# North Dakota Climate Bulletin

Spring 2013

Volume: 7 No: 2

**In This Issue**



NDSCO

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## From the State Climatologist

The North Dakota Climate Bulletin is a digital quarterly publication of the North Dakota State Climate Office, the College of Agriculture, Food Systems and Natural Resources, North Dakota State University in Fargo, North Dakota.

Compared historically, North Dakota had a cooler and wetter spring. Temperature-wise, this spring was the 4th coolest statewide since 1895. Precipitation-wise, it was the 5th wettest spring statewide since 1895.

Above normal snowfall, late-spring snow pack and extensive snow cover in the valley contributed to the Red River reaching major flood stage in Fargo. The peak river stage in Fargo was 33.31' (3.31' above the major flood-sage) on May 1, 2013. It marked the latest major spring flood in recorded history. Previously, the latest major spring flood occurred on April 19, 1979.

There were 13 wind, 11 hail, and 2 tornado events reported this spring. The storm and daily record weather events are listed on pages 15 and 16.

This bulletin can be accessed at http://www.ndsu.edu/ndsco/. This website hosts other great resources for climate and weather information.

Adnan Akyüz, Ph.D.
North Dakota State Climatologist

Fargo Flood 2013: Photo by Vern Whitten Photography

# Weather Highlights

## Seasonal Summary:

by B. A. Mullins

**March 2013**

The state average precipitation was 0.78 inches which is below the 1981-2010 normal of 0.85 inches. March 2013 state average precipitation ranked 55th wettest (65th driest) in the last 119 years with a maximum of 2.72 inches in 1902 and a minimum of 0.09 inches in 1930.

Below normal precipitation totals of ~50% to ~70% of normal fell in the southern and the east-central part of the state. Above normal amounts of ~130% to ~200% of normal fell in the north, northwest, and a small corner of the southeast based on the High Plains Regional Climate Center (HPRCC) analysis. HPRCC total precipitation amounts were between ~0.5 inches in the below normal regions and greater than an inch in the areas with above normal precipitation. The National Weather Service Grand Forks office reported a major storm on the 4th with significant snowfall in the northeastern part of the state of over a foot including Cavalier at 18", Park River at 16.5", and Gilby 2E at 15.0". A second storm on the 18th also brought the highest totals of 4 to 6 inches to the northeastern part of the state. The U.S. Drought Monitor March 26th report listed 66.51% of the state as having anywhere from Abnormally Dry (D0) through Severe Drought (D2). The Severe Drought (D2) was reported for 24.73% of the state with 33.49% of the state having no drought conditions.

The National Weather Service (NWS) recorded breaking a few precipitation records in March. Grand Forks NWS and Williston had record snowfall on the 4th while Williston and Minot had record precipitation on the 4th. Grand Forks Airport had record precipitation on the 13th and 17th. A list of winter records can be viewed in the "Storms and Record Events" section later in this bulletin.

The US Drought Monitor April 2, 2013 report had Severe (D2) to Extreme (D3) drought conditions for 25.23% of the state. The report had Abnormally Dry (D0) to Moderate drought (D1) conditions for 39.06% of the state and no drought conditions for 35.71% of the state.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 6% very short, 25% short, 58% adequate, and 11% surplus with a subsoil moisture reported as 10% very short, 40% short, 47% adequate, and 3% surplus (Weekly Weather and Crop Bulletin Vol. 100, No. 15).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), there were no severe weather reports of wind, hail, or tornadoes in March.

The top five March daily maximum wind speeds recorded from NDAWN were 46.5 mph at Edgeley on the 18th, 46.2 mph at Jamestown on the 18th, 46.2 mph at Linton on the 17th, 45.8 mph at Robinson on the 18th and 45.1 mph at Britton on the 18th. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 17.3 °F which is below the 1981-2010 normal of 27.33 °F. March 2013 state average air temperature ranked 16th coolest in the past 119 years with a maximum of 40.7°F in 1910 and a minimum of 6.9 °F in 1899.

NDAWN March average air temperatures ranged from ~11 °F in the northeast to ~27 °F in the southwest. Departure from normal average air temperatures ranged from -15 °F to -3 °F. The daily average temperatures were primarily below normal throughout the state. March average monthly temperature for Grand Forks Univ. NWS was the 10th coolest for 2013 and 1956. Fargo March 2013 was 14th coolest along with 1996 and 1923. Minot REC average temperature for March 2013 was 4th coolest.

The National Weather Service (NWS) reported breaking low temperature records at Grand Forks Airport on the 16th and 17th with -18 °F and -23 °F, respectively. Low temperature records were broken or tied on the 21st at Grand Forks Airport, Grand Forks NWS, and Jamestown with -13 °F, -9 °F, and -13 °F, respectively. A list of the temperature records can be viewed in the "Storms and Record Events" section later in this bulletin.

NDAWN's highest recorded daily air temperature for March was 68.3 °F at Hettinger on the 14th. The lowest recorded daily air temperature was -26.9 °F at Forest River on the 17th.

**April 2013**

The state average precipitation was 1.21 inches which is below the 1981-2010 normal state average of 1.23 inches. April 2013 state average precipitation ranked the 55th driest in the past 119 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987.

Percent of normal precipitation totals were above normal in the central, southeast, and eastern regions and below normal elsewhere based on the High Plains Regional Climate Center (HPRCC) analysis. HPRCC total precipitation amounts were ~0.5 inches in the below normal regions and greater than 1.5 inches in the areas with above normal precipitation. Most of the precipitation that fell in April was in the form of snow. April ranked 4th snowiest month in Fargo with 16.7 inches and the snowiest month in Bismarck with 21.8 inches. 17.3 inches of snow fell in Bismarck on April 14th which broke the record for a daily snowfall for any day in Bismarck. The greatest amount of the April snow fell during the storm event from the 14th through the 15th. The highest amounts fell in the south central regions with totals reaching 15 to over 20 inches. The southeast received about 8 to 10 inches during that storm.

The National Weather Service (NWS) reported breaking snowfall records at Bismarck and Fargo. See the "Storms and Record Events" section later in this publication for details on April event records.

The U.S. Drought Monitor April 23rd report listed 49.04% of the state as having anywhere from Abnormally Dry (D0) through Severe Drought (D2). Severe Drought (D2) was only reported for 1.84% of the state with 50.96% of the state having no drought conditions.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 1% very short, 11% short, 71% adequate, and 17% surplus with a subsoil moisture reported as 4% very short, 30% short, 61% adequate, and 5% surplus (Weekly Weather and Crop Bulletin Vol. 100, No. 18).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), there were no severe weather reports of wind, hail or tornadoes in April.

The top five April daily maximum wind speeds recorded from NDAWN were 46.9 mph on the 30th at Mandan; 45.8 mph on the 24th at Linton; 45.1 mph on the 30th at Linton; 44.7 mph on the 24th at Mandan; and 44.7 mph on the 14th at Turtle Lake. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 31.0 °F which is below the 1981-2010 normal of 42.37 °F. April 2013 state average air temperature ranked the coolest in the past 119 years. The maximum of state average temperature was 50.2°F in 1987.

NDAWN April average air temperatures ranged from ~24 °F in the north to ~35 °F in the southwest. Departure from normal average air temperatures ranged from -16 °F to -7 °F. The daily average temperatures were primarily far below normal throughout the state for the first 24 days of April breaking several low temperature records from the 18th through the 23rd. According to the National Climatic Data Center (NCDC), April was the 3rd coldest average temperature at Bismarck with 34.5 °F and it was the 5th coldest average temperature at Fargo with 33.8 °F. Fargo also broke the latest first 50 degree day in the recorded history. It happened on April 26th when the thermometer reached the 50 °F threshold for the first time in 2013. The previous record was set 133 years ago on April 17, 1881. After the 24th, average daily air temperatures were above normal across the state for most of the remaining days. The two-day (26th-27th) average maximum temperature at Bismarck ranked 6th warmest with 78.0 °F.

The National Weather Service (NWS) reported breaking several low temperature records in the in April. Most of the low temperature records were on the 20th and included Minot at 13 °F, Jamestown at 13 °F, Bismarck at 15 °F, and Grand Forks NWS at 18 °F. See the "Storms and Record Events" section later in this publication for a complete list on April event records.

NDAWN's highest recorded daily air temperature for April was 80.2 °F at Linton on the 27th. The lowest recorded daily air temperature was -9.0 °F at Bottineau on the 1st.

**May 2013**

The state average precipitation was 5.52 inches which is above the 1981-2010 normal of 2.53 inches. May 2013 state average precipitation ranked 2nd wettest in the past 119 years with a maximum of 5.73 inches in 1927 and a minimum of 0.31 inches in 1901.

The North Dakota Agricultural Weather Network recorded percent of normal precipitation totals were slightly below normal in the far southeast corner and above normal elsewhere. NDAWN total precipitation amounts ranged from 11.34 inches at Bowman to 2.61 inches at Wyndmere. The first half of May was dry with few rain events. Beginning on the 16th rain fell frequently if not daily throughout the rest of the month. The highest monthly totals of over 9 inches fell in the southwest, northeast, and around the Jamestown area. NDAWN recorded a four day total rainfall from the 18th through the 21st of 7.97 inches at Jamestown. The heavy rain caused Interstate 94 to flood which made travel hazardous.

The National Weather Service (NWS) reported breaking multiple rainfall records on the 19th – 20th and the 29th – 31st. See the "Storms and Record Events" section later in this publication for a complete list on May event records.

The U.S. Drought Monitor May 28th report listed 16.86% of the state as having Abnormally Dry (D0) and only 0.01% as Severe Drought (D2). No drought conditions were reported for 83.13% of the state. The Abnormally Dry conditions were reported in the far southwest corner and the southeast.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 1% short, 53% adequate, and 46% surplus with a subsoil moisture reported as 0% very short, 4% short, 70% adequate, and 26% surplus (Weekly Weather and Crop Bulletin Vol. 100, No. 24).

According to the preliminary reports of the National Weather Service's Storm Prediction Center (SPC), severe weather reports for May had 13 reports of high wind, 11 hail reports, and 2 reported tornado.

The top five May daily maximum wind speeds recorded from NDAWN included Linton on the 30th with 58.7 mph, Streeter on the 18th with 58.4 mph, Linton on the 18th with 57.3 mph, Turtle Lake on the 20th with 54.1 mph and Jamestown on the 18th with 53.0 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 53.2 °F which is below the 1981-2010 normal of 54.01 °F. May 2013 state average air temperature ranked the 57th coolest in the past 119 years with a maximum of 63.10°F in 1977 and a minimum of 43.30 °F in 1907.

NDAWN May average air temperatures ranged from ~51 °F in the north to ~57 °F in the southeast. Departure from normal average air temperatures ranged from -4 °F to 2 °F. The below normal average air temperatures felt throughout April continued into the first few days of May. On the 13th average air temperatures warmed up into the 70's. Average air temperatures hovered near normal for the remainder of the month.

The National Weather Service (NWS) reported that Bismarck had tied the record high temperature on the 13th with 91 ° F. No further temperature records for May were reported. See the "Storms and Record Events" section later in this publication for a complete list of May event records.

NDAWN's highest recorded daily air temperature for May was 94.6 °F at Prosper on the 13th. The lowest recorded daily air temperature was 15.2 °F at Hazen on the 2nd.

# Season in Graphics

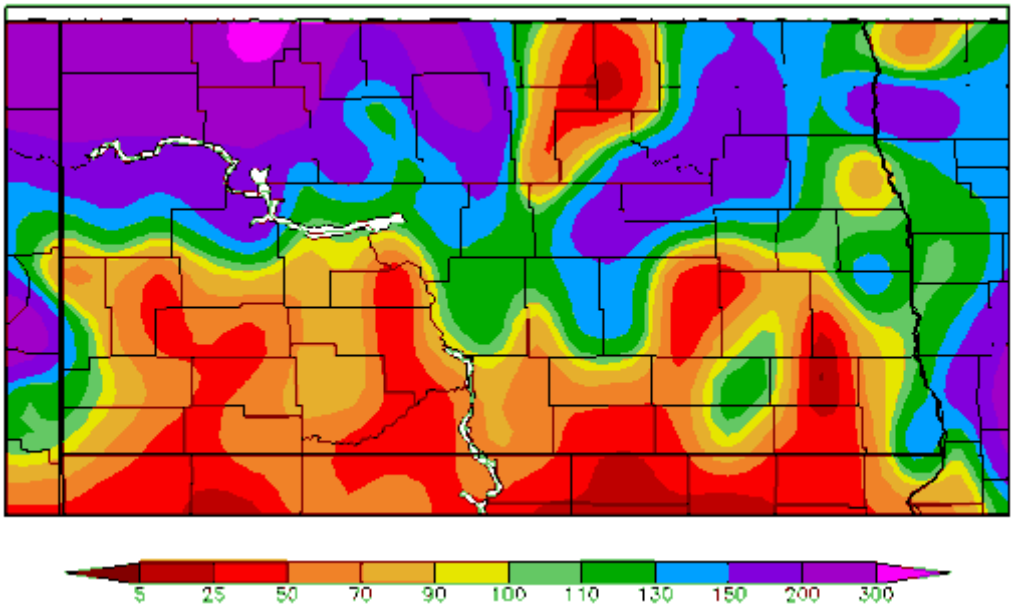
March 2013

## Spring 2013 Weather in North Dakota:

Total Precipitation percent of mean (1981-2010)

Precipitation Percent of Normal

(Data from NWS Cooperative Network)

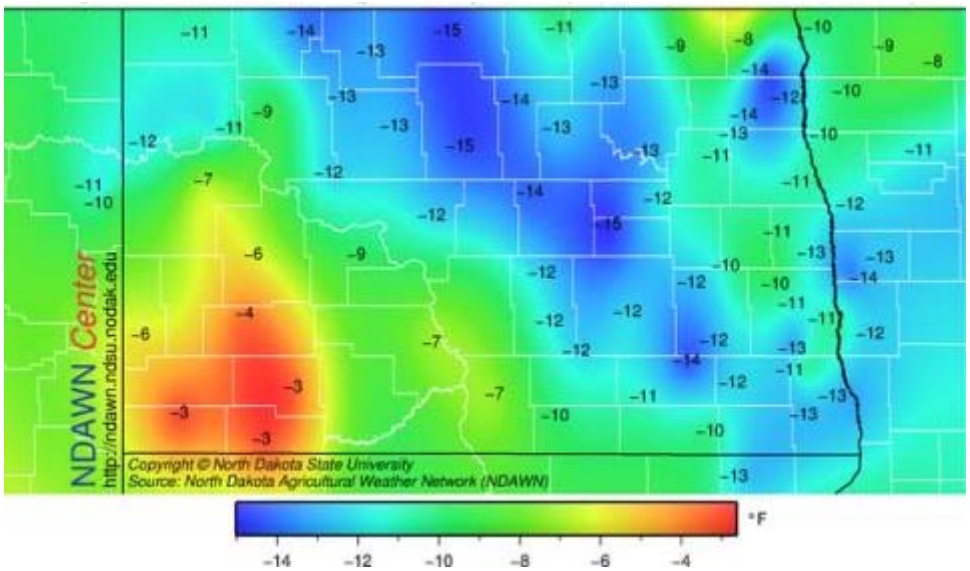



**North Dakota State Climate Office**

Average Temperature (°F) Deviation from Mean (1981-2010)

Departure From Normal Monthly
Average Air Temperature in degrees F

(Data from North Dakota Agricultural Weather Network (NDAWN))




**North Dakota State Climate Office**

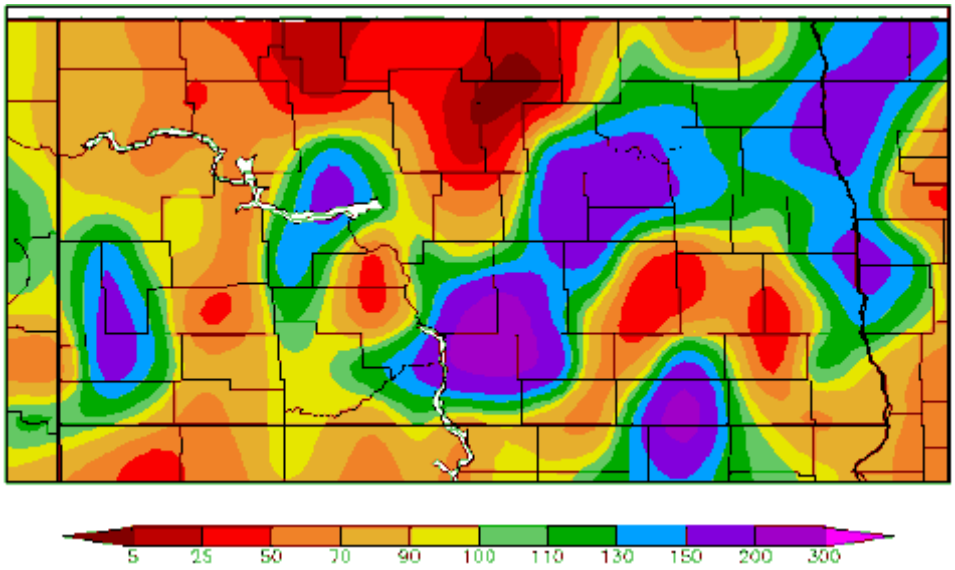
# Season in Graphics

April 2013

## Spring 2013 Weather in North Dakota:

### Total Precipitation percent of mean (1981-2010)

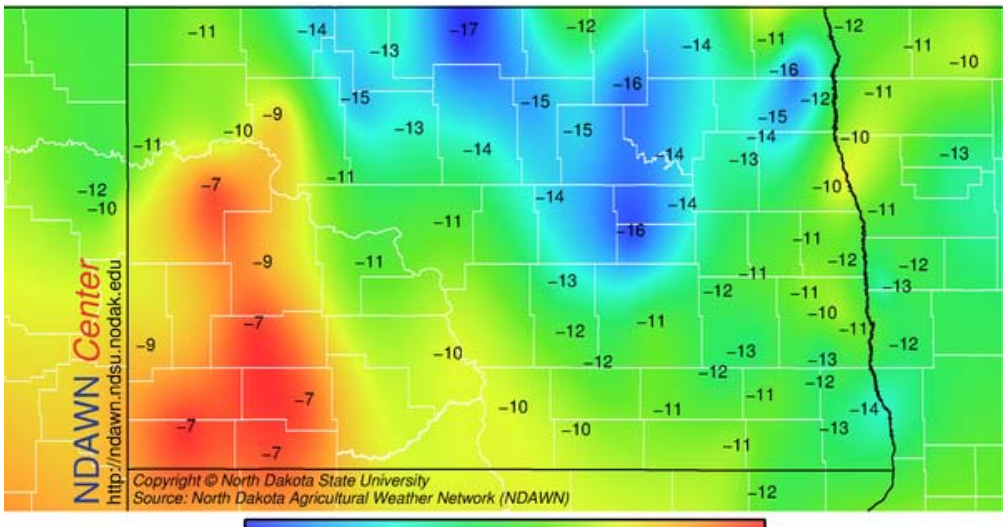
Precipitation Percent of Normal
(Data from NWS Cooperative Network)




**North Dakota State Climate Office**

### Average Temperature (°F) Deviation from Mean (1981-2010)

Departure From Normal Monthly
Average Air Temperature in degrees F
(Data from North Dakota Agricultural Weather Network (NDAWN))




**North Dakota State Climate Office**

# Season in Graphics

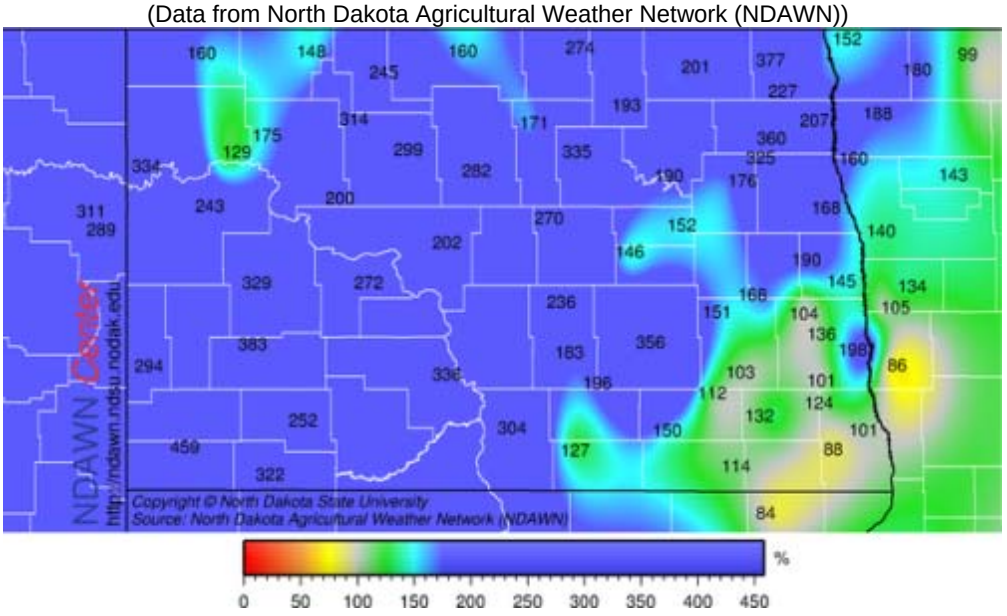
## Spring 2013 Weather in North Dakota:

May 2013

### Total Precipitation percent of mean (1981-2010)

Precipitation Percent of Normal

(Data from North Dakota Agricultural Weather Network (NDAWN))

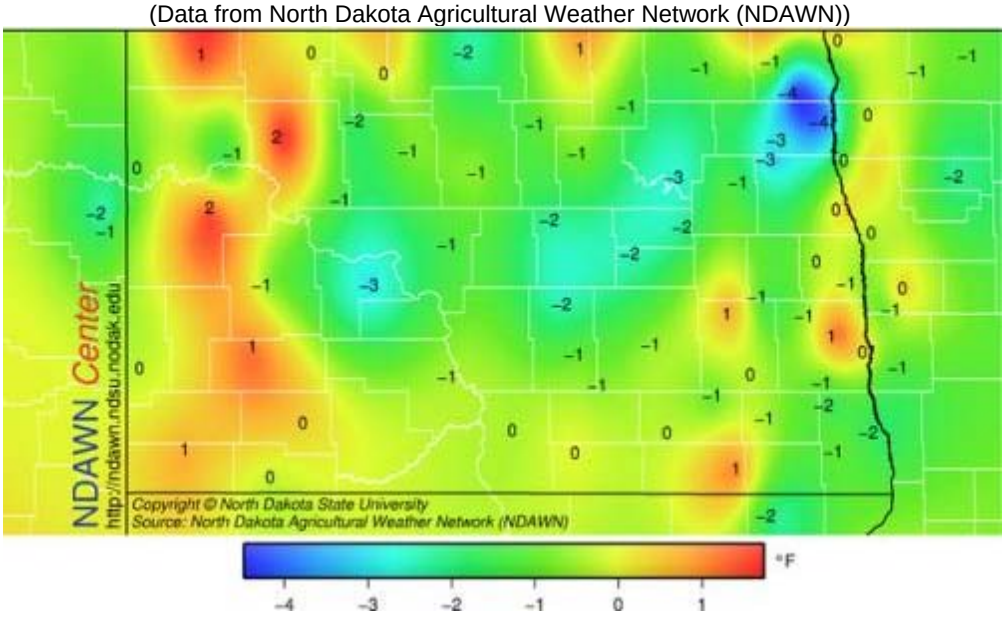



**North Dakota State Climate Office**

### Average Temperature (°F) Deviation from Mean (1981-2010)

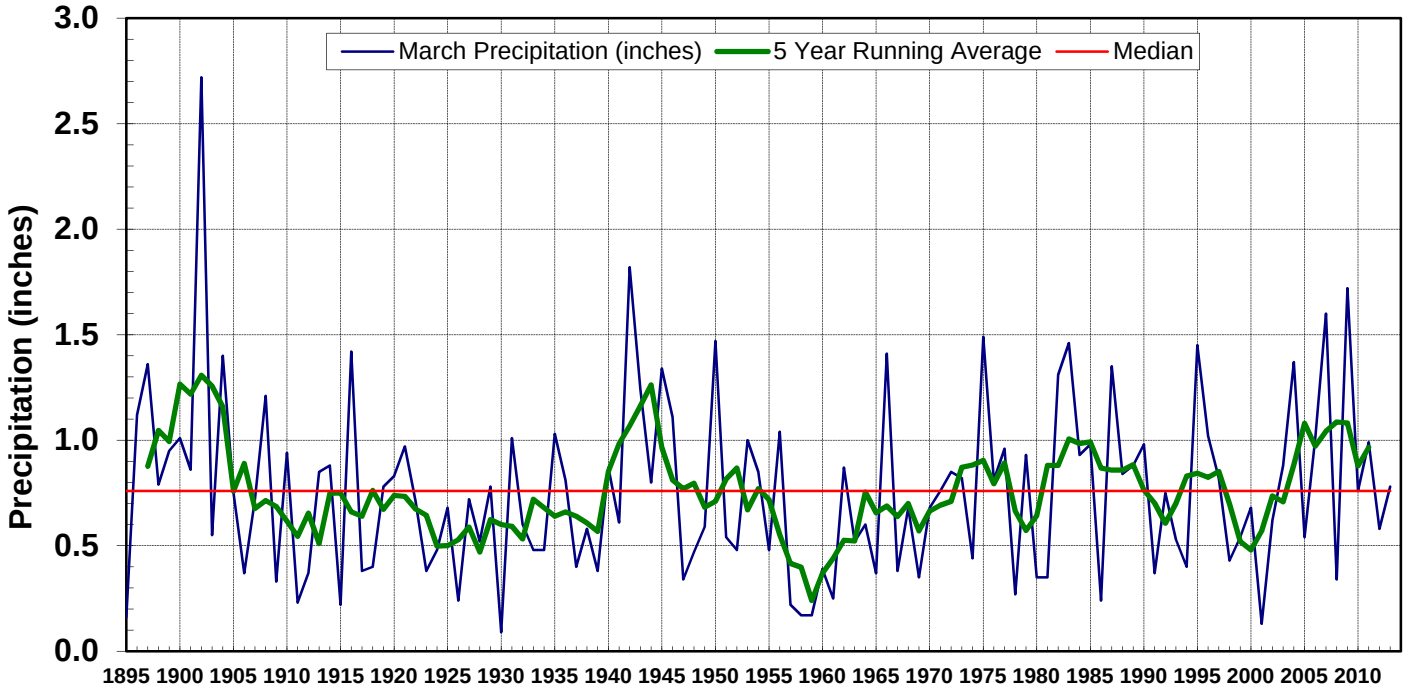
Departure From Normal Monthly
Average Air Temperature in degrees F

(Data from North Dakota Agricultural Weather Network (NDAWN))




**North Dakota State Climate Office**

# Historical March Precipitation for North Dakota

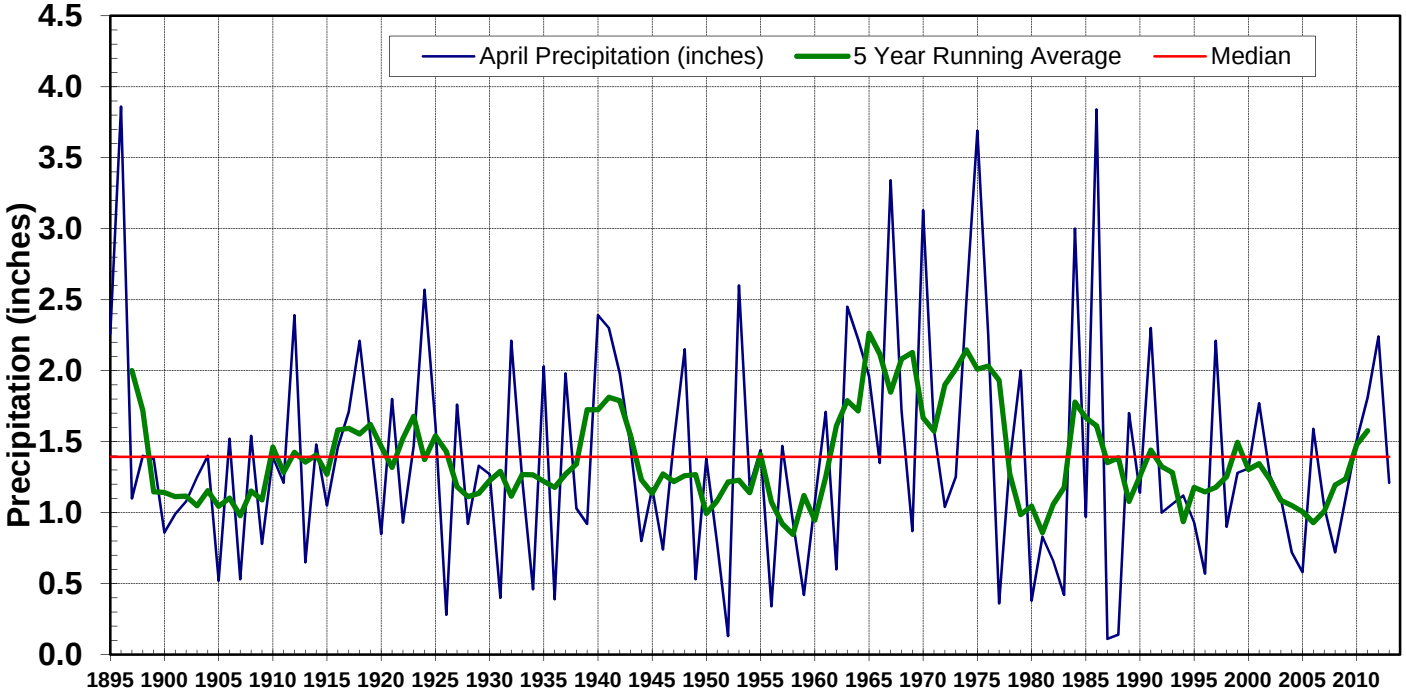



**March Precipitation Statistics**

2013 Amount: 0.78 inches
Maximum: 2.72 inches in 1902
State Normal: 0.85” (1981-2010)

Monthly Ranking: 65th driest in 119 years
Minimum: 0.09 inches in 1930
Years in Record: 119

# Historical April Precipitation for North Dakota

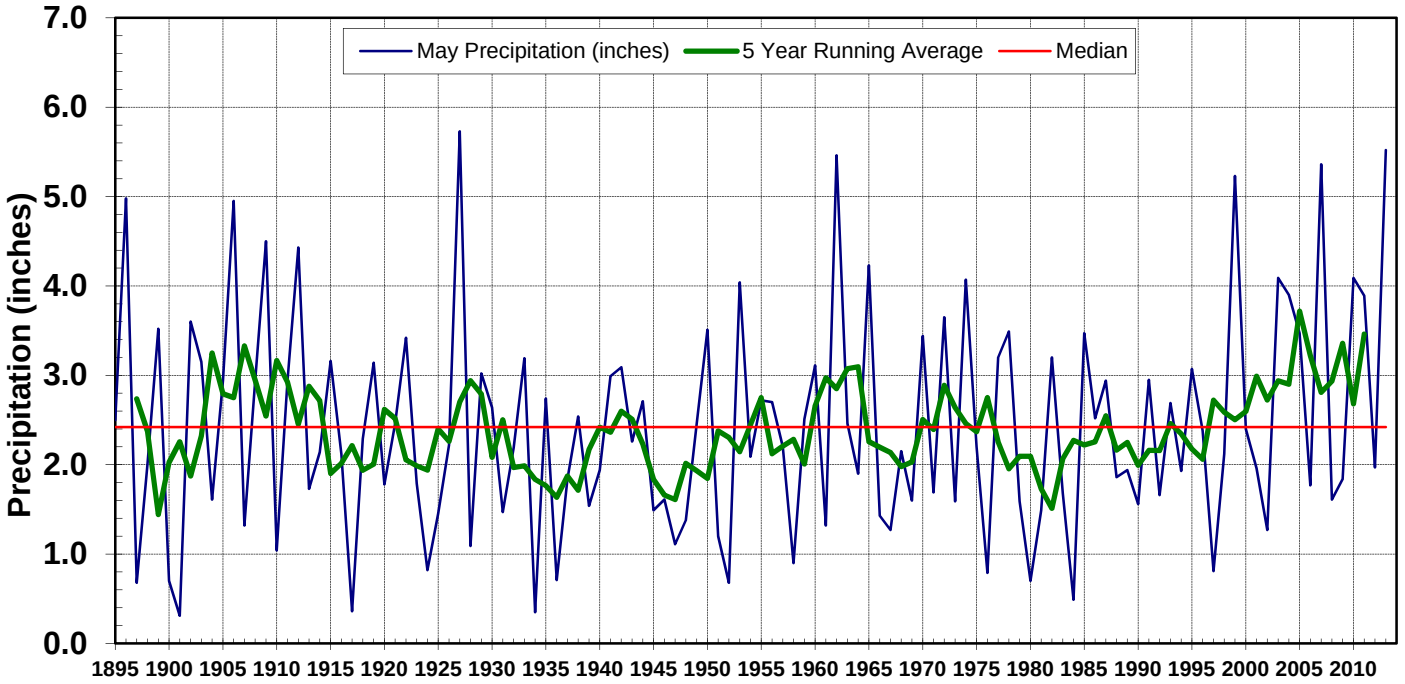



**April Precipitation Statistics**

2013 Amount: 1.21 inches
Maximum: 3.86 inches in 1896
State Normal: 1.23” (1981-2010)

Monthly Ranking: 55th Driest in 119 years
Minimum: 0.11 inches in 1987
Years in Record: 119

# Historical May Precipitation for North Dakota

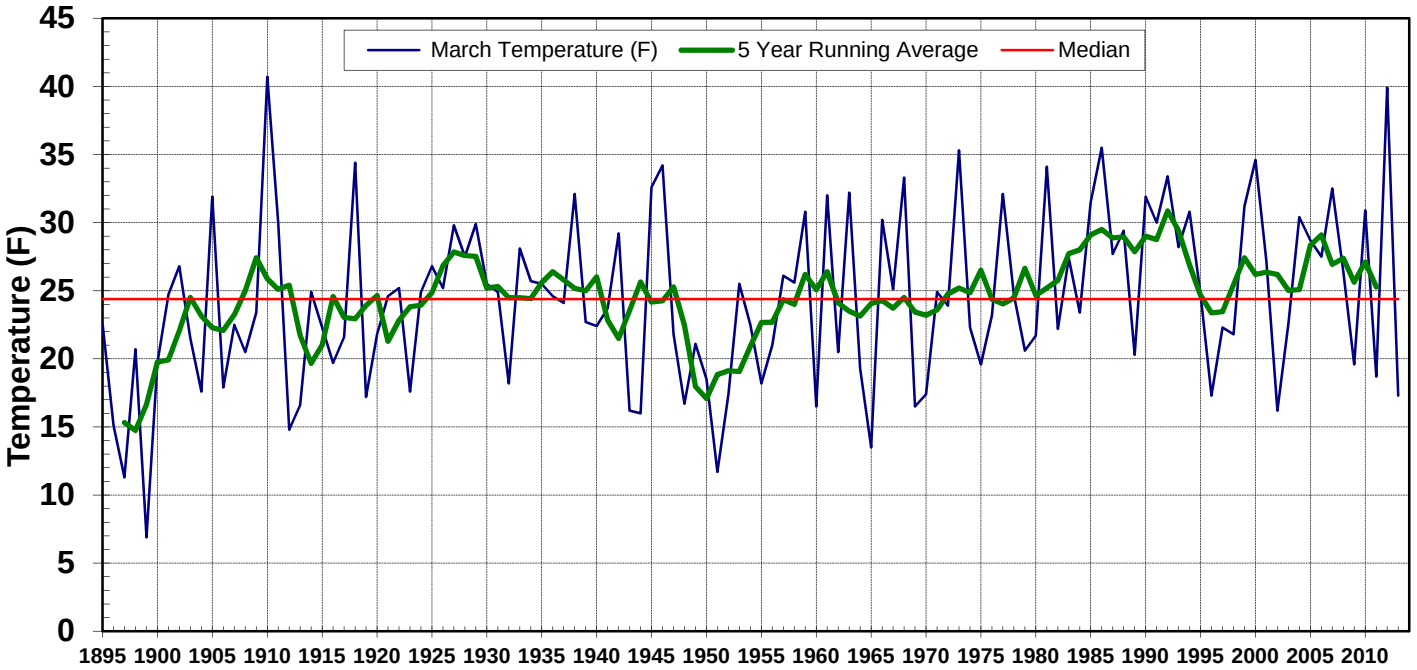



**May Precipitation Statistics**

2013 Amount: 5.52 inches
Maximum: 5.73 inches in 1927
State Normal: 2.53” (1981-2010)

Monthly Ranking: 2nd wettest in 119 years
Minimum: 0.31 inches in 1901
Years in Record: 119

# Historical March Temperature for North Dakota

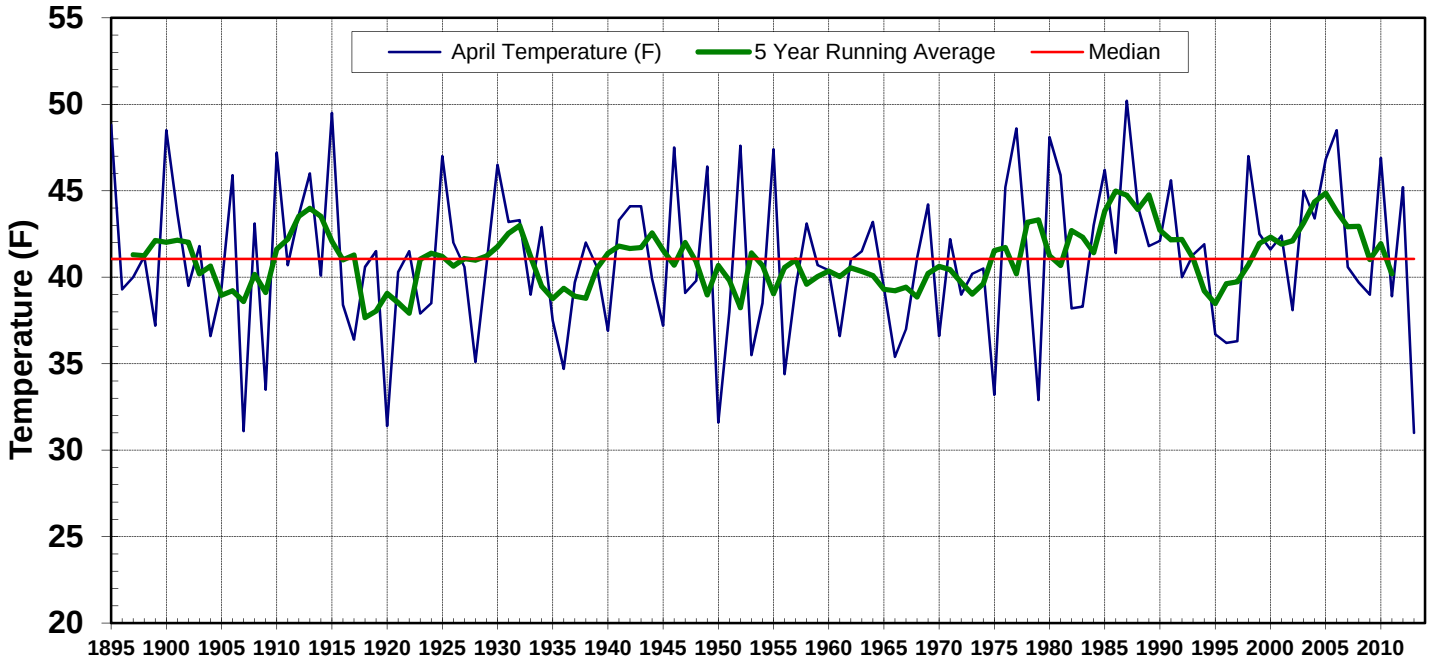



**March Temperature Statistics**

2013 Average: 17.3 °F
Maximum: 40.7 °F in 1910
State Normal: 27.33 °F (1981-2010)

Monthly Ranking: 16th Coolest in 119 years
Minimum: 6.9 °F in 1899
Years in Record: 119

# Historical April Temperature for North Dakota

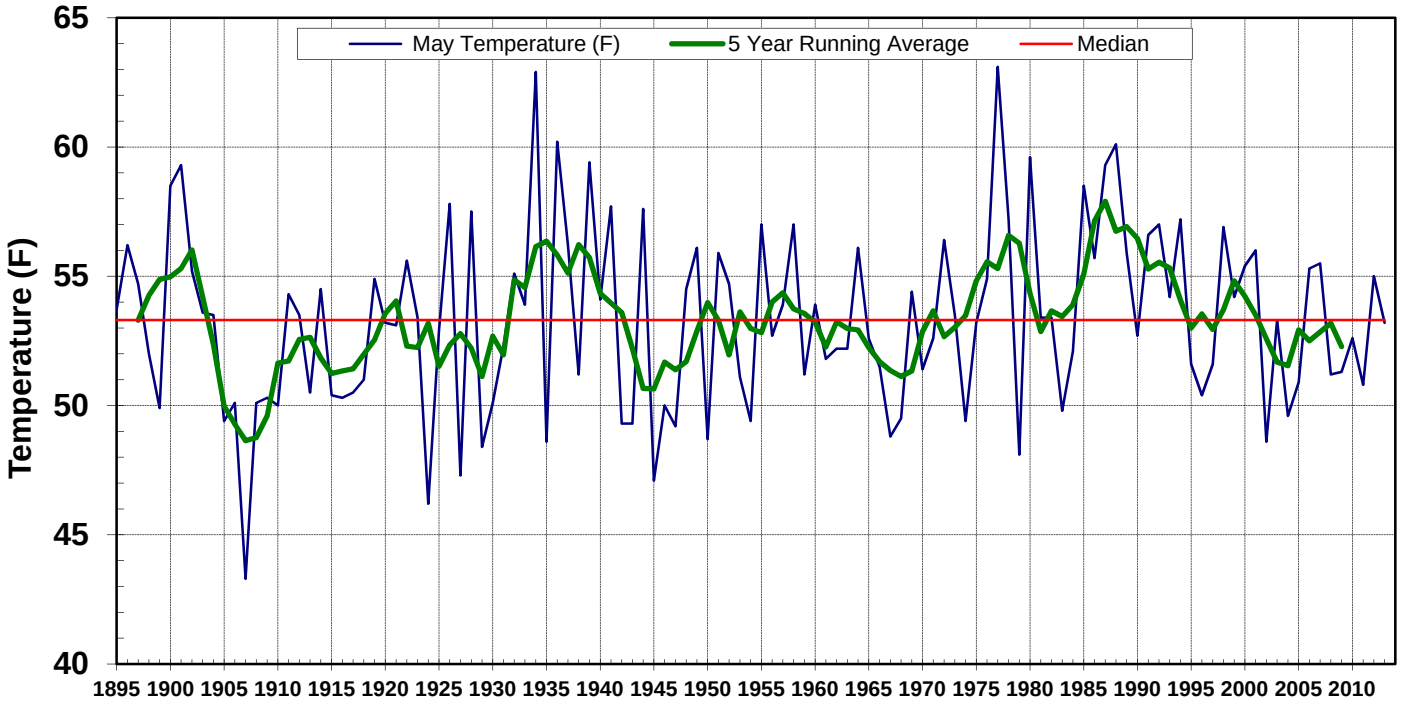



**April Temperature Statistics**

2013 Average: 31.0 °F
Maximum: 50.2 °F in 1987
State Normal: 42.37 °F (1981-2010)

Monthly Ranking: 1st coolest in 119 years
Minimum: 31.0 °F in 2013
Years in Record: 119

# Historical May Temperature for North Dakota




**May Temperature Statistics**

2013 Average: 53.2 °F
Maximum: 63.1°F in 1977
State Normal: 54.01 °F (1981-2010)

Monthly Ranking: 57th coolest in 119 years
Minimum: 43.3°F in 1907
Years in Record: 119

# Storms & Record Events

## State Tornado, Hail, and Wind Reports for Spring 2013 by B. A. Mullins

| North Dakota 3 Month Total | Wind | Hail | Tornado |
|---|---|---|---|
| | 13 | 11 | 2 |

| Reports by Month | | | |
|---|---|---|---|
| Month | Wind | Hail | Tornado |
| Total March | 0 | 0 | 0 |
| Total April | 0 | 0 | 0 |
| Total May | 13 | 11 | 2 |

## North Dakota Record Event Reports for Spring 2013

| Date | Location | Type of Record | Previous Record |
|---|---|---|---|
| **03/04/13** | Williston | 0.50 inches of rainfall | 0.40 inches in 1931 |
| **03/04/13** | Minot | 0.09 inches of rainfall | Ties 1999 |
| **03/04/13** | Williston | 11.0 inches of snowfall | 3.5 inches in 1995 |
| **03/04/13** | Grand Forks NWS | 7.0 inches of snowfall | 5.0 inches in 1966 |
| **03/13/13** | Grand Forks Airport | 0.12 inches of precipitation | 0.09 inches in 1997 |
| **03/16/13** | Grand Forks Airport | -18 °F Low temperature | -11 °F in 2007 |
| **03/17/13** | Grand Forks Airport | -23 °F Low temperature | -14 °F in 1967 |
| **03/17/13** | Grand Forks Airport | 0.19 inches of precipitation | 0.17 inches in 1994 |
| **03/21/13** | Grand Forks Airport | -13 °F Low temperature | -7 °F in 1965 |
| **03/21/13** | Grand Forks NWS | -9 °F Low temperature | Ties 1965 |
| **03/21/13** | Jamestown | -13 °F Low temperature | -10 °F in 1965 |
| **04/14/13** | Bismarck | 17.3 inches of snowfall | 5.0 inches in 1986 |
| **04/14/13** | Bismarck | 17.3 inches of snowfall | Breaks daily snowfall for any day. |
| **04/15/13** | Fargo | 6.3 inches of snowfall | 3.7 inches in 1986 |
| **04/18/13** | Dickinson | 11 °F Low temperature | 12 °F set in 1953 |
| **04/20/13** | Minot | 13 °F Low temperature | 14 °F set in 1927 |
| **04/20/13** | Jamestown | 13 °F Low temperature | 14 °F set in 1966 |
| **04/20/13** | Bismarck | 15 °F Low temperature | 17 °F set in 1966 |
| **04/20/13** | Grand Forks NWS | 18 °F Low temperature | Ties 1938 |
| **04/23/13** | Bismarck | 12 °F Low temperature | 16 °F set in 1988 |
| **05/13/13** | Bismarck | 91 °F High temperature | Ties 1932 |
| **05/19/13** | Grand Forks NWS | 1.37 inches of rainfall | 0.80 inches set in 1950 |
| **05/19/13** | Grand Forks AP | 1.35 inches of rainfall | 0.74 inches set in 1950 |
| **05/19/13** | Bismarck | 1.45 inches of rainfall | 1.36 inches set in 1877 |
| **05/19/13** | Dickinson | 1.04 inches of rainfall | 0.47 inches set in 1983 |
| **05/19/13** | Jamestown | 0.99 inches of rainfall | 0.34 inches set in 1983 |
| **05/19/13** | Minot | 1.13 inches of rainfall | 1.04 inches set in 1994 |
| **05/20/13** | Grand Forks NWS | 1.42 inches of rainfall | 0.75 inches set in 1908 |
| **05/20/13** | Jamestown | 1.23 inches of rainfall | 0.98 inches set in 2005 |
| **05/29/13** | Fargo | 3.77 inches of rainfall | 3.12 inches set in 1909 |
| **05/30/13** | Dickinson | 1.23 inches of rainfall | 0.95 inches set in 2007 |

| | | | |
|---|---|---|---|
| **05/31/13** | Dickinson | 1.14 inches of rainfall | 0.77 inches set in 1969 |
| **05/31/13** | Minot | 1.32 inches of rainfall | 1.24 inches set in 1978 |

# Seasonal Outlook

## Summer 2013 Climate Outlooks

by D. Ritchison[1]

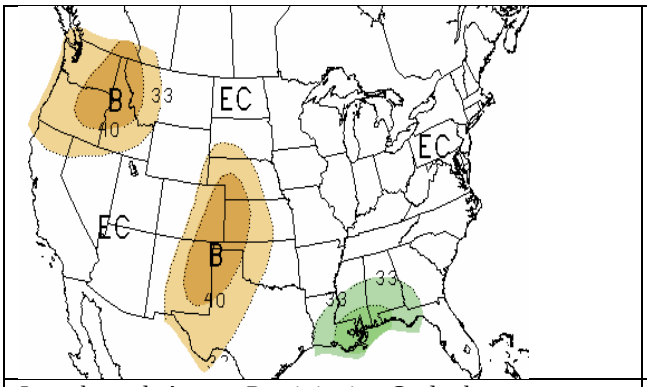
After a cold and wet spring, many of you are probably wondering if that trend will continue through the summer. A late planting season attributed to both a cold spring and poorly timed heavy rain events in May, leaves the area in need of heat units and drier conditions as the warm season begins.

Below average temperatures and above average rainfall look to be continuing for much of area during the month of June as the overall weather pattern in the northern hemisphere will be slow to change. Yet, my suspicion is that June will also serve as the transitional month from cool and wet that started back in February to a slightly drier and warmer pattern for the rest of the summer. Therefore, July and August are expected to be much closer to the long-term average for temperatures, meaning the summer as a whole will come in fairly close to average or perhaps leaning slightly on the cool side of normal.

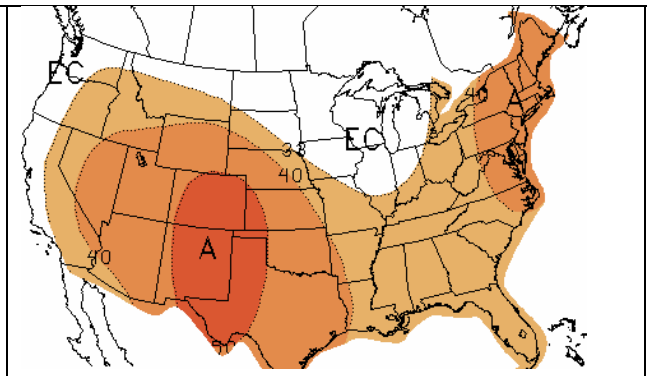
Summer precipitation comes mainly from thunderstorms that bring forecasting challenges based on the large spot to spot variations in rainfall associated with the storms. Like temperatures, much of the state is expected to record above average rainfall in June, with July and August becoming drier, meaning a close to average summer for precipitation over much of the state.

These forecasts are based on several analog years (years with similar atmospheric and oceanic patterns) including 2007, 1998, 1996, 1979, and1956.

The latest summer outlook from the Climate Prediction Center (CPC) for the next three months can be seen below. The CPC is forecasting equal chances of above, below or normal temperatures and precipitation for this area that seems to follow my ideas. You can find their current and future outlooks at http://www.cpc.ncep.noaa.gov/products/predictions/90day.




June through August Precipitation Outlook




June through August Temperature Outlook

Also, the North Dakota State Climate Office has links to the National Weather Service's local 3-month temperature outlooks for the upcoming year. Those forecasts can be found at: http://www.ndsu.edu/ndsco/outlook/L3MTO.html. The readers will also find the following National Weather Service office web sites very useful for shorter term weather forecasts:

Eastern North Dakota: http://www.crh.noaa.gov/fgf/
Western North Dakota: http://www.crh.noaa.gov/bis/

[1] The corresponding author: Daryl Ritchison is a broadcast meteorologist working at WDAY-TV Fargo, ND.
E-Mail: daryl@ritchison.com

# Hydro-Talk

## North Dakota Flooding Update

by A. Schlag[2]

As we enter June the floods of spring tend to be a mere painful memory for many. However, the past few years have been painful for residents along the Souris River, also known as the Mouse River in North Dakota. In the past edition of the ND Climate Bulletin, I mentioned the Souris, James, and Red River basins as being the most likely places for significant flooding this year. The magnitude of flooding in each basin varied greatly based on spring runoff conditions and additional rainfall, as discussed below.

The potential for Red River flooding made national news outlets, only to have a very favorable melt pattern play out where much of the water was absorbed into the soil. Even with the slow melt and lack of coincident heavy rains this year, the Red River Valley still saw its fair share of flooding and could likely have been just one ill-timed rainstorm away from revisiting near record to record stages at Fargo and many of the small rivers that feed into the Red River. Great planning and good fortune are allies of our riparian residents.

Along the James River basin, heavy spring rains have piled on to the back end of the spring snowmelt. This additional moisture has not only made it problematic for farmers to get their spring field work done, but has pushed water levels at Pipestem Dam to just over 1,474 ft MSL as of June 13, 2013. Note: it appears to finally be leveling off and has 40.9% of its exclusive flood control storage occupied. Its sister dam above Jamestown on the James River leveled off and started to slowly head down just a few days ago. It currently has 22.6% of its exclusive flood control storage occupied. This has led to high water coming through the city of Jamestown for much of this spring and will ensure the high water remains until most likely sometime in early July. Of course, the significance of having water stored in the exclusive flood control zone is that it reduces the amount of water the dam(s) would be able to capture if heavy rain occurred before the excess water can be discharged.

Finally, the Souris River kicked off its flood season in North Dakota on March 25th, 2013 by discharging water from Lake Darling dam in preparation for high discharges from the upstream dams of Rafferty and Alameda. The managing agencies sought to provide even more flood control than otherwise called for by international agreements and operating manuals for all three dams. Indeed, this early man-made minor flood did exactly that. Alameda dam did not even fully rebound to full supply level from the runoff generated by the spring melt. Rafferty and Lake Darling did fill back up to full supply level and used their exclusive flood control zones to manage the spring runoff and control flooding to roughly that already experienced during the preparation of the dams.

Fast-forward to today, the Souris River in North Dakota still has a significant amount of ongoing flood problems. Not only did the river rise above flood stage in May due to the runoff from melting snow, but that region has been much wetter than normal since mid-May. The NWS weather station at the Minot Airport recorded 6.75 inches of rainfall over the last 17 days of May, and another 2.89 inches of rain from June 1st through June 12th. That 9.64 inches of rain over roughly 30 days is a remarkably wet period for anywhere in ND. Similarly wet conditions are evident in observations from Jamestown to Belfield, and Bismarck to Williston. The only real difference is the Souris River basin got a head start on flooding with the spring snowmelt season.

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# Science Bits

## Cool and Wet Weather Stress on Corn in North Dakota

by Joel Ransom[3]

Progress in corn planting has moved forward at a record pace. However, recent storms have once again curtailed planting in some regions of the state. On average, corn has been planted later is ideal. Earlier planted fields are now beginning to emerge. Corn requires about 120 Growing Degree Days (GDDs) to emerge (a bit later if planted deeper than 2 inches or for fields with moderate to heavy residue cover). Corn growing degree days can be used to predict emergence and leaf appearance in most environments. Data from ND suggest that new leaves appear after about 70 GDDs. Figure 1 shows accumulated GDDs across the state based on the average planting date of May 15 (North Dakota Agricultural Weather Network, NDAWN).

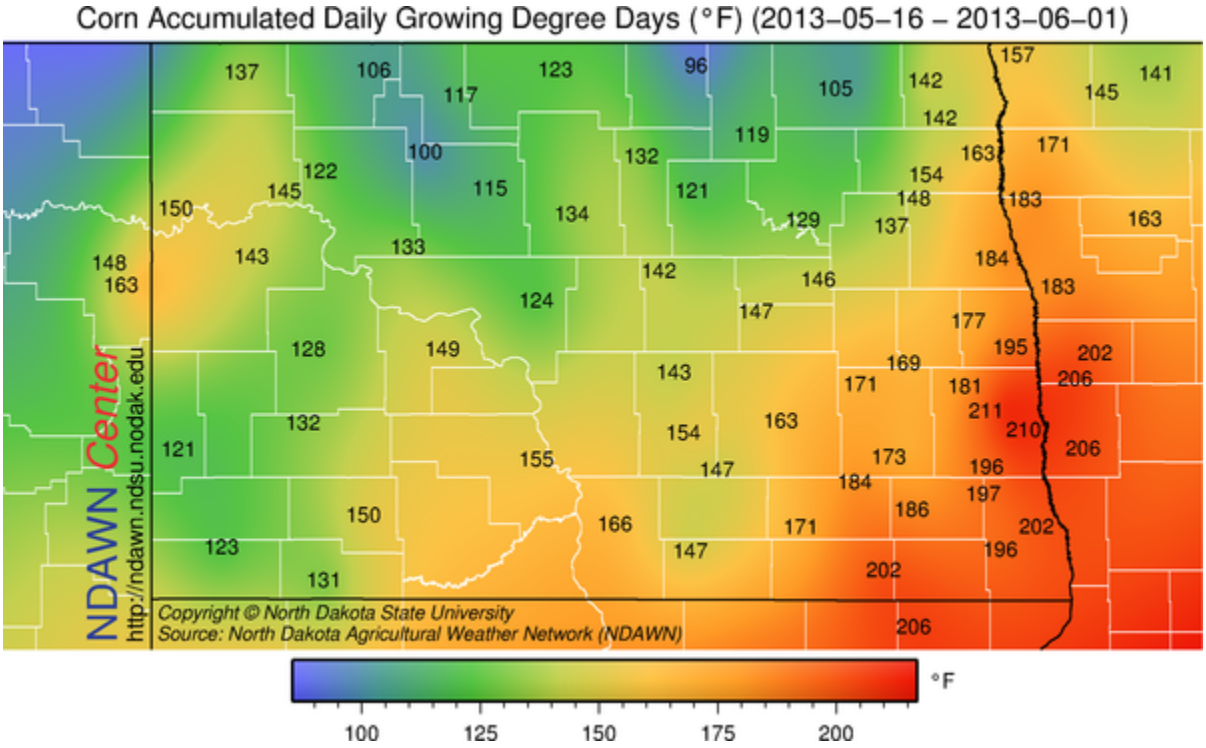


**Figure 1 Accumulated Corn Growing Degree Days based on May 15 planting date in North Dakota (North Dakota Agricultural Weather Network)**

While corn planted on the 15th of May should just be emerged, GDDs are running behind normal for May and Early June. This is good news for the small grains, but not for corn. Not only is above ground development of corn delayed by cool weather, but the root system is also impacted. It is not unusual for corn to appear yellow and nutrient deficient when soil temperatures hover around 50 degrees. Extensive root development is needed for the corn plant

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to find and take up phosphorous. Even when a pop-up fertilizer is applied, the plants may appear yellow until temperatures warm up and root growth increases. The best cure for yellow corn seedlings at this time is a good dose of warm weather.

Currently, in most fields, plants appear yellow, purple, and/or have bleached areas on the leaf (Figure 2). There is little that can be done at this stage to improve the appearance of the corn plant. The main reason that they appear yellow and sickly is not so much the lack of nutrients in the soil, but the plant's inability to access them because of limited root development (associated with cool soils), and the lack of sufficient sunlight to enable optimum photosynthesis. Photosynthesis produces the energy and building blocks for chlorophyll development which give the corn plant its green color. Corn has a much longer growth cycle than small grains. Therefore, stress during a short period of the growing cycle (in this case temperature stress), is less likely to have a negative impact on yield development than for small grains. That being said, corn can be sensitive to competition from weeds during early growth stages, so early weed control can be more critical to corn yield development than early side dressing Nitrogen (N). Currently, corn growth stages vary considerably in the state depending on the planting date. The mid-May planted fields are probably approaching the three leaf stage. During this stage, root and ear shoots develop. By the 5 leaf stage the number of rows of kernels is fixed. Row numbers, however, are usually determined by the genetics of the plant, rather than by the growing environment. It is not until the 12 to 14 leaf stage that the number of kernels per row is fixed. Therefore, the window for obtaining a yield response from side dressing if N is limiting is fairly large, particularly if some N was applied at or before planting. For practical reasons, however, side dressing is best done before the plant gets too tall (6 to 9-leaf stages). The corn plant has its greatest demand for N from the 9 leaf stage to early grain filling, so having the additional N in place by that period will ensure a high potential for its utilization. The risk of N loss is low during periods of high use, as well, so delaying splits until this period helps improve N fertilizer use efficiency.

*Cool weather stresses emerged corn this spring.*

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Please contact us if you have any inquiries, comments, or would like to know how to contribute to this quarterly bulletin.


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