

## 2008 Growing Season Weather Summary for North Dakota

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### Introduction

The 2008 growing season (the period from April through September) for North Dakota can simply be characterized as “cooler” and “wetter” than normal compared to the 30-year average from 1971 to 2000. The state average temperature during the growing season was 57.6° which was the 46<sup>th</sup> coolest growing season among the past 114 years. Likewise, the state average precipitation during the 2008 growing season was 14.29” which was the 46<sup>th</sup> wettest growing season among the past 114 years. Precipitation-wise, there was an apparent gradient from west to east with the eastern part of the state being wetter than normal and western third of the state being drier than normal. Figures 1 and 2 depict spatial distribution of temperature and precipitation pattern respectively during the 2008 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 2008 average temperature and precipitation rankings for select North Dakota locations.**

City	Temperature Ranking	Precipitation Ranking
Bowman	39 <sup>nd</sup> Coolest (Since 1915)	43 <sup>rd</sup> Driest (Since 1915)
Bismarck	67 <sup>th</sup> Warmest (Since 1874)	67 <sup>th</sup> Wettest (Since 1874)
Fargo	62 <sup>nd</sup> Coolest (Since 1881)	9 <sup>th</sup> Wettest (Since 1881)
Minot Exp. Station	31 <sup>st</sup> Coolest (Since 1905)	6 <sup>th</sup> Driest (Since 1905)
Cavalier	11 <sup>nd</sup> Coolest (Since 1934)	41 <sup>st</sup> Wettest (Since 1927)
Williston Exp. Station	15 <sup>th</sup> Warmest Since 1953)	12 <sup>th</sup> Driest (Since 1956)
North Dakota Average	<b>46<sup>th</sup> Coolest (Since 1895)</b>	<b>46<sup>st</sup> Wettest (Since 1895)</b>

**Table 2. Length and the ranking of the 2008 growing season based on number of consecutive days between the last and the first day of frost.**

City	Length of the 2008 Growing Season	Ranking of the 2008 Growing Season
Bowman	148 Days (May 11- Oct 7)	18 <sup>th</sup> Longest (Since 1914)
Bismarck	153 Days (May 14-Oct 14)	6 <sup>th</sup> Longest (Since 1875)
Fargo	140 Days (May 27-Oct 14)	43 <sup>rd</sup> Longest (Since 1881)
Minot Exp. Station	135 Days (May27-Oct 10)	31 <sup>st</sup> Longest (Since 1905)
Cavalier	145 Days (May 11-Oct 4)	13 <sup>th</sup> Longest (Since 1934)
Williston Exp. Station	109 Days (May 27- Sep 14)	14 <sup>th</sup> Shortest (Since 1894)

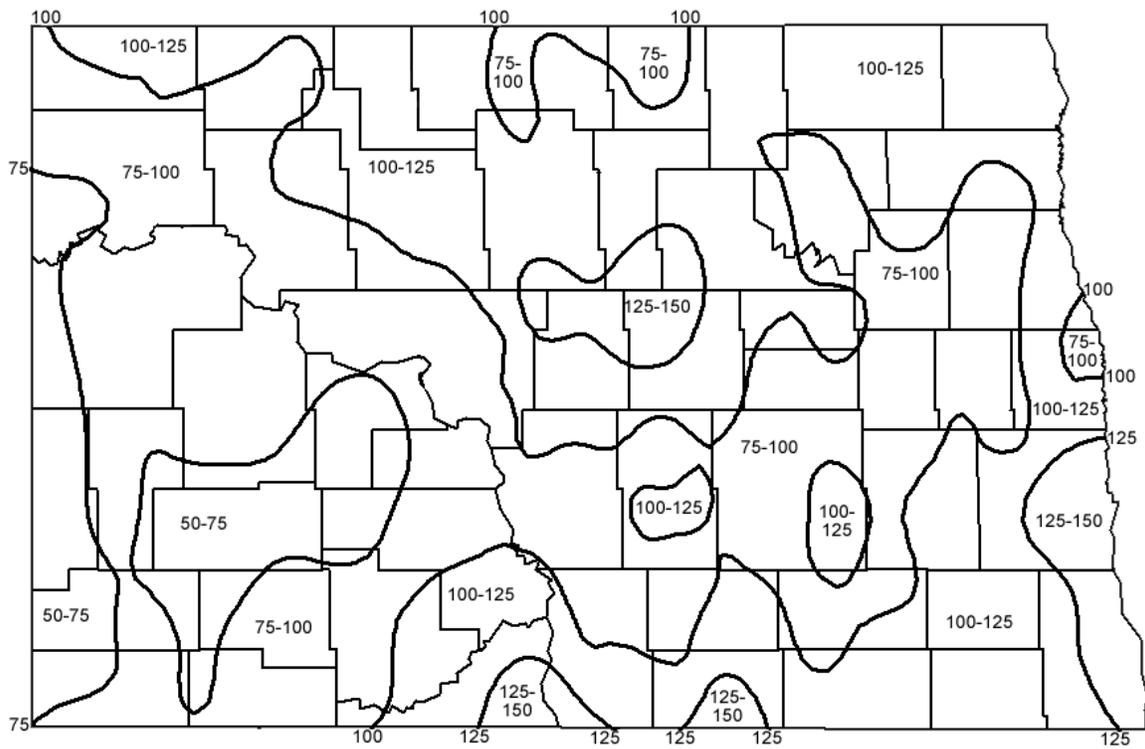


Figure 1. April through September 2008 Precipitation Percent of Normal (%) in North Dakota.

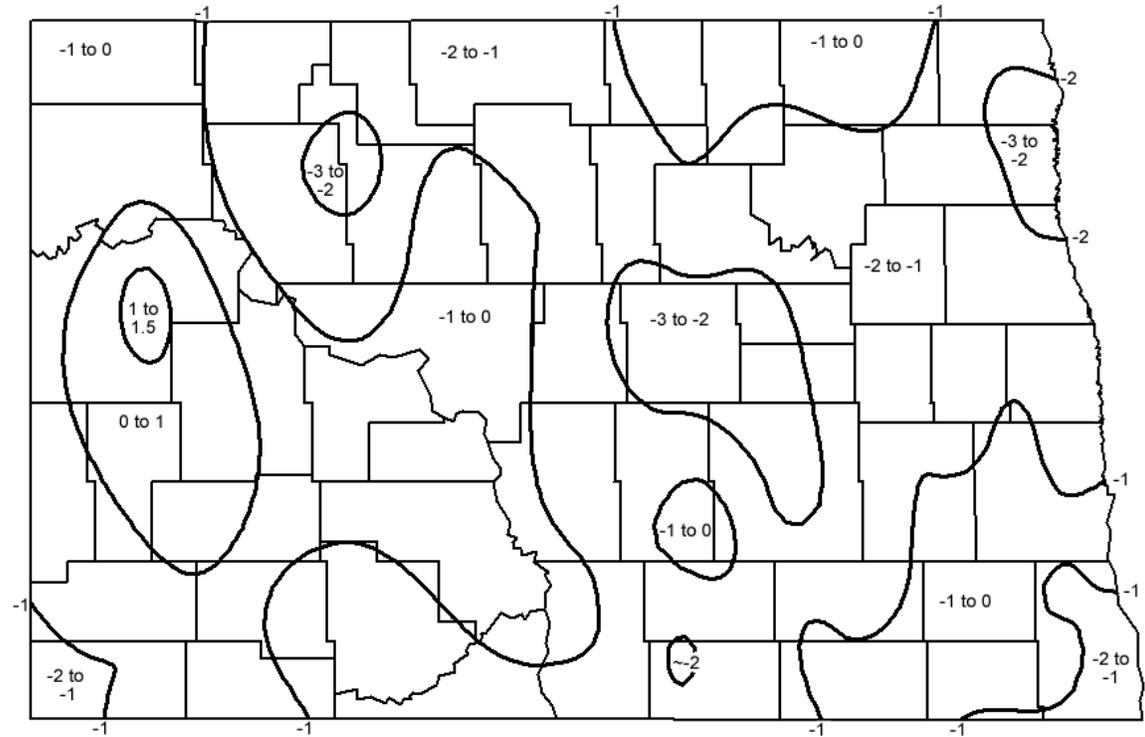


Figure 2. April through September 2008 Temperature Departure from Normal (°F) in North Dakota.

### 2008 Growing Season Drought Conditions:

Figure 3 shows the state's drought coverage and severity for the period from April 1 through September 30, 2008. The vertical axis is the accumulated coverage and the horizontal axis is the time. The intensity scale is labeled as D0, D1, D2 and D3 indicating "Abnormally Dry", "Moderate Drought", "Severe Drought" and "Extreme Drought" respectively. The graphic shows that the entire state of North Dakota was experiencing at least abnormally dry conditions at the beginning of the growing season in North Dakota. Extreme drought was affecting more than 20% of the state and was confined in the north central North Dakota (Figure 4). Between June 10 and July 15, extreme drought was eliminated with well above normal precipitation. Then it reappeared in the northwestern parts of the state and migrated southward. At the end of the 2008 growing season, extreme drought still existed in the southwestern part of the state (Figure 5).

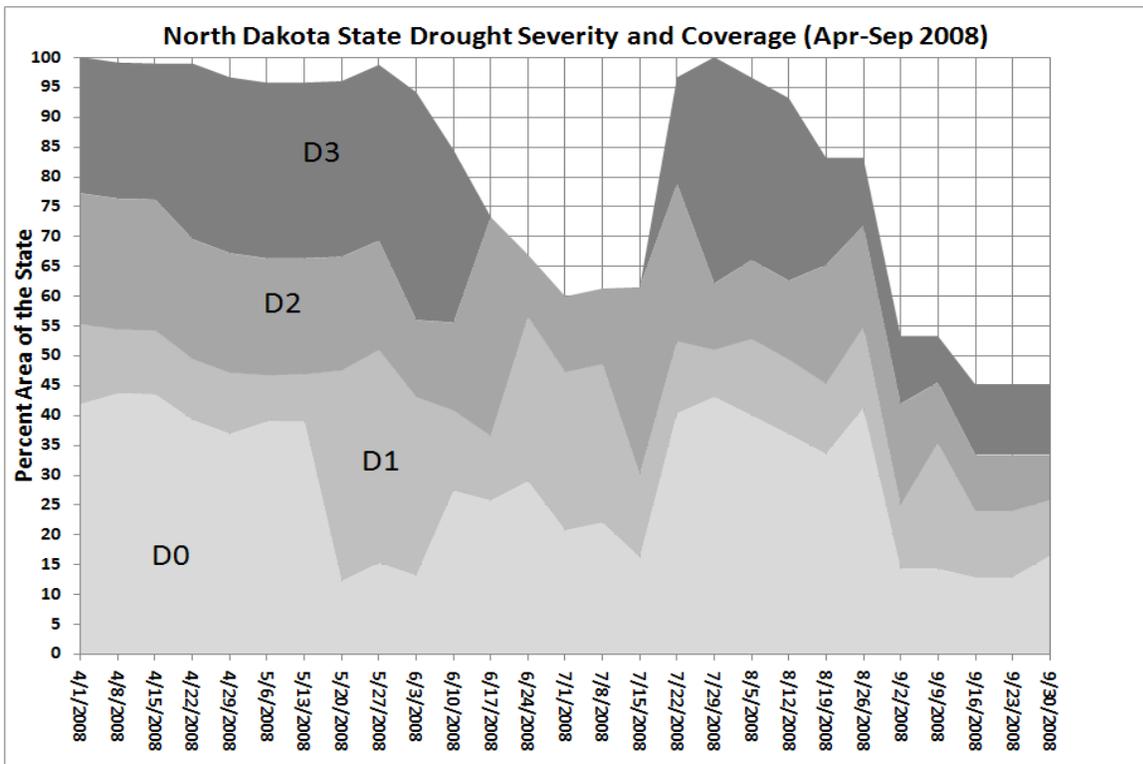


Figure 3 April through September 2008 North Dakota State Drought Severity and Coverage.

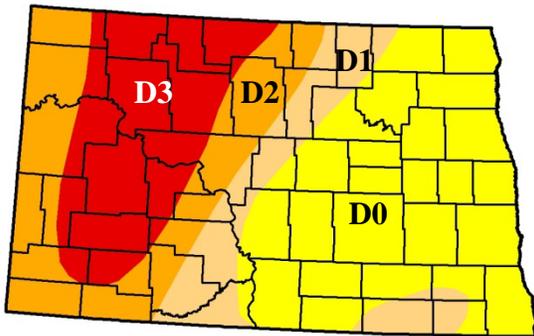


Figure 4 Drought Status (April 1, 2008)

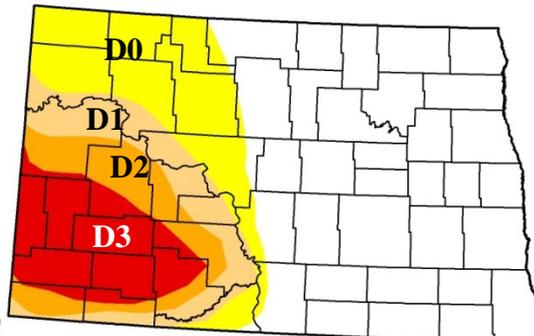


Figure 5 Drought Status (September 30, 2008)

## Monthly Weather Summary:

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

### April 2008

The western half of the state continued to have below normal precipitation with percent of normal's at less than 50% and lower. The dry conditions in the west caused grass fires that damaged hay and pasture land. The eastern half of the state's precipitation was primarily below normal with only a portion of the northeast having slightly above normal and the far southeast corner having 150% of normal precipitation (Figure 6). Snow continued to fall throughout April. Record snowfall was recorded at Grand Forks on the 11<sup>th</sup> of 4.2 inches. A major snow event dropped 8 to 18 inches of heavy wet snow in the southeast corner on April 25<sup>th</sup> and 26<sup>th</sup>. The total snowfall 26<sup>th</sup> set a new record in Fargo of 4.8 inches. Fargo's April snowfall total ranked 2<sup>nd</sup> in the past 114 years. Overall, the state average precipitation was 0.82 inches which was below the 1971-2000 normal state average of 1.40 inches. April 2008 state average precipitation ranked the 26<sup>th</sup> driest in the past 114 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987.

The cool weather continued as most areas had average April temperatures were 1 to 3° F below normal (Figure 7). Daily average temperatures across the state hovered near 35 to 40° F from the 1<sup>st</sup> through the 13<sup>th</sup>. There was a warm-up from the 14<sup>th</sup> through the 20<sup>th</sup> after which average temperatures again reverted back to around 35° causing record low temperatures at Williston, Jamestown, Bismarck and Grand Forks. The state average air temperature was

40.0 °F which is slightly below the 1971-2000 normal of 41.7°F. The average air temperature was the 43<sup>rd</sup> coolest in the past 114 years with a maximum of 50.2 °F in 1987 and a minimum of 31.1 °F in 1907.

### May 2008

The percent of normal precipitation for eastern half of the state ranged from single digits in the south to approximately 35% in the north. The far southeastern corner had near normal precipitation. The percent of normal precipitation in the western half of the state ranged from 50% to 150% (Figure 8). The drought monitor indicated that western North Dakota had extreme drought conditions. The eastern half of North Dakota ranged from moderate drought intensity in the north to abnormally dry to no drought conditions in the south. There were many scattered showers during the first half of May. During the second half of May, most of the rain fell on the 24<sup>th</sup>, 25<sup>th</sup>, 29<sup>th</sup>, and 30<sup>th</sup>. The state average precipitation was 1.81 inches, which is below the 1971-2000 normal of 2.31 inches. The average precipitation in May ranked the 42<sup>nd</sup> driest in the past 114 years with a maximum of 5.73 inches in 1927 and a minimum of 0.31 inches in 1901.

Cool temperatures continued throughout the month of May. The departure from normal temperatures ranged from -7 in the northeast to -1 in the west (Figure 9). Grand Forks either tied or broke record low temperatures on the 4<sup>th</sup>, 5<sup>th</sup>, 21<sup>st</sup>, and the 27<sup>th</sup>. Bismarck tied for the record low temperature of 24° F on May 11<sup>th</sup>.

The statewide average air temperature was 51.4° F, which is below the 1971-2000 normal of 54.8° F. The average air temperature ranked the 37<sup>th</sup> coolest in the past 114 years with a maximum of 63.1 °F in 1977 and a minimum of 43.3 °F in 1907.

### **June 2008**

The state average precipitation was 4.22 inches which is above the 1971-2000 normal of 3.19 inches. The statewide average precipitation ranked as the 28<sup>th</sup> wettest in the last 114 years with a maximum of 7.21” in 2005 and a minimum of 1.14” in 1974. Welcomed rains fell across the state throughout the first half of June with daily record rainfall at several locations on June 11<sup>th</sup>. The second half of June saw drier conditions with intermittent showers across the state. June precipitation ranged from just under 2” in the west to as high as nearly 7” in the southeast. The percent of normal precipitation ranged from 50% in the west and isolated areas in the east central region to nearly 200% in the southeast with a couple pockets of over 200% (Figure 10).

The state average air temperature was 60.9 °F which is below on the 1971-2000 normal of 63.7 °F. The average temperature ranked as the 29<sup>th</sup> coolest in the past 114 years with a maximum of 74.2 °F in 1988 and a minimum of 56.2 °F in 1915.

The daily average temperatures for the first half of the month were below normal across the state while the second half of June’s daily temperatures were near normal (Figure 11). The average monthly air temperature ranged from 66°F in the southeast to 57°F in the northwest. The monthly departure from

normal average air temperatures ranged from -1 to -5. Therefore, even with an increase in temperatures in the second half of June, the monthly end result was below normal temperatures across the state.

NDAWN’s highest recorded daily air temperature for June was 98°F at Sidney, MT on the 30<sup>th</sup>. The lowest recorded daily air temperature was 34.9°F at Mott on the 10<sup>th</sup>.

### **July 2008**

The state average precipitation was 2.73 inches which was nearly equal to the 1971-2000 normal state average of 2.75 inches. The statewide average precipitation ranked as the 67<sup>th</sup> driest in the past 114 years with a maximum of 7.88 inches in 1993 and a minimum of 0.62 inches in 1936.

Total July rainfall ranged from just under an inch, primarily in the west, to just over 5 inches, primarily in the east. The areas of the state that received above normal precipitation were the south central and east central regions. Most of the above normal precipitation was between 100 and 150% of normal with a few areas in McIntosh, Steele, and Trail counties with 150 to 300% of normal. The remainder of the state received below normal precipitation with the lowest value of less than 50% of normal on the western edge of the state (Figure 12). According to the US Drought Monitor, a third of North Dakota including the northwest, north central, and southwest is under severe to extreme drought conditions. The majority of the remainder of the state was considered abnormally dry. The dry conditions depleted pastureland and forced some producers to harvest small

grains for hay. There were also reports of producers selling livestock because of the dry conditions.

The highest July daily rainfall total measured from NDAWN was 2.73" on the 29<sup>th</sup> at Perley MN. The highest July daily maximum wind speeds recorded from NDAWN was 62.3 mph on the 30<sup>th</sup> at Mandan. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature ranked the 61<sup>st</sup> coolest in the past 114 years with a maximum of 79.7°F in 1936 and a minimum of 61.8°F in 1992.

The average monthly air temperatures ranged from 65°F in the northeast to 70°F in the southwest. The departure from normal monthly average air temperature ranged from -4 in the northeast to 4 in the southwest. Therefore, while the southwest had above normal average air temperatures, the remainder of the state had below normal average air temperatures (Figure 13). The higher temperatures in the southwest skewed the state average air temperature to be 69.3°F which was slightly above normal.

NDAWN's highest recorded daily air temperature for July was 99°F at Dickinson on the 10<sup>th</sup>. The lowest recorded daily air temperature was 40°F at Bottineau on the 3<sup>rd</sup>.

### **August 2008**

The state average precipitation was 2.48 inches which is above the 1971-2000 normal of 2.10 inches. The average precipitation was the 36<sup>th</sup> wettest in the past 114 years with a maximum of 5.02 inches in 1900 and a minimum of 0.72 inches in 1961.

The August total rainfall in the southwest was primarily between 0.5 and 1.5 inches. Most of the rainfall totals in the central, north central, northwest and northeast part of the state were widespread falling from 2 to 7 inches. The southeast corner also varied with anywhere between 1 and 4 inches of rain. Around half or more of the state had below normal precipitation, however the state average was 2.48 inches which is above the 1971-2000 normal of 2.10 inches. The north central region generally had approximately 200% to 300% of normal precipitation (Figure 14). The US Drought Monitor classified the south-eastern 1/3<sup>rd</sup> of the state as no longer under drought conditions. McKenzie, Dunn, Golden Valley, Billings and Stark counties were classified as having extreme drought. Counties surrounding the area of extreme drought along with the counties in the northwest were classified as severe drought. The remaining western counties fell in the abnormally dry to moderate drought range

The highest daily rainfall total measured from NDAWN was 3.92" on the 11<sup>th</sup> at Wahpeton. The highest August daily maximum wind speed recorded from NDAWN was 70.5 mph on the 3<sup>rd</sup> at Plaza

The average air temperature was 68.6° F which is above the 1971-2000 normal of 67.2° F. The average air temperature ranked the 33<sup>rd</sup> warmest in the past 114 years with a maximum of 73.6 °F in 1983 and a minimum of 60.9 °F in 1977.

The average monthly air temperatures ranged from 70°F in the southwest to 65°F in the northeast. Most of the state

had above normal air temperatures with most of the state being 1 to 3 ° F above normal (Figure 15). The second half of August had record high temperatures. According to the National Weather Service (NWS) on the 19<sup>th</sup> Williston tied the record high temperature of 98°F that was set in 1992. Again on the 30<sup>th</sup> Williston tied the 1983 record high temperature of 97°F. Also on the 30<sup>th</sup>, Bismarck had a record high temperature of 100°F breaking the previous record of 97° set in 1948 and Dickinson had a record high temperature of 101°F breaking the previous record of 96° set in 1929. On the 31<sup>st</sup> Grand Forks had a record high minimum temperature of 68°F breaking the previous record of 67° set in 1953. The highest August maximum daily air temperature recorded from NDAWN was 101.8°F on the 1<sup>st</sup> at Sidney MT.

### **September 2008**

The state average precipitation was 2.58 inches which is above the 1971-2000 normal of 1.74 inches. The average precipitation was the 18<sup>th</sup> wettest in the last 114 years with a maximum of 5.00” in 1900 and a minimum of 0.28” in 1897.

The first half of September had several events of scattered rains across ND. The second half of September was drier with rain events falling on the 21<sup>st</sup> through the 24<sup>th</sup>. The eastern half of the state had greater than normal monthly precipitation with most areas between 125 and 375% of normal. The northwestern part of the state had near normal or slightly above normal monthly precipitation. The southwest part of the state had 25 to 50% of normal monthly precipitation (Figure 16). The US Drought Monitor classified the

northwest part of the state as abnormally dry and the southwest part of the state as extreme drought.

The highest September daily rainfall totals measured from NDAWN was 2.47” at Fargo on the 1<sup>st</sup>. The highest September daily maximum wind speed recorded from NDAWN was 56.6 mph at McHenry on the 22<sup>nd</sup>.

The average air temperature was 56.4°F which is about the same as the 1971-2000 normal of 56.1 °F. The average air temperature was the 64<sup>th</sup> coolest in the past 114 years with a maximum of 63.4 °F in 1897 and a minimum of 45.2 °F in 1965.

September’s average monthly temperatures ranged from approximately 65°F in the southeast to around 55°F in the northwest. For the most part, the east half of the state had 1 to 2°F above normal temperatures. The western part of the state was closer to normal. The central part of the state had a mix of near normal in the north central areas and slightly above normal in the south central areas with a few areas in the center having temperatures 1 to 2°F below normal (Figure 17). The western part of the state had scattered frost on the 24<sup>th</sup> and 29<sup>th</sup>.

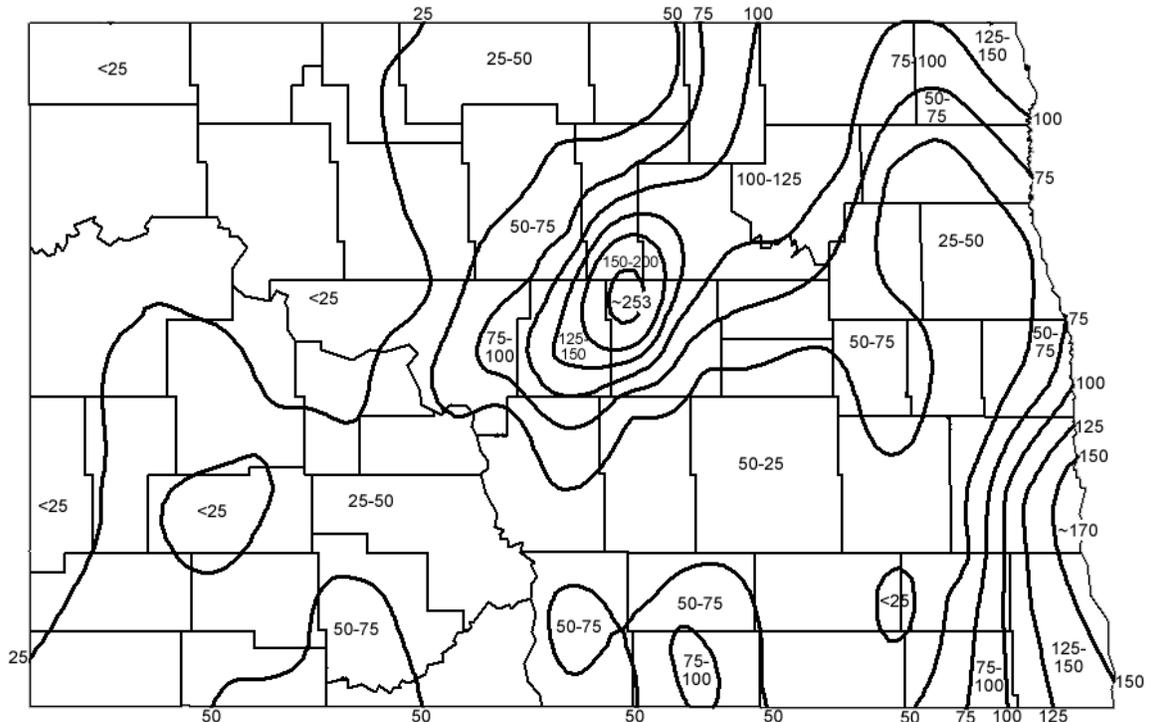


Figure 6 April 2008 Precipitation Percent of Normal (%).

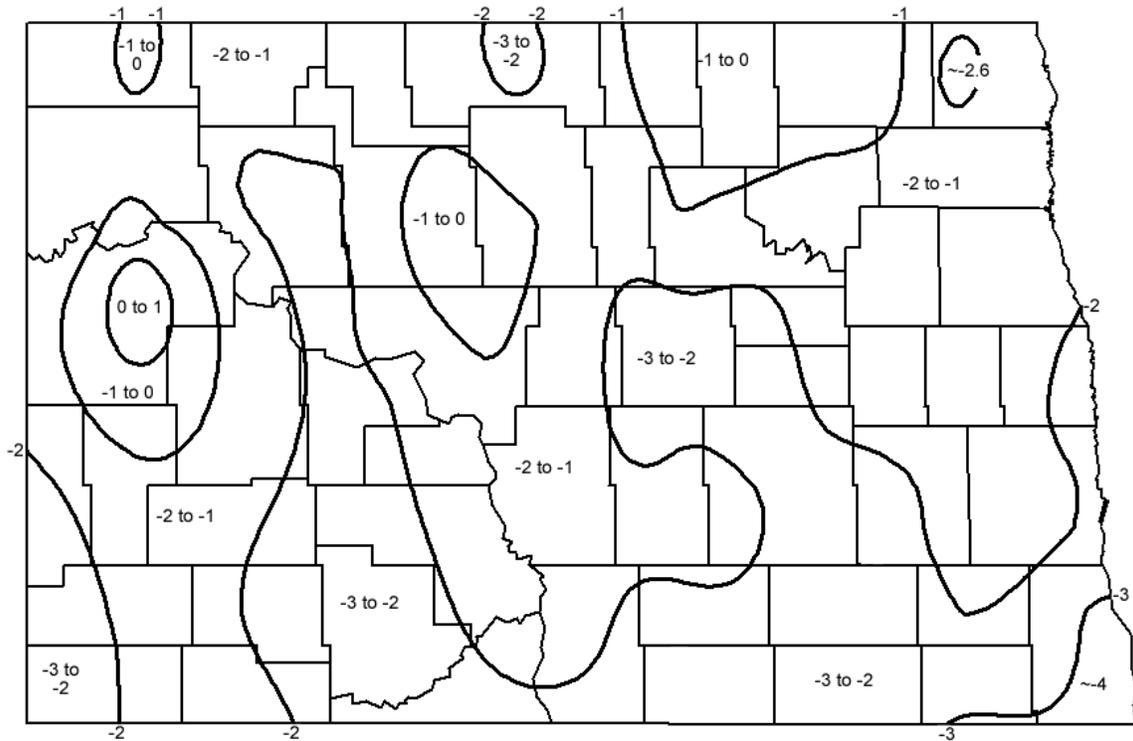
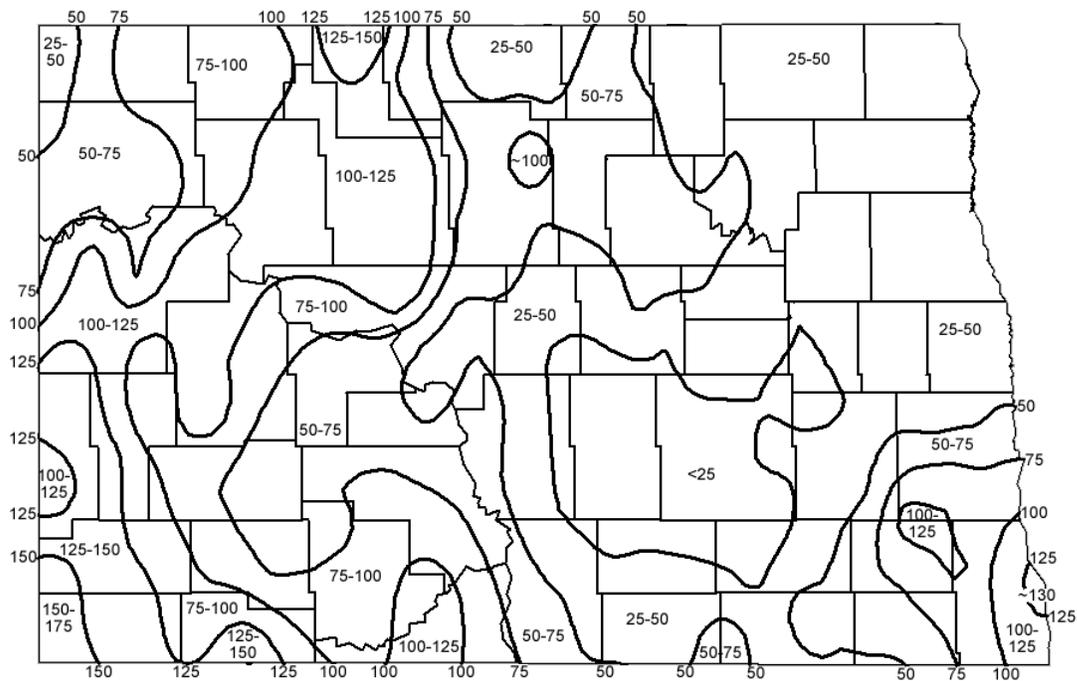
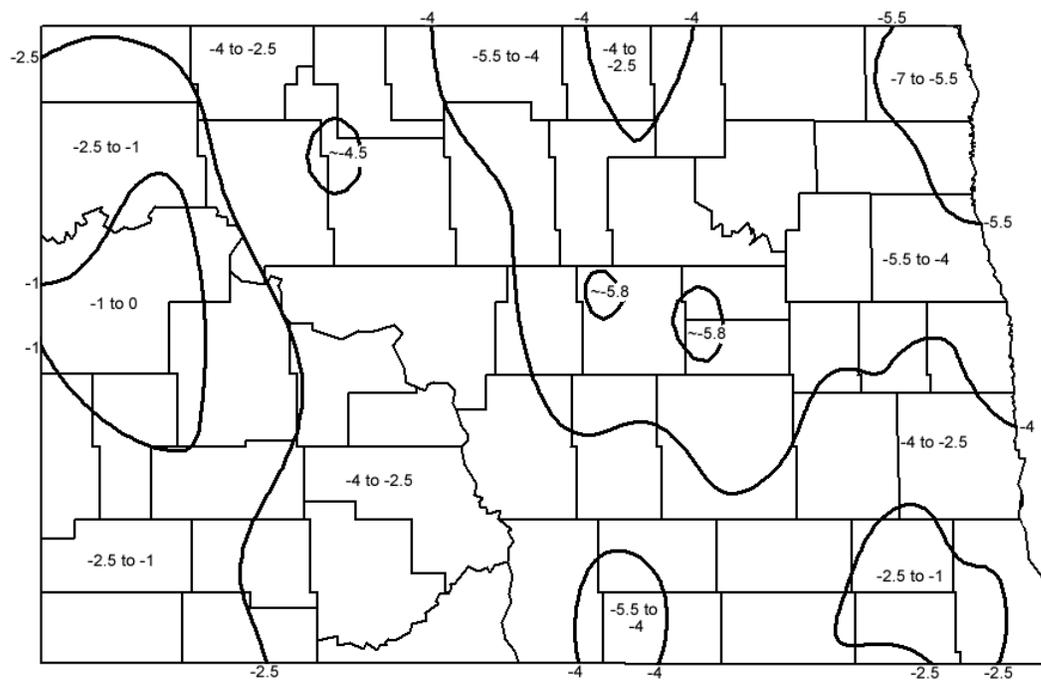


Figure 7 April 2008 Temperature Departure from Normal (°F).



**Figure 8 May 2008 Precipitation Percent of Normal (%).**



**Figure 9 May 2008 Temperature Departure from Normal (°F).**



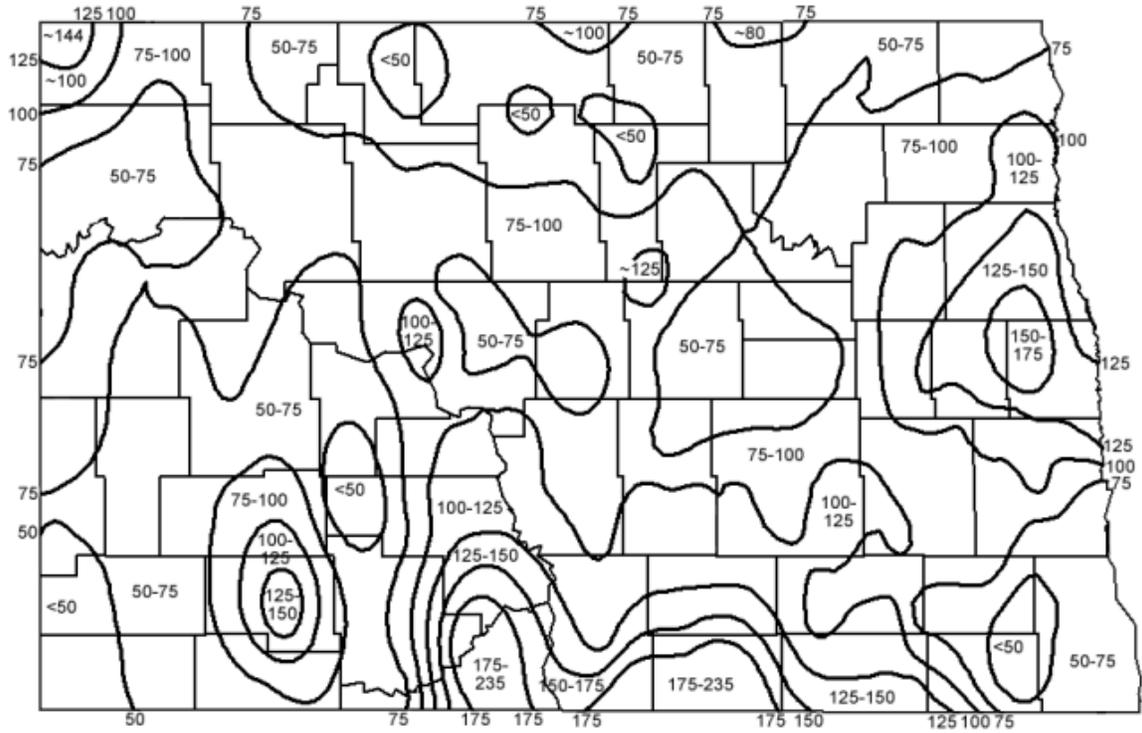


Figure 124 July 2008 Precipitation Percent of Normal (%).

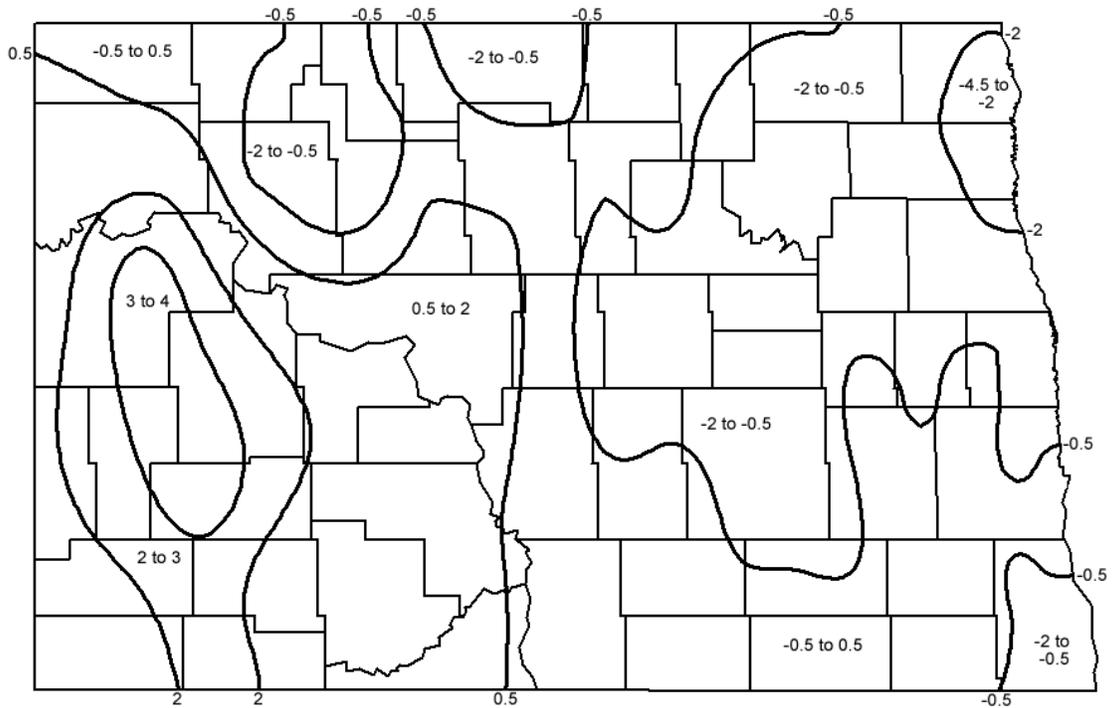


Figure 13 July 2008 Temperature Departure from Normal ( $^{\circ}$ F).

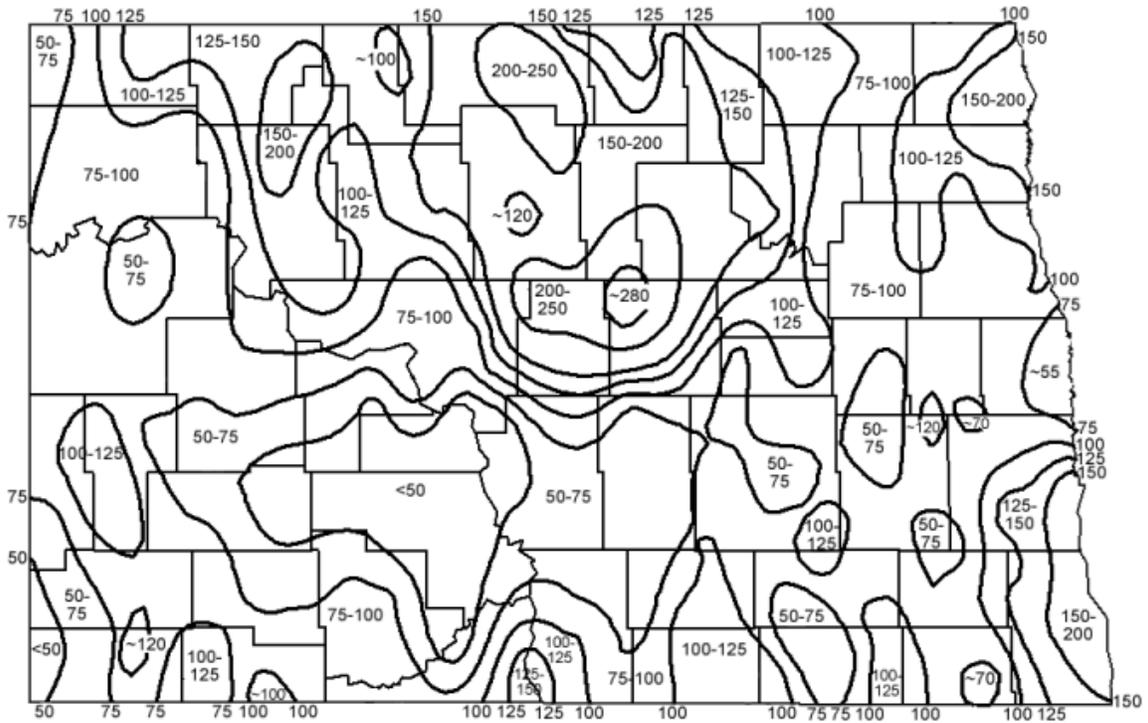


Figure 14 August 2008 Precipitation Percent of Normal (%).

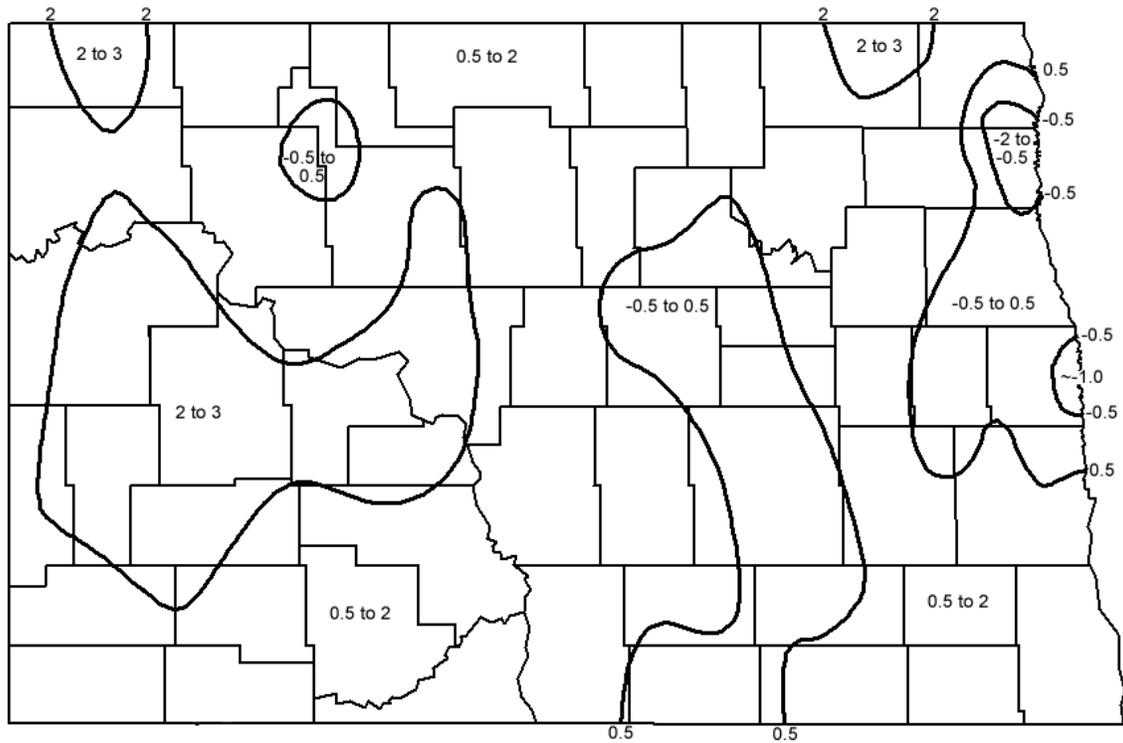


Figure 15 August 2008 Temperature Departure from Normal (°F).

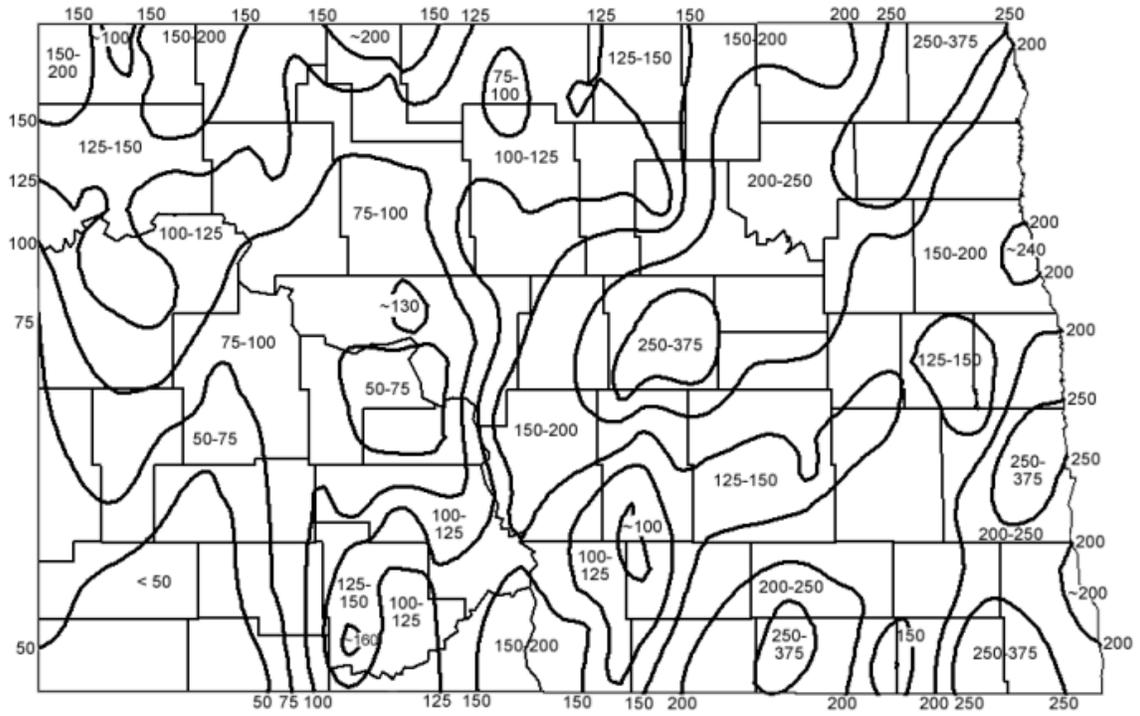


Figure 16 September 2008 Precipitation Percent of Normal (%).

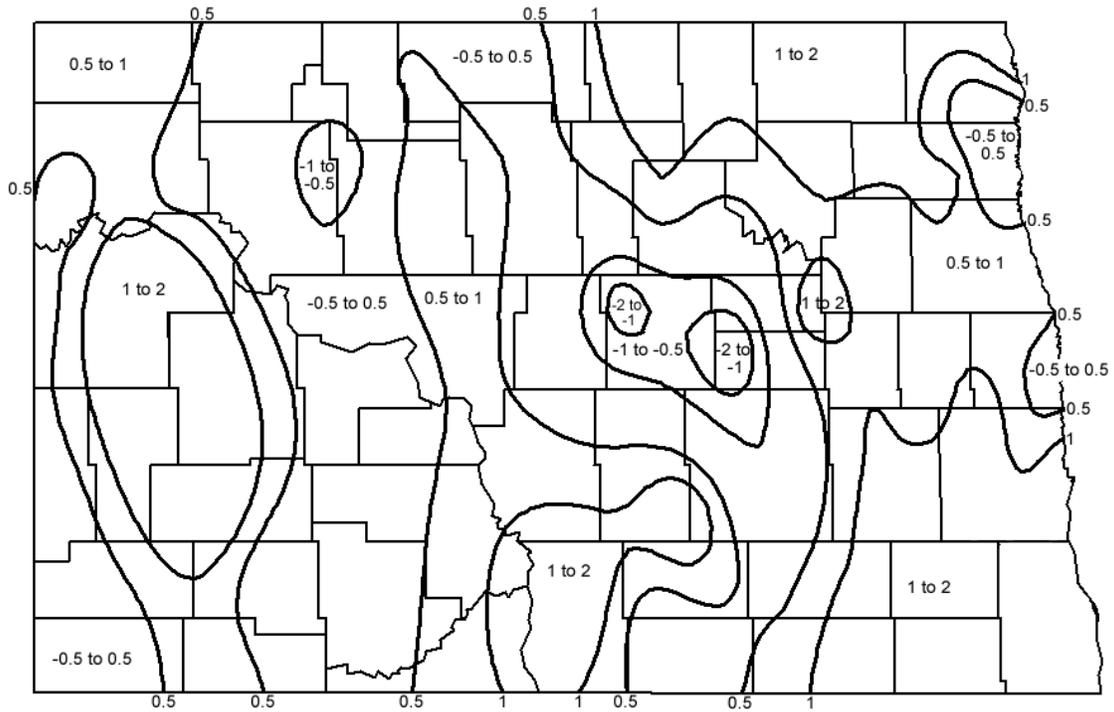


Figure 17 September 2008 Temperature Departure from Normal (°F).