



North Dakota Climate Bulletin

Spring 2012

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North Dakota State Climate Office
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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 warmer and wetter spring. Temperature-wise, this spring was the 2nd warmest statewide since 1895. Precipitation-wise, it was the 41st wettest spring statewide since 1895.

Earlier in spring, ND won the CoCoRaHS March Madness observer recruitment competition in the population density category. This is the second time the cup was awarded to North Dakota since 2010. Currently, 212 volunteer observers are actively reporting daily precipitation observations from 43 out of 53 counties in ND. To join CoCoRaHS, readers can click on the following link: <http://www.cocorahs.org/>.

There were 319 temperature related records either broken or tied in March. We only listed the records in major cities on pages 15 and 16. Some records were broken by 2-digit differentials. For example, the minimum temperature of 57°F on March 19, 2012 in Fargo was 20°F warmer than the previous record set in 1987.

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



CoCoRaHS Cup held by Young Observers



Weather Highlights



Seasonal Summary:

by B. A. Mullins

March 2012

The state average precipitation was 0.58 inches which is below the 1981-2010 normal of 0.85 inches. March 2012 state average precipitation ranked 46th driest in the last 118 years with a maximum of 2.72 inches in 1902 and a minimum of 0.09 inches in 1930.

The High Plains Regional Climate Center (HPRCC) March percent of normal precipitation was less than 50% for most of North Dakota including western, southern, and east central regions. The driest regions of less than 5% to 25% fell mostly west of the Missouri River plus parts of Emmons, McIntosh, Logan, Kidder and Dickey Counties. The highest amounts of 150% to 200% fell in the north central and northeast corner. According to the National Weather Service, a snow storm on the 1st through the 3rd produced up to 6 inches of snow in the northeast. The remainder of the months precipitation fell primarily as rain with the heaviest amounts falling in the central region with up to 6 tenths of an inch. The USDA, National Agricultural Statistics Service, North Dakota Field Office reported that there was nearly no snow cover on March 25th. The US Drought Monitor March 27, 2012 report had abnormally dry conditions for most of the state. The report listed the north central with no drought conditions and the northeast with severe dry conditions.

The National Weather Service (NWS) recorded breaking no precipitation records in March. A list of winter records can be viewed in the "Storms and Record Events" section later in this bulletin.

The US Drought Monitor April 3, 2012 report had no drought conditions in parts of the central north and the southeast regions. Severe drought was reported in the west and northeast corner. Abnormally dry conditions were reported elsewhere.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 10% very short, 24% short, 57% adequate, and 9% surplus with a subsoil moisture reported as 0% very short, 16% short, 70% adequate, and 14% surplus (Weekly Weather and Crop Bulletin Vol. 99, No. 14).

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

The top five March daily maximum wind speeds recorded from NDAWN were 53.7 mph at Crosby on the 13th, 53.3 mph at Britton on the 26th, 51.2 mph at Fargo on the 27th, 50.5 mph at Bowbells on the 13th and 49.8 mph at Leonard on the 26th. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 39.9 °F which is above the 1981-2010 normal of 27.33 °F. March 2012 state average air temperature ranked 2nd warmest in the past 118 years with a maximum of 40.7°F in 1910 and a minimum of 6.9 °F in 1899.

NDAWN March monthly average air temperatures ranged from 35 °F to 45 °F. NDAWN departure from normal average temperatures were above normal across the state and ranged from 12 °F to 16 °F. Daily average air temperatures were primarily below normal at most locations for the first nine days of March. The remainder of the month had above normal to far above normal average air temperatures. The National Weather Service from the 10th through the 23rd recorded breaking a maximum air temperature and/or a high minimum air temperature at several locations nearly every day. According to the Applied Climate Information System (ACIS), the Grand Forks International Airport had the warmest March on record with an average air temperature of 38.0 °F which broke the previous record of 35.4 °F set in 1973. Fargo also had the warmest average air temperature for March with 41.6 °F breaking the previous record of 36.0 °F set in 1973. Bismarck tied the 1910 warmest March average air temperature with 43.2 °F.

The National Weather Service (NWS) reported breaking multiple high temperature records nearly daily from the 10th through the 23rd. 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 82.6 °F at Hazen on the 18th. The lowest recorded daily air temperature was -12.8 °F at Warren MN on the 4th.

April 2012

The state average precipitation was 2.24 inches which is above the 1981-2010 normal state average of 1.23 inches. April 2012 state average precipitation ranked the 17th wettest in the past 118 years with a maximum of 3.86 inches in 1896 and a minimum of 0.11 inches in 1987.

The North Dakota Agricultural Weather Network (NDAWN) April percent of normal precipitation was less than 100% in the northeast and northwest. The remaining areas were above normal. The greatest amounts of around 200% of normal fell in the central and southern parts of the state. The first 12 days of April were relatively dry with only a few scattered showers across the state. Rain events were more wide spread for the remainder of the month. NDAWN total monthly rainfall ranged from approximately 0.50 inches in the northwest to 3.60 inches in the southeast.

The National Weather Service (NWS) reported breaking a few precipitation records in April on the 13th. See the “Storms and Record Events” section later in this publication for details on April event records.

The US Drought Monitor April 24, 2012 reported moderate (D1) drought listed for the northeast corner and the southwest, no drought conditions in the north central and southeast, and abnormally dry (D0) conditions listed elsewhere.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 1% very short, 5% short, 81% adequate, and 13% surplus with a subsoil moisture reported as 0% very short, 8% short, 79% adequate, and 13% surplus (Weekly Weather and Crop Bulletin Vol. 99, 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 58.4 mph on the 21st at Sabin, MN; 53.0 mph on the 15th at Britton, SD; 53.0 mph on the 7th at Linton; 50.8 mph on the 7th at Turtle Lake; and 49.8 mph on the 1st at Crosby. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 45.2 °F which is above the 1981-2010 normal of 42.37 °F. April 2012 state average air temperature ranked the 23rd warmest in the past 118 years with a maximum of 50.2°F in 1987 and a minimum of 31.1°F in 1907.

NDAWN April monthly average air temperatures ranged from 43 °F to 49 °F. NDAWN departures from normal average temperature were above normal across the state and ranged from 2 °F to 7 °F. Daily average air temperatures were primarily above normal the first few days of April with the remainder of the month having mostly near normal to above. The National Weather Service reported breaking several high temperature records on the 23rd and 24th in the central and western parts of the state.

The National Weather Service (NWS) reported breaking several high temperature records in the in April. Maximum temperature records were broken on the 1st, 23rd, and 24th. 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 91.3 °F at Mott on the 24th. The lowest recorded daily air temperature was 10.7 °F at Hofflund on the 10th.

May 2012

The state average precipitation was 2.15 inches which is less than the 1981-2010 normal of 2.53 inches. May 2012 state average precipitation ranked 56th driest in the past 118 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 (NDAWN) May percent of normal precipitation was up to ~130% of normal in the northwest and a few scattered areas in the eastern half. The remaining areas were below normal with the driest areas of ~50% of normal precipitation in the southeast and north central regions. The first one third of the month had scattered showers with the heavier amounts falling in the northwest corner. The middle of the month was dry with roughly six days of no precipitation across the state. The last one-third of the month had the greatest total amount of rainfall.

The National Weather Service (NWS) reported one precipitation record in May at Grand Forks Airport on the 27th with 0.61 inches, breaking the previous record of 0.60 inches set in 1954. See the "Storms and Record Events" section later in this publication for a complete list on May event records.

The US Drought Monitor May 29, 2012 report had moderate (D1) drought listed for the northeast corner, moderate (D1) to mostly Abnormally Dry (D0) for the southwest corner, and no drought conditions elsewhere.

The USDA, National Agricultural Statistics Service, North Dakota Field Office reported a topsoil moisture of 0% very short, 14% short, 77% adequate, and 9% surplus with a subsoil

moisture reported as 0% very short, 10% short, 79% adequate, and 11% surplus (Weekly Weather and Crop Bulletin Vol. 99, No. 22).

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, 15 hail reports, and 1 reported tornado.

The top five May daily maximum wind speeds recorded from NDAWN included Linton on the 2nd with 81.3 mph, Turtle Lake on the 27th with 56.9 mph, Mayville on the 22nd with 54.4 mph, Jamestown on the 22nd with 53.3 mph and McHenry on the 14th with 53.0 mph. NDAWN wind speeds are measured at a height of 10 feet (3 m).

The state average air temperature was 54.7 °F which is above the 1981-2010 normal of 54.01 °F. May 2012 state average air temperature ranked the 39th warmest in the past 118 years with a maximum of 63.10°F in 1977 and a minimum of 43.30 °F in 1907.

NDAWN May monthly average air temperatures ranged from 51 °F to 61 °F. NDAWN departure from normal average temperatures ranged from -3 °F to 4 °F. Daily average air temperatures hovered near normal across the state for the first half of the month. From roughly the 12th through the 19th average air temperatures climbed to 10 and 20 °F above normal. From the 24th through the end of the month there was seasonably cooler weather as average daily air temperatures dropped to between 10 °F and 20 °F below normal.

The National Weather Service (NWS) reported Fargo Airport breaking one temperature record and tying two in May. No other records were recorded. See the "Storms and Record Events" section later in this publication for a complete list on May event records.

NDAWN's highest recorded daily air temperature for May was 97.1 °F at Sabin, MN on the 18th. The lowest recorded daily air temperature was 26.9 °F at Hazen on the 12th.

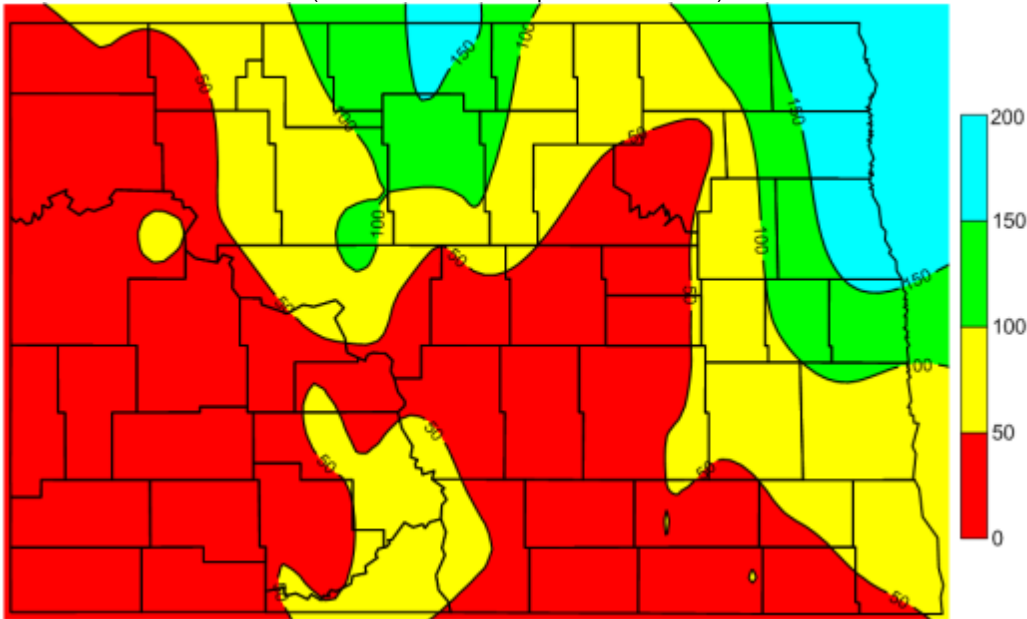
Season in Graphics

Spring 2012 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

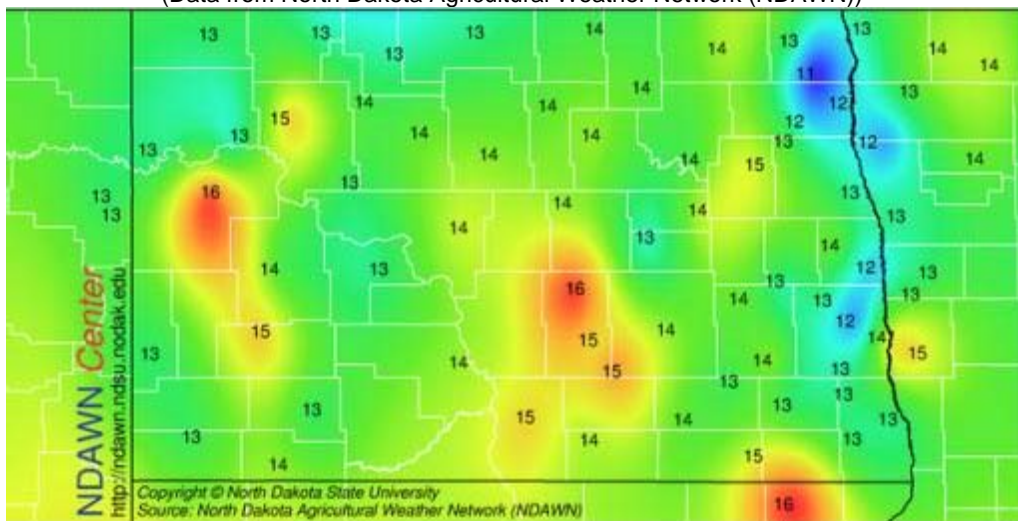
March 2012

Average Temperature (°F) Deviation from Mean (1971-2000)

Departure From Normal Monthly

Average Air Temperature in degrees F

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



North Dakota State Climate Office

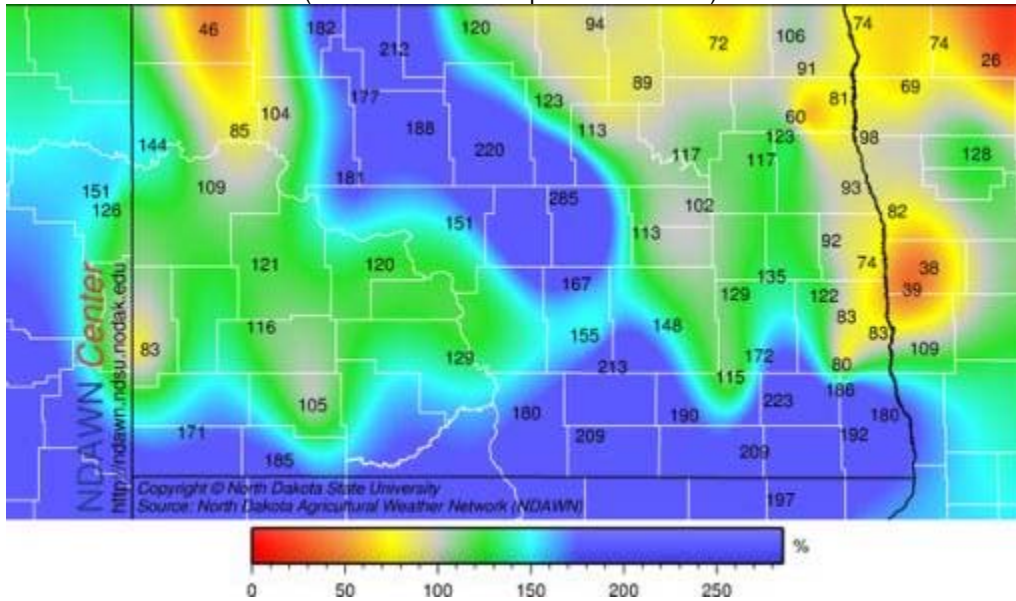
Season in Graphics

Spring 2012 Weather in North Dakota:

Total Precipitation percent of mean (1971-2000)

Precipitation Percent of Normal

(Data from NWS Cooperative Network)

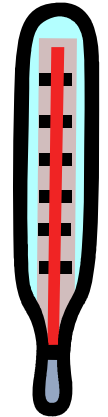
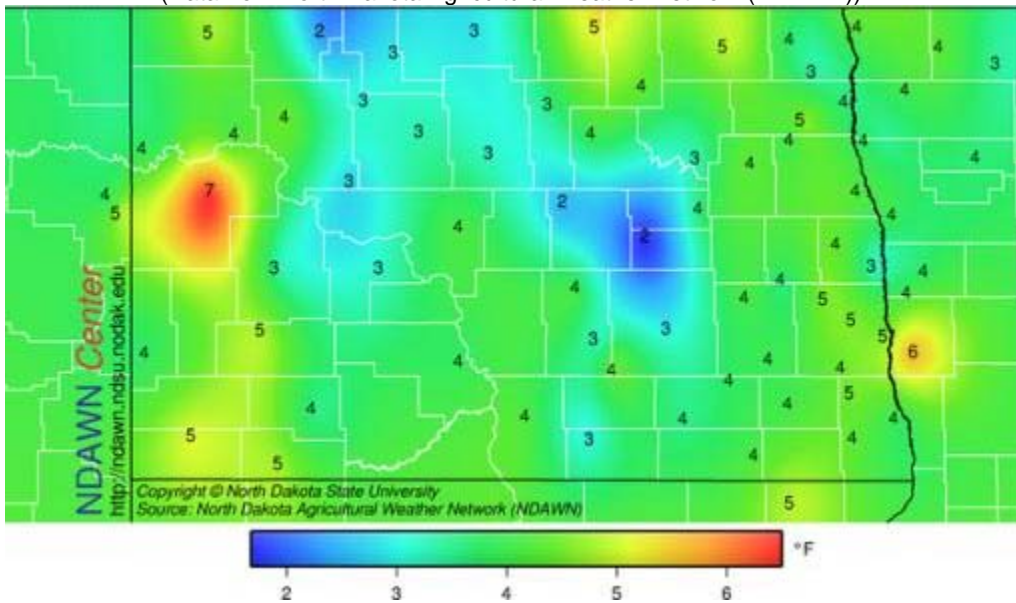


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Average Temperature (°F) Deviation from Mean (1971-2000)

Departure From Normal Monthly
Average Air Temperature in degrees F

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



North Dakota State Climate Office

April 2012

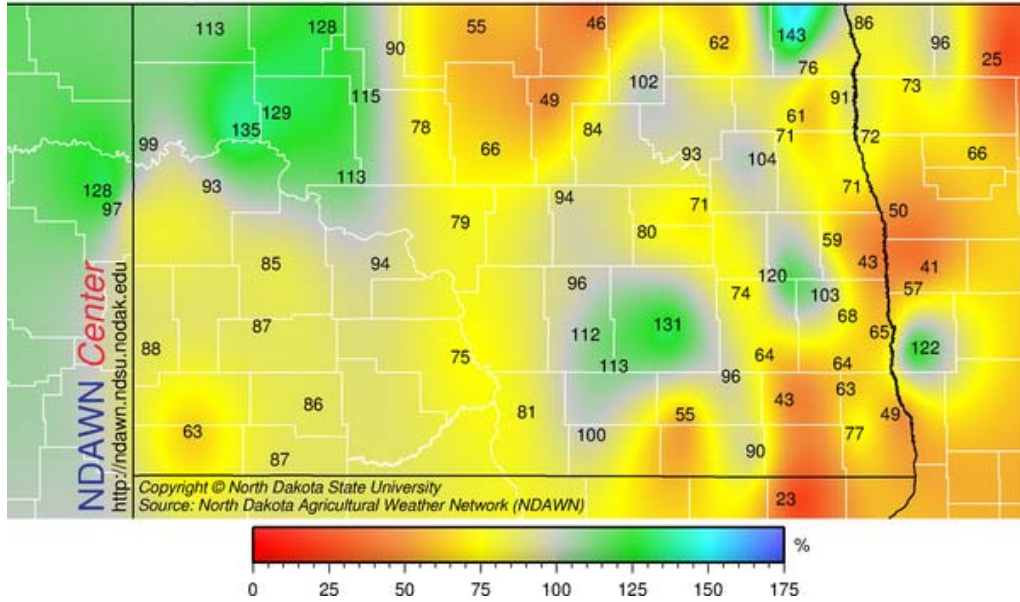
Season in Graphics

Spring 2012 Weather in North Dakota:

Total Precipitation percent of mean (1971-2000)

Precipitation Percent of Normal

(Data from NWS Cooperative Network)

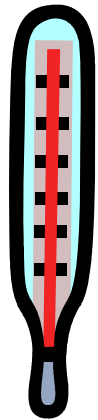
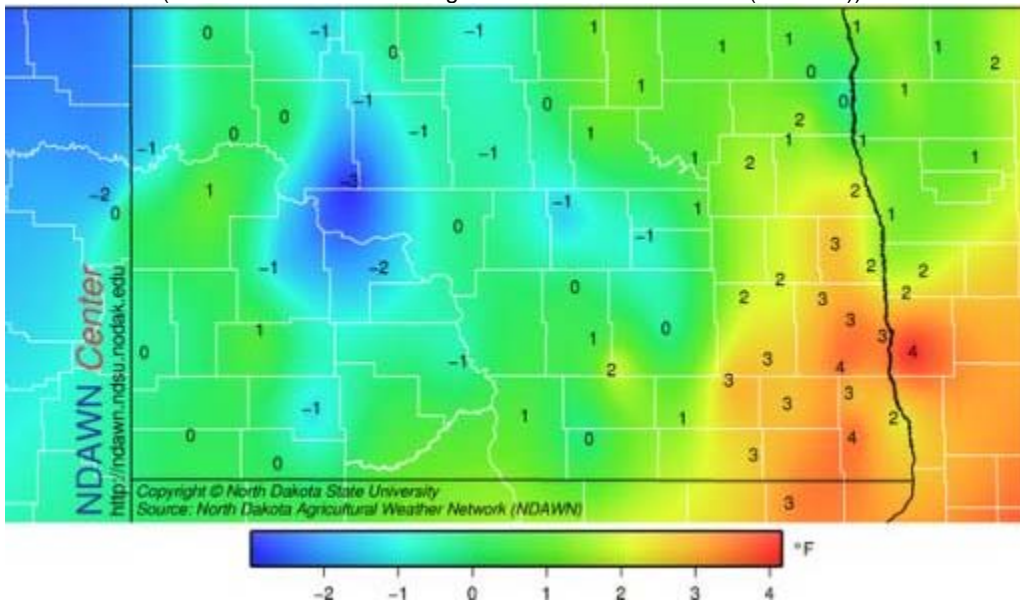


North Dakota State Climate Office

Average Temperature (°F) Deviation from Mean (1971-2000)

Departure From Normal Monthly
Average Air Temperature in degrees F

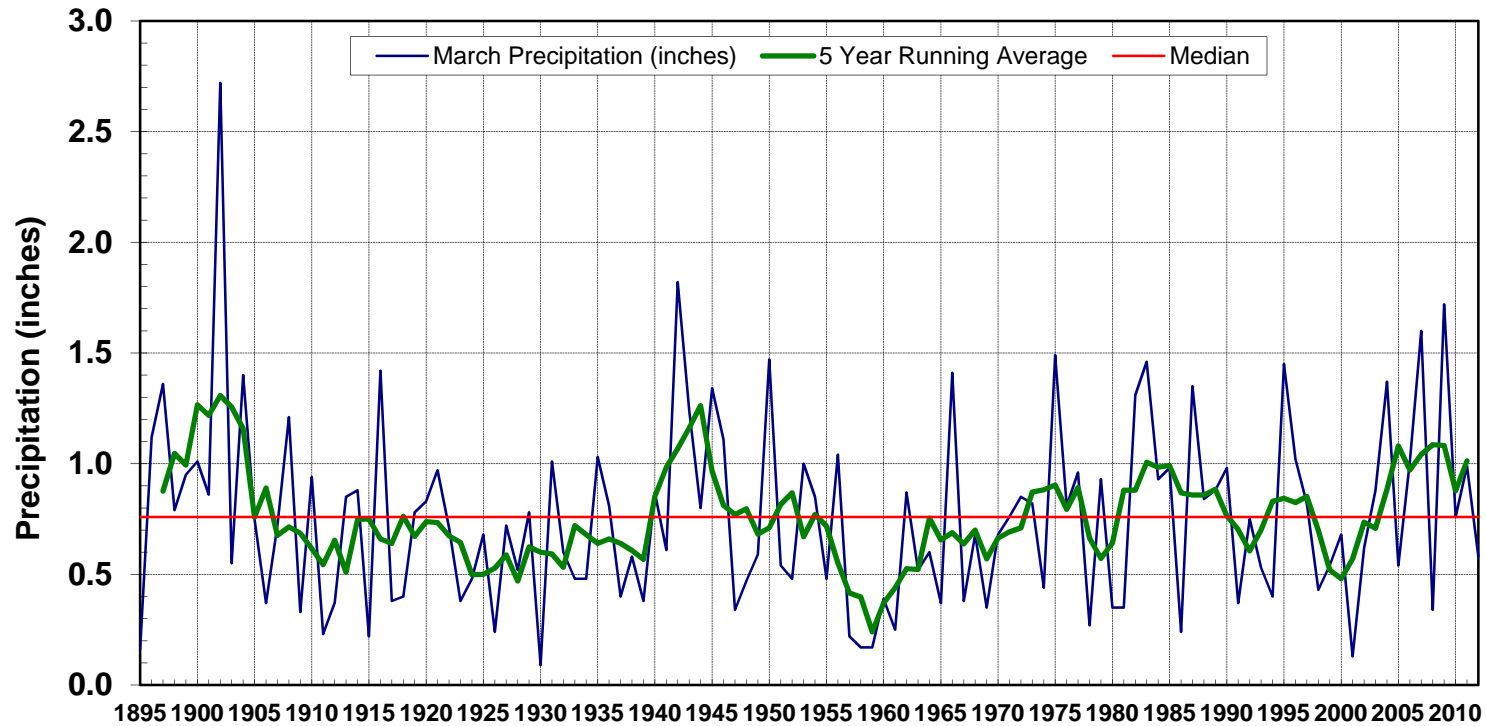
(Data from North Dakota Agricultural Weather Network (NDAWN))



North Dakota State Climate Office

May 2012

Historical March Precipitation for North Dakota

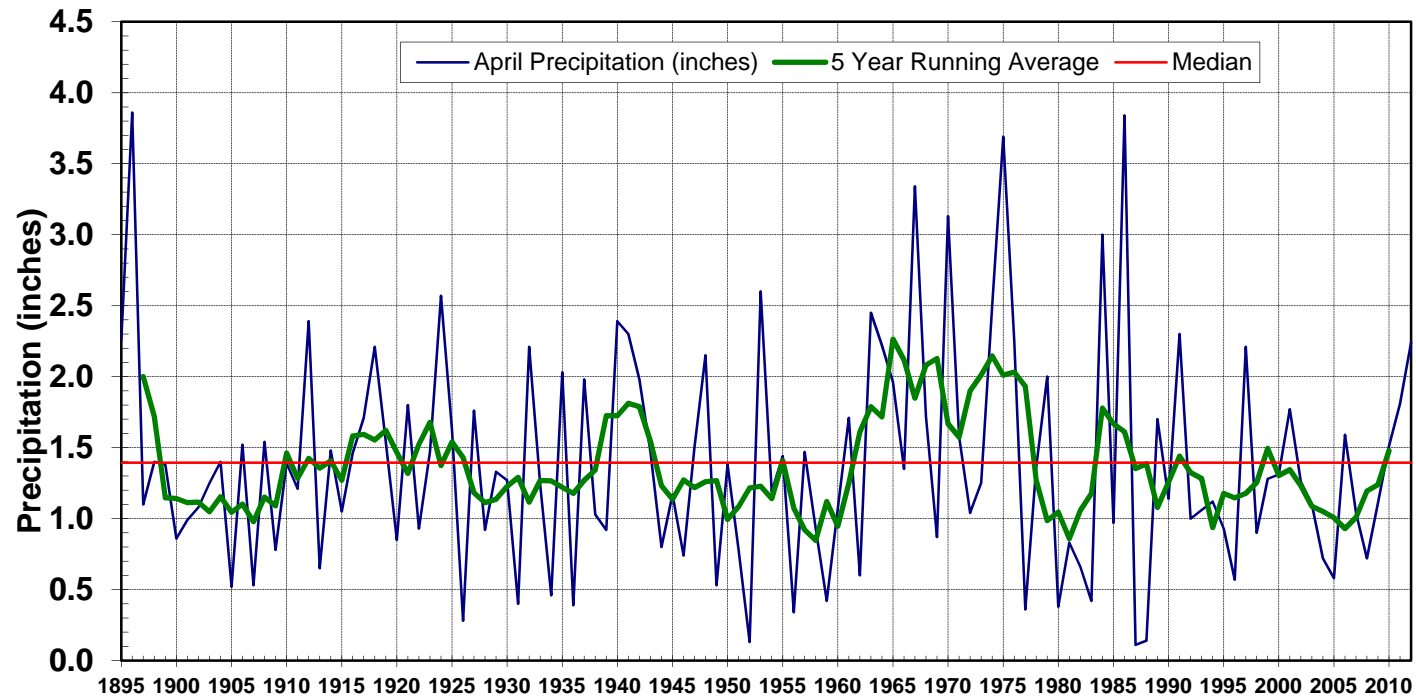


March Precipitation Statistics

2012 Amount: 0.58 inches
Maximum: 2.72 inches in 1902
State Normal: 0.85" (1981-2010)

Monthly Ranking: 46th driest in 118 years
Minimum: 0.09 inches in 1930
Years in Record: 118

Historical April Precipitation for North Dakota

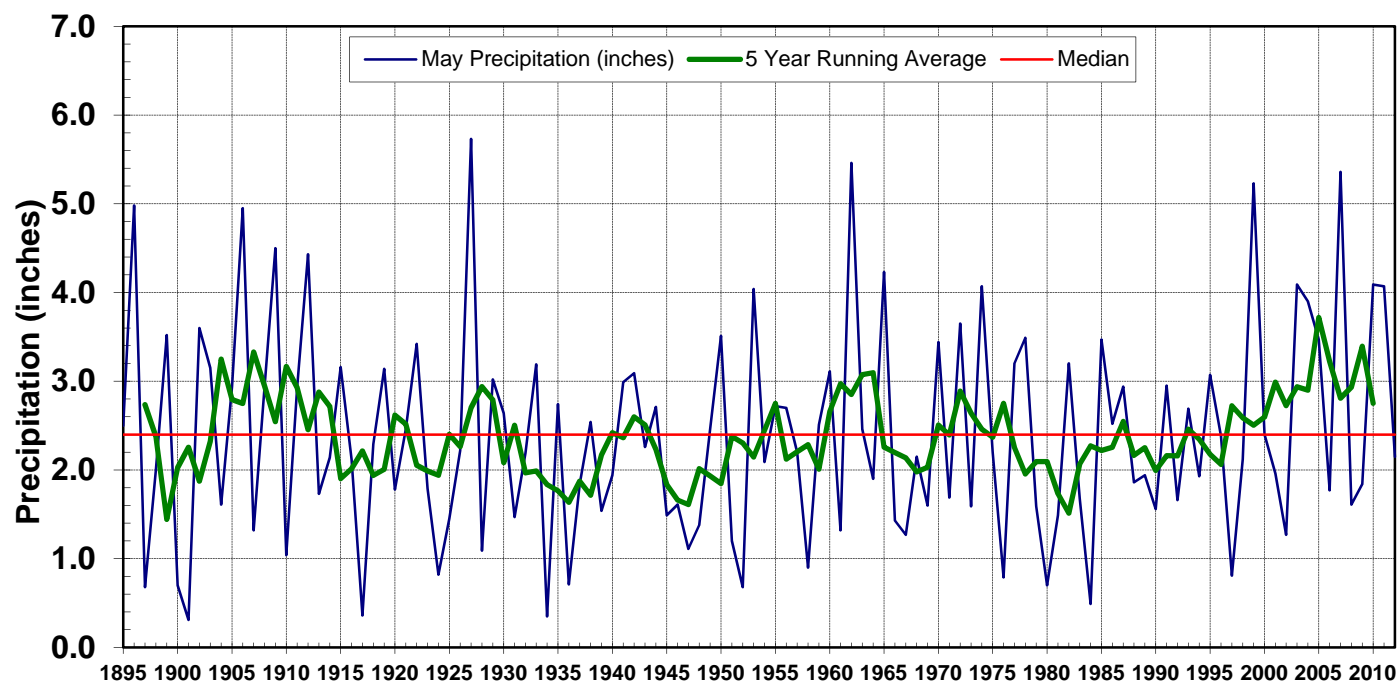


April Precipitation Statistics

2012 Amount: 2.24 inches
Maximum: 3.86 inches in 1896
State Normal: 1.23" (1981-2010)

Monthly Ranking: 17th Wettest in 118 years
Minimum: 0.11 inches in 1987
Years in Record: 118

Historical May Precipitation for North Dakota

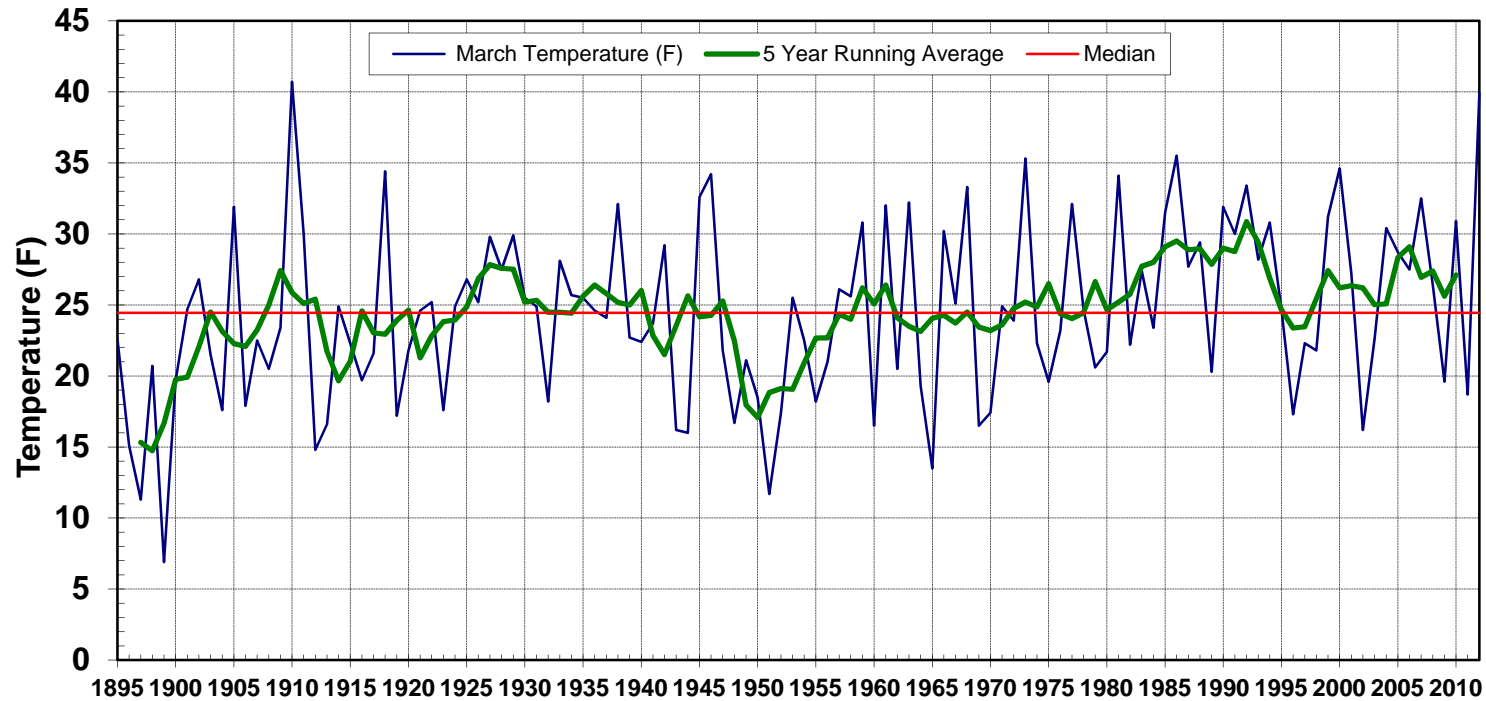


May Precipitation Statistics

2012 Amount: 2.15 inches
Maximum: 5.73 inches in 1927
State Normal: 2.53" (1981-2010)

Monthly Ranking: 56th Driest in 118 years
Minimum: 0.31 inches in 1901
Years in Record: 118

Historical March Temperature for North Dakota

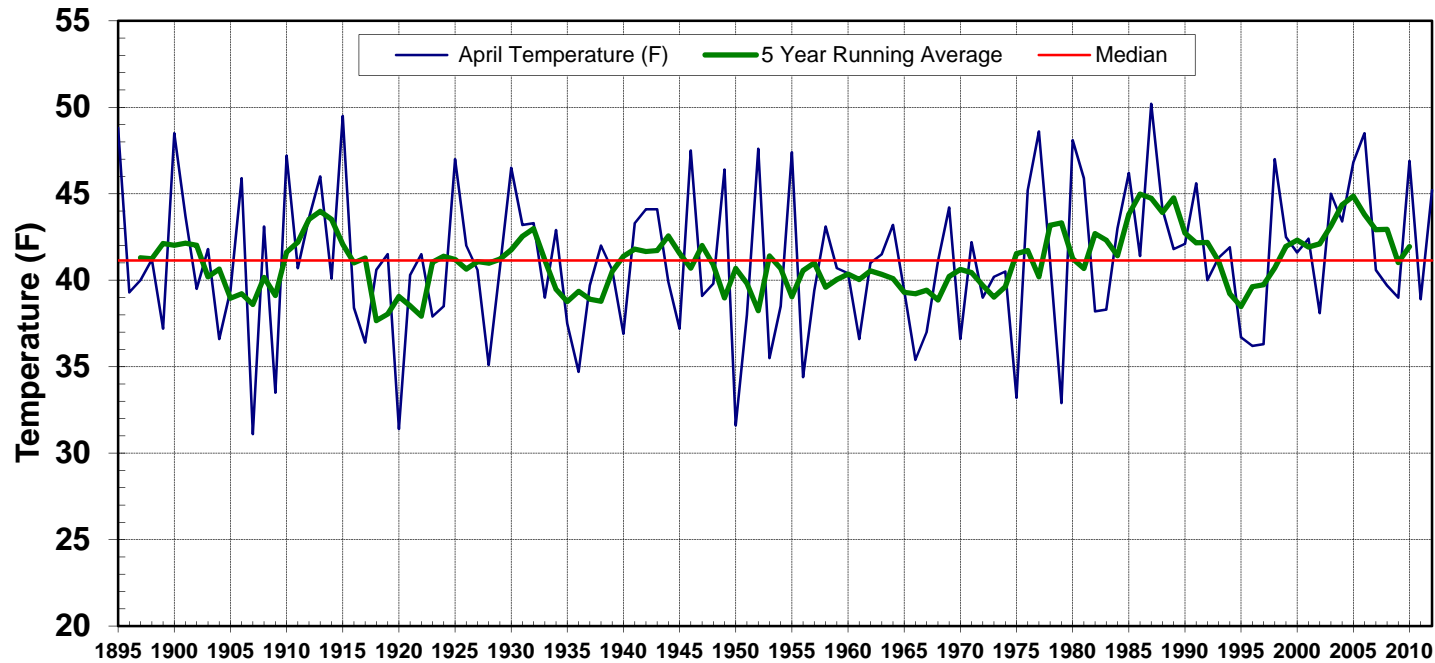


March Temperature Statistics

2012 Average: 39.9 °F
Maximum: 40.7 °F in 1910
State Normal: 27.33 °F (1981-2010)

Monthly Ranking: 2nd Warmest in 118 years
Minimum: 6.9 °F in 1899
Years in Record: 118

Historical April Temperature for North Dakota

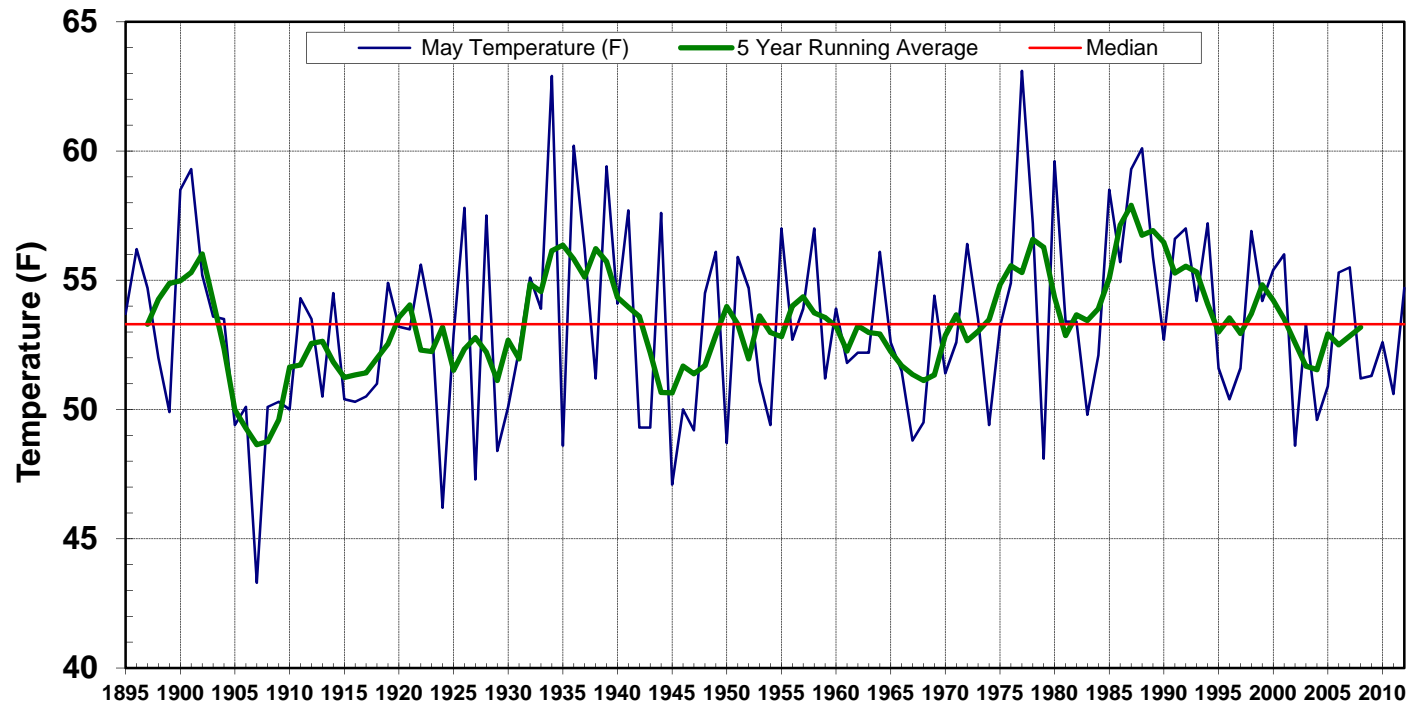


April Temperature Statistics

2012 Average: 45.2 °F
Maximum: 50.2 °F in 1987
State Normal: 42.37 °F (1981-2010)

Monthly Ranking: 23rd Warmest in 118 years
Minimum: 31.1°F in 1907
Years in Record: 118

Historical May Temperature for North Dakota



May Temperature Statistics

2012 Average: 54.7 °F

Maximum: 63.1°F in 1977

State Normal: 54.01 °F (1981-2010)

Monthly Ranking: 39th Warmest in 118 years

Minimum: 43.3°F in 1907

Years in Record: 118



Storms & Record Events



State Tornado, Hail, and Wind Reports for Spring 2012 by B. A. Mullins

North Dakota 3 Month Total	Wind	Hail	Tornado
	13	15	1

Reports by Month			
Month	Wind	Hail	Tornado
Total March	0	0	0
Total April	0	0	0
Total May	13	15	1

North Dakota Record Event Reports for Spring 2012

Date	Location	Type of Record	Previous Record
03/10/12	Bismarck	High temperature of 72 °F	64 °F set in 2008
03/10/12	Williston	High temperature of 69 °F	59 °F set in 1991
03/10/12	Minot	High temperature of 64 °F	57 °F set in 1990
03/10/12	Dickinson	High temperature of 71 °F	68 °F set in 1903
03/10/12	Jamestown	High temperature of 65 °F	62 °F set in 1911
03/11/12	Bismarck	High temperature of 69 °F	67 °F set in 1934
03/11/12	Dickinson	High temperature of 71 °F	Ties 1990
03/11/12	Jamestown	High temperature of 63 °F	62 °F set in 1934
03/11/12	Grand Forks NWS	High temperature of 57 °F	Ties 1981
03/11/12	Grand Forks Airport	High temperature of 56 °F	Ties 1981
03/11/12	Fargo	High temperature of 59 °F	Ties 1981
03/12/12	Grand Forks Airport	High temperature of 55 °F	53 °F set in 2002
03/13/12	Grand Forks NWS	High temperature of 59 °F	55 °F set in 1914
03/13/12	Grand Forks Airport	High temperature of 58 °F	51 °F set in 1945
03/15/12	Fargo	High temperature of 62 °F	61 °F set in 1927
03/15/12	Grand Forks Airport	High temperature of 59 °F	52 °F set in 2003
03/15/12	Williston	High temperature of 68 °F	67 °F set in 1996
03/15/12	Minot	High temperature of 64 °F	62 °F set in 1938
03/15/12	Dickinson	High temperature of 71 °F	68 °F set in 1995
03/16/12	Bismarck	High temperature of 81 °F	64 °F set in 1981
03/16/12	Williston	High temperature of 77 °F	70 °F set in 1981
03/16/12	Minot	High temperature of 73 °F	66 °F set in 1910
03/16/12	Jamestown	High temperature of 78 °F	64 °F set in 1981
03/16/12	Dickinson	High temperature of 78 °F	68 °F set in 1999
03/16/12	Fargo	High temperature of 76 °F	64 °F set in 1968
03/16/12	Grand Forks Airport	High temperature of 73 °F	62 °F set in 1981
03/16/12	Fargo	High minimum temperature of 39 °F	35 °F set in 1995
03/17/12	Fargo	High temperature of 76 °F	73 °F set in 1968
03/17/12	Grand Forks Airport	High temperature of 70 °F	56 °F set in 1968
03/17/12	Grand Forks NWS	High temperature of 70 °F	65 °F set in 1938
03/17/12	Fargo	High minimum temperature of 48 °F	43 °F set in 1968
03/17/12	Grand Forks Airport	High minimum temperature of 36 °F	34 °F set in 1979

03/17/12	Grand Forks NWS	High minimum temperature of 40 °F	36 °F set in 1954
03/17/12	Bismarck	High temperature of 74 °F	67 °F set in 1910
03/17/12	Minot	High temperature of 69 °F	Ties 1910
03/17/12	Jamestown	High temperature of 71 °F	69 °F set in 1968
03/17/12	Dickinson	High temperature of 70 °F	66 °F set in 1910
03/18/12	Grand Forks Airport	High minimum temperature of 47 °F	36 °F set in 1995
03/18/12	Grand Forks NWS	High minimum temperature of 52 °F	36 °F set in 1995
03/18/12	Fargo	High temperature of 78 °F	72 °F set in 1910
03/18/12	Grand Forks Airport	High temperature of 74 °F	57 °F set in 1985
03/18/12	Bismarck	High temperature of 79 °F	70 °F set in 1910
03/18/12	Minot	High temperature of 77 °F	73 °F set in 1910
03/18/12	Jamestown	High temperature of 79 °F	69 °F set in 1921
03/18/12	Dickinson	High temperature of 79 °F	68 °F set in 2007
03/18/12	Williston	High temperature of 67 °F	Ties 1910
03/18/12	Bismarck	High minimum temperature of 42 °F	37 °F set in 1972
03/19/12	Williston	High minimum temperature of 33 °F	30 °F set in 1900
03/19/12	Fargo	High temperature of 76 °F	66 °F set in 1910
03/19/12	Fargo	High minimum temperature of 57 °F	37 °F set in 1987
03/19/12	Grand Forks Airport	High temperature of 74 °F	57 °F set in 1991
03/19/12	Grand Forks Airport	High minimum temperature of 54 °F	35 °F set in 1987
03/19/12	Grand Forks NWS	High temperature of 74 °F	69 °F set in 1910
03/19/12	Grand Forks NWS	High minimum temperature of 54 °F	36 °F set in 1987
03/20/12	Fargo	High minimum temperature of 42 °F	41 °F set in 1987
03/20/12	Grand Forks Airport	High minimum temperature of 37 °F	36 °F set in 1987
03/20/12	Grand Forks NWS	High minimum temperature of 39 °F	38 °F set in 1987
03/21/12	Grand Forks Airport	High temperature of 68 °F	63 °F set in 1945
03/23/12	Grand Forks Airport	Record high rainfall of 0.55 inches	0.46 inches set in 2009
03/23/12	Fargo	High minimum temperature of 51 °F	48 °F set in 1910
03/23/12	Grand Forks Airport	High minimum temperature of 52 °F	39 °F set in 2009
04/01/12	Fargo	High temperature of 73 °F	70 °F set in 1925
04/01/12	Grand Forks Airport	High temperature of 73 °F	61 °F set in 1955
04/01/12	Grand Forks NWS	High temperature of 72 °F	69 °F set in 1928
04/01/12	Bismarck	High minimum temperature of 50 °F	42 °F set in 1899
04/01/12	Bismarck	High temperature of 79 °F	75 °F set in 1976
04/01/12	Dickinson	High temperature of 76 °F	74 °F set in 1964
04/02/12	Jamestown	High rainfall of 0.27 inches	0.23 inches set in 1963
04/06/12	Minot	High rainfall of 0.16 inches	Ties 1964
04/13/12	Grand Forks Airport	High rainfall of 0.43 inches	0.39 inches set in 1967
04/13/12	Jamestown	High rainfall of 0.55 inches	0.48 inches set in 1991
04/13/12	Bismarck	High rainfall of 0.58 inches	0.53 inches set in 1941
04/23/12	Bismarck	High temperature of 84 °F	Ties 1895
04/23/12	Dickinson	High temperature of 87 °F	81 °F set in 1906
04/23/12	Williston	High temperature of 87 °F	84 °F set in 1982
04/23/12	Minot	High temperature of 85 °F	82 °F set in 1982
04/24/12	Dickinson	High temperature of 90 °F	89 °F set in 1962
04/24/12	Williston	High temperature of 90 °F	Ties 1962
04/24/12	Minot	High temperature of 88 °F	87 °F set in 1962
05/17/12	Fargo	High temperature of 92 °F	Ties 1911
05/18/12	Fargo	High temperature of 96 °F	92 °F set in 1988
05/22/12	Fargo	High temperature of 93 °F	Ties 1980
05/27/12	Grand Forks Airport	High rainfall of 0.61 inches	0.60 inches set in 1954



Seasonal Outlook



Summer 2012 Climate Outlooks

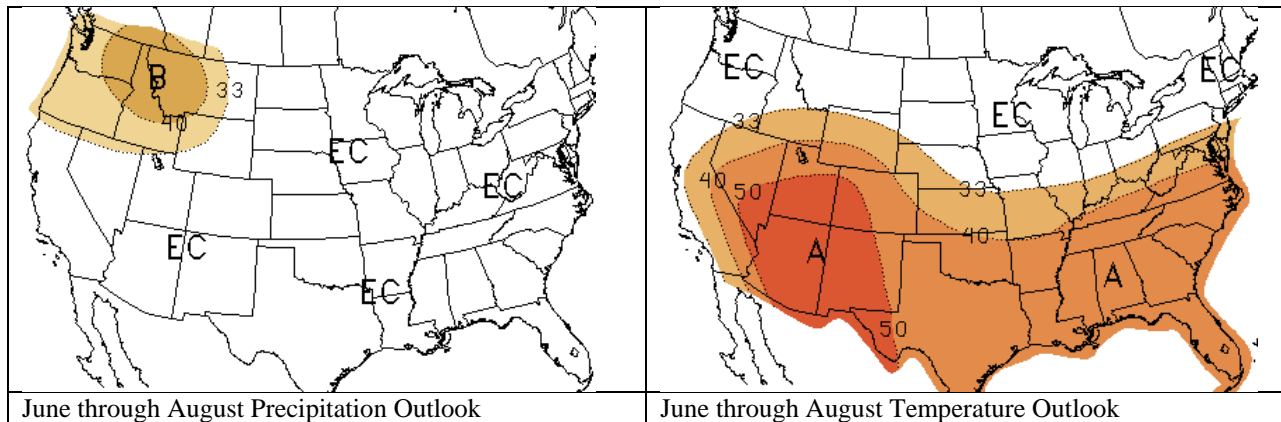
by D. Ritchison¹

Although winter often gets the most publicity, it is summer weather that has the largest economic impact on North Dakota. This impact is obviously first and foremost in agriculture, but also felt in tourism and recreational activities. Last summer started off very wet with most of the state receiving well above average precipitation during June and July, with August trending drier. That drier pattern once it set in, has for the most part, persisted for the next 9 months.

One of the many techniques in seasonal forecasting is looking at past years with similar patterns (both atmospheric and oceanic) and then making the assumption that the weather this year will parallel those other similar scenarios. Each year is unique, but this tool can be useful.

Using this technique, there are a few years, 2006, 2000, and 1981, among others, that are comparable to what has been happening the past several months. The year 2006 will raise eyebrows, as that was the warmest and driest summer in the region since the drought years of the late 1980s. Using those years as an analogue, I feel this summer has a higher than normal probability to finish with temperatures above average and rainfall being near or below normal for the next three months. With most of our precipitation falling as localized thunderstorms this time of year, the precipitation always varies from spot to spot, yet, I feel overall, more locations than not will be much drier than recent summers.

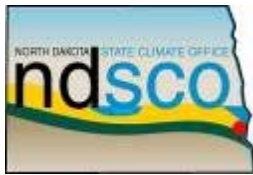
The latest summer outlook from the Climate Prediction Center (CPC) for the next three months can be seen below and differs from my analysis. The CPC is forecasting equal chances of the area finishing either above, below or near normal for both precipitation and temperatures in the entire state. You can find the current and future outlooks, when new ones become available, at <http://www.cpc.ncep.noaa.gov/products/predictions/90day>.



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

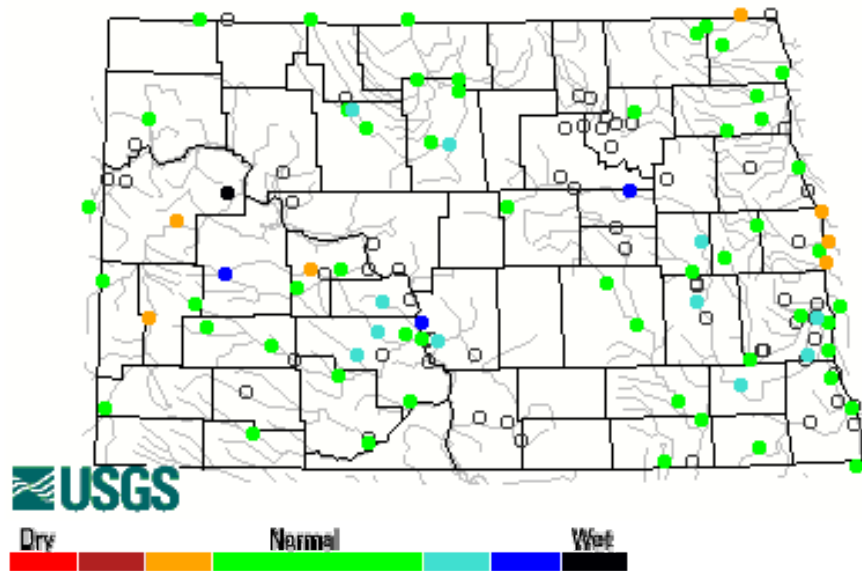


Flash Flood Safety

by A. Schlag²

The past winter and fall were fairly dry across much of North Dakota, accordingly the river and streams across the state have been well behaved thus far. As the following image taken from the North Dakota Water Science Center’s website depicts, the vast majority of rivers remain near normal, with only a few significantly above or below normal.

Friday, June 08, 2012 11:30ET



This brings us to what does constitute the greatest flood risk for this time of year, and that is flash flooding. Flash flooding in North Dakota generally does not receive near the infamy as flash floods in other places of the country. However, with us fully into severe weather season now, the possibility of locally heavy rains (generally in the form of 1.5 to 3 inches of rain in less than a couple of hours) are indeed possible and do create conditions where water overtops roadways on small drainages. Flash flooding at night can be particularly hazardous as heavy rains fill road ditches and create fast moving water over the top of roadways. Nationally, around 50% of all flood caused drowning are vehicle related with the vast majority of them simply underestimating the depth of water on the road.

Please keep this National Weather Service recommendation in mind for your safety: “When Flooded, Turn Around, Don’t Drown”.



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Science Bits



Wheat Management Options under Freeze Injury

by Roger Ashley³

Since May 1, 2012 fields in southwestern North Dakota may have experience three freeze events which may have damaged wheat growth and development. The most recent freeze occurring Friday morning, May 25 could very well have severely damaged winter wheat that was in the boot stage to early stages of flowering. The North Dakota Agricultural Weather Network (NDAWN) on that day recorded low temperatures of 29°F at Beach and Mott and 30°F at Bowman and Dickinson. Some producers in low lying areas reported temperatures as low as 20 to 25°F. Whether freeze injury will cause damage to the wheat crop (winter or spring) depends on several factors including plant growth stage, plant moisture content, freeze type, duration of exposure and lowest temperature reached. Determining if a wheat crop has been injured and how severely it has been injured will help the producer decide if another fungicide or nutrient application is required or if the crop should be hayed or terminated. Freezing normally does not kill the entire plant and the roots may continue to absorb nitrates from the soil. With no grain to use the nitrates, the plant may accumulate nitrate in the forage.

Susceptibility to freezing temperatures steadily increases as maturity progresses through the flowering stage then decreases slightly as seed develops. All cereals are most sensitive to freeze injury during reproductive growth, beginning at jointing and continuing through the boot, heading and pollination stages. A light freeze (28°-32°F) can severely injure cereals at these stages and greatly reduce grain yields.

Mechanical disruption of cells by ice crystals that enlarge both within and between cells will injure plants. Cereals grown under good growing conditions and high soil test nitrogen levels are more susceptible to freeze injury. Drought and other stresses tend to harden plants to cold.

The degree of injury is influenced by the duration of low temperatures as well as the lowest temperature reached. Prolonged exposure to a given temperature can cause much more severe damage than brief exposures. Topography can affect the extent of freeze injury. Also the temperature that is recorded at a particular site may not reflect the actual temperature experience by the plant in the field. These factors make it difficult to make general statements about the extent of damage caused by a freeze event. Extensive scouting of a field will help in defining severity and area affected by freezing.

Diagnosis of freeze injury requires knowledge of plant parts most vulnerable at each growth stage, their location and their appearance as well as when they are normal. The following section summarizes freeze injury symptoms by growth stage

Emergence to tillering – Zadoks 10-25. During seedling to early tillering stages the growing point is below the soil surface and protected from freeze injury. Most damage occurs to leaves which may have distinct light-yellow bands and which become chlorotic or necrotic and usually twisted.

Jointing – Zadoks scale 31-39. Leaves of freeze-injured plants develop damage symptoms similar to those of the tillering stage. The most serious injury can occur to the growing points. The growing point in a stem is located just above the uppermost node you can feel when you run the stem between your thumb and forefinger. To observe the growing point, split the stem lengthwise with a sharp blade to expose the developing head. Normal uninjured growing point is bright pearl white to yellow green and turgid. Freeze injury causes the growing point to turn dull white or brownish and water soaked. Injury to growing point can occur in plants that appear to be otherwise normal because the growing point is most sensitive to cold. When the growing point is injured, stem elongation stops but later uninjured tillers continue to grow masking the damage. Expect normal and late tillers, uneven maturity and decrease in grain yield. Stem discoloration is associated with reduced metabolite transport through the nodes.

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Boot – Zadoks scale 41-49. Freezing may cause heads to be trapped inside the boot so that they cannot emerge. The heads may remain in the boot, split out the side or the boot or emerge from the boot base first. Often the peduncle or stem supporting the head continues to elongate normally, causing crimps in the stem that can inhibit normal transfer of photosynthates. The result is low test weight grain. Often the head appears normal from the outside even though the anthers are dead. Because wheat (barley and oats) are self-pollinated, male sterility causes poor seed set and low grain yield. Anthers are more sensitive to freezing temperatures than female flower parts. Normal anthers are light green, full of developing pollen grains and turgid. They turn yellow when they mature and shed pollen. Freeze injury causes anthers to turn white and shrivel. It usually prevents them from shedding pollen and extruding. Anthers should be examined during this stage as leaves and stem may appear normal.

Heading – Zadoks scale 51-59. Most symptoms of freeze injury at this stage are similar to those of earlier growth stages – sterility, leaf burn and stem lesions. The most apparent symptom is chlorosis or bleaching of awn tips. White tipped awns usually indicate that floral parts have been injured. Awn tips may have a purple cast before turning white. A light-green or white freeze ring may encircle the stem below the head several days after exposure to freezing temperatures. This ring marks the juncture of the stem and flag leaf at the time of the freeze.

Anthesis – Zadoks scale 61-69. Flowering stage is most sensitive to freeze injury. Light freezes at this stage will result in the amount of injury. Usually light freezes at this stage will result in the appearance of more random damage than at other stages. More severe freezes usually cause the entire head to be sterile. Awns of damaged plants will bend to nearly 90 degree angles from the rachis as they mature.

Milk and Dough – Zadoks 71-89. Freeze injury can occur in grain during the milk and dough stages. Usually grain will grow to normal size but then produce light, shriveled grain at maturity. Cereals frozen at milk stage often shatter easily at maturity and germination percentage is usually reduced as a result of the freeze injury. Cereal kernels frozen during the dough stage will have slightly reduced test weights and appear shriveled. Seed germination may be reduced.

CONTACTING THE NORTH DAKOTA STATE CLIMATE OFFICE

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