

2014 Growing Season Weather Summary for North Dakota

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Introduction

The 2014 growing season (the period from April through September) in North Dakota can simply be characterized as “wet” and “cold” when compared to the 30-year average from 1981 to 2010. The state average precipitation during the 2014 growing season was 16.33 inches which was the 18th wettest growing season among the past 120 years since 1895. Historical records indicate that the state average precipitation values range between the lowest value of 5.70 inches in 1936 to the highest value of 20.03 inches in 1941. On the average the state has experienced 0.08 inch increase in precipitation per decade since 1895 (Figure 1). Compared historically, spring, summer and fall was the 42nd wettest, 8th wettest, and 28th driest respectively. The highest 24 hour precipitation during this growing season was 5.45 inches that was recorded in Taylor, ND on August 16, 2014.

The statewide average temperature during the 2014 growing season was 56.6°F which is the 41st coolest growing season on record. Historical state average growing season temperature values in North Dakota gave ranged between 62.5°F in 1988 and 53.4°F in 1907. The average growing season temperature in North Dakota increased linearly by 0.11°F per decade since 1895 (Figure 2). Compared historically, spring, summer and fall was the 39th, 34th and 39th coldest respectively. The highest temperature during this growing season was 99°F that was recorded in Williston on July 5, 2014.

Table 1 shows the temperature and precipitation rankings for select locations in North Dakota. Table 2 summarizes the length of the growing season based on the number of consecutive days between the last and first freeze (32°) and ranking for those at select locations. Figures 3 and 4 display statewide precipitation percent of normal, and temperature departure from normal conditions 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 (zero is no different than the normal). The values in the map represent the magnitude of daily average departures from normal.

Table 1. April-September 2014 Average Temperature and Precipitation Rankings for Select North Dakota Locations.

City	Temperature Ranking	Precipitation Ranking
Bowman	57.1°F (15th Coolest Period since 1915)	17.6 in (6th Wettest Period Since 1915)
Bismarck	59.7°F (63rd Coolest Period Since 1875)	11.67 in (63rd Driest Period Since 1875)
Cavalier	56.7 °F (20th Coolest Period Since 1934)	16.23 in (30st Wettest Period Since 1927)
Fargo	60.8°F (46th Warmest Period Since 1881)	17.3 in (51st Wettest Period Since 1881)
Minot Exp. Station	57.4°F (41st Coolest Period Since 1905)	18.16 in (10th wettest Period Since 1905)
Williston Exp. Station	58.9° (50th Coolest Period Since 1894)	9.02 in (34th Driest Period Since 1894)
North Dakota Average	57.6°F (41st Coldest Period Since 1895)	16.40 in (19th Wettest Period Since 1895)

Table 2. 2014 Growing Season Length Rankings for Select North Dakota Locations.

City	Length of Growing Season (Days)	Ranking
Bowman	119 (5/11- 9/12)	25 th Shortest
Bismarck	120 (5/17-9/15)	32 nd Shortest
Cavalier	139 (5/17-10/04)	16 th Longest
Fargo	144 (5/16-10/08)	35 th Longest
Minot Exp. Station	141 (5/14-10/3)	14 th Longest
Williston Exp. Station	118 (5/15-9/11)	33 rd Shortest



North Dakota Seasonal Average Precipitation

Growing Season 2014

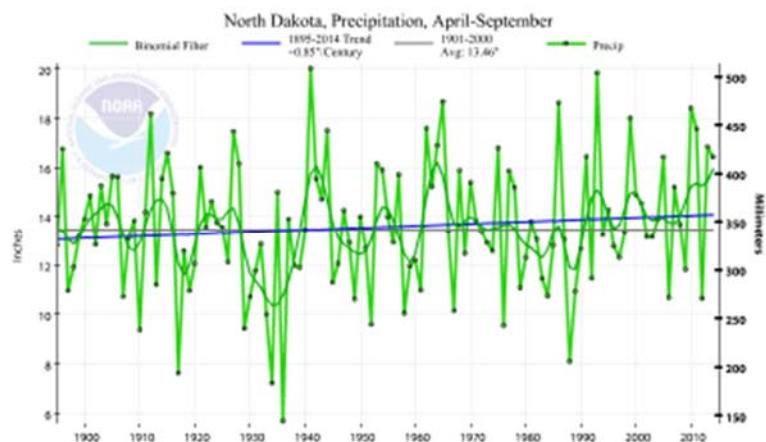


Figure 1. State Historical Growing Season Average Precipitation since 1890.



North Dakota Seasonal Average Temperatures

Growing Season 2014

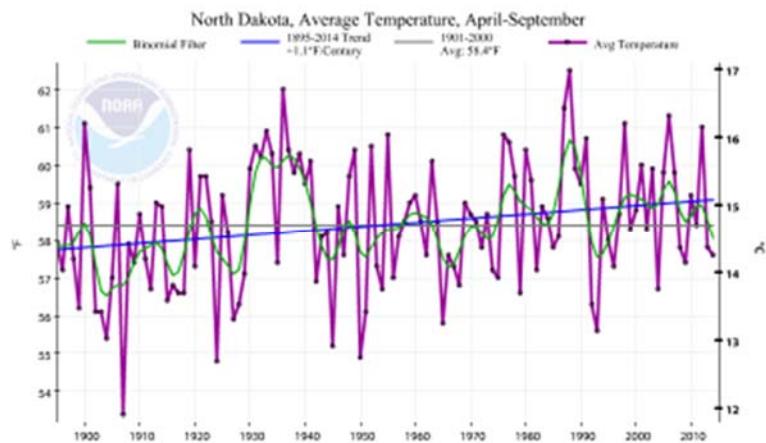


Figure 2 State Historical Growing Season Average Temperatures since 1890.

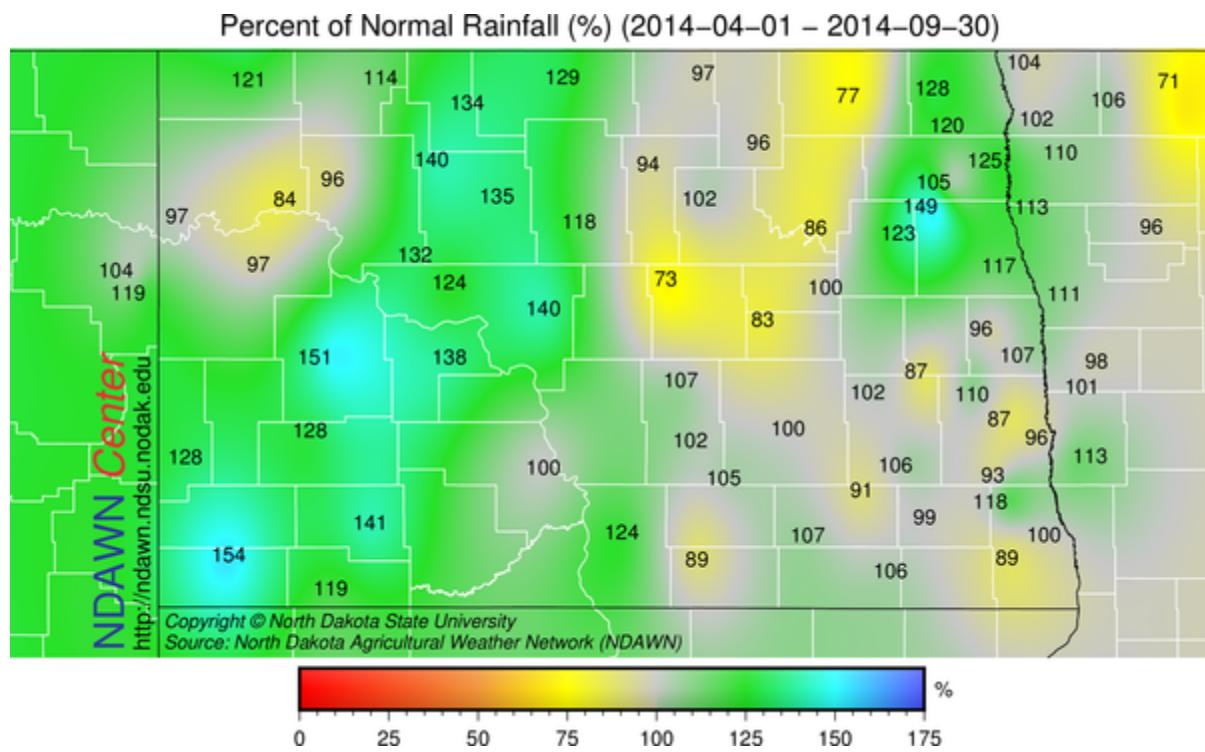


Figure 3. April through September 2014 Precipitation Percent of Normal (%) in North Dakota.

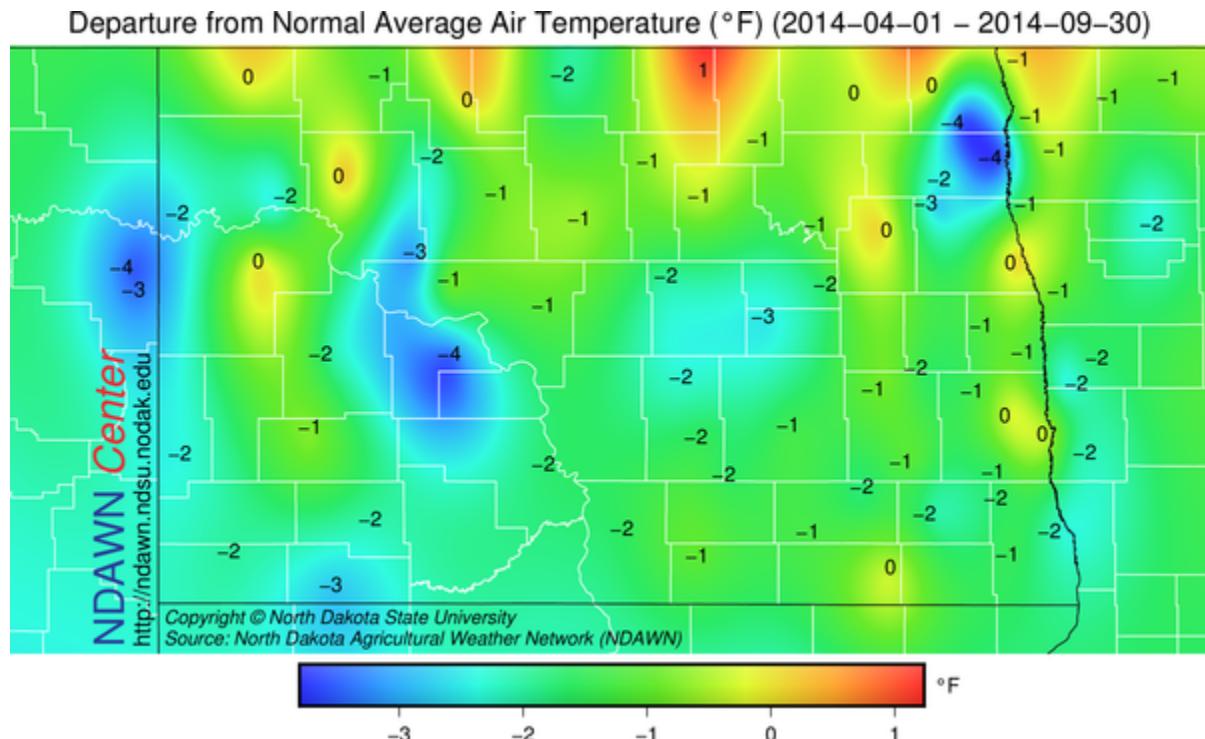


Figure 4. April through September 2014 Temperature Departure from Normal ($^{\circ}\text{F}$) in North Dakota.

2014 Growing Season Drought Conditions:

North Dakota drought coverage and severity for the period from April through September is presented in Figure 5. The vertical axis is the accumulated coverage and the horizontal axis is the time. The intensity scale is labeled from D0 through D3. D0, D1, D2 and D3 represent “Abnormally Dry”, “Moderate Drought”, “Severe Drought” and Extreme Drought” conditions respectively. The figure below indicated that no parts of the state was under any types of drought. However, at the beginning of the growing season, only 4 counties in the north-eastern parts for the state was experiencing abnormally dry conditions that was left over from the previous season (Figure 6). There was another period of abnormally dry conditions that affected a very small area along the South Dakota border and a small area in the east central ND in August lasting only 3 weeks. A much wetter than normal summer followed by a wetter than normal spring discouraged any dryness intrusion during the 2014 growing season.

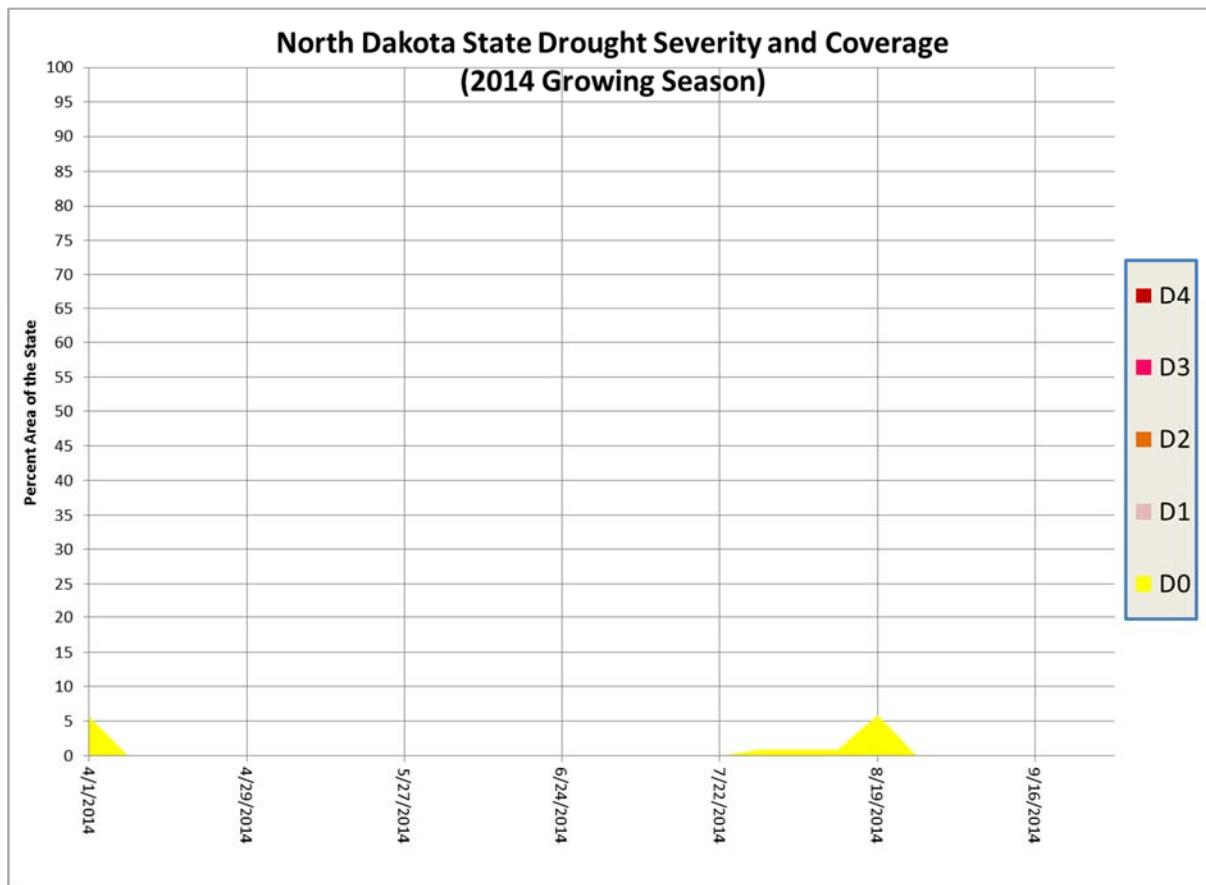


Figure 5. April through September 2014 North Dakota State Drought Severity and Coverage.

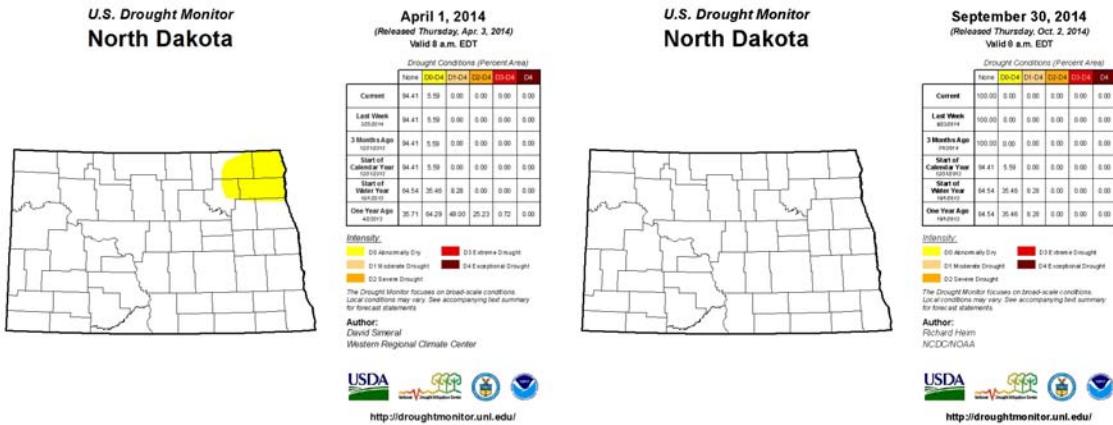


Figure 6. Drought Coverage and Intensity Comparison between the beginning and the end of the 2014 Growing Season.

Monthly Weather Summary:

Weather summaries for the individual months of the 2014 growing season, taken from the North Dakota State Climate Office quarterly bulletins, are presented below. The graphics associated with each month are located at the end of the monthly summaries.

April 2014

The state average precipitation was 2.09 inches which is above the 1981-2010 normal state average of 1.22 inches. April 2014 state average precipitation ranked the 20th wettest in the past 120 years with a maximum of 3.71 inches in 1986 and a minimum of 0.11 inches in 1987 (Figure 7).

The most notable precipitation event during the month was a large slow moving storm that impacted much of the central part of the United States in late April. In North Dakota, although some snowfall was recorded in the western part of the state that storm system was principally a rain maker. The storm came with many waves of rainfall and by the time that area of low pressure moved out of the area all of the NDAWN stations recorded over one inch of rain. The highest totals were in southeastern North Dakota where some locations recorded over three inches of rain.

The excessive rain recorded in southeastern North Dakota attributed to quick rises for streams and rivers, especially in the southern Red River Valley. The Wild Rice at Abercrombie, North Dakota rose to 17.14 feet, just shy of the 18 foot major flood stage for that location. The Red River gauge at Wahpeton, North Dakota rose to 12.5 feet, not too far from the 13 foot moderate stage. In Fargo, the Red River rose into the moderate flood stage with a crest near 26.7 feet on May 2. Although the heaviest rain was near the headwaters of the Red River, even locations far removed from the heaviest rain recorded notable river rises. As an example, the Red River at East Grand Forks rose into the minor flood stage and Pembina, North Dakota, along the Canadian border, the Red River gauge crested near flood stage.

The National Weather Service (NWS) reported record rainfall of 0.68 inches at the Grand Forks Airport on the 23rd, a record 0.84 inches at Jamestown on the 28th, and a

record 1.30 inches at the Grand Forks Airport on the 28th.

The US Drought Monitor May 13, 2014 report had no drought conditions listed for the state (<http://droughtmonitor.unl.edu/>). The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 1% short, 66% adequate, and 33% surplus with a subsoil moisture reported as 0% very short, 1% short, 78% adequate, and 21% surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 19).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for April had 0 reports of high wind, 0 hail reports, and 0 reported tornadoes. The top five April daily maximum wind speeds recorded from NDAWN were 54.8 mph on the 23rd at Linton, 54.4 mph on the 27th at Britton, SD, 53.7 mph on the 26th at Britton, SD, 53.7 mph on the 19th at Leonard and 53.3 mph on the 9th at Hettinger. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 38.0 °F which is below the 1981-2010 normal of 42.4 °F (Figure 8). April 2014 state average air temperature ranked the 25th coolest in the past 120 years with a maximum of 50.2 °F in 1987 and a minimum of 31.2 °F in 2013. With the exception of a brief warm periods on April 9 and then a couple of days around April 20, the month was persistently below average which led to almost no spring planting occurring during the month. The National Weather Service (NWS) reported breaking low temperature records on the 15th at Grand Forks NWS and Fargo with 11 °F, and 12 °F, respectively.

NDAWN's highest recorded daily air temperature for April was 81.0 °F at Ekre on the 9th. The lowest recorded daily air temperature was -11.7°F at Greenbush, MN on the 2nd.

May 2014

The state average precipitation was 2.30 inches which is below to the 1981-2010 normal of 2.53 inches (Figure 9). May 2014 state average precipitation ranked 64th driest in the past 120 years with a maximum of 5.96 inches in 1927 and a minimum of 0.23 inches in 1905. The National Weather Service (NWS) reported record rainfall of 2.67 inches at the Dickinson Airport on the 25th and another record at the Dickinson Airport on the 26th with 1.61 inches being recorded.

The US Drought Monitor June 3, 2014 report had no drought conditions listed for the state (<http://droughtmonitor.unl.edu/>). The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 5% short, 68% adequate, and 27% surplus with a subsoil moisture reported as 0% very short, 2% short, 77% adequate, and 22% surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 23).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for May had 2 reports of high wind, 14 hail reports, and 1 reported tornado. That tornado caused extensive damage to a "man camp" just south of Watford City on May 26. It was rated an EF-2, destroyed 13 trailers and damaging two others. At least nine individuals were injured, one critically. The top five May daily maximum wind speeds recorded from NDAWN were from Berthold on the 28th with 52.3 mph, Ada on the 30th with 47.6 mph, Watford City on the

29th with 46.2 mph, Berthold on the 29th with 45.8 mph and Dunn on the 26th with 45.1 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 53.5 °F which is near the 1981-2010 average of 54.1°F (Figure 10). May 2014 state average air temperature ranked the 54th warmest in the past 120 years with a maximum of 64.5°F in 1934 and a minimum of 44.4 °F in 1907.

The month of May was dominated by two separate air masses. The first 15 days of the month, most NDAWN sites recorded temperatures five to seven degrees below average. The second half of the month, most NDAWN sites recorded temperatures of five to seven degrees above average, meaning, in the end, the month finish near the current 30 year average.

The cool air during the first part of May was a continuation of a prolong period of colder than average temperatures that began in October 2013. The combination of a cool astronomical autumn and the lack of truly warm conditions not being observed until the second half of May meant that there was an extended period from the last 80° high temperature of 2013 and the first 80° reading in 2014.

Fargo recorded 238 straight days with a high temperature below 80° which ranked as the 12th longest such period since 1891. Bismarck recorded 242 days in a row without an 80° temperature which ranked as the 11th longest such streak since 1874 and the residents of Williston had to wait even longer with 247 days without an 80° temperature being observed. That was the 4th longest such periods since 1894. Other cities with extended periods between 80° days included Grand Forks that recorded

240 consecutive below 80° days which was the 9th longest such period on record and the Minot Experiment Station with 247 days between 80° days which ranked 6th on record.

The National Weather Service (NWS) reported two record lows and one record high in May. The Bismarck Airport recorded a record low of 24°F on May 15. The Dickinson Airport tied a record low on May 15. The Fargo Airport tied a record high temperature of 90 °F on the 24th.

NDAWN's highest recorded daily air temperature for May was 94.4 °F at Prosper, ND on the 30th. The lowest recorded daily air temperature was 20.0 °F at Hazen, ND, on the 15th.

June 2014

The state average precipitation was 4.73 inches which is above the 1981-2010 normal of 3.34 inches (Figure 11). June 2014 state average precipitation ranked as the 19th wettest in the last 120 years with a maximum of 7.01 inches in 2005 and a minimum of 1.11 inches in 1974.

The US Drought Monitor July 1, 2014 report had no drought conditions reported for North Dakota.

(<http://droughtmonitor.unl.edu/>)

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 2% short, 64% adequate, and 34% surplus with a subsoil moisture reported as 0% very short, 1% short, 69% adequate, and 30% surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 26).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for June had 15 reports of high wind, 27 hail reports, and 9 reported tornadoes.

The top five June daily maximum wind speeds recorded from NDAWN were Baker with 55.5 mph, Michigan with 54.8 mph, Turtle Lake with 50.5 mph, Minot with 49.8 mph and Oakes with 49.0 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 62.5 °F which is below the 1981-2010 normal of 63.3 °F (Figure 12). June 2014 state average air temperature was the 58th coolest in the past 120 years with a maximum of 74.1 °F in 1988 and a minimum of 56.8 °F in 1915. NDAWN's highest recorded daily air temperature for June was 91.5 °F at Britton, SD on the 21st. The lowest recorded daily air temperature was 35.1 °F at Plaza, ND, on the 12th.

July 2014

The state average precipitation was 1.56 inches which is below the 1981-2010 normal state average of 2.87 inches (Figure 13). July 2014 state average precipitation ranked the 16th driest in the past 120 years with a maximum of 3.86 inches in 1958 and a minimum of 1.79 inches in 1930.

The National Weather Service (NWS) reported record rainfall of 2.79 inches at the Grand Forks Airport on the 21st, and a record rainfall of 2.71 at the National Weather Service office (UND) of 2.71 on the 21st as well.

The US Drought Monitor July 29, 2014 reported less than 1% of North Dakota in Abnormally Dry Conditions (D0) with no areas in Moderate or above drought conditions. (<http://droughtmonitor.unl.edu/>). The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 1% very short, 11% short, 75% adequate, and 13% surplus with a subsoil moisture reported as 1% very

short, 6% short, 79% adequate, and 14% surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 30).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for July had 71 reports of high wind, 44 hail reports, and 5 reported tornadoes. The top five April daily maximum wind speeds recorded from NDAWN were 54.8 mph on the 23rd at Linton, 54.4 mph on the 27th at Britton, SD, 53.7 mph on the 26th at Britton, SD, 53.7 mph on the 19th at Leonard and 53.3 mph on the 9th at Hettinger. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 66.8 °F which is below the 1981-2010 normal of 69.1 °F (Figure 14). July 2014 state average air temperature ranked the 25th coolest in the past 120 years with a maximum of 80.1 °F in 1936 and a minimum of 61.8 °F in 1992.

The National Weather Service (NWS) reported a record daily low maximum temperature of 68 degrees at Jamestown. That tied the old record of 68 degrees set in 1937.

NDAWN's highest recorded daily air temperature for April was 96.0 °F at Marion, ND on the 5th. The lowest recorded daily air temperature was 38 °F at Hazen, ND on the 2nd.

August 2014

The state average precipitation was 4.32 inches which is well above the 1981-2010 normal of 2.12 inches (Figure 15). August 2014 state average precipitation ranked as the 4th wettest with 120 years of records with a maximum of 5.96 inches in 1927 and a minimum of 0.23 inches in 1905. The

National Weather Service (NWS) reported record rainfall of 1.15 inches at the Grand Forks Int'l Airport and 1.83 inches at the National Weather Service (UND) in Grand Forks on August 3 with the previous record being 0.98 inches in 1981 for the Grand Forks Airport and for the UND site the old record was 1.48 inches also previously set in 1981. The Dickinson airport recorded a record daily rainfall on August 3 with 0.42 inches being recorded. That broke the previous record of 0.38 inches set in 2013. The Dickinson airport set a daily maximum rainfall record on August 4 with 1.28 inches being recorded. This surpassed the previous record of 0.59 inches set in 1981. The Dickinson Airport set a new daily rainfall record of 1.85 inches on August 15, the previous record was 0.87 inches in 1981. With several daily rainfall records being broken at the Dickinson Airport, it is no surprise that the Dickinson airport recorded a total of 6.79 inches of rain in August which smashed the previous August month record precipitation of 5.55 inches set in 1954.

The US Drought Monitor August 26, 2014 report had no drought conditions listed for the state (<http://droughtmonitor.unl.edu/>). The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 4% short, 76% adequate, and 20% surplus with a subsoil moisture reported as 0% very short, 4% short, 82% adequate, and 14% surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 35).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for August had 9 reports of high wind, 8 hail reports, and No reported tornadoes.

The top five August daily maximum wind speeds recorded from NDAWN were from Mott on the 20th with 48.0 mph, McHenry on the 17th with 47.6 mph, Linton on the 17th with 39.7 mph, Dazey on the 18th with 39.6 mph and Jamestown on the 16th with 37.2 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 67.0 °F which is slightly below the 1981-2010 average of 67.6 °F (Figure 16). That would place August 2014 state average as the 59th warmest in the past 120 years with a maximum of 73.8 °F in 1983 and a minimum of 61.2 °F in 1977. NDAWN's highest recorded daily air temperature for August was 95.5 °F at Sidney, MT on the 12th. The lowest recorded daily air temperature was 38.4 °F at Harvey, ND, on the 30th.

September 2014

The state average precipitation was 1.20 inches which is below the 1981-2010 normal of 1.71 inches (Figure 17). September 2014 state average precipitation ranked as the 50th driest in the last 120 years with a maximum of 4.68 inches in 1941 and a minimum of 0.20 inches in 2012. The National Weather Service (NWS) reported record rainfall of 1.13 inches in Jamestown on the 4th, and a record rainfall of 0.89 inches in Williston on the 30th.

The US Drought Monitor September 30, 2014 report had no drought conditions reported for North Dakota.

(<http://droughtmonitor.unl.edu/>)

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 5% short, 84% adequate, and 10% surplus with a subsoil moisture reported as 0% very short, 5% short, 85% adequate, and 10%

surplus. (Weekly Weather and Crop Bulletin Vol. 101, No. 39).

According to the preliminary reports of the Storm Prediction Center (SPC), severe weather reports for September had 18 reports of high wind, 35 hail reports, and 2 reported tornadoes. The first tornado tracked for a mile in NW Skandia Township in Barnes County on September 3. The second one tracked intermittently around SW of Kindred, in Cass County on the same day approximately 30 minutes after the first tornado.

The top five September daily maximum wind speeds recorded from NDAWN were Greenbush, MN with 93.1 mph (side swiped by a tornado), Hofflund with 56.9 mph, Perley, MN with 54.0 mph, Humboldt, MN with 52.6 mph and Turtle Lake with 49.4 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 57.7 °F which is above the 1981-2010 normal of 56.9 °F (Figure 18). September 2014 state average air temperature was the 43rd warmest in the past 120 years with a maximum of 63.5 °F in 1897 and a minimum of 45.5 °F in 1965. NDAWN's highest recorded daily air temperature for September was 97.6 °F at Williston on the 25th. The lowest recorded daily air temperature was 25.5 °F at Bowman, on the 12th. An early hard freeze on September 12 brought the growing season to an end in

many locations in the western parts of the state. The National Weather Service (NWS) reported numerous record high temperatures with the very warm temperatures across North Dakota in late September.

Conclusion of the 2014 Growing Season:
An early season frost in the middle of September (14-16) ended the growing season in several parts of the state. A statewide hard freeze occurred on October 3 and again on October 4 that ended the growing season for the rest of the state. Temperatures fell to low 20s in the western half of the state while they dipped down to high 20s in the eastern half of the state on those days. By October 6th, the North Dakota Ag Statistical Services (NDASS) were reporting behind normal progress reports in almost all North Dakota crops. For example, corn was 57% mature which was behind 69% normal. Sugarbeet however, was the only crop that was ahead of the normal progress according to the NDASS. Even though the growing season was consistently cool and wet, dryer and warmer than normal conditions in October was a welcoming stage for much needed field progress. By the end of the growing season, accumulated corn growing degree days ranged from 1600 DD in the north-central ND to 2200 DD in the southwest ND. Demand for mechanical drying process for the grain created statewide propane shortages.

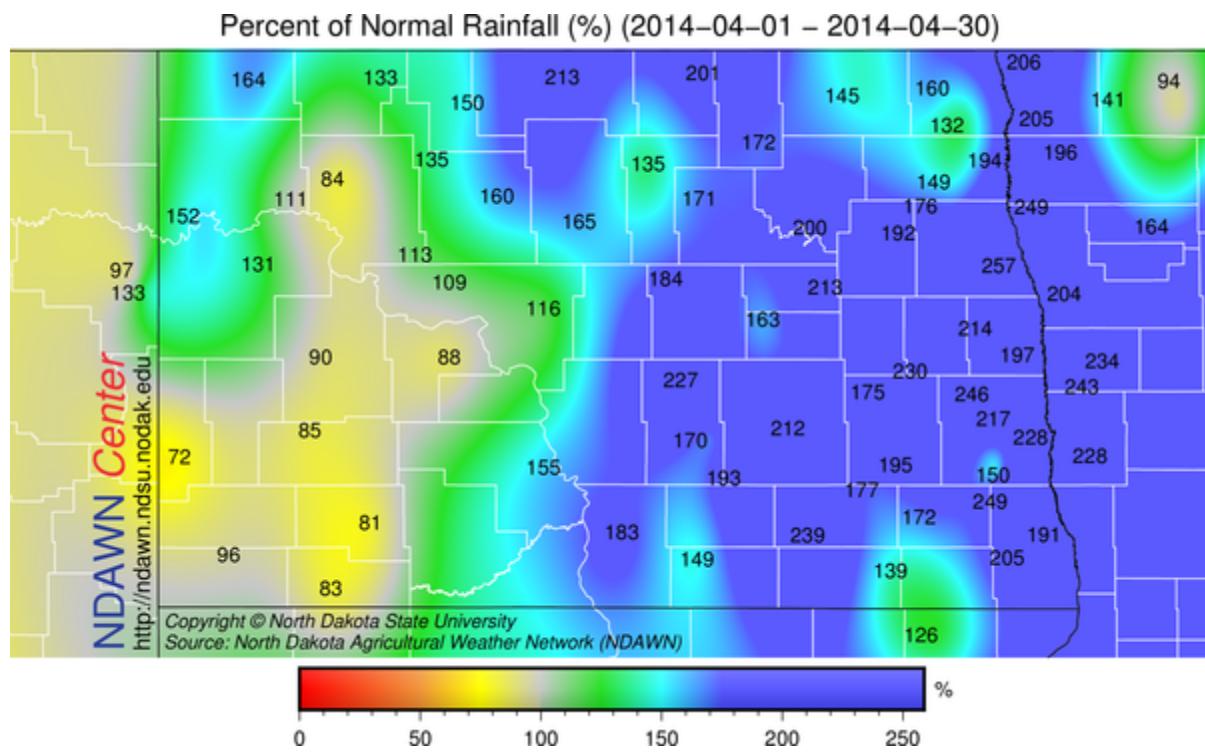


Figure 7. April 2014 Precipitation Percent of Normal (%).

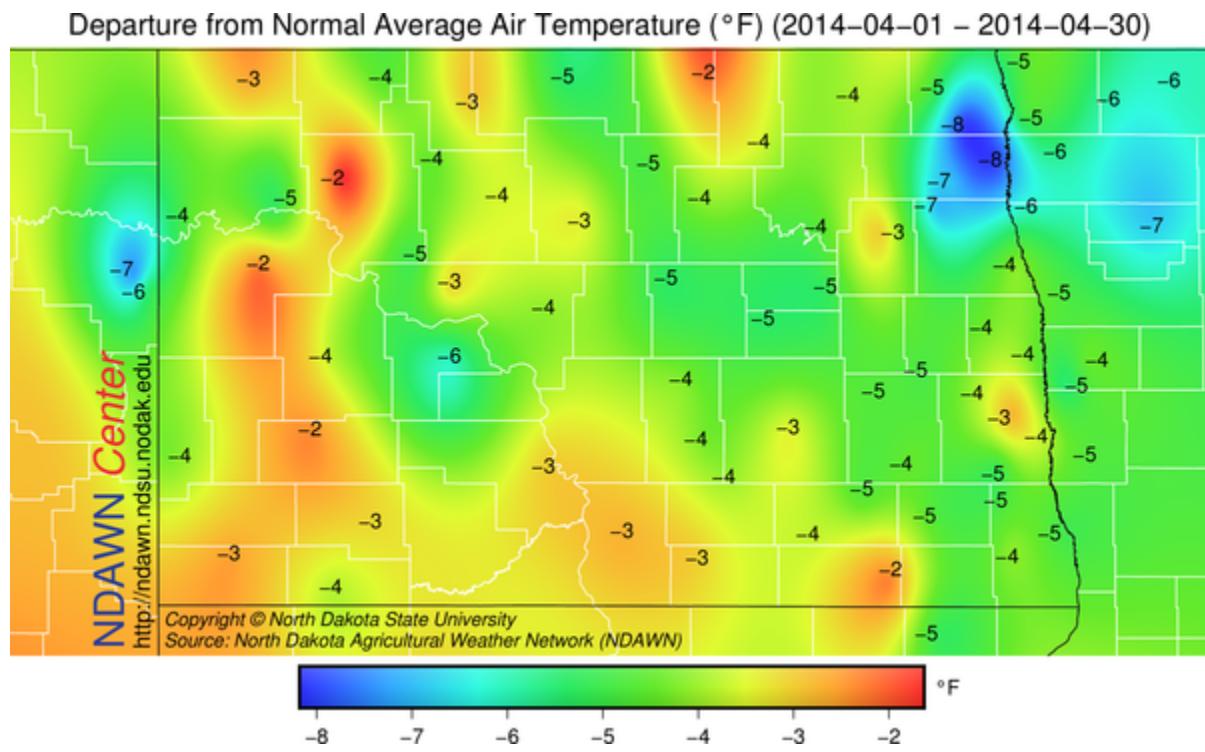


Figure 8. April 2014 Temperature Departure from Normal ($^{\circ}\text{F}$).

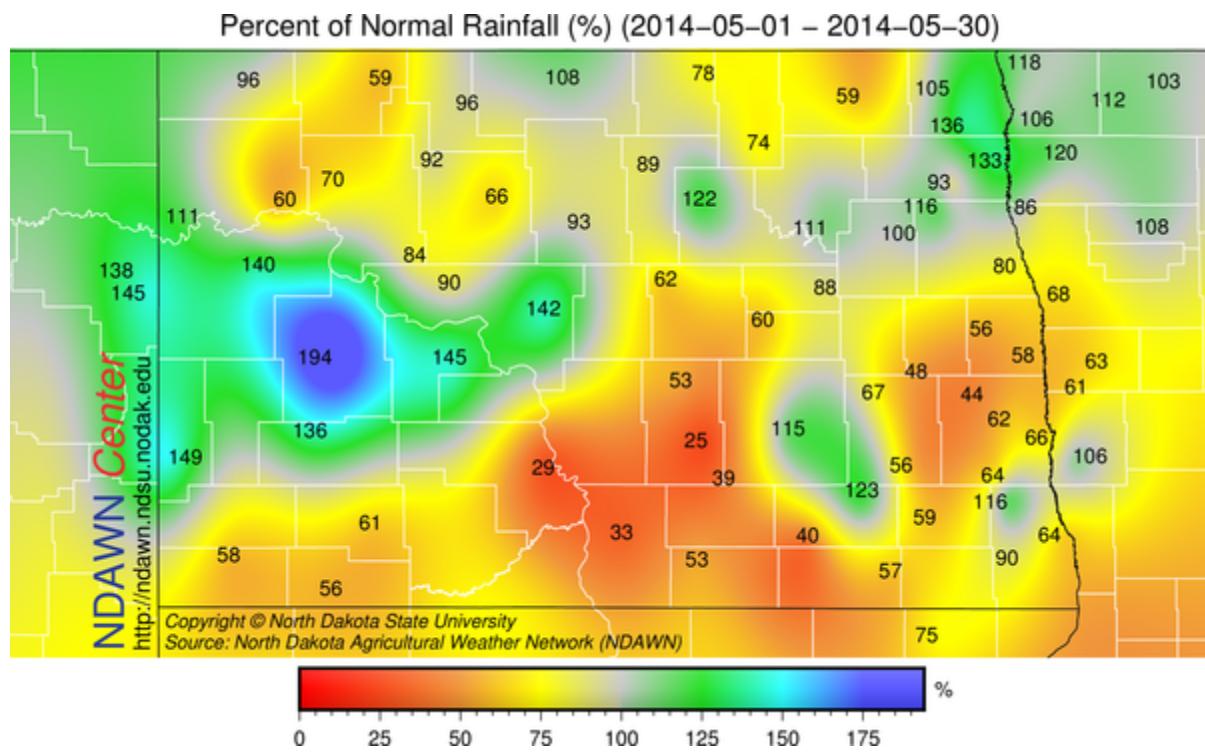


Figure 9. May 2014 Precipitation Percent of Normal (%).

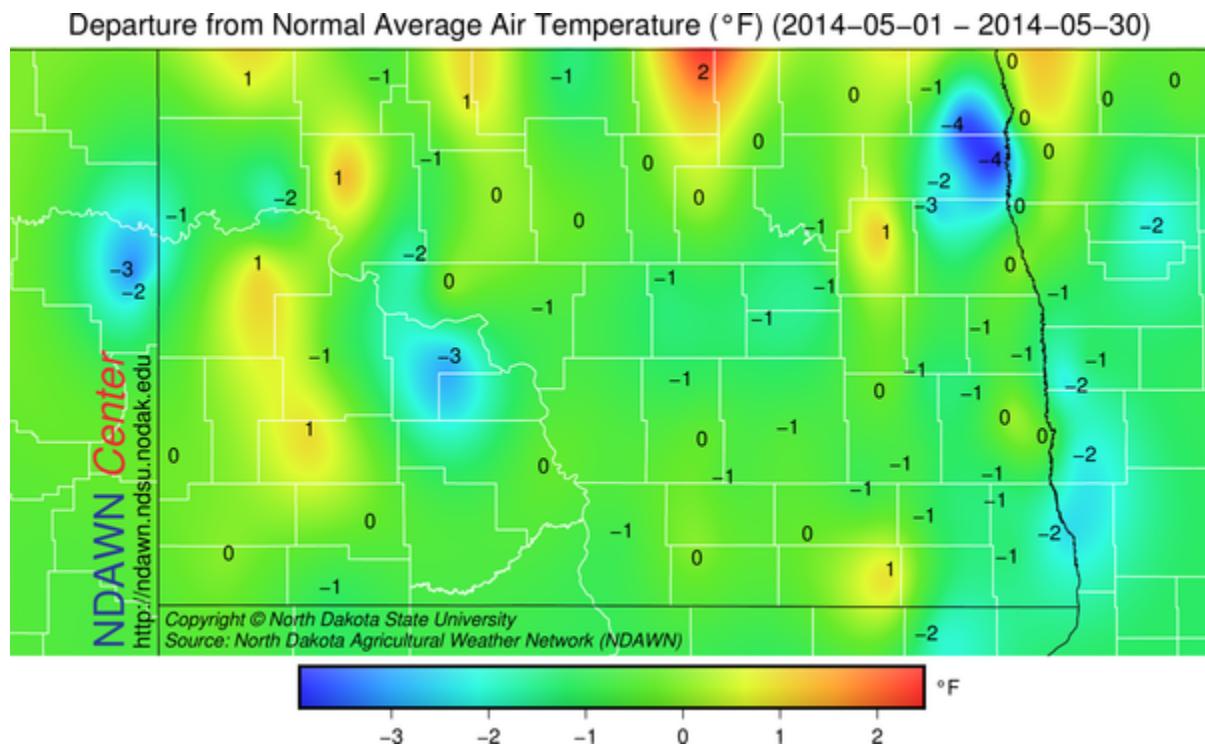


Figure 10. May 2014 Temperature Departure from Normal ($^{\circ}\text{F}$).

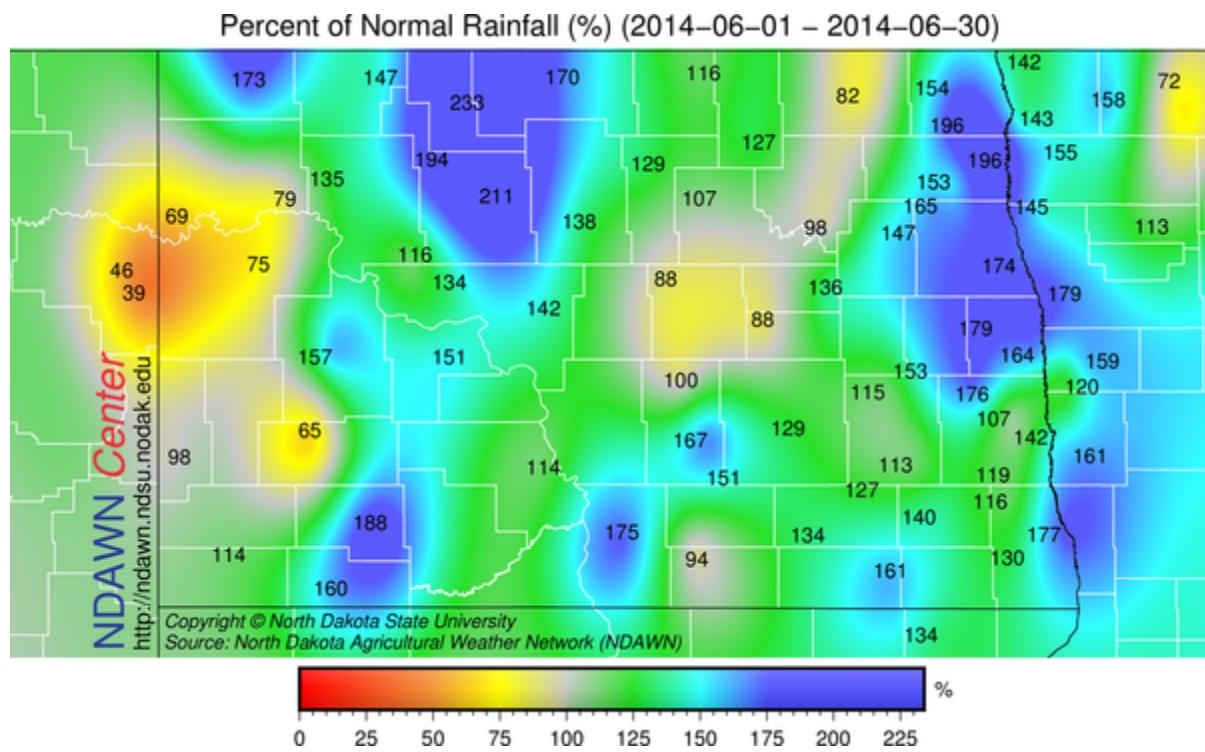


Figure 11. June 2014 Precipitation Percent of Normal (%).

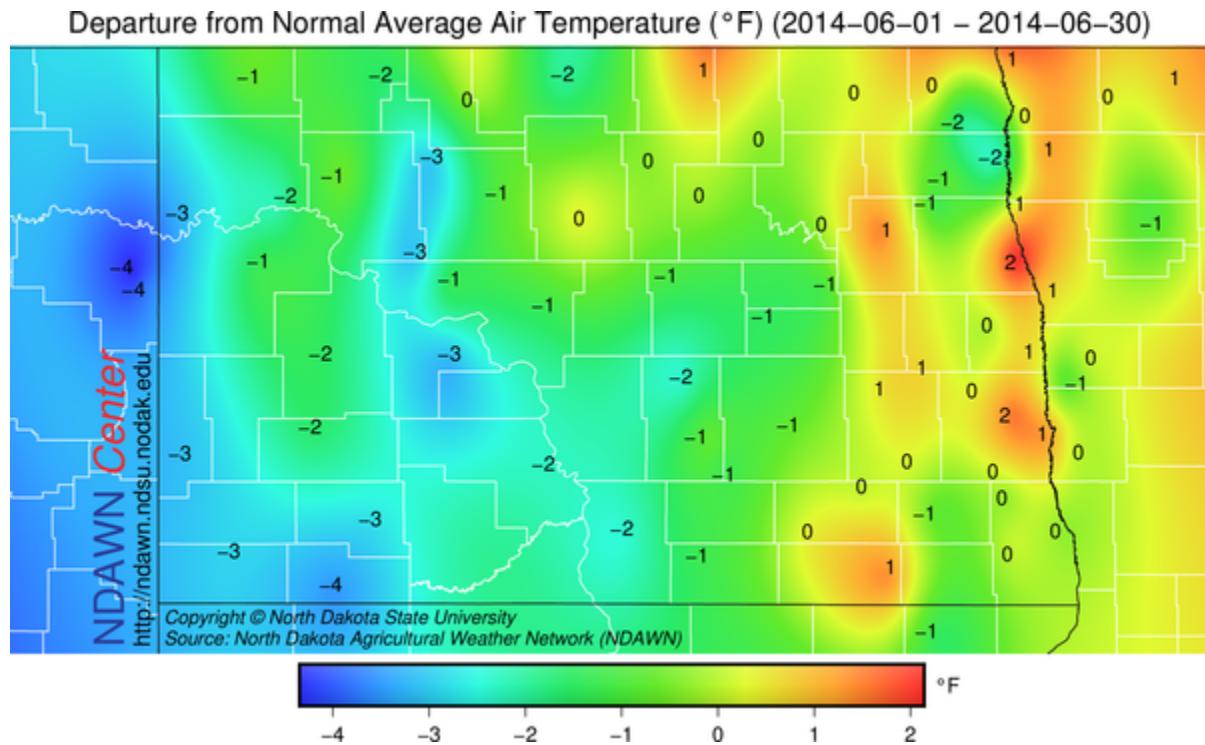


Figure 12. June 2014 Temperature Departure from Normal (°F).

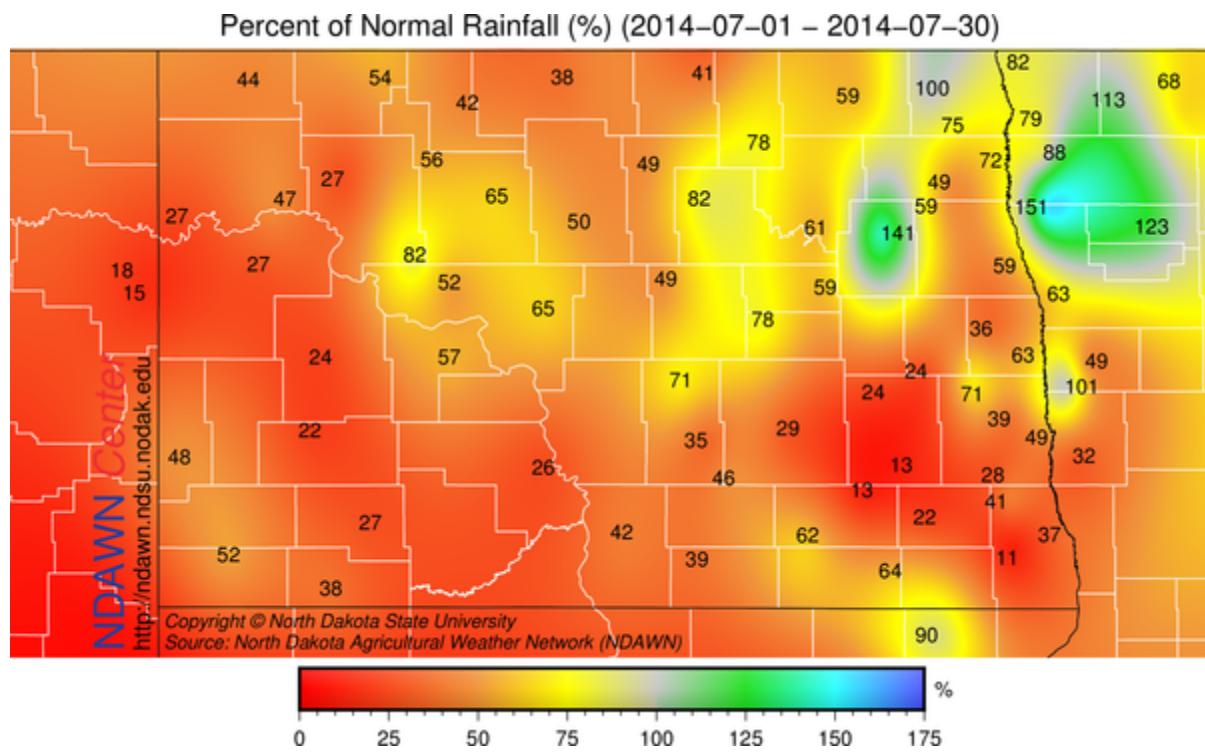


Figure 13. July 2014 Precipitation Percent of Normal (%).

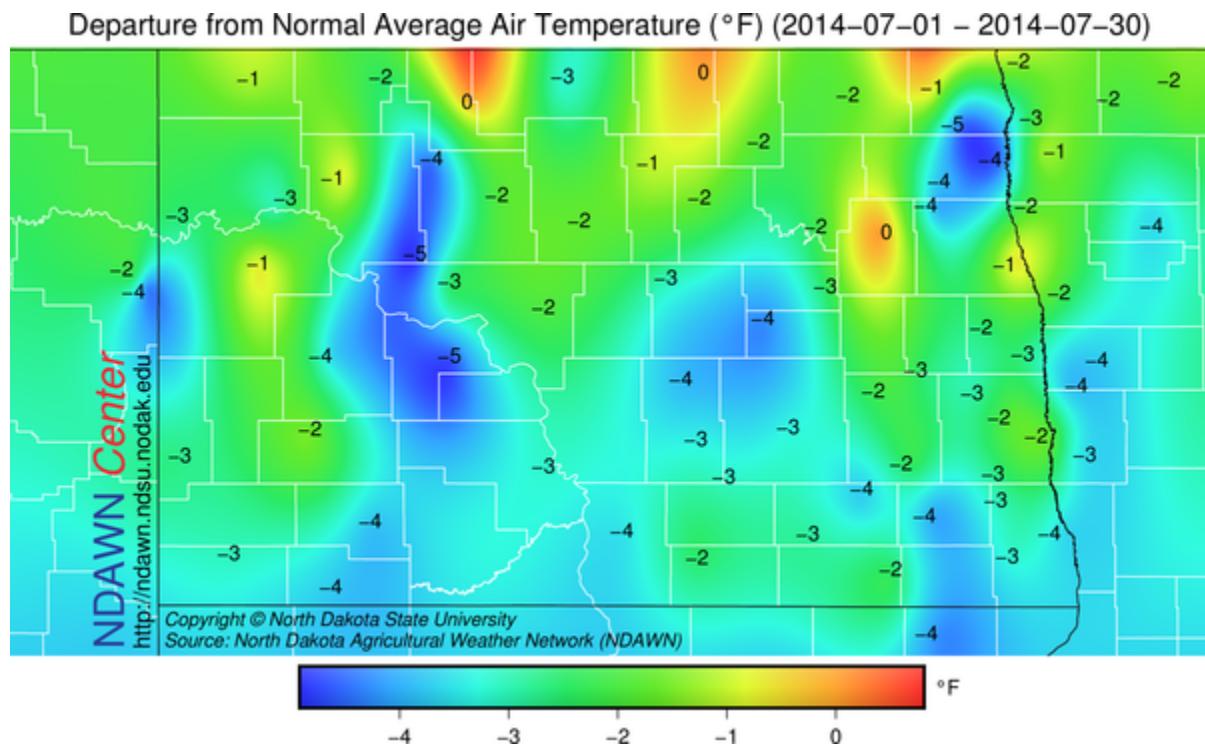


Figure 14. July 2014 Temperature Departure from Normal ($^{\circ}\text{F}$).

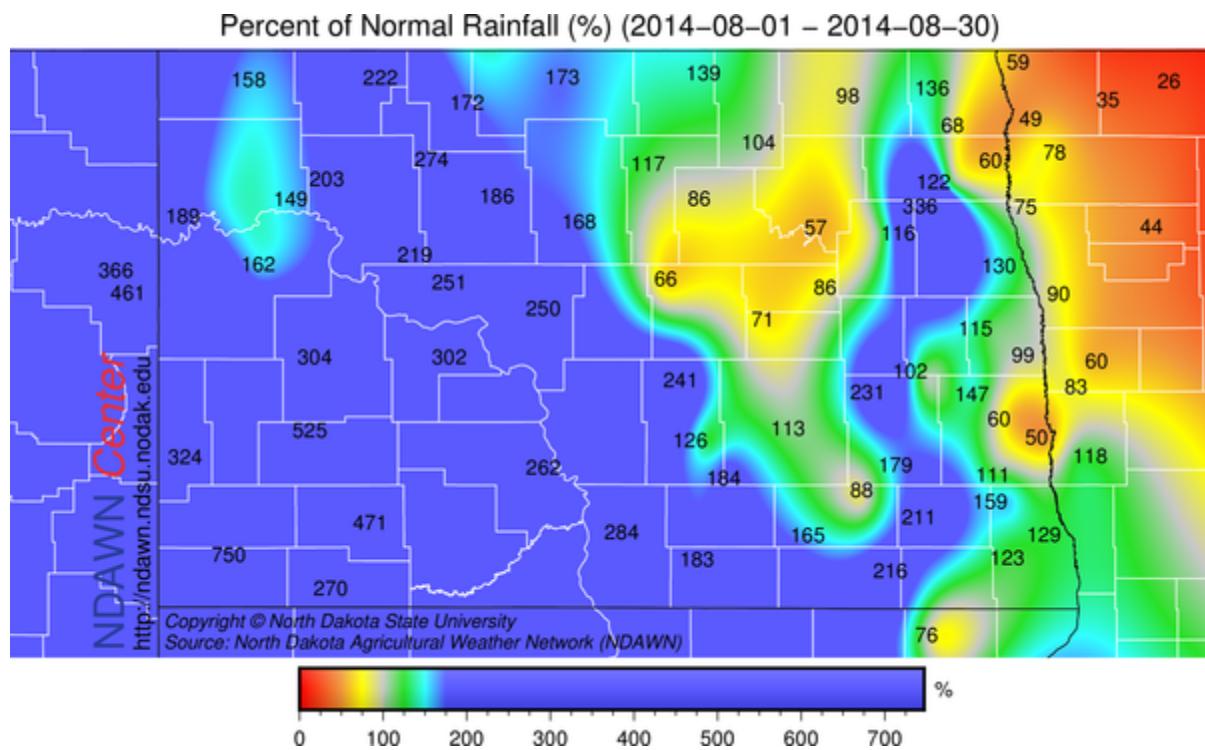


Figure 15. August 2014 Precipitation Percent of Normal (%).

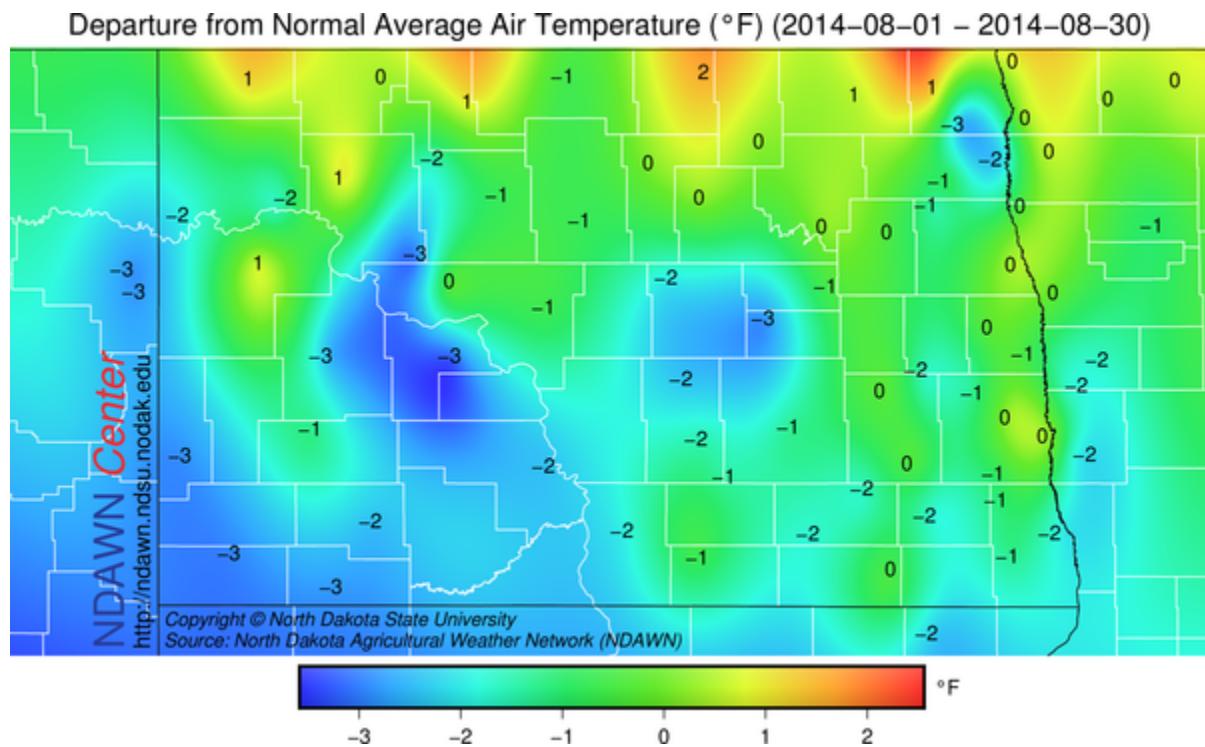


Figure 16. August 2014 Temperature Departure from Normal (°F).

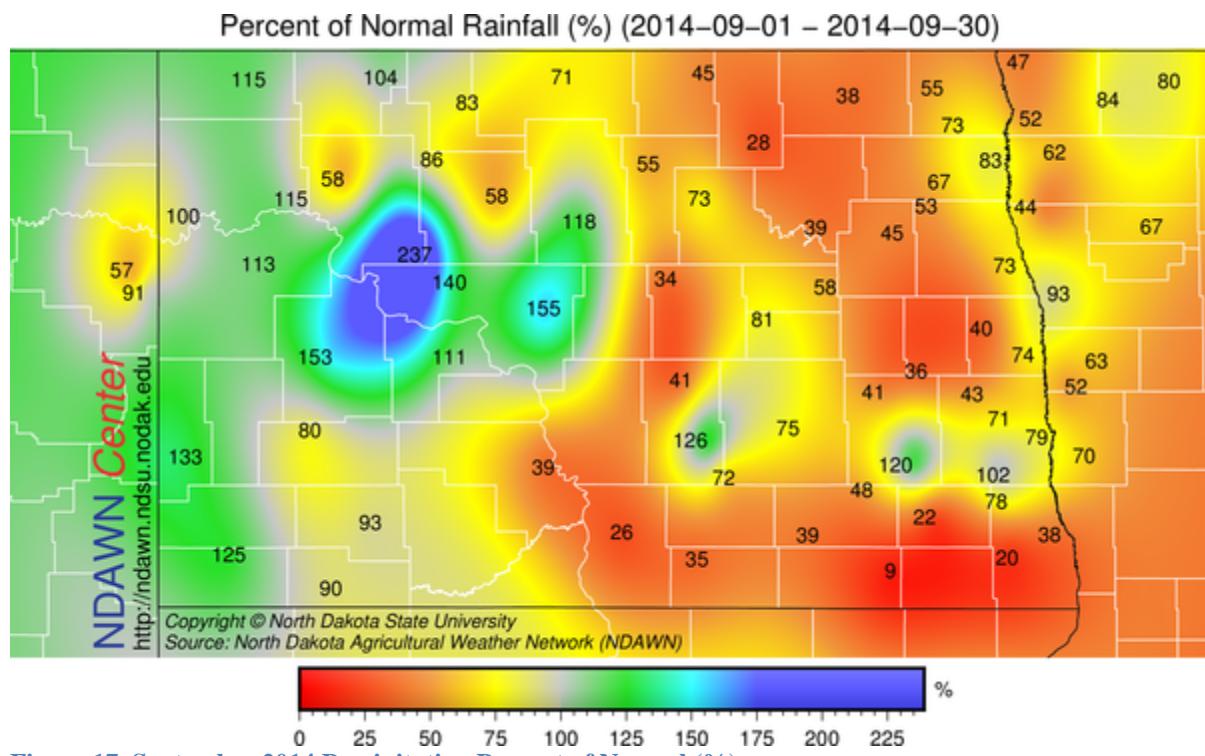


Figure 17. September 2014 Precipitation Percent of Normal (%).

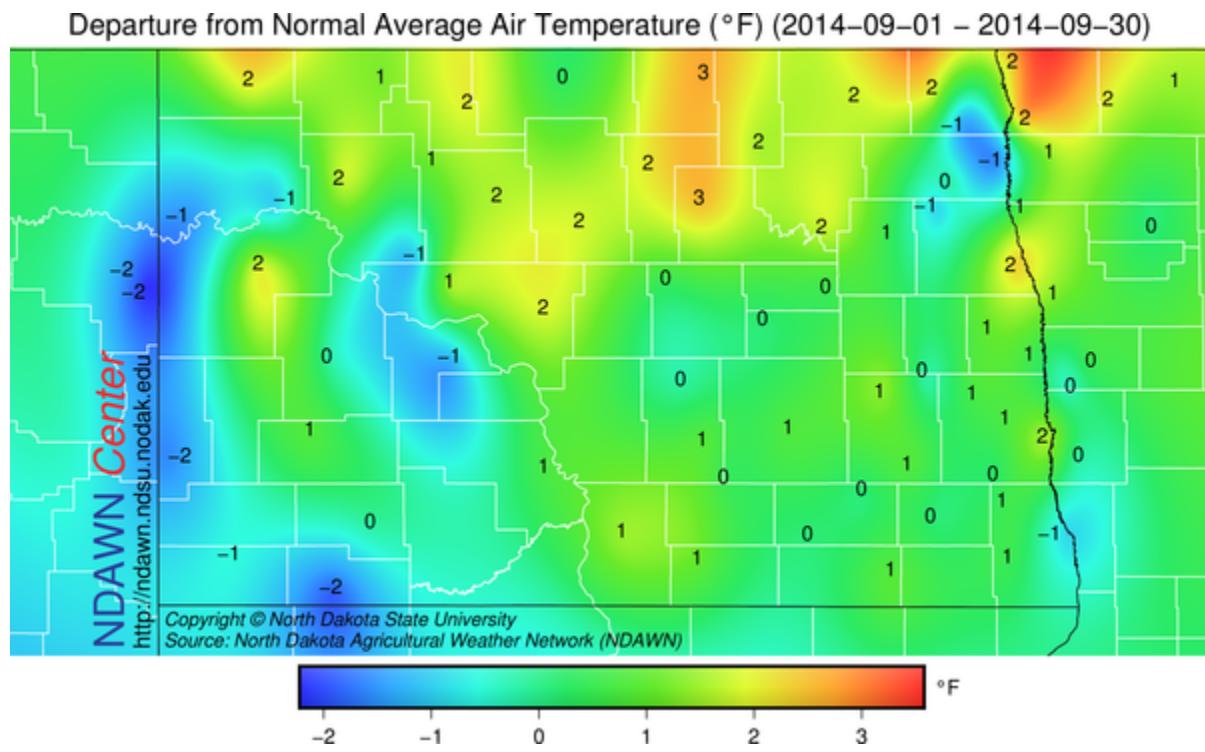


Figure 18 September 2014 Temperature Departure from Normal ($^{\circ}\text{F}$).