

2010 Growing Season Weather Summary for North Dakota

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Introduction

The 2010 growing season (the period from April through September) for North Dakota can simply be characterized as “warmer” and “wetter” than normal compared to the 30-year average from 1971 to 2000. The state average temperature during the 2010 growing season was 59° which was the 36th warmest growing season among the past 116 years. Likewise, the state average precipitation during the 2010 growing season was 18.32” which was the 5th wettest growing season among the past 116 years (Table 1). Figures 1 and 2 depict spatial distribution of precipitation and temperature patterns respectively during the 2010 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 2010 average temperature and precipitation rankings for select North Dakota locations.

City	Temperature Ranking	Precipitation Ranking
Bowman	3 rd Warmest(Since 1915)	9 th Wettest (Since 1915)
Bismarck	48 th Warmest(Since 1874)	12 th Wettest (Since 1874)
Fargo	10 th Warmest(Since 1881)	15 th Wettest (Since 1881)
Minot Exp. Station	27 th Warmest(Since 1905)	11 nd Wettest (Since 1905)
Cavalier	8 th Warmest (Since 1934)	5 th Wettest (Since 1927)
Williston Exp. Station	30 th Wettest(Since 1953)	9 th Wettest(Since 1956)
North Dakota Average	36th Warmest (Since 1895)	5th Wettest (Since 1895)

Table 2. Length and the ranking of the 2010 growing season based on number of consecutive days between the last and the first day of frost.

City	Length of the 2010 Growing Season	Ranking of the 2010 Growing Season
Bowman	130 Days (May 10- Sep 18)	22 nd Longest (Since 1915)
Bismarck	145 Days (May 9-Oct 2)	23 rd Longest (Since 1875)
Fargo	145 Days (May 9-Oct 2)	31 st Longest (Since 1881)
Minot Exp. Station	131 Days (May 9-Sep 18)	29 th Longest (Since 1905)
Cavalier	145 Days (May 9-Oct 2)	5 th Longest (Since 1934)
Williston Exp. Station	130 Days (May 10- Sep 18)	43 rd Longest (Since 1894)

Figure 1 and Figure 2 show statewide precipitation percent of normal, and temperature departure from normal conditions respectively averaged over the period from April 1 through September 30. In Figure 1, numbers above 100 indicates wetter than normal, while less than 100 indicates dryer than normal conditions.

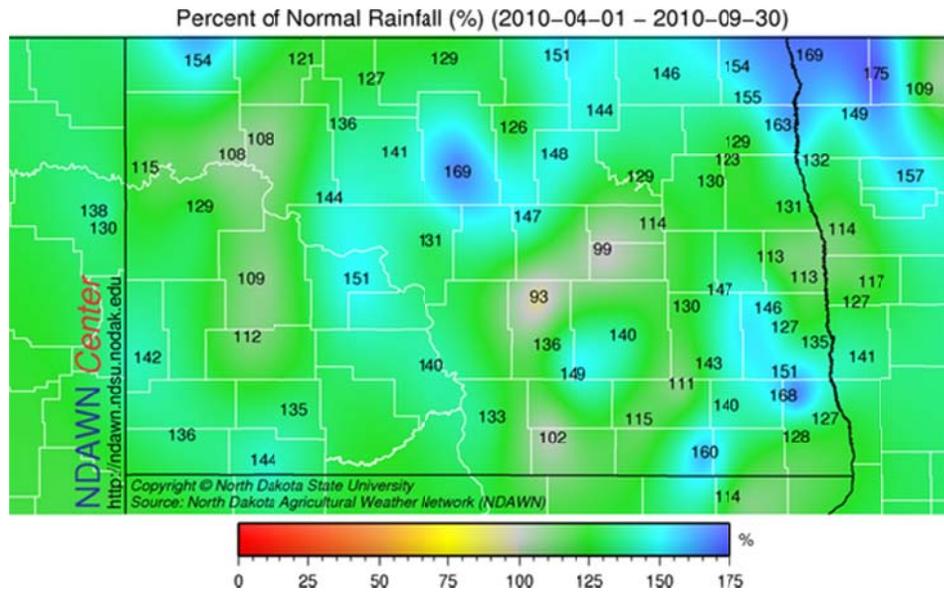


Figure 1. April through September 2010 Precipitation Percent of Normal (%) in North Dakota.

In Figure 2, negative numbers indicate cooler than normal, while positive numbers indicate warmer than normal conditions. The values in the map represent the magnitude of daily average departures from normal.

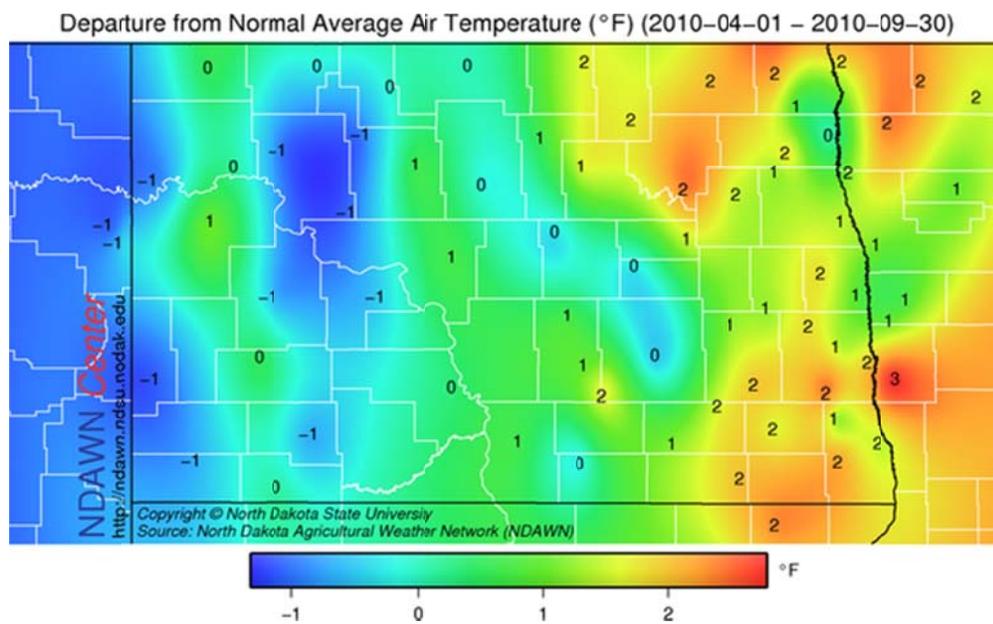


Figure 2. April through September 2010 Temperature Departure from Normal (°F) in North Dakota.

2010 Growing Season Drought Conditions:

Figure 3 shows the state's drought coverage and severity for the period from April 1 through September 30, 2010. The vertical axis is the accumulated coverage and the horizontal axis is the time. The intensity scale is labeled as D0, indicating "Abnormally Dry" conditions. The graphic shows the lack of statewide dry conditions with only 25% of the state, at worst, is experiencing dry conditions around the end of the growing season. It was highly desirable conditions statewide as it allowed much of the field work done by the end of the season. The 2010 growing season was the first growing season since 2000 when the state experienced the longest stretch of a drought free period. Figures 4 and 5 depict the spatial coverage of the dryness at the beginning and the end of the growing season respectively.

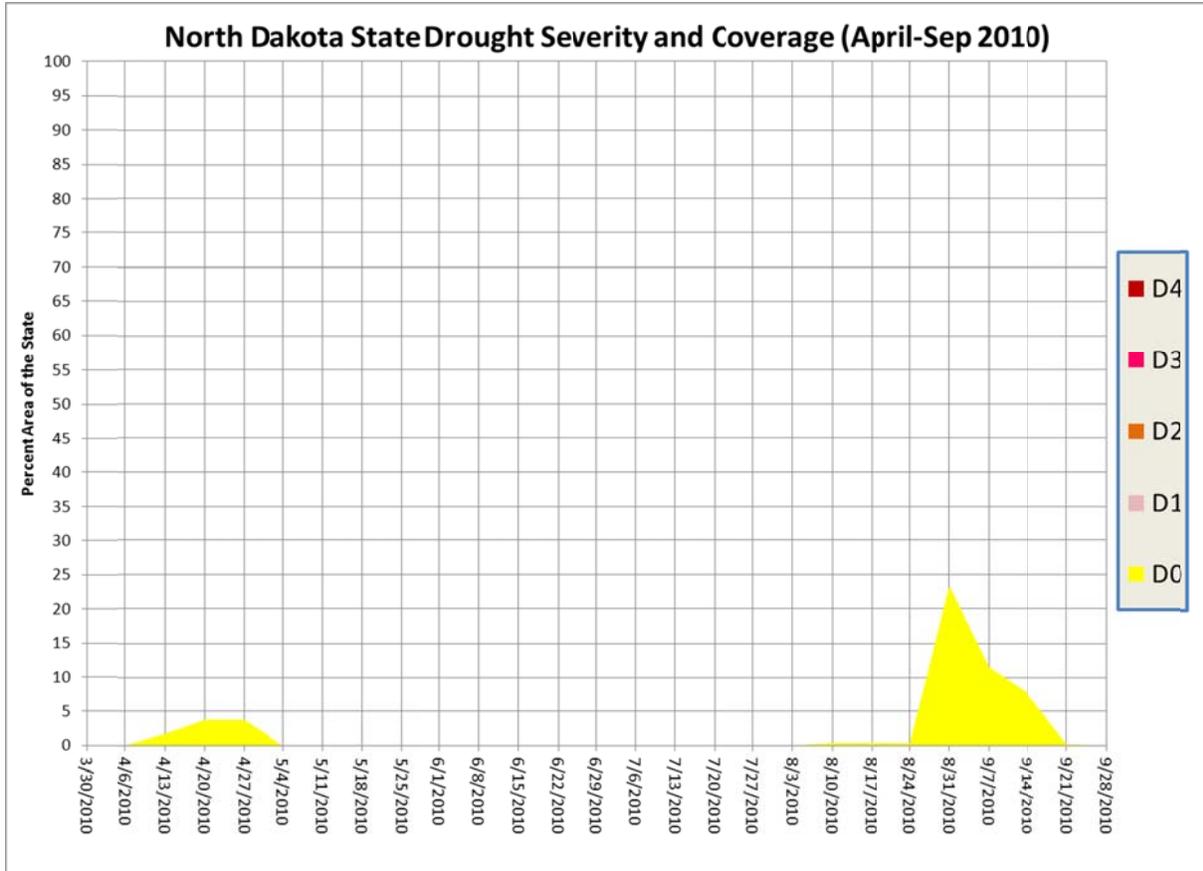


Figure 3 April through September 2010 North Dakota State Drought Severity and Coverage.

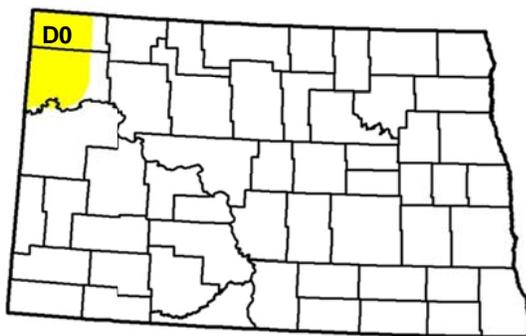


Figure 4 Drought Status (April 20, 2010)

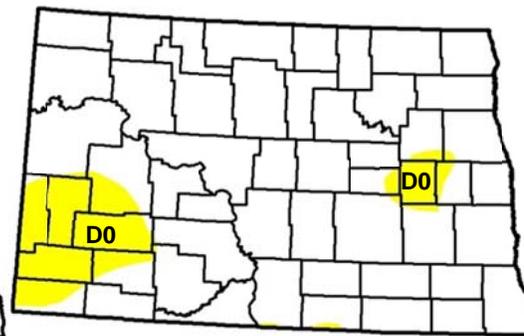


Figure 5 Drought Status (September 7, 2010)

Monthly Weather Summary:

Weather conditions during the individual months of the growing season in 2010 are discussed in detail below:

April 2010

The state average precipitation was 1.51 inches which was above to the 1971-2000 normal state average of 1.40 inches. April 2010 state average precipitation ranked the 40th wettest in the past 116 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987. Monthly precipitation totals were 1.5 to 3.75 inches in the central and southeast corner of the state with less than an inch falling elsewhere. Percent of normal monthly precipitation was 150% to 300% of normal in the central part of the state. The southwest and southeast corners also had above normal precipitation. The western and eastern parts of the state had below normal precipitation (Figure 6). Most days in April were dry. The primary daily rainfall events happened from the 1st to the 3rd, 12th and 13th, and scattered showers across the state from the 22nd to the end of the month. The April 1st and 2nd severe storm event produced freezing rain, ice and heavy snow in the central part of the state. The storm caused thousands of residents to lose power. The President declared the storm a major disaster which released federal funds to be used by 12 counties and the Standing Rock Sioux Indian Reservation to repair the damage. The eastern part of the state continued with mild spring weather that produced only a trace or no snow throughout April.

The state average air temperature was 46.9°F which is above the 1971-2000 normal of 41.71°F. April 2010 state average air temperature ranked the 14th warmest in the past 116 years with a maximum of 50.2°F in 1987 and a minimum of 31.1°F in 1907. April average monthly temperatures ranged from 41°F to 52°F with the higher

temperatures in the southeast and the lower temperatures in the northwest. The average departure from normal temperatures was in the positive across the state with a range of 2 to 9 (Figure 7). The eastern half of the state had monthly departures of 4°F and greater. The western half of the state had near normal and slightly above normal monthly temperatures. The daily average air temperatures were near or above normal throughout most of the month. The last few days of the month had cooler than normal daily air temperatures. The mild April temperatures allowed producers to get in their fields two weeks earlier than the previous year. The USDA, National Agricultural Statistics Service, North Dakota Field Office reported the statewide average starting date for fieldwork was April 18.

May 2010

The state average precipitation was 4.20 inches which is 1.89" above the 1971-2000 normal. May 2010 state average precipitation ranked 10th wettest in the past 116 years with a maximum of 5.73 inches in 1927 and a minimum of 0.31 inches in 1901. Monthly precipitation totals ranged from 2 to 7 inches. The higher amounts from 5 to 7 fell in the northeast and east central regions with 2 to 4 inches falling elsewhere. Total precipitation was above normal for most of the state and ranged primarily from 50% to 300% of normal (Figure 8). The first half of the month had lighter scattered rainfall and a snowfall event. Snow fell in the southwest and central regions on the 7th with totals ranging from 8 inches in the southwest to 2 inches in the central region. The second half of the month had widespread heavy rains and thunderstorms. A major thunderstorm on the 24th produced hail and damaging high

winds in the central, northeast, and southwest parts of the state. Tornadoes were reported on the 24th in Sioux and Morton counties.

The state average air temperature was 51.9°F which is below the 1971-2000 normal of 54.80°F. May 2010 state average air temperature ranked the 44th coolest in the past 116 years with a maximum of 63.10°F in 1977 and a minimum of 43.30 °F in 1907. May average monthly air temperatures ranged from 48°F to 58°F with the lower temperatures in the west and higher temperatures in the east. The average May temperatures were near normal in the east and below normal in the west with departure from normal temperatures ranging from 1 °F to -5 °F (Figure 9). Daily air temperatures were below normal in the first half of the month. The second half of the month had near normal daily temperatures with the last few days having above normal temperatures. The NWS recorded record high temperatures on the 29th at Grand Forks airport with 93°F and Fargo with 95°F.

June 2010

The state average precipitation was 3.69 inches which is above the 1971-2000 normal of 3.19 inches. June 2010 state average precipitation ranked 46th wettest in the last 116 years with a maximum of 7.21 inches in 2005 and a minimum of 1.14 inches in 1974. Monthly precipitation totals ranged from about 2 to 6 inches. The highest amounts of 4 to 6 inches fell primarily in the north central, northeast, and southwest regions. The lowest amounts of 2 to 4 inches fell in the northwest and southeast regions. Percent of normal precipitation ranged from approximately 30% to 200% (Figure 10). The northwest and southeast regions had less than 100% of normal with greater than 100% elsewhere. Daily rainfall events were scattered throughout the month. According

to the USDA, National Agricultural Statistics Service, ND Field Office, the wet conditions hampered fieldwork for much of the month. A severe storm on the 17th produced high winds, hail, and tornadoes. Approximately 20 tornadoes were reported across the eastern part of North Dakota and northwestern Minnesota. The tornadoes reported from Holmes ND, Wadena MN, and Almora MN were rated EF4 (166 to 200 mph) by the National Weather Service (NWS). There were three fatalities in MN from the June 17th tornadoes that struck at Almora, Mentor, and Albert Lea.

The state average air temperature was 63.0 °F which is below the 1971-2000 normal of 63.73 °F. June 2010 state average air temperature ranked 49th warmest in the past 116 years with a maximum of 74.2 °F in 1988 and a minimum of 56.2 °F in 1915. June average air temperatures ranged from 60 °F to 67 °F with the lower temperatures in the north and higher temperatures in the southeast. June average temperatures were near normal across the state (Figure 11). Departure from normal average air temperatures ranged of -3 °F to 2 °F. The temperatures that were slightly above normal fell in the southeast. Temperatures that were 3 °F below normal fell in the northeast.

July 2010

The state average precipitation was 2.81 inches which is above to the 1971-2000 normal state average of 2.75 inches. July 2010 state average precipitation ranked the 48th wettest in the past 116 years with a maximum of 7.88 inches in 1993 and a minimum of 0.62 inches in 1936. 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% (Figure 12). Areas of the east, southeast, southwest and the far northeast corner had greater than 100% of normal precipitation with less than 100% elsewhere. 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.

The state average air temperature was 68.6 °F which is nearly the same as the 1971-2000 normal of 68.7 °F. July 2010 state average air temperature ranked the 53rd coolest in the past 116 years with a maximum of 79.7 °F in 1936 and a minimum of 61.8 °F in 1992. July average air temperatures ranged from 65 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 western region being slightly below normal and the eastern regions being slightly above normal (Figure 13). Departure from normal average air temperatures ranged from -2.2 to 3.4 °F. July's warm temperatures promoted good crop development throughout most of the month according to the USDA, National Agricultural Statistics Service (NASS), ND Field Office.

August 2010

The state average precipitation was 2.30 inches which is above the 1971-2000 normal of 2.10 inches. August 2010 state average precipitation ranked 41st wettest in the past 116 years with a maximum of 5.02 inches in 1900 and a minimum of 0.72 inches in 1961. The North Dakota Agricultural Weather Network (NDAWN) August precipitation

totals ranged from approximately 0.5 to 6.5 inches with the higher amounts of greater than 3 inches falling in the northwestern, north central, and southeast regions. NDAWN's percent of normal precipitation ranged from about 30% to 250% (Figure 14). Areas in the northwest, north central, southeast, and southwest edge had greater than 100% of normal with less than 100% falling elsewhere. Most of the daily rainfall events happened on the 1st and 2nd, 7th through the 13th, and the 30th. The National Weather Service (NWS) Storm Prediction Center reported 14 tornadoes in August. According to the NWS, on the 7th an EF3 (Enhanced Fujita Scale) tornado touched down about 10 miles south of Wahpeton, ND and tracked northwestward for approximately 5 miles, increasing in intensity to a low end EF4, and ended 7 miles south southeast of Breckenridge, MN. On the 12th the NWS reported an EF3 tornado near Bowbells that destroyed one home and damaged a second. The tornado also threw a car 200 yards resulting in one injury and one fatality.

The state average air temperature was 68.6 °F which is above the 1971-2000 normal of 67.23 °F. August 2010 state average air temperature ranked the 34th warmest in the past 116 years with a maximum of 73.6 °F in 1983 and a minimum of 60.9 °F in 1977. NDAWN's August average air temperatures ranged from 65 to 73 °F. The eastern part of the state had above normal temperatures and the western part had near normal to below normal average air temperatures. NDAWN departure from normal air temperatures ranged from -1 to 4 °F (Figure 15). According to the NASS, North Dakota Field Office much of August had warm, dry weather which allowed good progress for small grain harvest. High winds, especially around the middle of the month, caused damage to some crops. NDAWN on the 12th

recorded a maximum wind speed of 68 mph at Hettinger, 66 mph at Mott, 64 mph at Linton and 50 mph at Bowbells. NDAWN wind speeds are measured at a height of 10 feet (3 m).

September 2010

The state average precipitation was 3.92 inches which is above the 1971-2000 normal of 1.74 inches. September 2010 state average precipitation ranked 4th wettest in the last 116 years with a maximum of 5.00 inches in 1900 and a minimum of 0.28 inches in 1897. The precipitation data based on the NDAWN network ranged from 0.72 to 9.33 inches. NDAWN's percent of normal precipitation ranged from about 50% to 400% (Figure 16). The lower rainfall totals fell in Williams and McKenzie Counties which had 50% to 100% of normal rainfall. Bottineau, Renville, northern McHenry and Pierce Counties had approximately 100% to 140% of normal rainfall. The greatest majority of the remaining parts of the state had greater than 200% of normal. The eastern part of the state, especially the Red River Valley (RRV) had the greatest amounts of rainfall resulting in 200% to 300% of normal. The late September rains saturated soils in the RRV which could contribute to spring flooding. The NDAWN Oakes station recorded a total of 9.33 inches of rain which is 413% of normal. Most of the first 10 days of September had showers for many parts of the state followed by a relatively dry stretch with scattered light showers from the 12th through the 21st. Rain fell state wide on the 23rd with the greatest amounts falling in the eastern half of the state. The September 23rd storm system hit parts of southern Minnesota with greater than 10 inches of rain in 24 hours. The

heavy rain flooded the towns of Truman, Pine Island and Owatonna causing flooded roads and many home evacuations.

The state average air temperature was 54.1 °F which is below the 1971-2000 normal of 56.14 °F. September 2010 state average air temperature ranked 29th coolest in the past 116 years with a maximum of 63.4 °F in 1897 and a minimum of 45.2 °F in 1965. NDAWN's September average air temperatures ranged from 51 to 57 °F. NDAWN departure from normal temperatures ranged from 1 to -3 °F (Figure 17). The eastern central and eastern part of the state had departures from normal of -2 to -3 °F with 1 to -1 °F elsewhere. The first half of the month, the daily average air temperatures held steady at below normal with a few slightly above normal days with a rough range of 10 to -10 °F, depending on location. Morning temperatures dipped below the killing freeze of 28 °F on the 18th in the northwestern parts of the state. From the 21st through the 24th temperatures continued to be below normal but then rebounded state wide to above normal for the rest of the month.

Conclusion of the season:

A killing frost occurred on September 18 in most of the northwestern parts of the state. Wet conditions continued throughout the season until the end of November which raised concern for spring flooding in the Red River. In fact, the fall precipitation ranking for Fargo was 10th wettest in recorded history. 7 out of the wettest 15 falls resulted in major floods in the Red River in Fargo. Agriculturally, it may also result in a late start in the upcoming spring season.

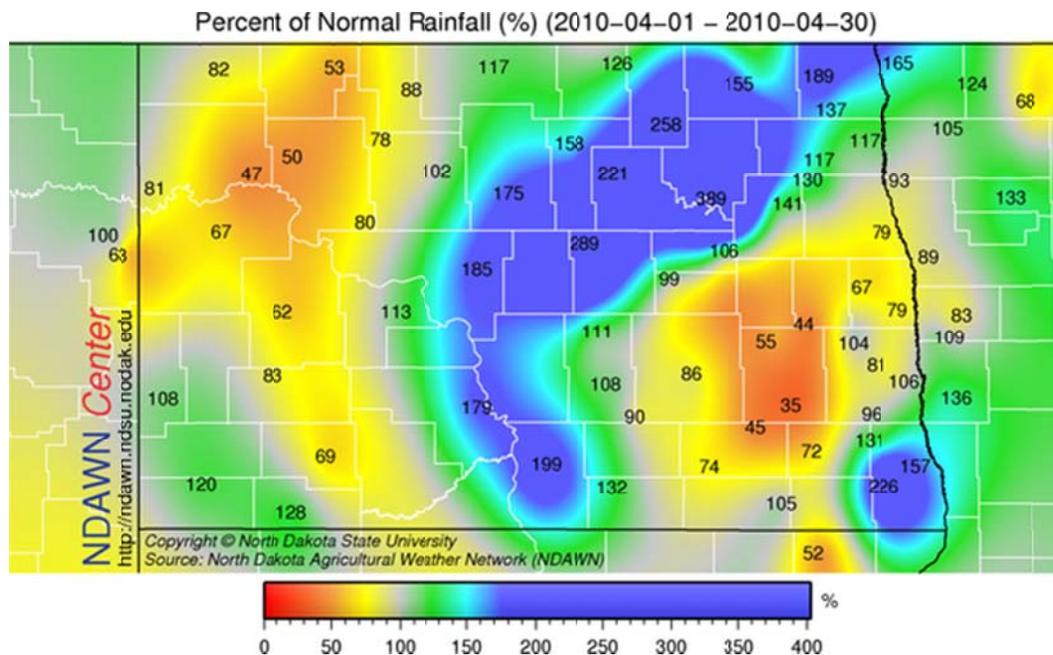


Figure 6. April 2010 Precipitation Percent of Normal (%).

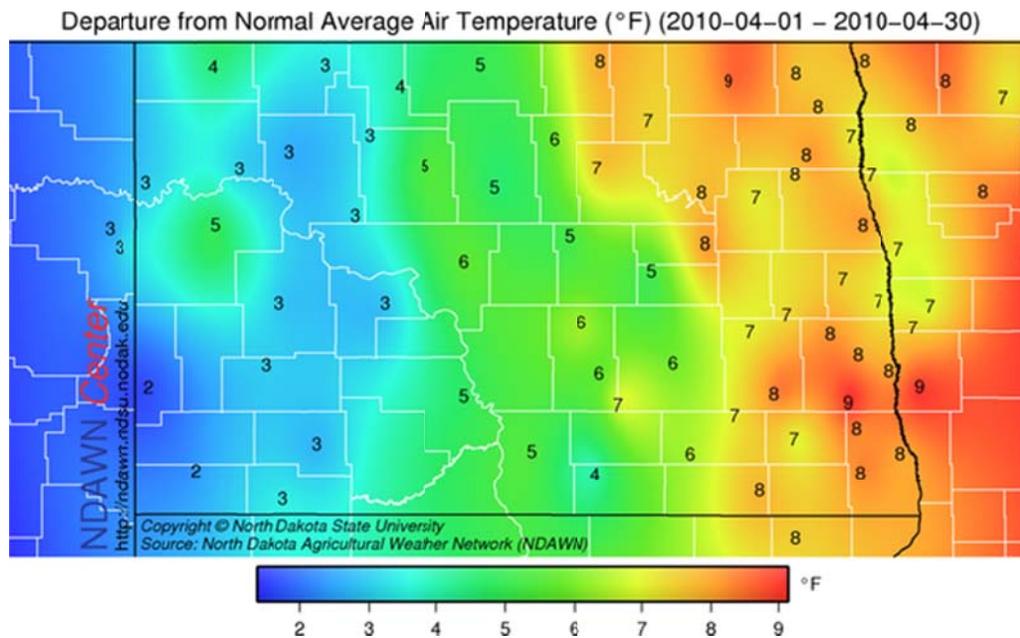


Figure 7. April 2010 Temperature Departure from Normal (°F).

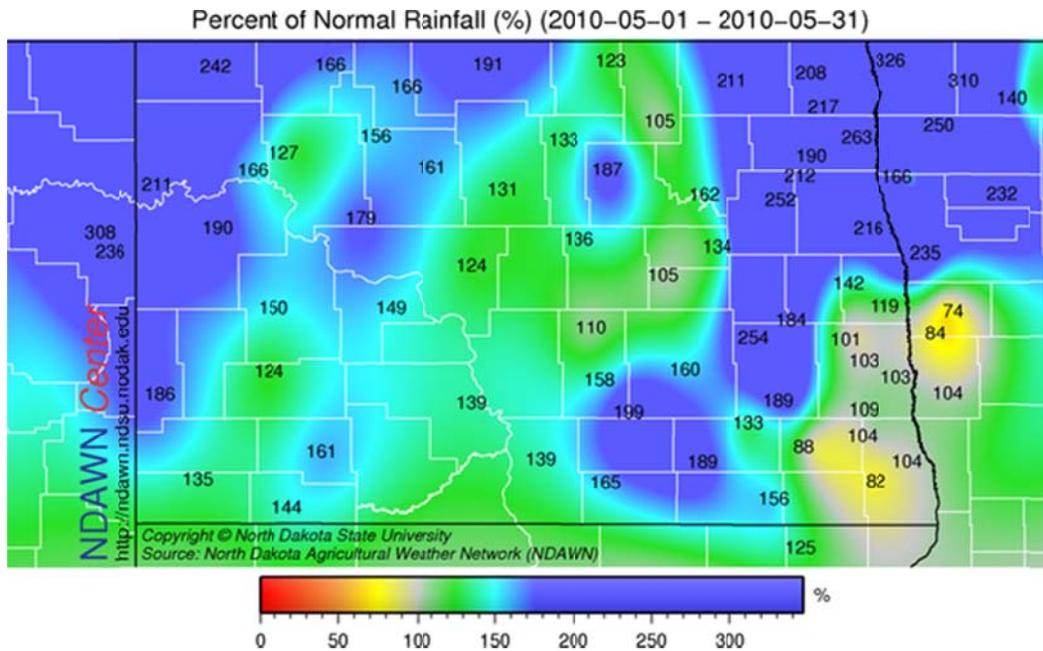


Figure 8. May 2010 Precipitation Percent of Normal (%).

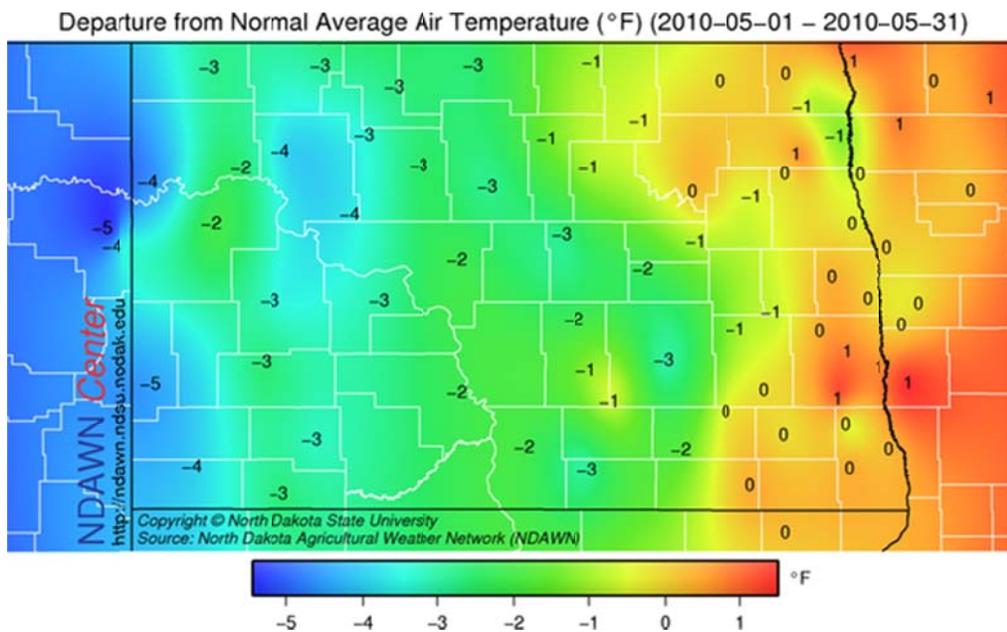


Figure 9. May 2010 Temperature Departure from Normal (°F).

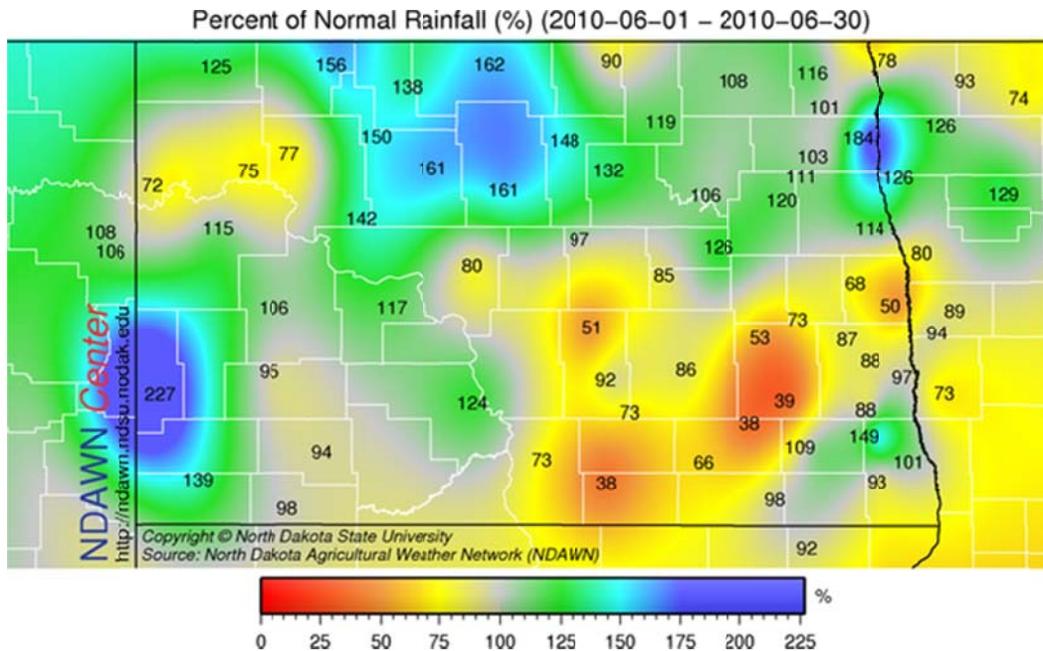


Figure 10. June 2010 Precipitation Percent of Normal (%).

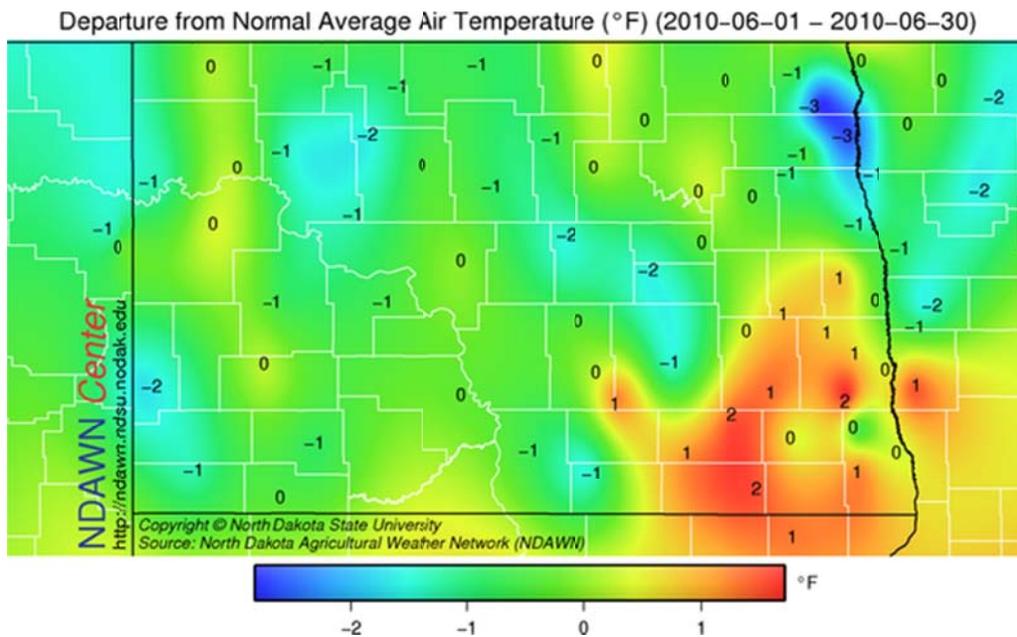


Figure 11. June 2010 Temperature Departure from Normal (°F).

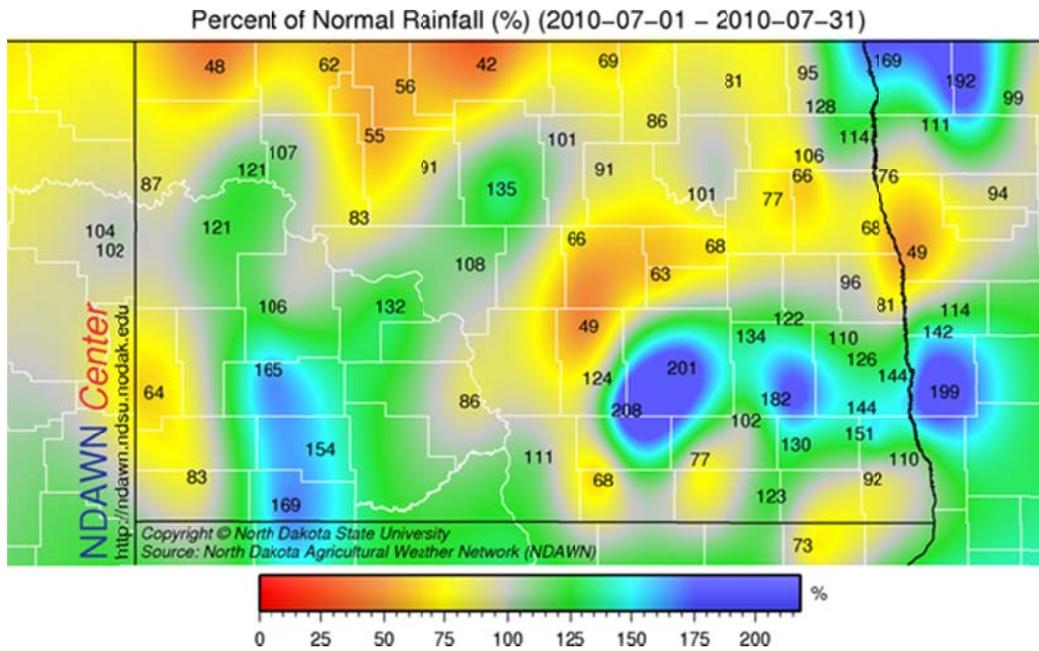


Figure 12. July 2010 Precipitation Percent of Normal (%).

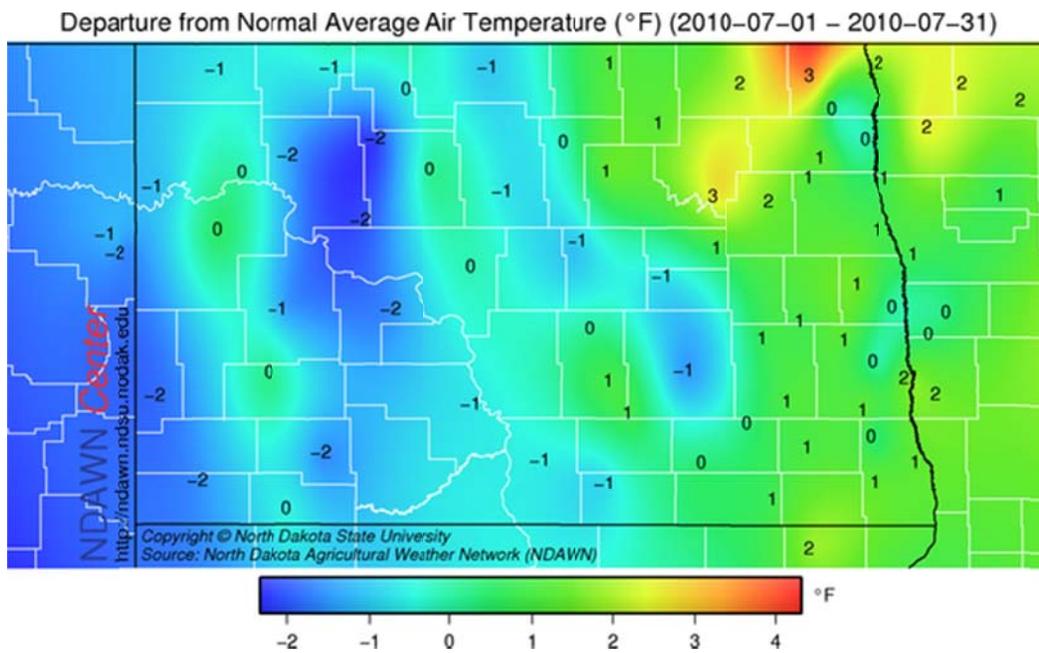


Figure 13. July 2010 Temperature Departure from Normal (°F).

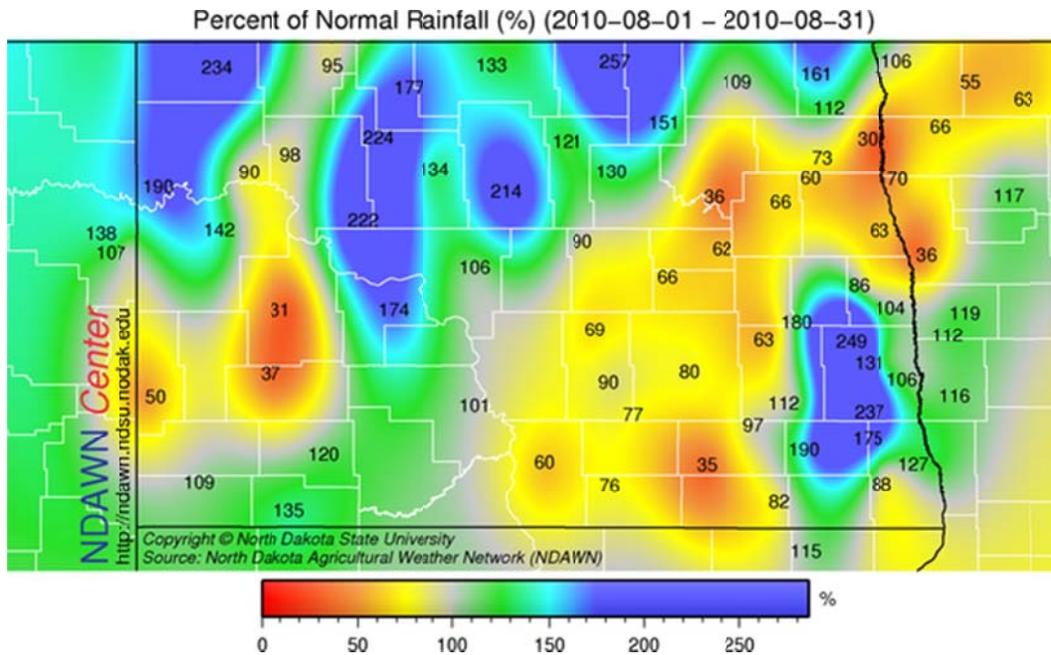


Figure 14. August 2010 Precipitation Percent of Normal (%).

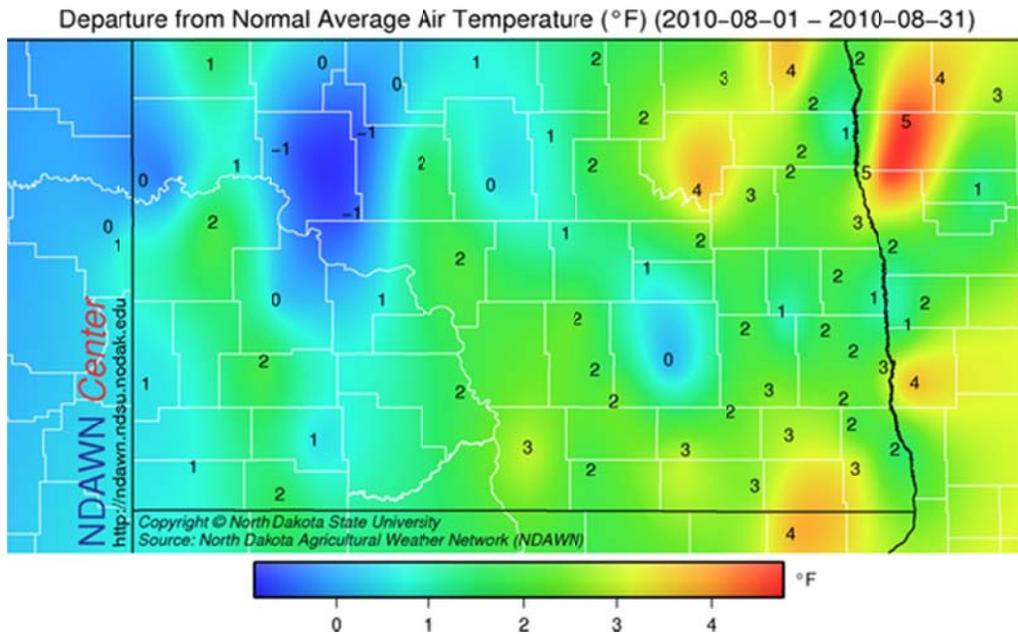


Figure 15. August 2010 Temperature Departure from Normal (°F).

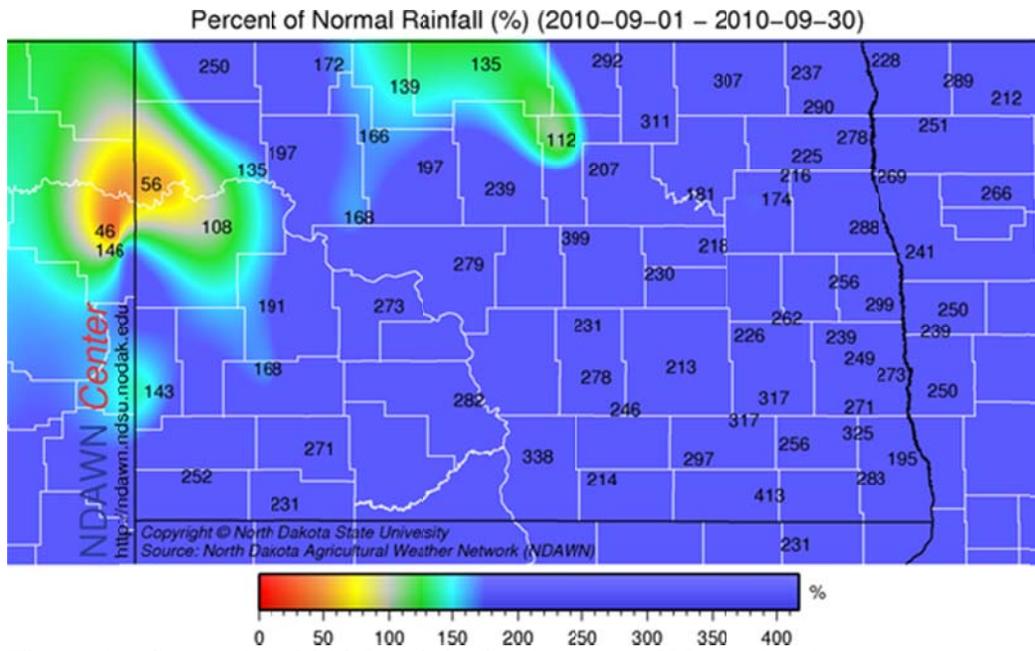


Figure 16. September 2010 Precipitation Percent of Normal (%).

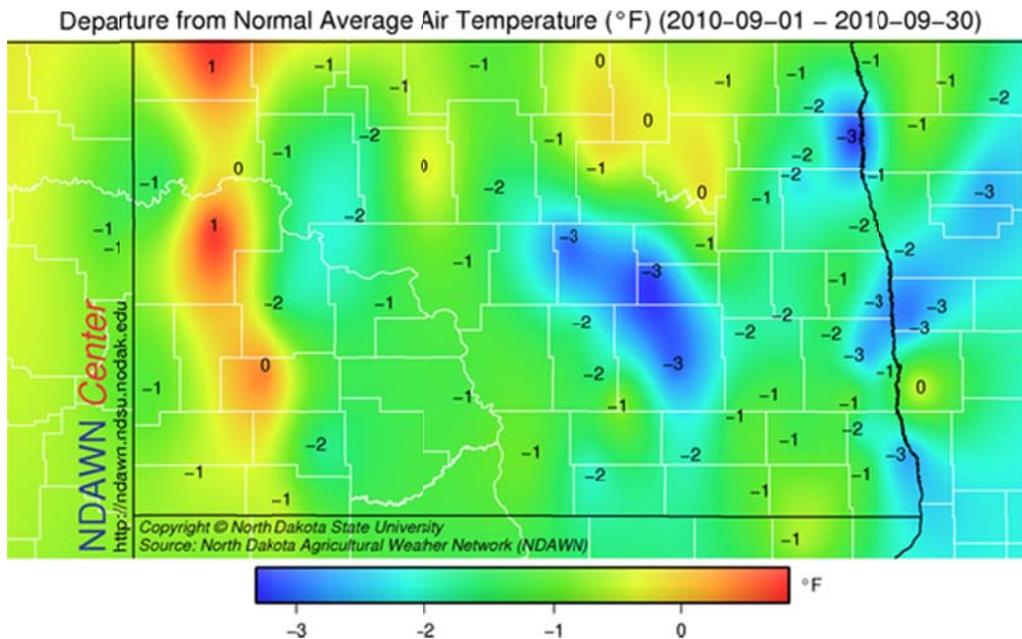


Figure 17. September 2010 Temperature Departure from Normal (°F).