

2011 Growing Season Weather Summary for North Dakota

Adnan Akyüz and Barbara A. Mullins

Department of Soil Science

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Introduction

The 2011 growing season (the period from April through September) for North Dakota can simply be characterized as “wetter” than normal compared to the 30-year average from 1981 to 2010. The state average precipitation during the 2011 growing season was 16.94” which was the 12th wettest growing season among the past 117 years since 1895. Historical records indicate that the state average precipitation values range between the lowest value of 5.62” and the highest value of 20.03” occurred in 1936 and 1941 respectively. On the average the state experienced 0.04” increase in precipitation per decade since 1895 (Figure 1).

Likewise, the state average temperature during the 2011 growing season was 58.3°F which was the 57th coolest growing season among the past 117 years (Figure 2). Even though the state average growing season temperature appears to be cooler than normal, it can be characterized by much cooler spring followed by warmer summer and much warmer fall compared to the normal values. Figure 2 shows that growing season temperature in North Dakota increased by 0.15°F per decade on the average since 1895. Historical state average growing season temperature values in North Dakota range between 62.5 and 52.7 in 1988 and 1907 respectively.

Table 1 shows temperature and precipitation rankings for select locations in ND. Table 2 summarizes the length of growing season based on the number of consecutive days between the last and first day of frost and ranking for those select locations in ND. Figures 3 and 4 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 3, numbers above 100 indicates wetter than normal, while less than 100 indicates dryer than normal conditions. In Figure 4, 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.

Table 1. April-September 2011 average temperature and precipitation rankings for select North Dakota locations.

City	Temperature Ranking	Precipitation Ranking
Bowman	25 th Warmest	6 th Wettest
Bismarck	40 th Coolest	12 th Wettest
Fargo	29 th Warmest	33 rd Wettest
Minot Exp. Station	21 st Warmest	3 rd Wettest
Cavalier	5 th Warmest	4 th Wettest
Williston Exp. Station	53 rd Coolest	11 th Wettest
North Dakota Average	57th Coolest (117 years)	12th Wettest (117 years)

Table 2. Length and the ranking of the 2011 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)	47 th Longest (Since 1915)
Bismarck	145 Days (May 9-Oct 2)	25 th Longest (Since 1875)
Fargo	145 Days (May 9-Oct 2)	33 rd Longest (Since 1881)
Minot Exp. Station	131 Days (May 9-Sep 18)	37 th Longest (Since 1905)
Cavalier	145 Days (May 9-Oct 2)	7 th Longest (Since 1934)
Williston Exp. Station	130 Days (May 10- Sep 18)	48 th Longest (Since 1894)

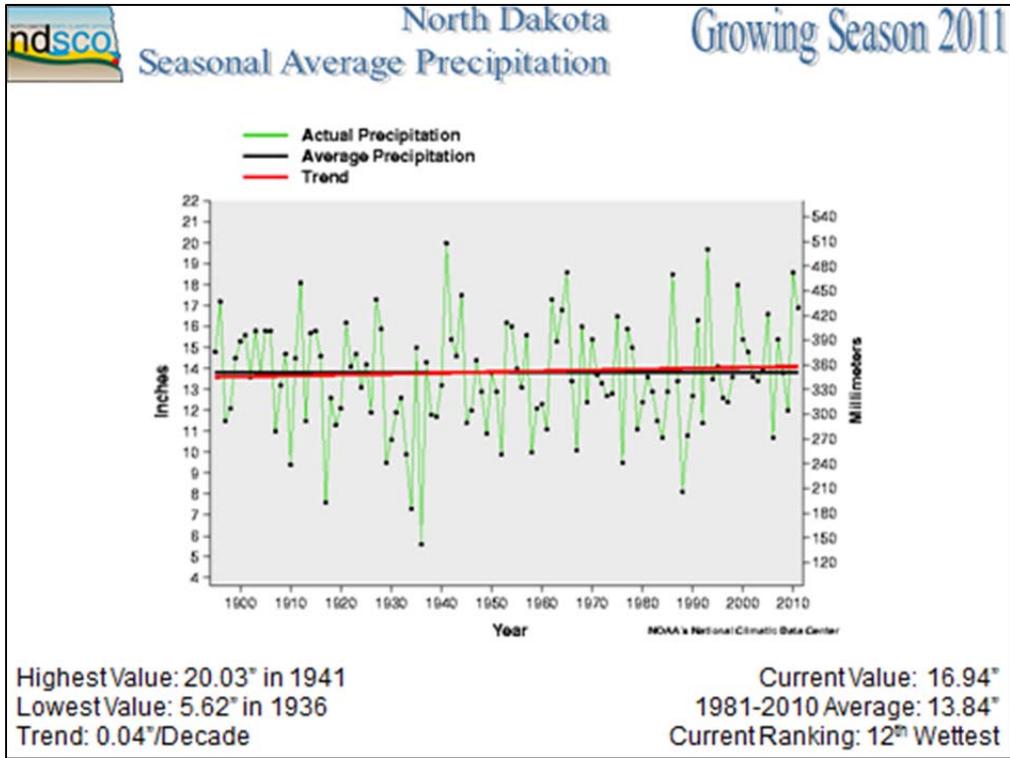


Figure 1. State Historical Growing Season Average Precipitation since 1890.

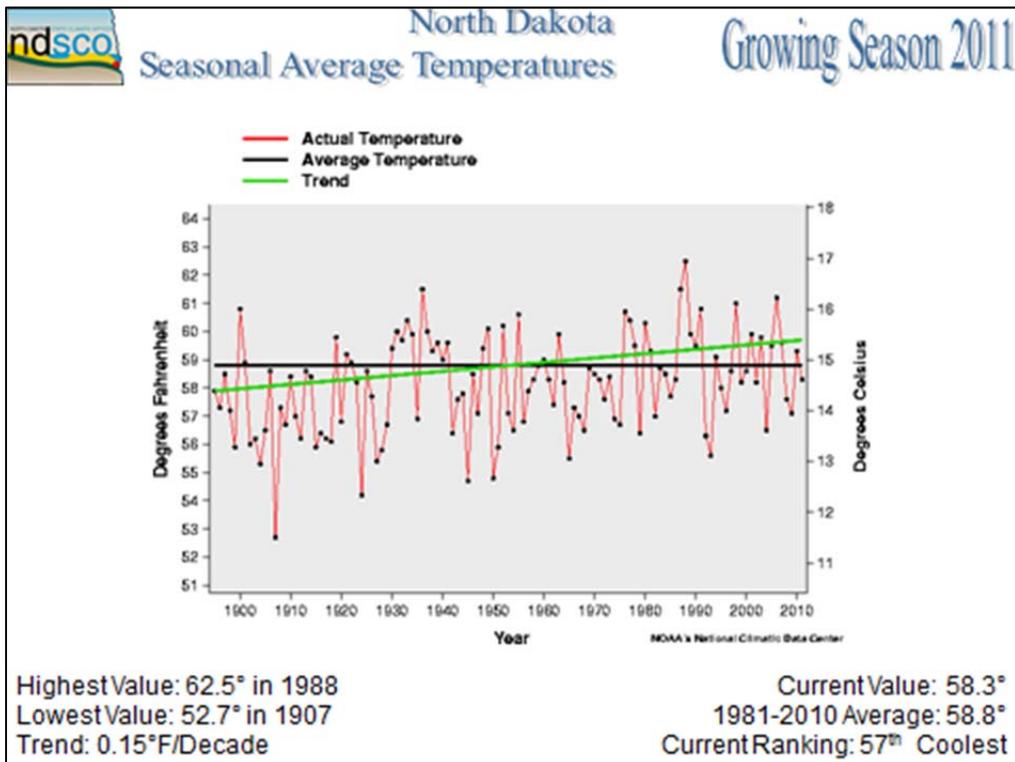


Figure 2 Figure 1 State Historical Growing Season Average Temperatures since 1890.

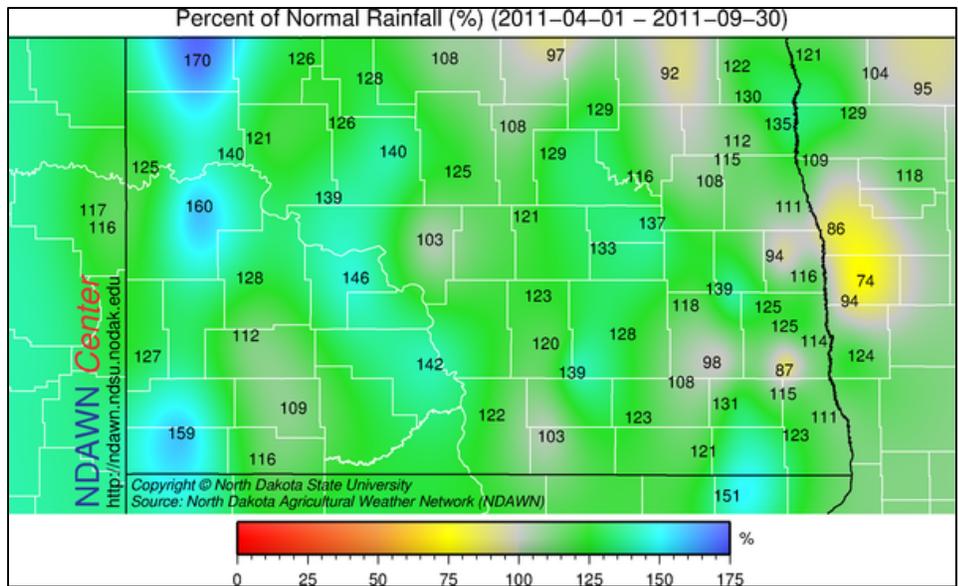


Figure 3. April through September 2011 Precipitation Percent of Normal (%) in North Dakota.

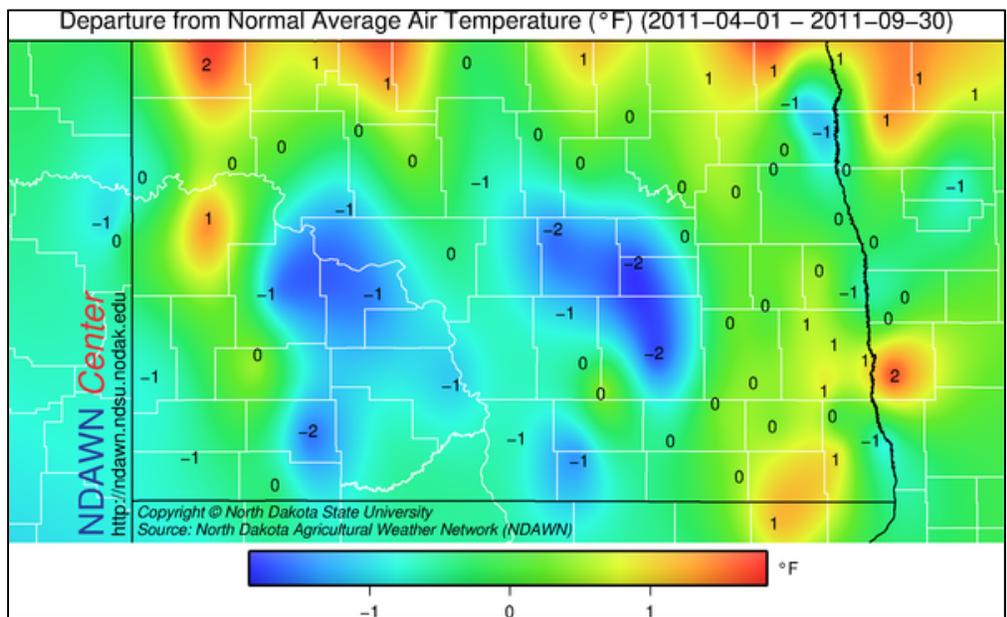


Figure 4. April through September 2011 Temperature Departure from Normal (°F) in North Dakota.

2011 Growing Season Drought Conditions:

Figure 5 shows the state's drought coverage and severity for the period from April through September. 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 until the end of the season with minor dryness entering the state in the beginning of October. Abnormally dry conditions began in southeastern and southwestern portions of the state (Figure 7) which was highly desirable conditions statewide as it allowed much of the field work done during the post growing season. The end of the 2011 growing season concluded the longest stretch of a drought free period in the state since 2000. No dryness were reported anywhere in the state for 53 consecutive weeks from 9/21/2010 through 9/27/2011. Figures 6 and 7 depict the spatial coverage of the dryness at the beginning and the end of the growing season respectively.

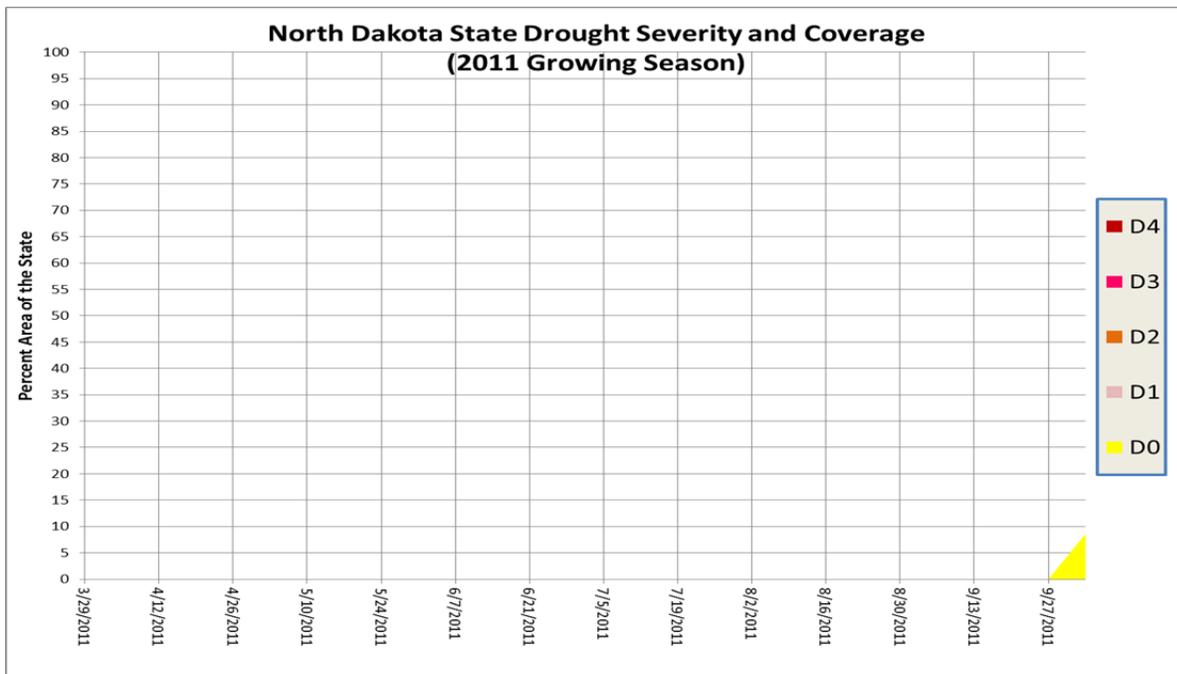


Figure 5. April through September 2011 North Dakota State Drought Severity and Coverage.

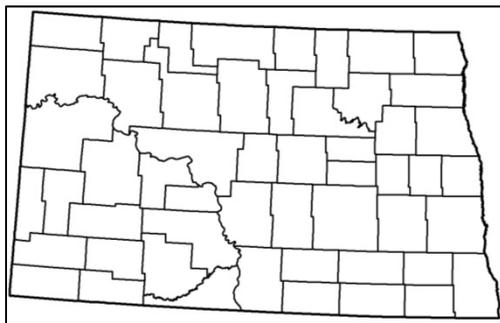


Figure 6. Drought Status (April 5, 2011)

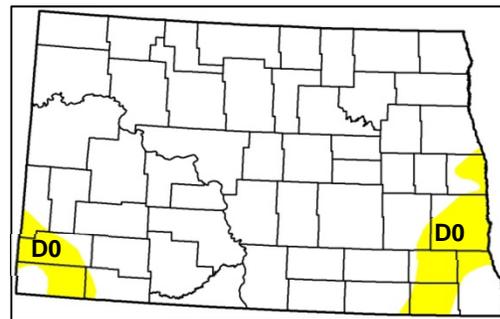


Figure 7. Drought Status (October 4, 2011)

Monthly Weather Summary:

Weather conditions during the individual months of the growing season in 2011 are discussed in detail below. Graphics associated with each text are located at the end of the monthly summaries.

April 2011

The state average precipitation was 1.8 inches which was above to the 1981-2010 normal state average of 1.23 inches. April 2011 state average precipitation ranked the 27th wettest in the past 117 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987. Precipitation ranged from approximately 50% to 300% of normal precipitation (Figure 8). The heaviest amounts of above normal precipitation fell in the southwest and eastern regions. Precipitation totals ranged primarily from 0.50 to 3.0 inches. A cool wet period continued into April. April had two scattered snow events which were from the 15th through the 16th and from the 17th through the 19th. The heaviest snow totals of 7 and up to 9 inches fell on the 15th in the central part of the state. The Red River crested at Fargo on the 9th at 38.75 ft which was the 4th highest on record. Many roads including parts of the interstate were closed due to overland flooding for much of April especially in the Red River Valley. The state average air temperature was 38.9 °F which is below the 1981-2010 normal of 42.4 °F. April 2011 state average air temperature ranked the 32nd coolest in the past 117 years with a maximum of 50.2°F in 1987 and a minimum of 31.1°F in 1907. The North Dakota Agricultural Weather Network (NDAWN) April average air temperatures ranged from 35 °F to 43 °F. NDAWN departure from normal temperatures ranged from 1 °F to -5 °F (Figure 9). April is the fifth straight month of below average air temperatures for most of the state. The average of 12/01/2010 through 04/30/2011 departure from normal average air temperature range was 2 to 7 °F below

normal. Average daily air temperatures hovered near normal for most of the state during the first half of the month. Average air temperatures dropped to 10 and 20 °F below normal across the state during the majority of the last half of the month. The wet and cool conditions prohibited field work. According to the USDA, National Agricultural Statistics Service, North Dakota Field Office the average starting date for field work is May 7th which is 16 days behind the five-year (2006-2010) average.

May 2011

The state average precipitation was 4.07 inches which is above the 1981-2010 normal of 2.53 inches. May state average precipitation ranked 12th wettest in the past 117 years with a maximum of 5.73 inches in 1927 and a minimum of 0.31 inches in 1901. Percent of normal precipitation ranged from approximately 70% to 300%. The western half of the state had the highest amounts with 200% to 300% of normal (Figure 10). Much of the eastern half ranged from 70% to 150%. The North Dakota Agricultural Weather Network (NDAWN) May rainfall totals ranged from 1.60 to 7.01 inches. The greatest daily rainfall events occurred between the 8th and 10th, 19th and 22nd, and the 27th through to the 31st. According to the USDA, National Agricultural Statistics Service, North Dakota Field office the average planting date was May 7th which was 19 days later than 2010 and 16 days later than the previous five year average (2006-2010). Cool, wet conditions continued to hamper field work throughout May. Melting snow pack and heavy rains in eastern Montana and western North Dakota caused river levels to rise above the 100-

year flood level. The residents of the flooded areas filled sand bags and built dikes to protect property and still some had to evacuate their homes on short notice. Ground water also became an issue as the water table rose and began seeping into basements.

The state average air temperature was 50.6 °F which is below the 1981-2010 normal of 54 °F. May state average air temperature ranked the 32nd coolest in the past 117 years with a maximum of 63.1 °F in 1977 and a minimum of 43.3°F in 1907. NDAWN May average air temperatures ranged from 49 °F to 55 °F. NDAWN departure from normal temperatures ranged from -1 °F to -5 °F (Figure 11). May is the sixth straight month of below average air temperatures for most of the state. Average daily air temperatures across the state hovered near 50 °F throughout most of May. According to data from the NDAWN weather monitoring network, the first 2011 day a maximum air temperature of over 80 °F was measured in North Dakota was on the 30th in the southeastern part of the state. The hot humid temperature came on the doorstep of a large scale thunder storm that produced near hurricane force winds. The Fargo Hector International Airport measured a strongest gust of 72 mph. However, it is estimated from the damage that gusts could have been 90 to 100 mph. Straight-line winds in the Fargo-Moorhead metro area ripped up trees, knocked down power poles, and caused power outages. Some who lost power did not have it restored for over a day.

June 2011

The state average precipitation was 4.51 inches which is above the 1981-2010 normal of 3.38 inches. June 2011 state average precipitation ranked 23rd wettest in the last 117 years with a maximum of 7.21 inches in 2005 and a minimum of 1.14 inches in 1974.

Percent of normal precipitation ranged from approximately 40% to 250% (Figure 12). The northwest, eastern, and southwestern corner had above normal precipitation and below normal elsewhere. The North Dakota Agricultural Weather Network (NDAWN) June rainfall totals ranged from 1.07 inches at Brorson, MT to 6.89 inches at Streeter. The first half of the month was relatively dry and warm. During the second half of the month there was a significant rain event someplace in North Dakota almost daily. Major unprecedented flooding occurred along the Souris (Mouse) river. Heavy rains in western North Dakota and neighboring Canada contributed to the flooding. Towns along the Souris River including Minot, Burlington, Sawyer, and Velva were affected. Minot being the 4th largest city in North Dakota evacuated a fourth of its population. An estimated 11,000 people were evacuated in less than 24 hours. Many homes and business were damaged or lost. At Minot the river crested on the 25th at 1561.72 feet breaking the previous record set in 1881 of 1558 feet.

The state average air temperature was 62.0 °F which is below the 1981-2010 normal of 63.4 °F. June 2011 state average air temperature ranked 50th coolest in the past 117 years with a maximum of 74.2 °F in 1988 and a minimum of 56.2 °F in 1915. NDAWN June average air temperatures ranged from 60 °F to 66 °F. NDAWN departure from normal temperatures ranged from 1 °F to -2 °F (Figure 13). The beginning of the month had a few very warm days with above normal temperatures. The 7th through the 11th were cool and below normal for most locations. The rest of the month had fairly steady near normal temperatures. The last couple days of the month were hot with temperatures in the high 80's and 90's. The minimum temperatures in east on the 29th were in the

70's. Fargo set a new record high minimum temperature of 76 °F on the 30th.

July 2011

The state average precipitation was 3.29 inches which is below the 1981-2010 normal state average of 2.88 inches. July 2011 state average precipitation ranked the 21st wettest in the past 117 years with a maximum of 7.88 inches in 1993 and a minimum of 0.62 inches in 1936. Percent of normal precipitation ranged from approximately 40% to 230% (Figure 14). Below normal precipitation fell in the northwest and southwest corners, and along the northern parts of the State. Above normal precipitation fell most elsewhere. The North Dakota Agricultural Weather Network (NDAWN) July rainfall totals ranged from 1.19 inches at Crosby to 10.14 inches at Britton SD. July had scattered thundershowers throughout the month. Most of the daily rainfall events happened during the second half of the month. Minot recorded its third wettest July since 1948 with 5.58 inches. Minot's wettest July was in 1993 with 7.39 inches. Bismarck tied the 1969 record for the fourth wettest July since 1874 with 5.24 inches. Bismarck's wettest July was in 1993 with 13.75 inches.

The state average air temperature was 70.8 °F which is above the 1981-2010 normal of 69 °F. July 2011 state average air temperature ranked the 25th warmest in the past 117 years with a maximum of 79.7 °F in 1936 and a minimum of 61.8 °F in 1992. NDAWN July average air temperatures ranged from 68 °F to 76 °F. NDAWN departure from normal temperatures ranged from 0 °F to 5 °F (Figure 15). Average daily air temperatures were near normal on most days. July's favorable temperatures and precipitation aided crop development across the state. There was a stretch of hot and humid days from the 15th through the 19th.

Maximum air temperatures across the state reached in the 80's and 90's. Minimum air temperatures on the 18th and 19th were in the upper 60's to 70's for most of the state.

Fargo's July average minimum air temperature of 63.9 °F ranked 5th warmest since 1881. Grand Fork's July average minimum air temperature of 60.6 °F ranked 6th warmest since 1890.

August 2011

The state average precipitation was 2.75 inches which is above the 1981-2010 normal of 2.1 inches. August 2011 state average precipitation ranked 23rd wettest in the past 117 years with a maximum of 5.02 inches in 1900 and a minimum of 0.72 inches in 1961. Percent of normal precipitation ranged from approximately 25% to 300% (Figure 16). Below normal precipitation fell in the northern half with above normal precipitation falling in the southern region. The High Plains Regional Climate Center (HPRCC) August rainfall totals ranged from approximately 0.50 inches to 6.00 inches. Scattered showers fell throughout the month. Multiple hail and high wind events were reported by the Storm Prediction Center (SPC) on the 5th, 12th, 15th, 22nd, 27th, and the 31st. The SPC reported one tornado on the 12th in Stutsman County. Favorable weather in August assisted harvest progress.

The state average air temperature was 68.2 °F which is above the 1981-2010 normal of 67.5 °F. August 2011 state average air temperature ranked the 37th warmest in the past 117 years with a maximum of 73.6 °F in 1983 and a minimum of 60.9 °F in 1977. NDAWN August average air temperatures ranged from 66 °F to 71 °F. NDAWN departure from normal temperatures ranged from -1 °F to 4 °F (Figure 17). Most areas had above normal daily average temperatures from the 1st through the 5th. From the 6th through the 21st most days had

average air temperatures below normal with some near normal. The 22nd and 23rd had a spike in air temperature with above normal average temperatures across the state. The remainder of the month had most places with above normal average air temperatures. By the end of August, Corn Growing Degree Days (GDD) ranged from 1960 in the SE to 1660 in the NW of North Dakota, based on May 24th planting. Generally, 300 less GDD were accumulated than the required GDD for corn to reach maturity. Under normal conditions, the additional 300 GDD could be attained on October 12th in the NW and on October 1st in the SE of North Dakota.

September 2011

The state average precipitation was 1.37 inches which is below the 1981-2010 normal of 1.71 inches. September 2011 state average precipitation ranked 52nd driest in the last 117 years with a maximum of 5.00 inches in 1900 and a minimum of 0.28 inches in 1897. September was a quiet month with many dry days which aided harvest progress. The larger rainfall events that occurred in parts of North Dakota happened on the 1st, 18th, 19th, and 20th. The rainfall event on the 20th was widespread with the higher amounts falling in the northeast. For September, the northeastern part of the state had above normal precipitation ranging from approximately 125% to 250% of normal (Figure 18). For the most part, the rest of the state had below normal precipitation of less than 50%. The northwest corner had near normal September rainfall. September precipitation amounts ranged from a trace in the southeast to ~4 inches in the northeast. For many locations it was in the top 10 driest Septembers. For example, for Fargo it was the 4th driest September since 1881.

The state average air temperature was 58.1 °F which is above the 1981-2010 normal of

56.8 °F. September 2011 state average air temperature ranked 32nd warmest in the past 117 years with a maximum of 63.4 °F in 1897 and a minimum of 45.2 °F in 1965. NDAWN September average air temperatures ranged from 55 °F to 61 °F. NDAWN departure from normal temperatures ranged from -1 °F to 7 °F (Figure 19). In the late hours of August 31st and the early hours of September 1st a severe thunderstorm that produced powerful winds swept through northeast North Dakota and hit especially hard in northwestern Minnesota in which a peak wind of 121 mph was measured. The 121 mph peak wind is under review and could possibly become the new MN state record, beating the previous record of 117 mph. The first few days of September had near normal average air temperatures for most parts of ND which was followed by a stretch from the 5th through the 11th of above normal average temperatures. The first killing frost hit on the 14th-15th. Daily minimum temperatures on the 14th fell to 28 °F in parts of the central west. Daily minimum temperatures fell to 28 °F and less primarily in the east on the 15th. Average temperatures rebounded after the 15th to near normal. The 21st-22nd again had below normal average air temperatures for most. Beginning around the 25th was a long stretch of warm, sunny days that went into October.

Conclusion of the season:

A killing frost occurred on September 18 in most of the northwestern parts of the state which ended crop development in these locations especially with favorable topographic features. However, since the planting started late in most places, crops were still in development state. Most soybeans for example were still under full canopy. Dense canopy may have provided a necessary shelter for the plant to survive the hard freeze. Most reports from the field

(such as Carrington Research Station) indicated that hard freeze did not impact the plants as much as what was expected. Therefore, some growth continued until the next hard freeze which occurred statewide on October 18 through 20. Dry conditions towards the end of growing season were welcoming for two reasons:

1. Farmers enjoyed time to finish the season with optimal field days.
2. It relieved communal anxiety about spring flooding in the Red River of the North among the community live in the Valley.

So far in fall, September and October, many locations along the Red River Valley recorded less than normal precipitation. In Fargo, for example, 1.17” of precipitation fell. It was the 9th driest 61-day period since 1881. Historically, when fall is drier than normal, chance for major flooding in the following spring diminishes. In fact, only 2 major spring floods were followed by dryer than normal falls in Fargo. They were 1965 and 1975. The river stages in Fargo during

the following spring were 30.5’ and 33.26’ respectively. The river stage of 30’ and above is considered as a major flood in Fargo. There were 55 drier than normal conditions recorded during the instrumental period since 1881.

Climate Prediction Center (CPC) predicts cooler than normal winter and spring in the coming seasons. If the forecast comes true, late planting during the start of the coming growing season should be considered. The CPC gives equal chance of having wetter or dryer than normal winter and spring seasons. However, we are still under the influence of La Niña episode. There is a 69% probability that La Niña will persist into winter and 51 % chance that it will persist into April. There is only a 5% chance for the development of El Niño conditions by April. Historically, Eastern North Dakota has a better chance of having wetter than normal winters than dryer. However, these relationships are not strong enough to make a bet.

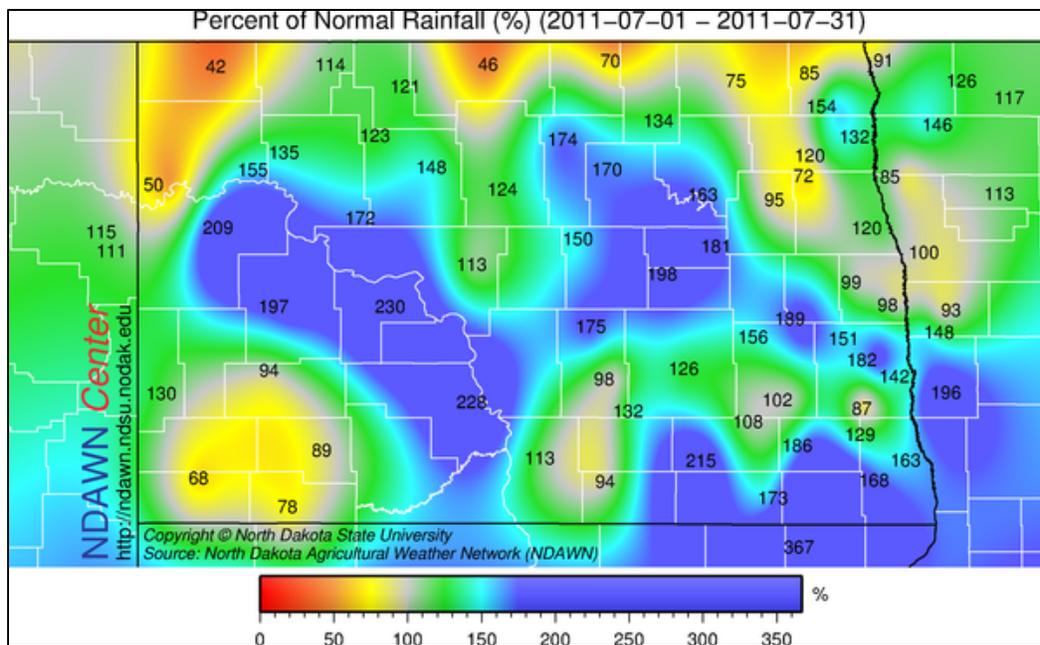


Figure 14. July 2011 Precipitation Percent of Normal (%).

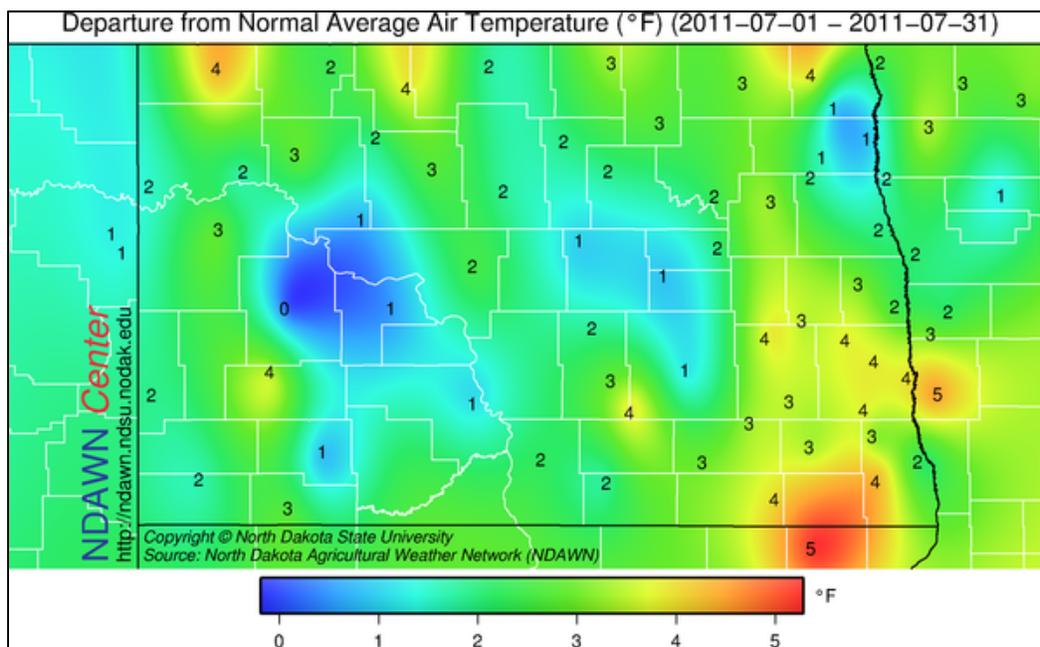


Figure 15. July 2011 Temperature Departure from Normal (°F).

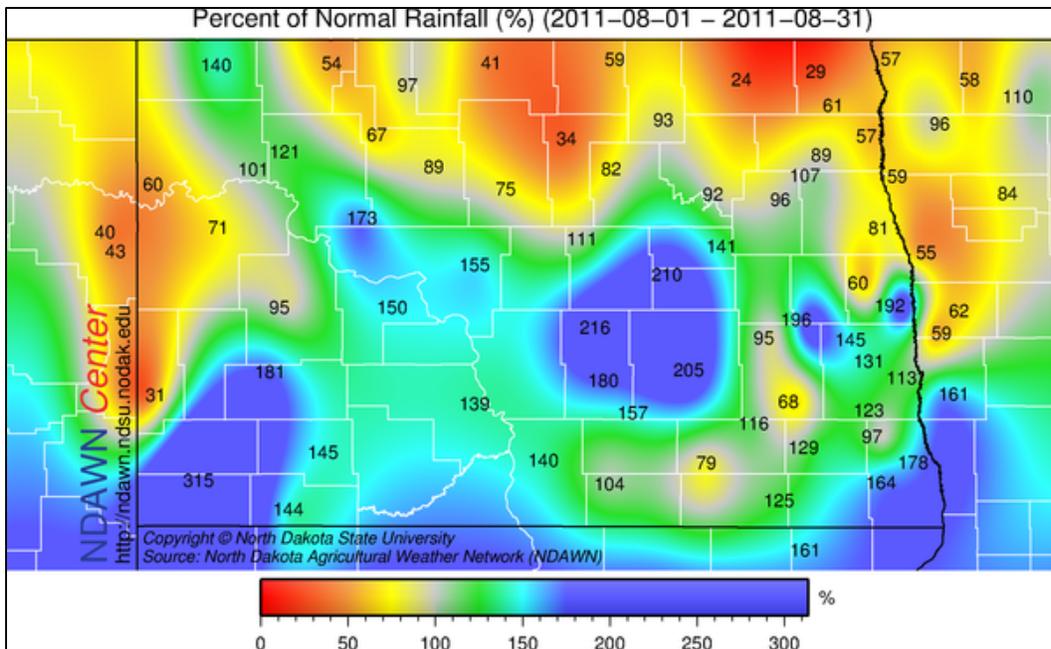


Figure 16. August 2011 Precipitation Percent of Normal (%).

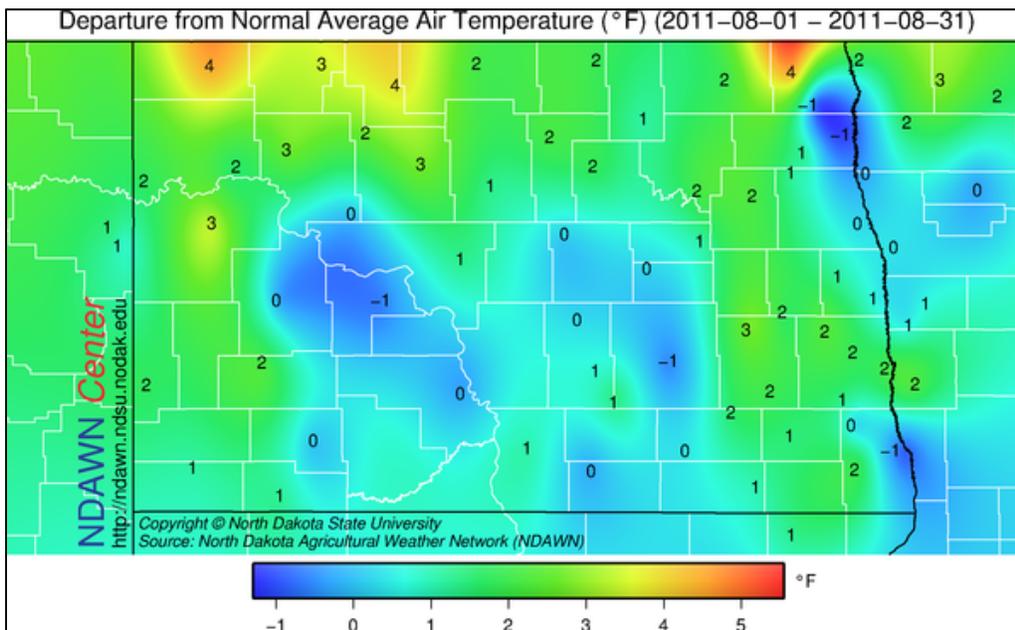


Figure 17. August 2011 Temperature Departure from Normal (°F).

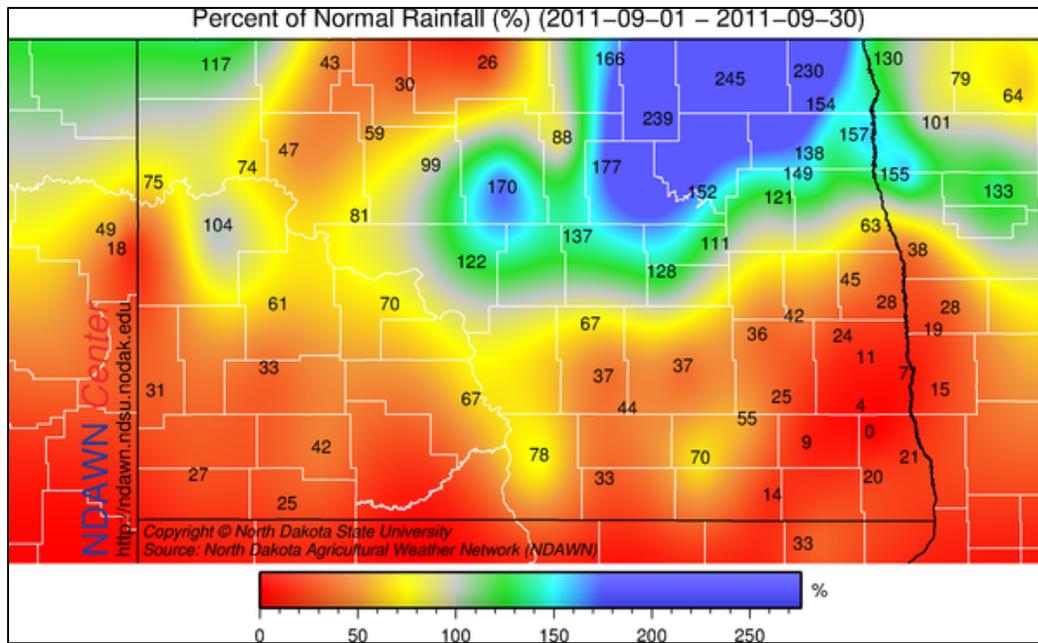


Figure 18. September 2011 Precipitation Percent of Normal (%).

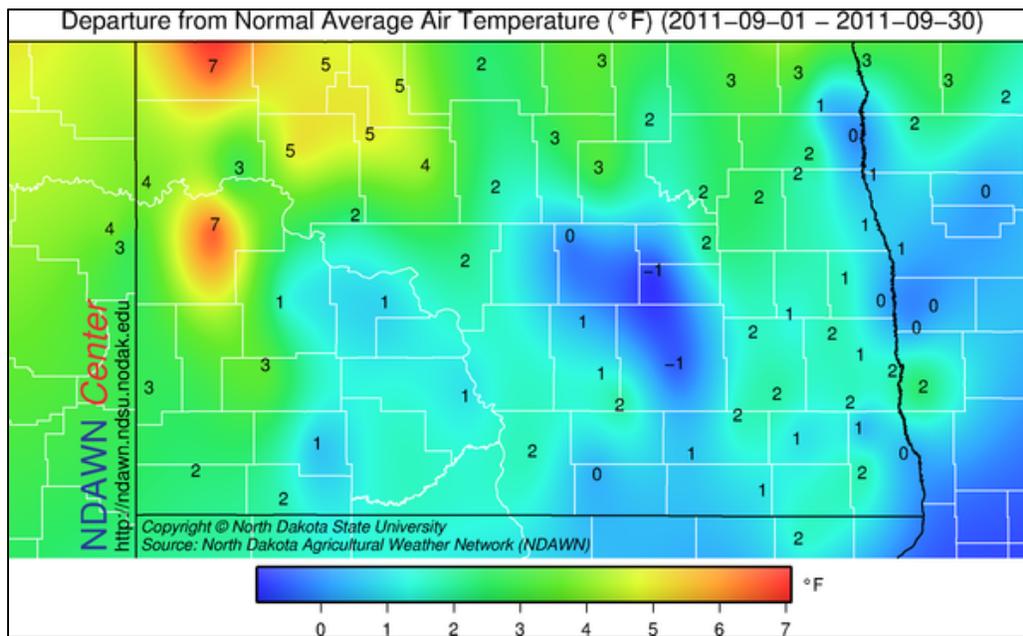


Figure 19 September 2011 Temperature Departure from Normal (°F).