2009 Growing Season Weather Summary for North Dakota

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November 1, 2009

Introduction

The 2009 growing season (the period from April through September) for North Dakota can simply be characterized as "cooler" and "dryer" than normal compared to the 30-year average from 1971 to 2000. The state average temperature during the 2009 growing season was 57.1° which was the 36th coolest growing season among the past 115 years. Likewise, the state average precipitation during the 2009 growing season was 11.38" which was the 21st driest growing season among the past 115 years (Table 1). Figures 1 and 2 depict spatial distribution of precipitation and temperature patterns respectively during the 2009 growing season. Table 1 shows the ranking of temperature and precipitation for 6 select cities in North Dakota. Table 2 shows the length and the ranking of the growing season based on the number of consecutive days between the last and first day of frost.

Table 1. April-September 2009 average temperature and precipitation rankings for select North Dakota locations.

City	Temperature Ranking	Precipitation Ranking
Bowman	13th Coolest (Since 1915)	24th Driest (Since 1915)
Bismarck	50th Coolest (Since 1874)	24th Wettest (Since 1874)
Fargo	52nd Coolest (Since 1881)	14th Driest (Since 1881)
Minot Exp. Station	20th Coolest (Since 1905)	22nd Driest (Since 1905)
Cavalier	11th Coolest (Since 1934)	36th Wettest (Since 1927)
Williston Exp. Station	20th Coolest (Since 1953)	20th Driest (Since 1956)
North Dakota Average	**36th Coolest (Since 1895)**	**21st Driest (Since 1895)**

Table 2. Length and the ranking of the 2009 growing season based on number of consecutive days between the last and the first day of frost.

City	Length of the 2009 Growing Season	Ranking of the 2009 Growing Season
Bowman	112 Days (Jun 7- Sep 28)	16th Shortest (Since 1915)
Bismarck	144 Days (May 16-Oct 8)	26th Longest (Since 1875)
Fargo	150 Days (May 10-Oct 8)	24th Longest (Since 1881)
Minot Exp. Station	141 Days (May 19-Oct 8)	17th Longest (Since 1905)
Cavalier	114 Days (Jun 6-Sep 29)	17th Shortest (Since 1934)
Williston Exp. Station	110 Days (Jun 3- Sep 22)	15th Shortest (Since 1894)

A strong cold front on October 8 put an end to the growing season bringing the temperatures into upper teens. Statewide killing frost on October 8 also put an end to most crops development making it challenging to corn growers especially.

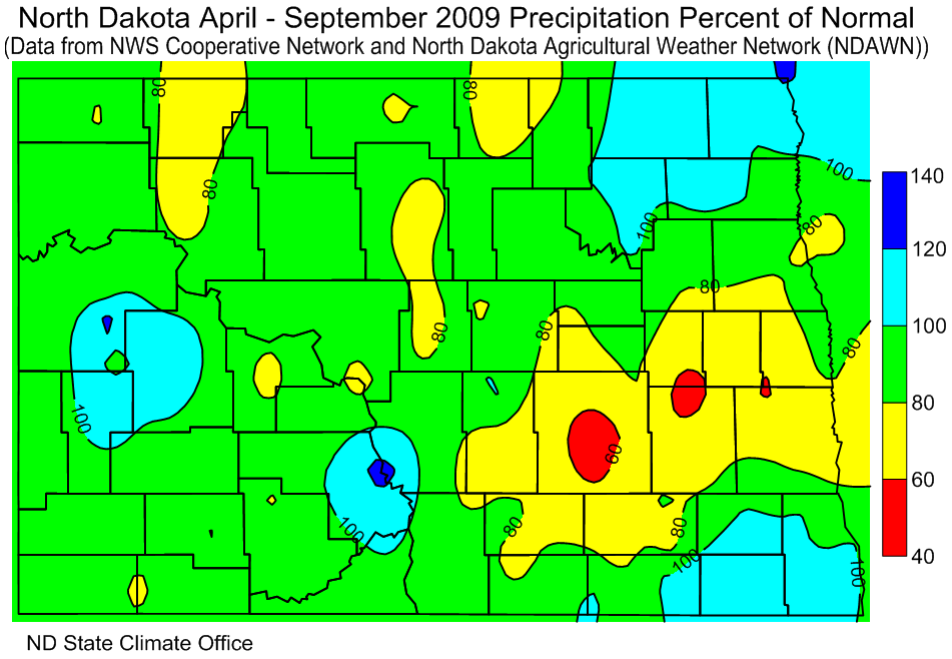

Figure 1. April through September 2009 Precipitation Percent of Normal (%) in North Dakota.

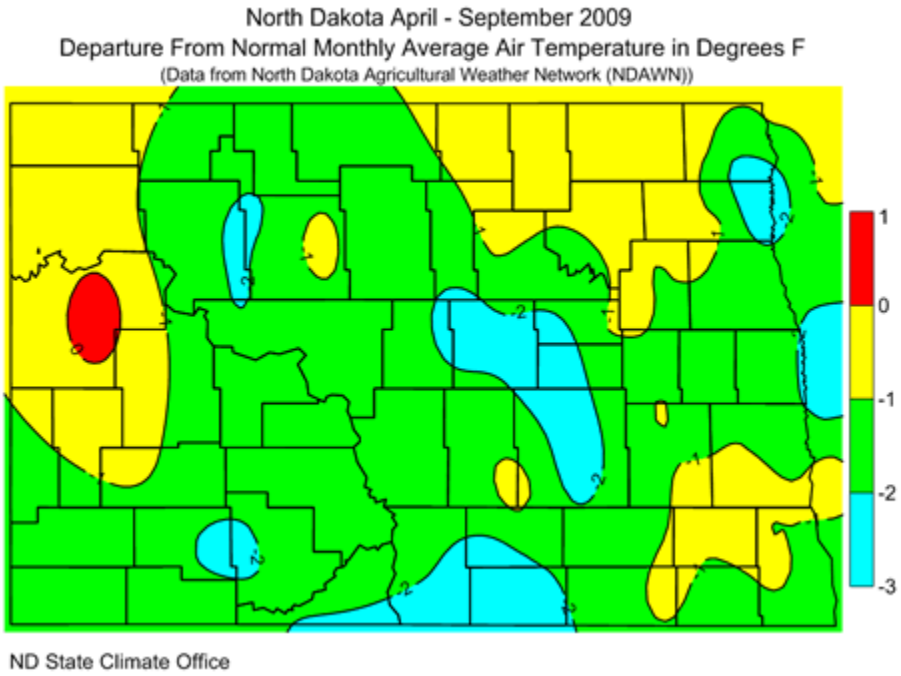

Figure 2. April through September 2009 Temperature Departure from Normal (°F) in North Dakota.

2009 Growing Season Drought Conditions:

Figure 3 shows the state's drought coverage and severity for the period from April 1 through September 30, 2009. The vertical axis is the accumulated coverage and the horizontal axis is the time. The intensity scale is labeled as D0, D1 indicating "Abnormally Dry" and "Moderate Drought" respectively. The graphic shows that the statewide dry conditions worsened in time into the mid-August when 47% of the state was experiencing at least abnormally dry conditions. Moderate drought was briefly introduced in the late July and to linger a few weeks before the conditions improved in late September. Figures 4 and 5 depict the spatial coverage of the drought at the beginning and the end of the growing season respectively.

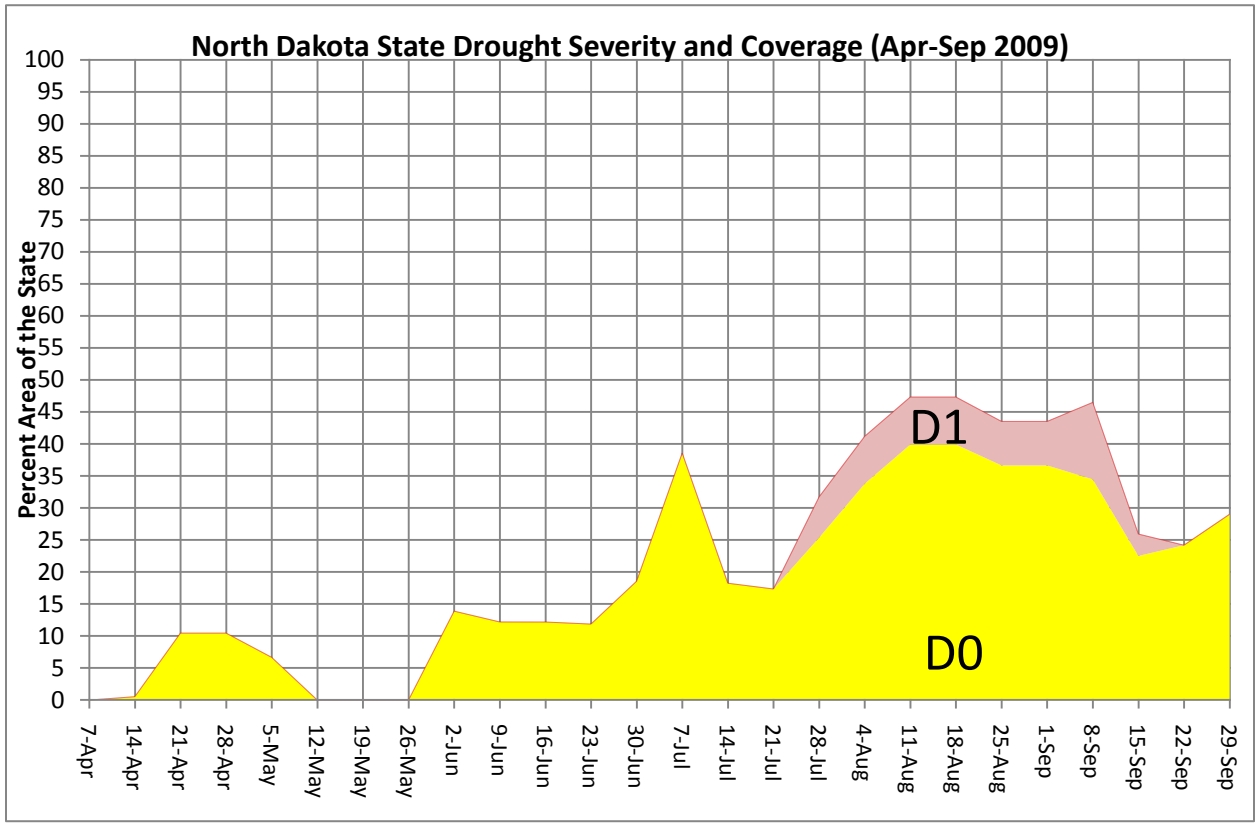

Figure 3 April through September 2009 North Dakota State Drought Severity and Coverage.

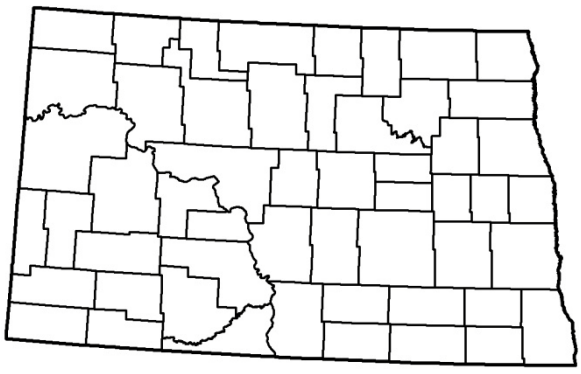

Figure 4 Drought Status (March 31, 2008)

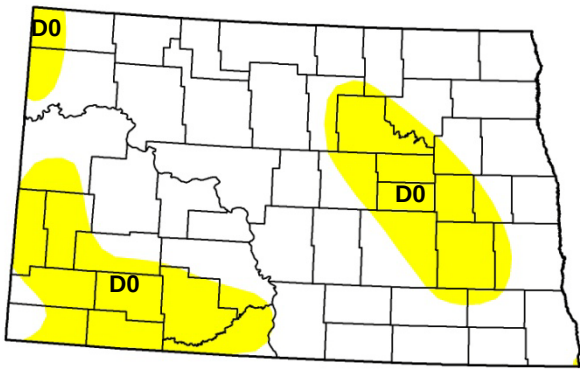

Figure 5 Drought Status (September 29, 2009)

Monthly Weather Summary:

Weather conditions during the individual months of the growing season in 2008 are discussed in detail below:

April 2009

The State average precipitation was 1.02 inches which was below the 1971-2000 normal state average of 1.40 inches. April 2009 state average precipitation ranked the 40th driest in the past 115 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987. Distinctly, while northern half of the state received near to above normal, southern half of the state received below normal precipitation (Figure 6). Most of the first few days of April were dry across the state with some snow in the central and northeast regions. The middle of the month saw more rain showers across the state. The last few days of April had heavier rains that turned to flurries with the larger snow accumulations in the western and central regions. Most of the NDAWN (North Dakota Agricultural Weather Network) stations recorded their highest daily April rainfall amounts on the 29th. The top four NDAWN daily rainfall amounts from April 29th were 1.26 inches at Crosby, 1.21 inches at Brorson MT, 1.01 inches at Williston, and 1.00 inches at Berthold.

The state average air temperature was 39.0°F which is below the 1971-2000 normal of 41.7°F. April 2009 state average air temperature ranked 32nd coolest in the past 115 years with a maximum of 50.2°F in 1987 and a minimum of 31.1°F in 1907. The average April air temperature was below normal across the state (Figure 7). There were a few days of above normal average air temperatures during the middle of the month. However, most of the daily average air temperatures were below normal. Many of the days that had above normal temperatures were quickly followed by precipitation events. For example, on April 23rd, the average air temperatures at Fargo dropped from 81°F to 68°F in one hour and temperatures continued to fall as a low pressure system moved in and brought cooler temperatures and rain showers to the area. The monthly average air temperatures ranged from 36°F to 42°F. The north central, central, and southwest regions had monthly air temperatures ranging from 36 to 39°F. The eastern and northwest regions had average monthly air temperatures from 40 to 42°F. The monthly departure from normal air temperatures ranged from 0 to -4°F. The northwest region had between 0 and -2°F departure from normal air temperatures with the remaining areas of the state having April departures of -2 to -4°F.

May 2009

The North Dakota state average precipitation was 1.53 inches which is below the 1971-2000 normal state average of 2.31 inches. May 2009 state average precipitation ranked the 28th driest in the past 115 years with a maximum of 5.73 inches in 1927 and a minimum of 0.31 inches in 1901. The wide spread rain events for May happened from the 11th through the 13th and the 24th through the 25th. The rain event two day totals for the 24th and 25th was heaviest in the northeast corner with amounts of over 2 inches. The total May rainfall ranged from 3.73 inches at Turtle Lake to 0.19 inches at Bowbells. The smallest monthly totals of a quarter inch and less were in the northwest corner. The highest monthly totals of greater than 3 inches were primarily recorded in Mercer, Mclean, Pierce, Benson, Rolette, and Pembina counties. The majority of the state had below normal precipitation. The areas of above normal precipitation ranged from 100% to 160% and included the west

central, north-central, and northwestern corner (Figure 8).

The state average air temperature was 51.0°F which is below the 1971-2000 normal of 54.8°F. May 2009 state average air temperature ranked the 33rd coolest in the past 115 years with a maximum of 63.1°F in 1977 and a minimum of 43.3°F in 1907. May departure from normal monthly air temperatures were below normal across the state. The departures ranged from -7°F in the upper northeast to near zero in the lower southwest. The average monthly air temperatures ranged from 47°F in the northeast to 56°F in the southeast (Figure 9). Most daily average air temperatures during the first half of May were well below 60°F. The second half of May had slightly warmer temperatures with daily temperatures in the upper 50's and some just above 60°F. The southeast corner of the state had two days with average daily air temperatures over 70°F.

June 2009

The state average precipitation was 2.71 inches which is below the 1971-2000 normal of 3.19 inches. June 2009 state average precipitation ranked 31st driest in the last 115 years with a maximum of 7.21 inches in 2005 and a minimum of 1.14 inches 1974. Daily precipitation was primarily below normal across the state from the 1st through the 13th. On June 6th, measureable snow of up to 3 inches fell in the west. Dickinson had the first measureable June snow since 1951. The second half of June had periodic daily rain events. The National Weather Service (NWS) reported breaking rainfall records at Bismarck on the 15th and 16th, plus Grand Forks on the 26th and 27th. The North Dakota Agricultural Weather Network (NDAWN) total June rainfall ranged from 7.64 inches at Mandan to 0.65 inches at Dazey. The percent of normal June total rainfall was above normal in the southwest, south central, and far northeast corner with a general range of 110% to 300% plus. Areas with below normal precipitation included the northwest corner, north central, and southeast with a general range of 25% to 70% (Figure 10).

The state average air temperature was 60.6°F which is below the 1971-2000 normal of 63.7°F. June 2009 state average air temperature ranked 26th coolest in the past 115 years with a maximum of 74.2°F in 1988 and a minimum of 56.2 °F in 1915. Most daily temperatures were below normal across the state from the 1st through the 13th. The NWS reported breaking several low minimum and maximum air temperatures during the first half of June. Fargo set a new June record with five straight days with high temperatures in the 50's. The second half of June had average daily air temperatures hovering near normal. Monthly average air temperatures ranged from the high 50's in the west to the low 60's in the east. June average air temperature departure from normal was below normal across the state. The monthly departure from normal temperatures ranged from roughly -5°F in the southwest to -1°F in the east (Figure 11).

July 2009

The state average precipitation was 2.35 inches which was below the 1971-2000 normal state average of 2.75 inches. July 2009 state average precipitation ranked the 57th driest in the past 115 years with a maximum of 7.88 inches in 1993 and a minimum of 0.62 inches in 1936. Most of the July precipitation fell in the first half of the month. The North Dakota Agricultural Weather Network (NDAWN) total July rainfall ranged from 4.59 inches at the northwestern Hofflund station to 0.40 inches at the eastern located Galesburg station. The percent of normal July total rainfall was

generally above normal in a stretch from the northwest to south central area with a range from roughly 100% to 200%. The north central, southwest corner, and eastern regions had below normal precipitation with the eastern region having the lowest amounts with 50% or less percent of normal precipitation (Figure 12). A major storm event occurred on the 8th in the western part of the state. The National Weather Service (NWS) Storm Prediction Center reported tornadoes on the 8th in Golden Valley, Burke, Billings, Stark, and Renville Counties. A tornado touched down in Dickinson on the evening of the 8th. The tornado was classified an EF3 with winds speeds of 150 mph and a path length of nearly 2 miles long and one tenth of a mile wide. The NWS also recorded record rainfall on the 8th at Dickinson of 0.71 inches which broke the previous record of 0.66 inches set in 2002.

The state average air temperature was 64.3°F which is below the 1971-2000 normal of 68.7°F. July 2009 state average air temperature ranked 5th coolest in the past 115 years with a maximum of 79.7°F in 1936 and a minimum of 61.8°F in 1992. July's cooler than normal temperatures slowed the maturity of grains and the development of row crops. The departure from normal monthly average air temperatures were below normal across the state and ranged from roughly 3 to 6 degrees below normal (Figure 13). The average monthly air temperatures recorded from NDAWN ranged from 62°F to 68°F with the cooler temperatures in the north and warmest temperatures in the southeast corner and central western edge. The NWS reported breaking the low maximum daily temperature at the Grand Forks Airport with 69°F on the 16th. The NWS also recorded a record low daily temperature at Williston of 42°F on the 17th. The monthly average air temperature for July at Bismarck was 66.9°F which ranked the 11th coolest of records going back to 1875. Similarly, the monthly average air temperature for July at Fargo was 66.5°F which ranked 12th coolest of records going back to 1881.

August 2009

The state average precipitation was 1.65 inches which is below the 1971-2000 normal state average of 2.10 inches. August 2009 state average precipitation ranked the 38th driest in the past 115 years with a maximum of 5.02 inches in 1900 and a minimum of 0.72 inches in 1961. In general, August was a cool, dry and uneventful month. The majority of the rain fell from the 6th through the 9th, the 14th through the 16th, the 19th to the 20th, and finally on the 24th. The North Dakota Agricultural Weather Network (NDAWN) total August rainfall ranged from 4.93 inches at Perley MN to 0.26 inches at Hazen. The majority of the state had below normal precipitation with the central region receiving less than 50% of normal (Figure 14). The driest regions had less than 25% of normal precipitation and included parts of McLean, Oliver, Morton, Burleigh, and Sheridan Counties. The areas of the state that received above normal precipitation included the northwest and southeast corners with primarily 130 to 200% of normal.

The state average air temperature was 64.6°F which is below the 1971-2000 normal of 67.2°F. August 2009 state average air temperature ranked the 32nd coolest in the past 115 years with a maximum of 73.6°F in 1983 and a minimum of 60.9°F in1977. Throughout the month of August, most of the daily average air temperatures were below normal or near normal. The daily average air temperatures were above normal around the 11th through the 14th. Below normal monthly average air temperatures continued across the state. In

2009, February through August had below normal monthly air temperatures across the state. The August departures generally ranged from 1°F to 4°F below normal. The northeast corner of the state had between 1 and 2°F below normal. The northwest, central, and southeast were 2 to 3°F below normal. The southwest was 3 to 4°F below normal. The average air temperatures ranged from 62°F in the north and 67°F in the southern part of the state (Figure 15).

September 2009

The state average precipitation was 1.73 inches which is nearly equal to the 1971-2000 normal of 1.74 inches. September 2009 state average precipitation ranked 72nd driest in the past 115 years with a maximum of 5.00 inches in 1900 and a minimum of 0.28 inches 1897. 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 130% and 300% of normal precipitation. The south central and southeast were below normal with the driest area in the northwest corner (Figure 16).

The state average air temperature was 62.8°F which is well above the 1971-2000 normal of 56.1°F. September 2009 state average air temperature ranked 3rd warmest in the past 115 years with a maximum of 63.4°F in 1897 and a minimum of 45.2°F in 1965. The monthly departure from normal air temperatures were above normal across the State with a range of 2 to 10°F (Figure 17). 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. With the help of the unseasonably warm temperatures, all crop development made good progress but still remained behind the average Most locations accumulated more growing degree units in September than that normally accumulates. For example, Fargo accumulated 197 more growing degree units than normal toward corn maturity which was welcomed by most corn growers. However, the growing season average for the accumulated corn growing degree units ranged from zero to 180 units below normal statewide. The North Dakota Agricultural Statistical Service reported 86 % dented, 23% mature and 0% harvested by the end of the first week in October 2009 compared to a 5-yr average of 96% dented, 71% mature and 5% harvested.

Conclusion of the season:

A killing frost occurred in the second week of October. Record low maximum temperatures were set at Bismarck on the 9th with 32°F and at Fargo on the 10th with 35°F. The second half of October continued to be cool with average temperatures at or below normal. Opposite to September, October 2009 state average air temperature ranked 6th coolest in the past 115 years. The monthly departure from normal air temperatures were below normal across the state with a range of 3°F below normal in the northeast and gradually falling to 9°F below normal in the southwest. The first half of October was cold with far below normal daily average temperatures ensuring the end of the growing season in 2009.

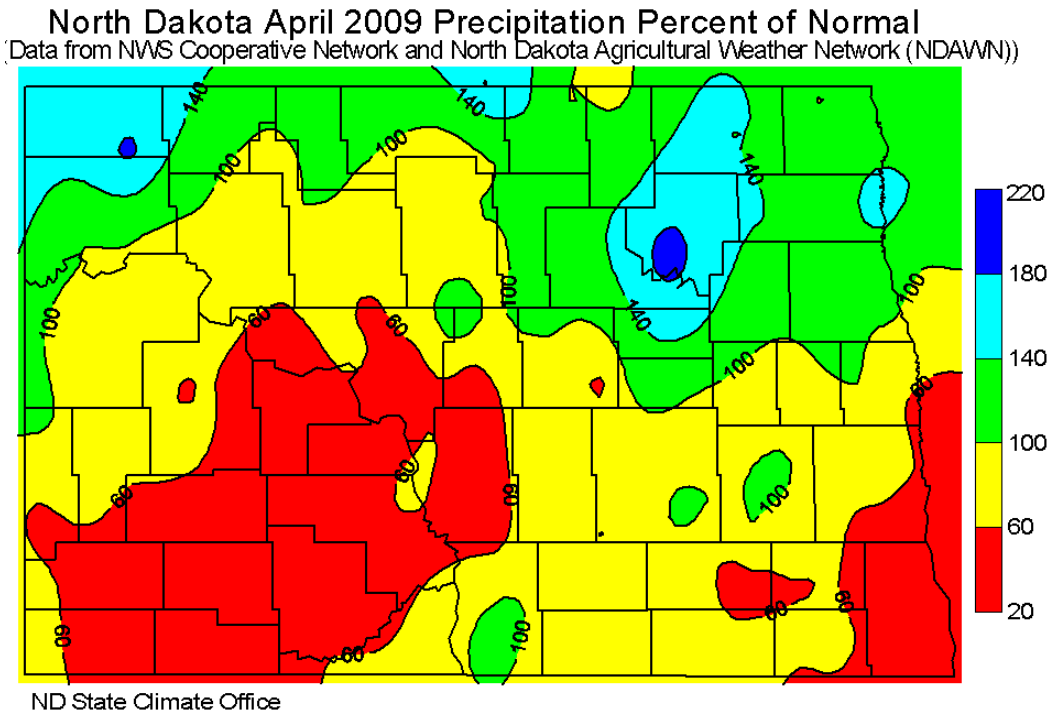

Figure 6. April 2009 Precipitation Percent of Normal (%).

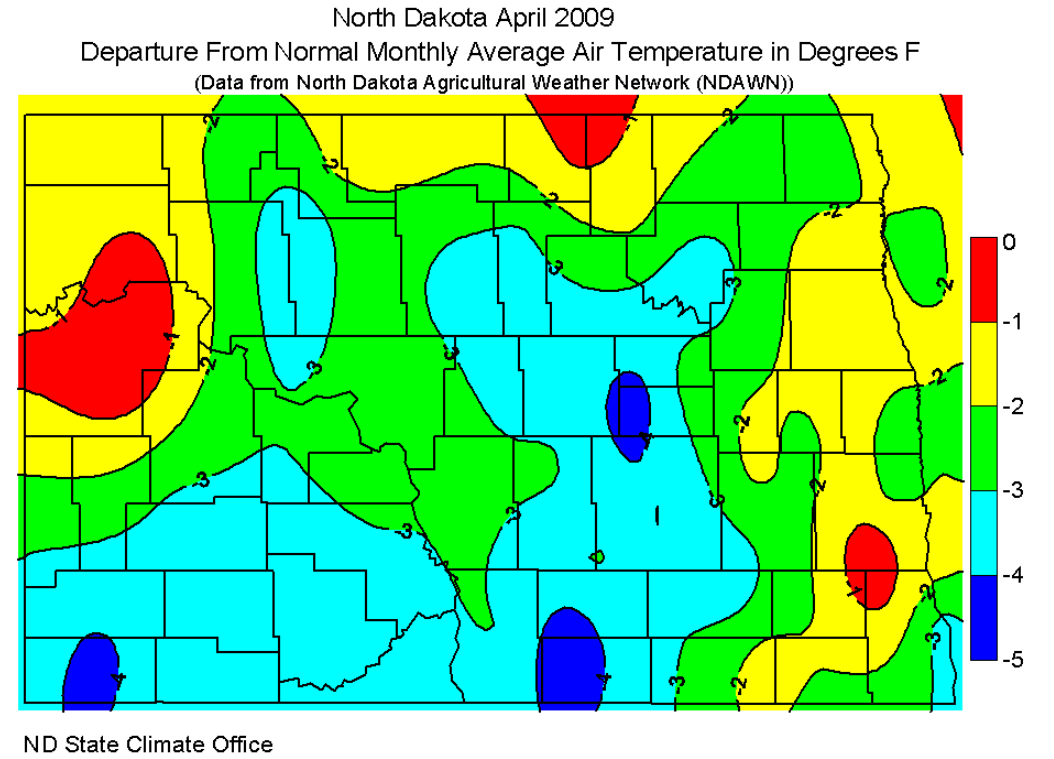

Figure 7. April 2009 Temperature Departure from Normal (°F).

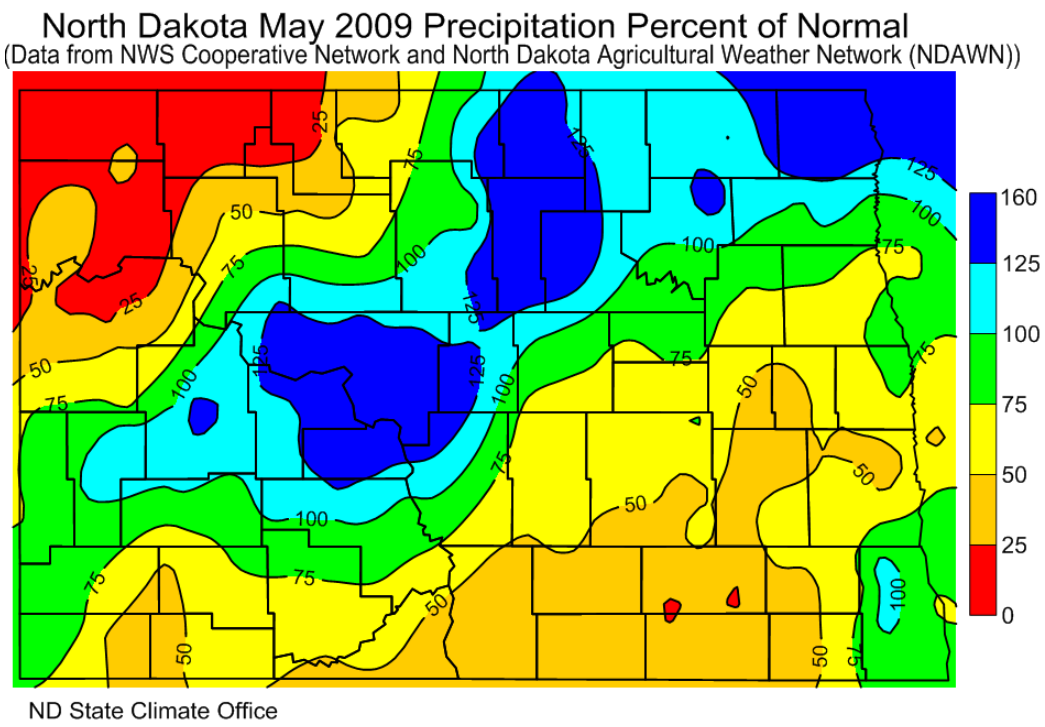

Figure 8. May 2009 Precipitation Percent of Normal (%).

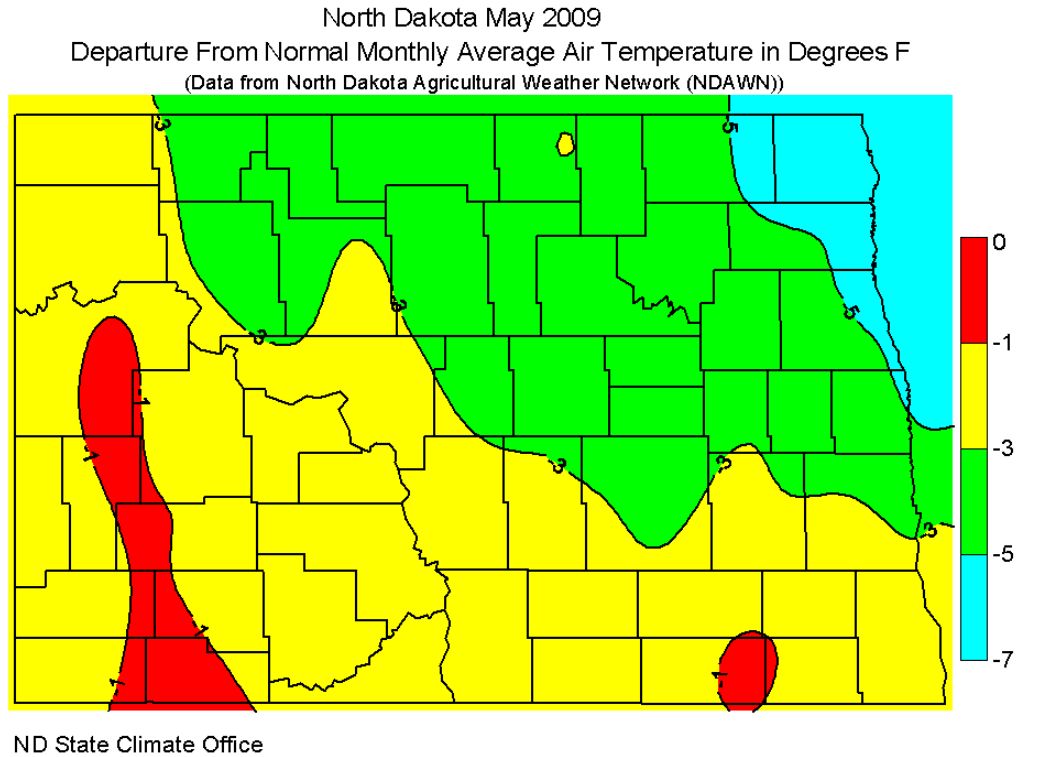

Figure 9. May 2009 Temperature Departure from Normal (°F).

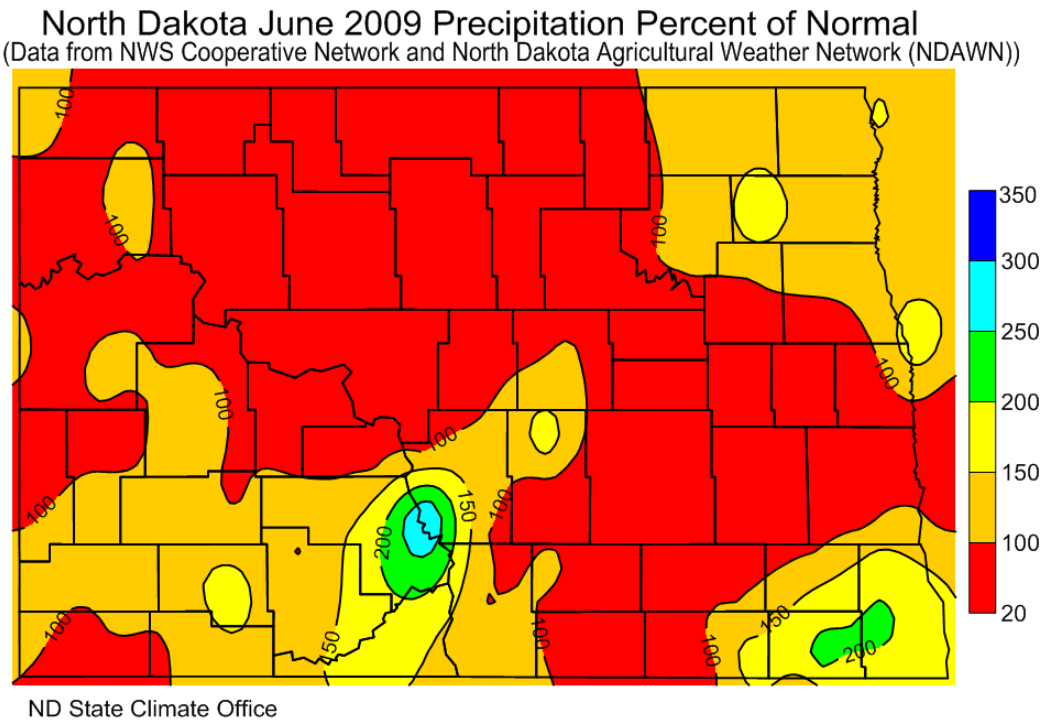

Figure 10. June 2009 Precipitation Percent of Normal (%).

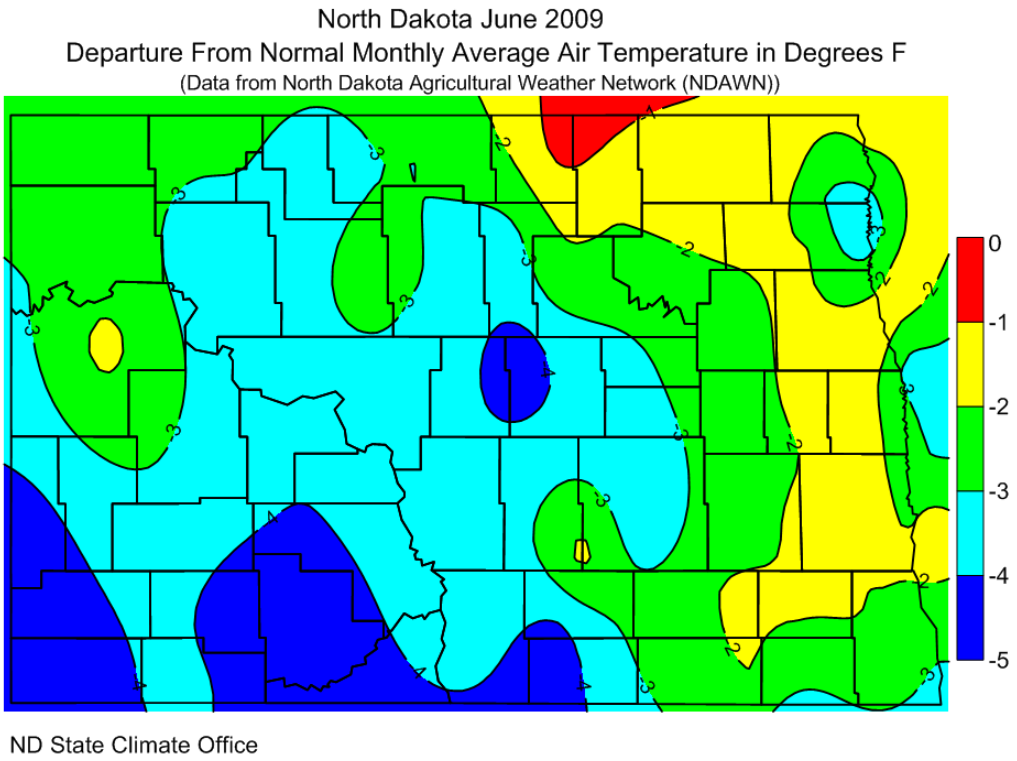

Figure 11. June 2009 Temperature Departure from Normal (°F).

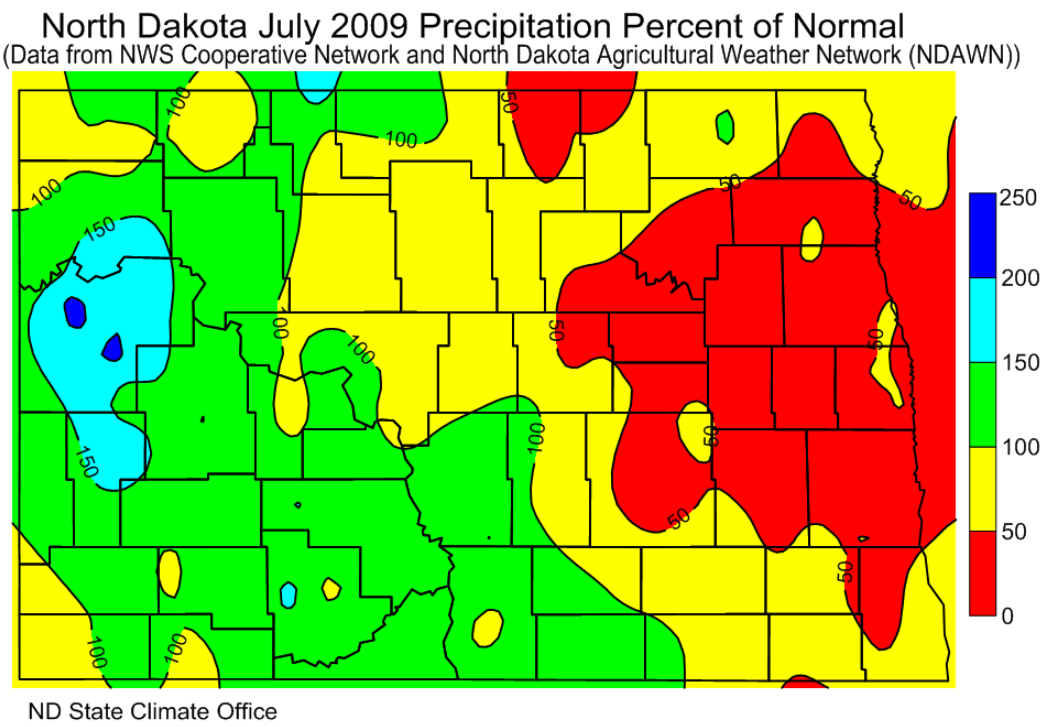

Figure 12. July 2009 Precipitation Percent of Normal (%).

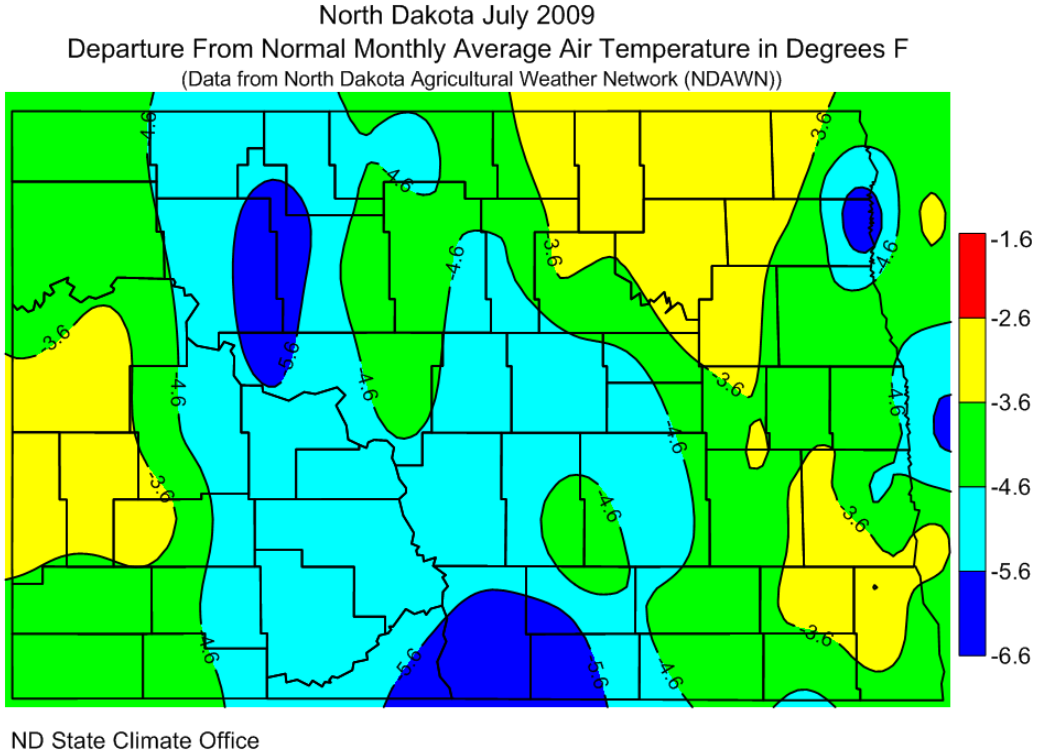

Figure 13. July 2009 Temperature Departure from Normal (°F).

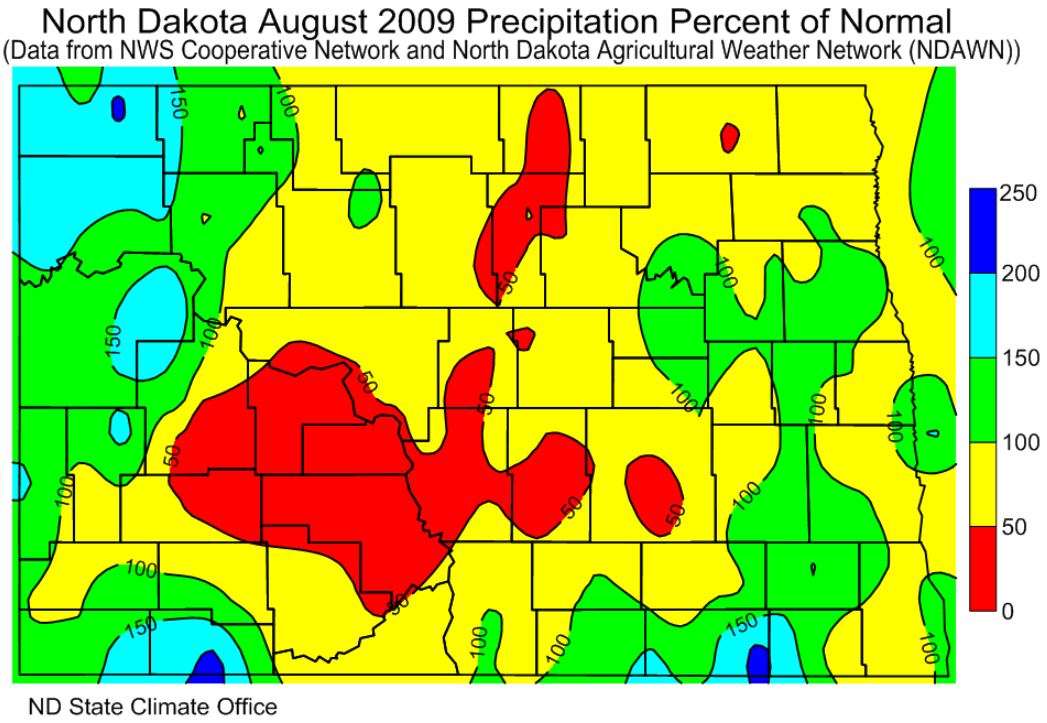

Figure 14. August 2009 Precipitation Percent of Normal (%).

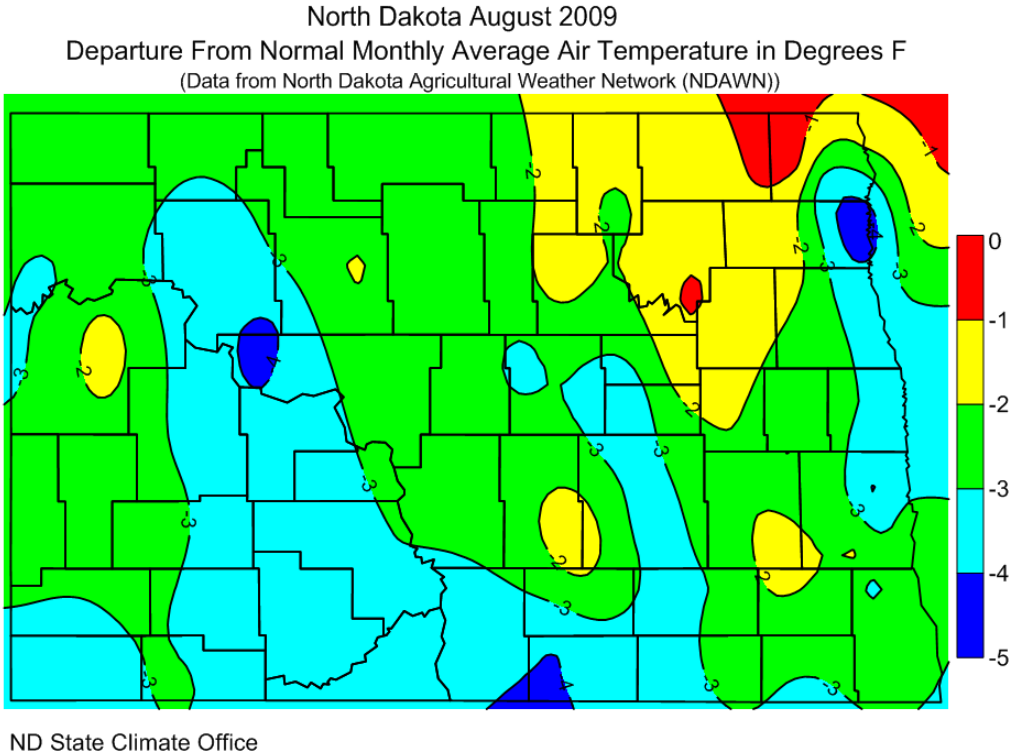

Figure 15. August 2009 Temperature Departure from Normal (°F).

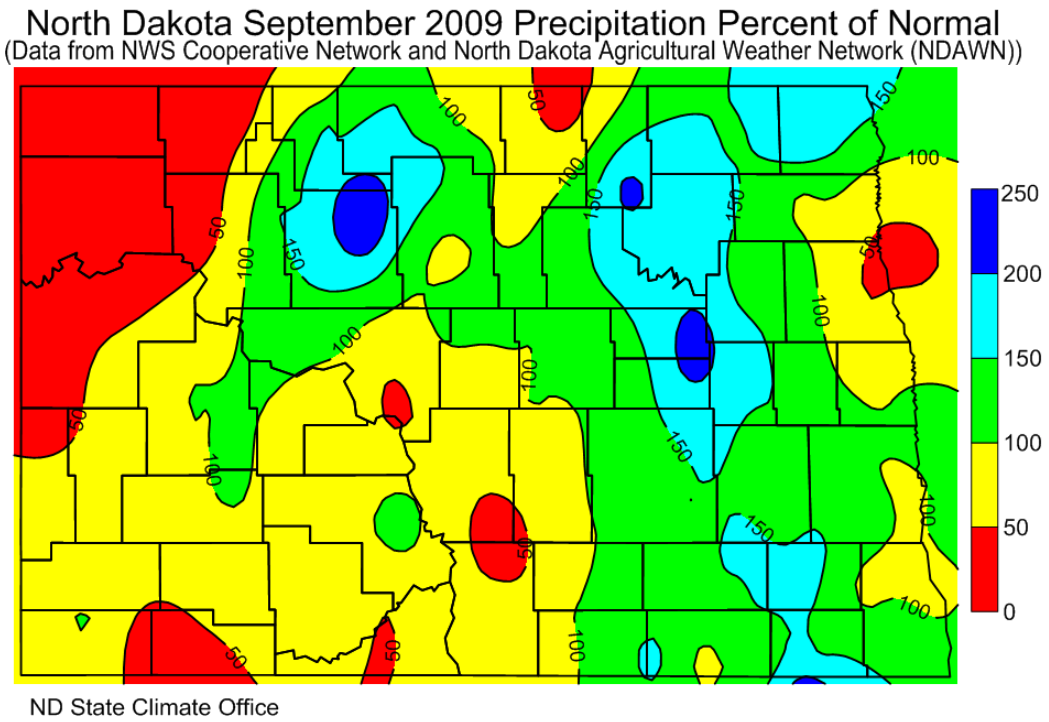

Figure 16. September 2009 Precipitation Percent of Normal (%).

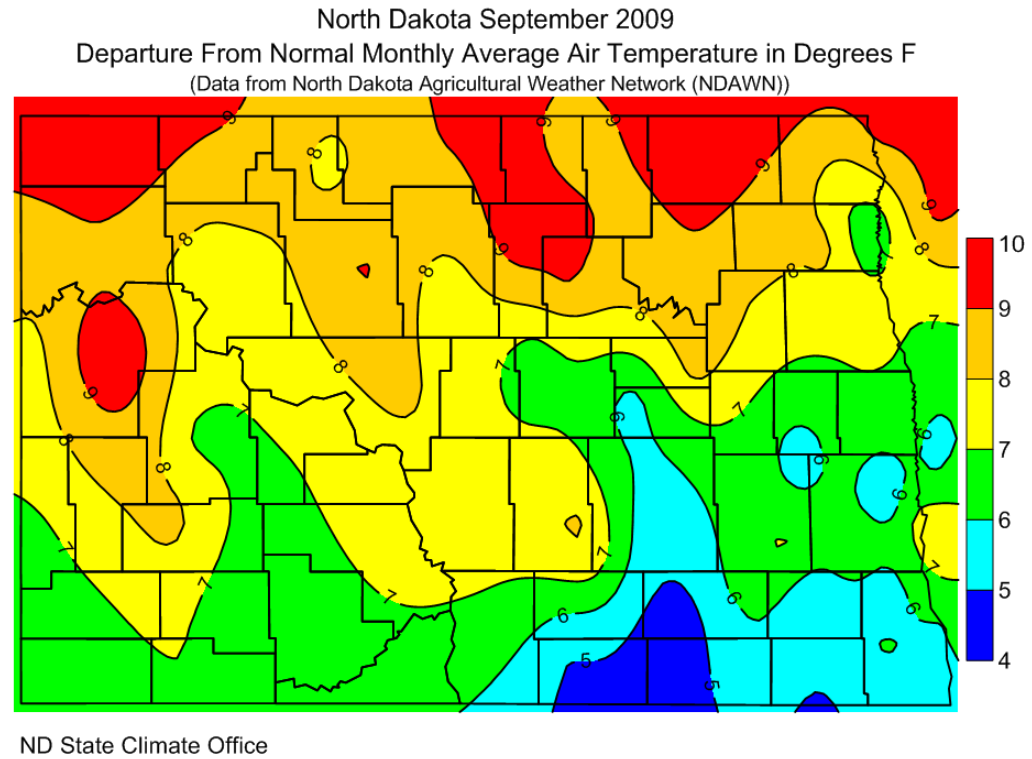

Figure 17. September 2009 Temperature Departure from Normal (°F).