971-2000 Normals) for March 2009 for Nebraska. These maps are produced by HPRCC and can be found on the Current Climate Summary Map page at: <http://hprcc.unl.edu/maps/current>.

## State Spotlight - South Dakota

**Dennis Todey - State Climatologist**  
**Joanne Puetz Anderson and Chirag Shukla**  
**South Dakota State Climate Office, South Dakota State University**



Three major storms hammered South Dakota in the month of March. All produced blizzard conditions during the track across the state. Two of the storms also brought severe weather in the warm sector ahead of the storm. All three storms also dropped double digit snowfall totals in the state somewhere.

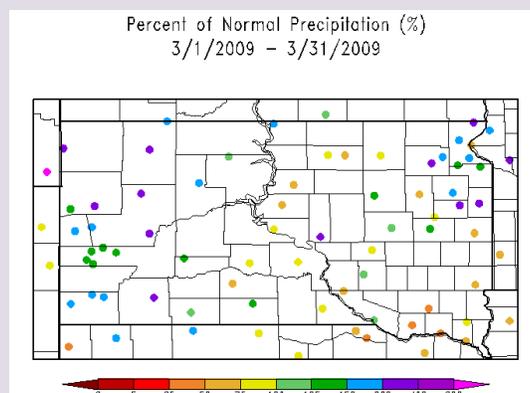
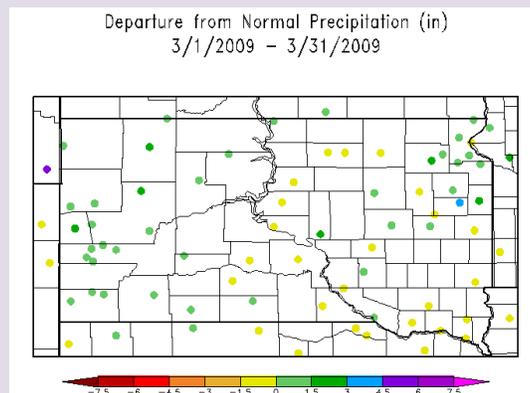
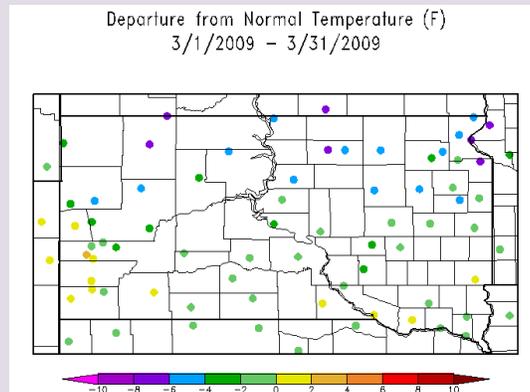
The March 8 – 12 storm left 30.7” in Deadwood while Corsica reported 16”. Pollock received hail on March 8th. The next storm on March 23-24 dropped snow in the northern portions of the state and produced thunderstorms over the southern half of the state. Woonsocket and Vermillion reported hail. Several locations also reported damaging winds. A Bison storm report listed 90 mph winds while downtown Rapid City reported 80 mph winds on the 24th. Both Freeman and Tea reported 70 mph winds on the 23rd from thunderstorm gusts. The Black Hills reported double digit snowfall amounts while only a few inches fell in the southeast portion of the state. Downtown Spearfish reported 25” of snow. Lead reported 43.7” of snow for that storm. Northeast parts of the state received an isolated heavy rainfall event on the 22nd, which dropped over 4” of rain from Kingsbury to Codington and Deuel Counties. Rapid City also saw record warm temperatures of 73°F and 77°F on the 22nd and 23rd ahead of the storm.

March ended with the third winter storm. Hail was reported at Fairfax on the 30th and at Avon, Clayton and Letcher on the 31st. Heavy rain was reported at Castlewood, Hayti and Hazel. Hazel received 2.76” of rain. On the cold side of the storm, Lead reported 36” and Deadwood reported 30” of snow. In the center of the state Chamberlain reported 13”, Mitchell 12.5”, and Aberdeen 10.8” of snow.

### Precipitation

For the month, the northeastern and western portions of the state were the wettest with some locations being 150 to 200 percent of average. The rest of the state was dryer with some location in the center of the state and southeast at 50 percent of average precipitation. At least nine stations reported top 5 wettest March precipitation totals. Most of these were stations in the northwest or northeast parts of the state. Deadwood 2 NE reported the largest total precipitation at 6.26”. This included 70.5” of snow. Winner reported the lowest total at 0.27”.

March has continued a trend since last fall of wetness since last fall. Several stations in the western part of the state have had their wettest water year on record. (Water year starts October 1). At least nine stations across the state are the wettest over this time on record. At least another 15 stations are in the top 5 wettest over the last 6 months.



Above: Departure from 1971-2000 Normal Mean Average Temperature (top), Departure from Normal Precipitation (inches) (middle), and Percent of 1971-2000 Normal Total Precipitation (bottom) for March 2009 for South Dakota. These maps are produced by HPRCC and can be found on the Current Climate Summary Map page at: <http://hprcc.unl.edu/maps/current>.



## State Spotlight - South Dakota, cont.



### Temperatures

Although temperatures across the state were generally below average, temperatures did warm enough to melt off most of the old snow pack. More recent snows still covered the northwest and northeast parts of the state. Average temperatures ranged from near average to 8°F below average. One more major cold spell from the 10th to the 12th helped keep monthly temperatures down. Britton recorded the coldest temperature of the month at -30°F on March 1. Porcupine had the warmest temperature of the month at 81°F. The cold spell from March 10-12 set several low temperature records and several low maximum daily temperature records. The overall warm-up did lead to flooding along the main rivers across the state and some overland flooding in the northern and northeast parts of the state where snow pack and rains were heavier.

Soil temperatures at 4" for the month averaged below freezing at several locations. But as of the end of the month all stations were above freezing across the state, but still generally below 40°F.

The US Drought Monitor continues a small area of D0 in the far southwest corner due to longer term dryness.

### Flooding Concerns

The National Weather Service has raised the potential for spring flooding across western and south central South Dakota. Minor to moderate flooding from melting snow in the northern Black Hills, northern foothills, and northwestern South Dakota is possible according to the revised Hydrologic Outlook. The James River will likely continue to see flooding. The rest of western South Dakota has little potential for snowmelt flooding.

Across northern South Dakota, according to the Advanced Hydrologic Prediction Services areal flooding and major river flooding continues. The combination of significant melting of a heavy winter snow pack and precipitation from the most recent storm system has set the stage for this flooding. Record flooding is occurred on the Elm River near Westport and the James River at Columbia. Major flooding is currently occurring on the James River at Ashton. Minor flooding is currently occurring on the James River at Stratford, Big Sioux River near Watertown, Little Minnesota River at Peeve, and the Grand River at Little Eagle. For the most recent and updated river levels and forecasts click on the link below to view the Advanced Hydrologic Prediction Services webpage.

Daily River Stage Records		
Station	New Record	Old Record
Westport	22.68'/25th	22.11'/1969
Westport	22.69'/26th	22.11'/1969
Columbia	18.92'/26th	18.63'/1997
Westport	22.69'/30th	22.11'/1969
Columbia	19.56'/30th	18.63'/1997
Little Eagle	23.86'/30th	22.75'/1950

### Impacts

The occurrence of the winter storms has been a difficult setting for many ranchers currently in calving. Not hard reports have been available on livestock loss, yet. Reports from county extension officials indicate some significant losses to individual ranchers. But the total losses are not know.

No major losses to flooding were reported other than washed out roads and gravel washed off roads due to heavy rainfall and combined snow melt. This snow melt led to some inundated soils, erosion and road damage in some northern areas.

All western reservoirs except for Angostura are near full. In some cases they are overflowing for the first time in many years.

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 is available through SDSU or the High Plains Regional Climate Center.

## State Spotlight - South Dakota, cont.



### Daily Records

Precipitation in inches/Temperature in degrees F

<b>Rainfall</b>	<b>Old Record</b>	<b>New Record</b>
Watertown	0.93/23rd	0.40/1946
Sisseton	0.84/23rd	0.52/1979
Watertown	0.97/24th	0.96/1975
Rapid City airport	0.78/24th	0.71/1975
Rapid City airport	0.31/30th	0.29/1977
Rapid City airport	0.39/31st	0.29/1977
East Rapid City	0.77/31st	0.73/1895
<b>Snowfall</b>		
East Rapid City	6.5/24th	2.4/1964
Rapid City airport	3.5/24th	3.0/2005
Rapid City airport	9.5/30th	3.4/1977
East Rapid City	6.5/30th	5.5/1890
Aberdeen	9.1/31st	3.0/1932
Rapid City airport	12.0/31st	3.4/1977
East Rapid City	11.3/31st	5.5/1890
<b>High Temperature</b>		
Rapid City airport	73/22nd	tied/1988
Rapid City airport	77/23rd	72/1945
<b>Coldest High Temperatures</b>		
East Rapid City	4/11th	6/1998
Aberdeen	0/11th	4/1896
Watertown	-1/11th	8/1984
Mobridge	0/11th	7/1948
Sisseton	0/11th	12/1956, 1998
Huron	4/11th	5/1956
<b>Low Temperatures</b>		
Pierre	-18/1st	-16/1962
Watertown	-19/1st	-18/1980
Huron	-20/1st	-17/1962
Mobridge	-17/11th	-16/1948
Sisseton	-14/12th	-4/1998
Mobridge	-17/11th	-16/1948

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# 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 - Service Climatologist - High Plains Regional Climate Center

(402) 472-6764 - [numphlett2@unl.edu](mailto:numphlett2@unl.edu)

714 Hardin Hall

3310 Holdrege Street

Lincoln, NE 68583-0997

