North Dakota Climate Bulletin

Fall 2007

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From the State Climatologist

The 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 dry and warm fall following a dry and a warm summer. As a result, severe and moderate drought still persists in the northwest 2/3 of the state. Temperature-wise, the fall of 2007 was the 20th warmest since 1895. However, it was the 41st driest fall since 1895. The fall temperature trend for the period of record (1895 to present) was 0.12° F per decade indicating that the fall seasons in ND is 1.2°F warmer today than 100 years ago on the average. The total precipitation as percentage of the normal and average temperature departure from normal are shown on pages 3 through 11 (Season in-Graphics). The Season in-Graphics also displays the time series of monthly total precipitation and average temperature of North Dakota for respective months of the season. You will also find the spring outlook in this issue. Hydro-Talk features historic floods in the central and western North Dakota. The "Science Bits" features "Nitrogen Recommendations" by the guest writer, Dr. Dave Franzen, NDSU Extension Soil Specialist, revealing the latest nitrogen recommendations for North Dakota's varying agroclimate zones. We hope you will enjoy this issue. This bulletin can be accessed at http://www.ndsu.edu/ndsco/. This web site hosts other great resources for climate and weather information.

Adnan Akyüz, Ph.D.
North Dakota State Climatologist

Weather Highlights

Seasonal Summary: by B. A. Mullins

September 2007

The state average rainfall was 1.32" which is below the 1971-2000 normal of 1.74". Most rainfall events happened from the 5th through the 8th, and from the 20th through the 24th. The greatest majority of the state had below normal precipitation. The North half of the state had less than 50% of normal precipitation. Only the southeastern and south central regions had somewhat above normal precipitation. September 2007 ranked 49th driest (or 64th wettest) in the last 113 years. The maximum state average rainfall was 5.00" in 1900 and the minimum was 0.28" in 1897.

Nearly the entire state ended with an average air temperature between 1 and 4 degrees above normal. The state average air temperature was 57.7 ° F which is slightly above the 1971-2000 normal state average of 56.1 ° F. The month ended ranking the 37th warmest (or 77th coolest) in the past 113 years. The maximum September state average air temperature was 63.4 ° F in 1897 and the minimum was 45.2 ° F in 1965.

October 2007

Central, west central, south western and east central parts of North Dakota had below normal precipitation. Most of these areas were 50% and less of normal precipitation. A few areas in the far upper northeast corner, south central, and northwest had 100 to 200% of normal rainfall. Rainfall events occurred mainly on the 1st through the 9th, the 17th through the 19th, and on the 31st. The rainfall on the 18th and 19th of October in the Red River Valley, temporarily hampered sugarbeet and potato harvest. However, by month's end, nearly all edible beans, potatoes and sugarbeets were harvested. The October state average precipitation was 1.13 inches which was below the 1971-2000 normal state average of 1.41 inches. October precipitation ranked 42nd wettest (71st driest) in the past 113 years. The maximum precipitation was 4.71 inches in 1982 and the minimum was 0.10 inches in 1952.

The October average air temperatures across the state all ended 1 to 5 degrees above normal. A state wide freeze did not occur until late October. Some areas in the eastern part of the state had long growing season. Fargo with 187 consecutive days of greater than 32 °F had its longest growing season in the past 113 years. The state average October air temperature was 46.3 °F which is above the 1971-2000 normal state average temperature of 43.62 °F. October 2007 ranked the 26th warmest (90th coolest) in the past 113 years. The maximum state average was 54.8 °F in 1963 and the minimum was 32.5 °F in 1925.

November 2007

There was some snowfall in November with totals of 3-5 inches in the northern part of the state. The majority of the state had less than a 1 inch snow total. Precipitation totals were less than an inch and below normal across the state. For the majority of the state, the percent of normal precipitation was less than 25%. According to North Dakota's National Agricultural Statistics Service, ND topsoil moisture supplies were rated 84 percent short to adequate, while subsoil moisture supplies were rated 83 percent short to adequate. The November state average precipitation was 0.23" which is below the 1971-2000 normal state average of 0.73". The month ended as the 23rd driest (91st wettest) November in the past 113 years. The November state average maximum precipitation was 2.51" in 2000 and the minimum was 0.02" in 1939.

November average temperatures ranged from 23.5 ° F to 32.0 °F. The temperatures were all from 0 °F to 5° F above normal. The November state average air temperature was 29.3° F which is slightly above the 1971-2000 normal of 26.1° F. The month ended as being the 37th warmest (78th coolest) November in the past 113 years. The state average maximum air temperature was 37.4° F in 2001 and the minimum was 7.3 °F in 1896. The state average temperature range then for the past 113 years is 30.1 °F.

Season in Graphics

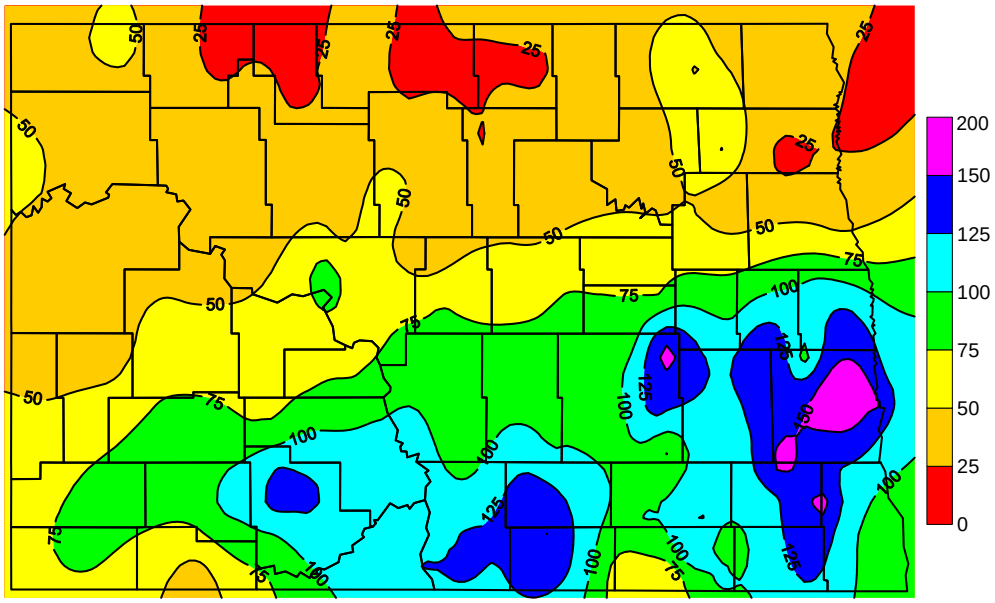
Fall 2007 Weather in North Dakota:

September 2007

Total Precipitation percent of mean (1971-2000)

Precipitation Percent of Normal

(Data from NWS Cooperative Network)



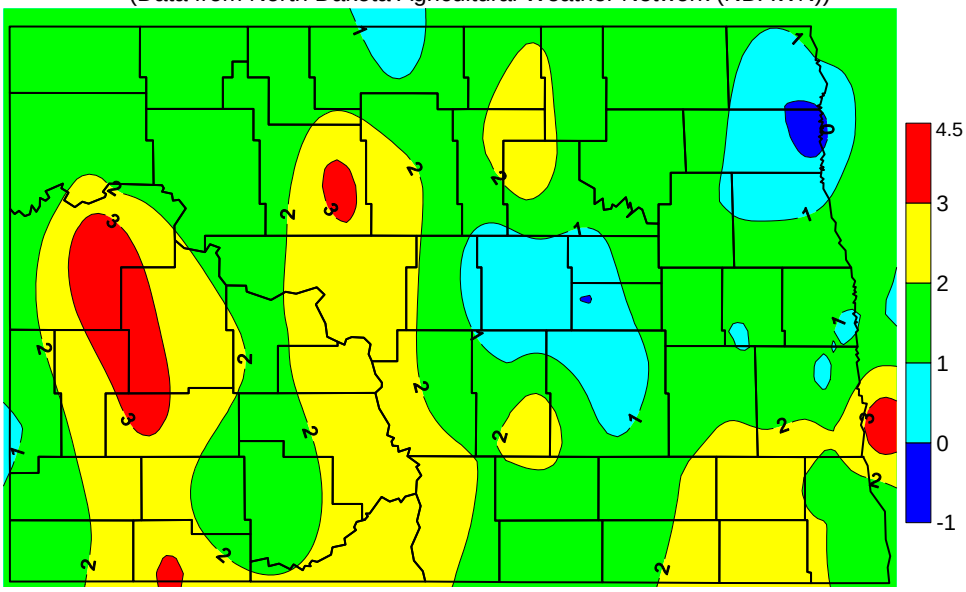
North Dakota State Climate Office

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

Season in Graphics

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October 2007

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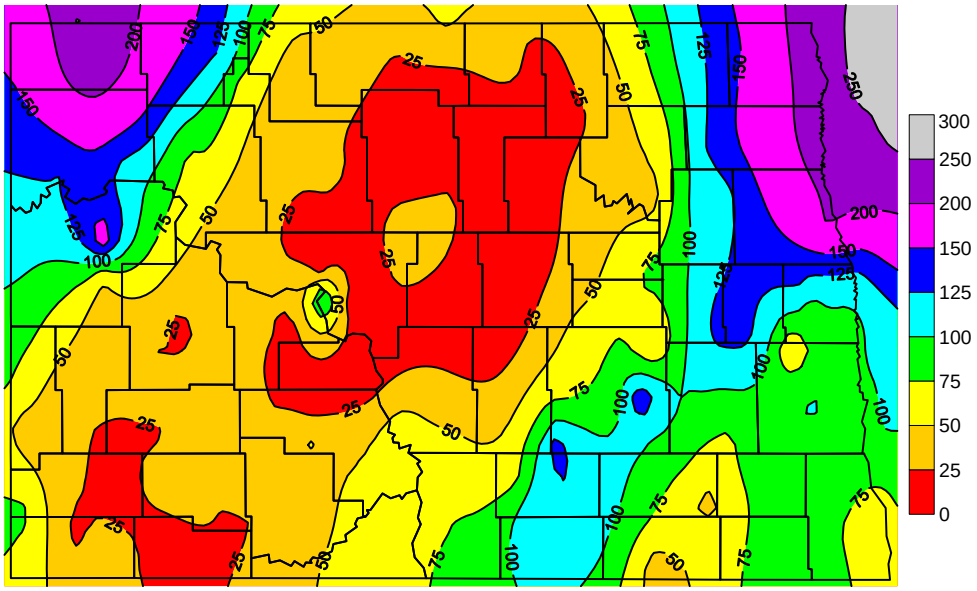

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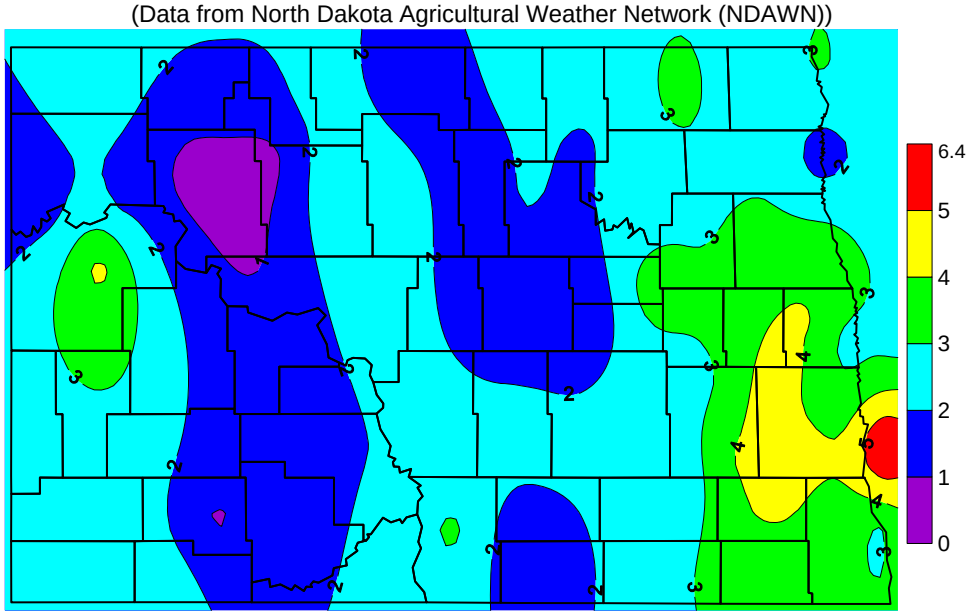

North Dakota State Climate Office

Season in Graphics

Fall 2007 Weather in North Dakota:

November 2007

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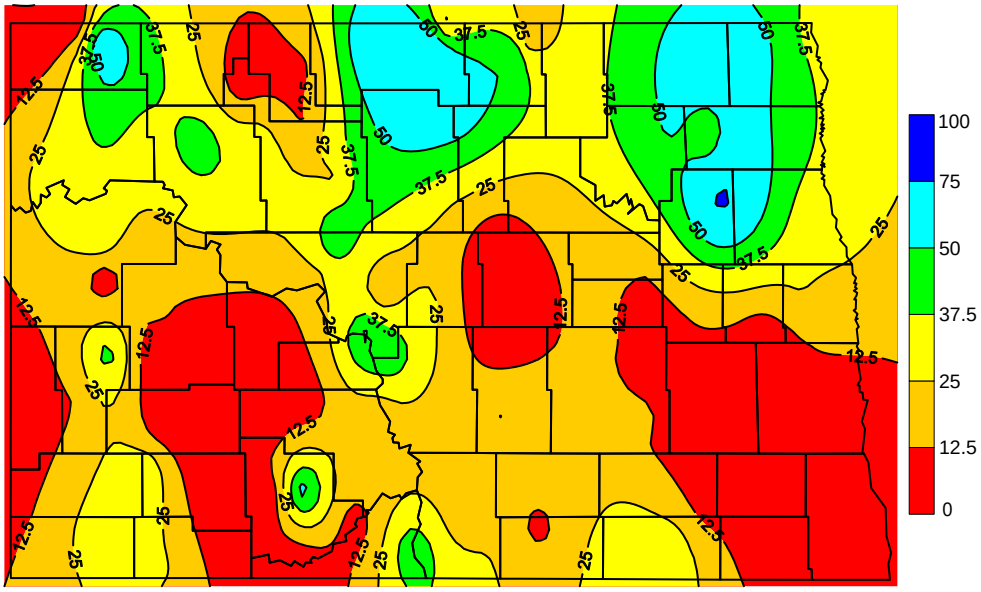
Precipitation Percent of Normal

(Data from NWS Cooperative Network)



North Dakota State Climate Office

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

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Average Air Temperature in degrees F

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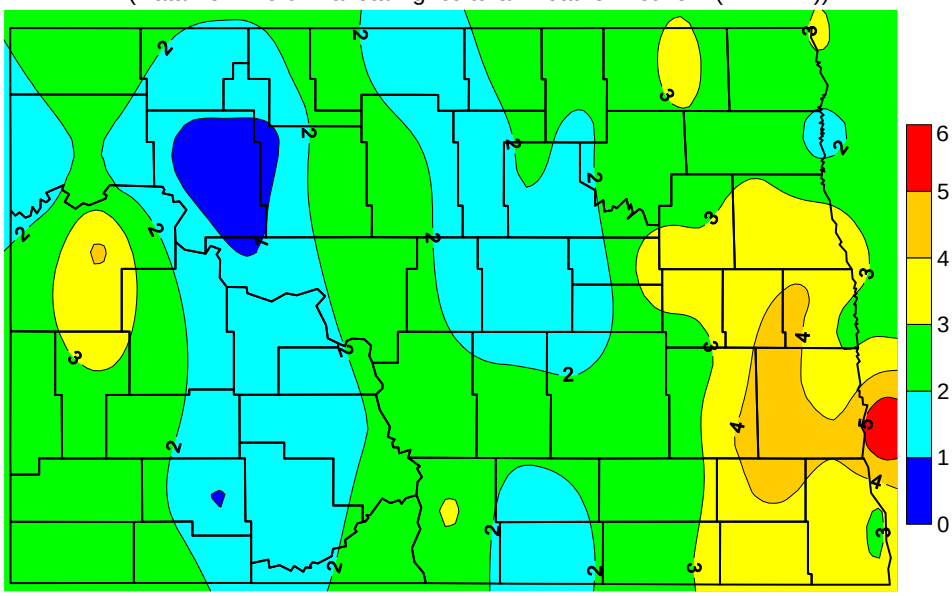
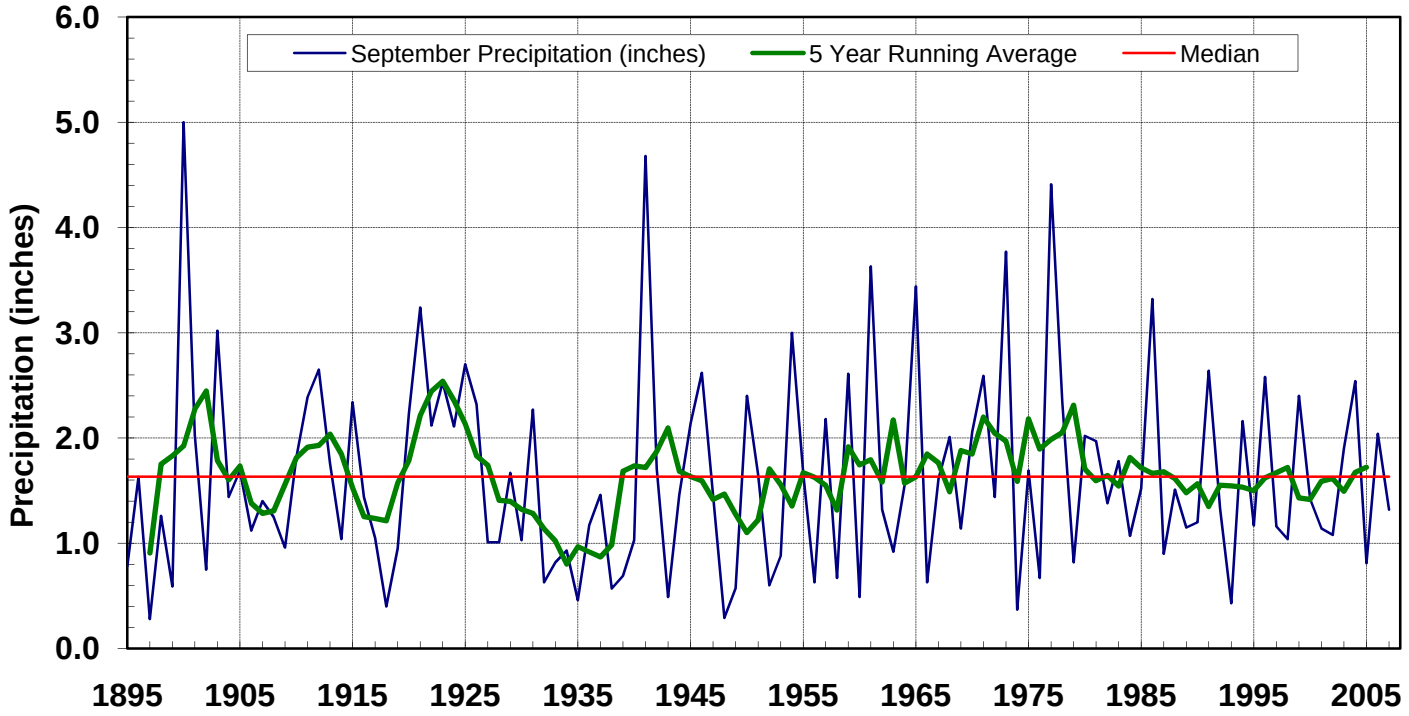


North Dakota State Climate Office

Historical September Precipitation for North Dakota

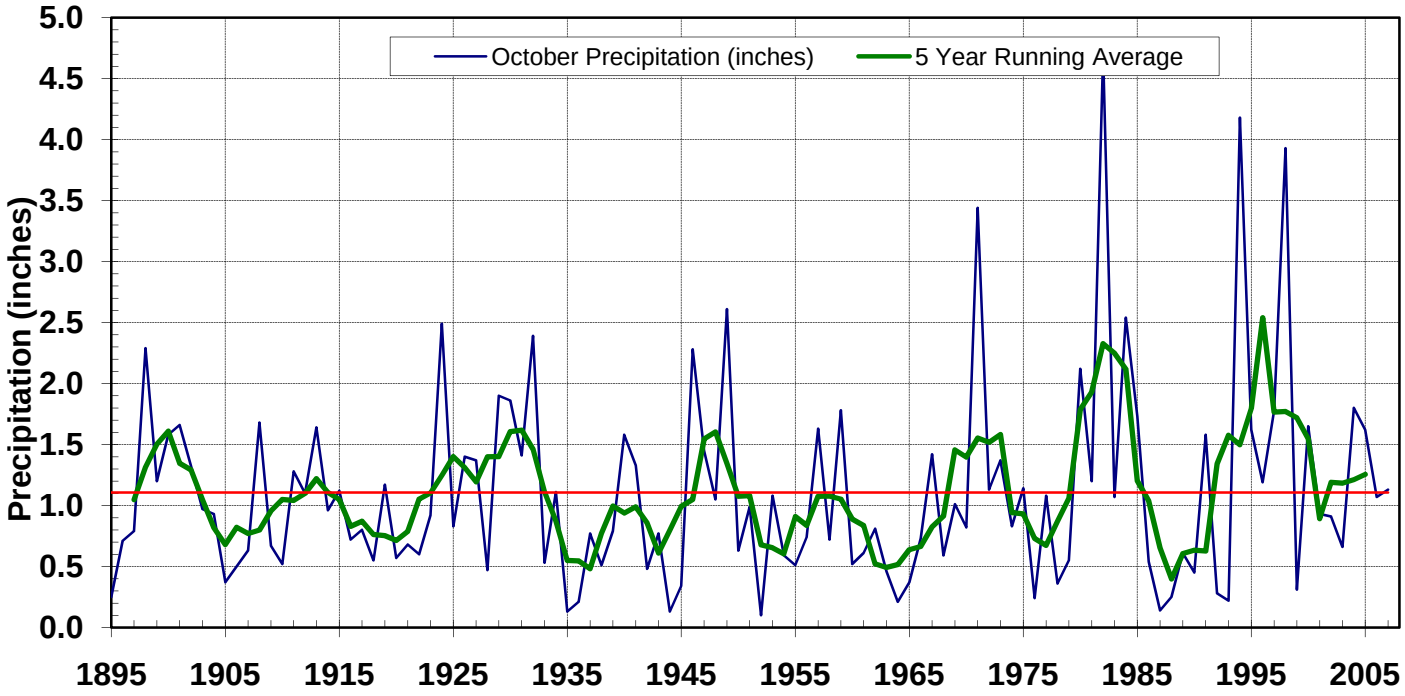


September Precipitation Statistics

2007 Amount: **1.32 inches**
Maximum: 5.00 inches in 1900
State Normal: 1.74" (1971-2000)

Monthly Ranking: 49th Driest in 113 years
Minimum: 0.28 inches in 1897
Years in Record: 113

Historical October Precipitation for North Dakota

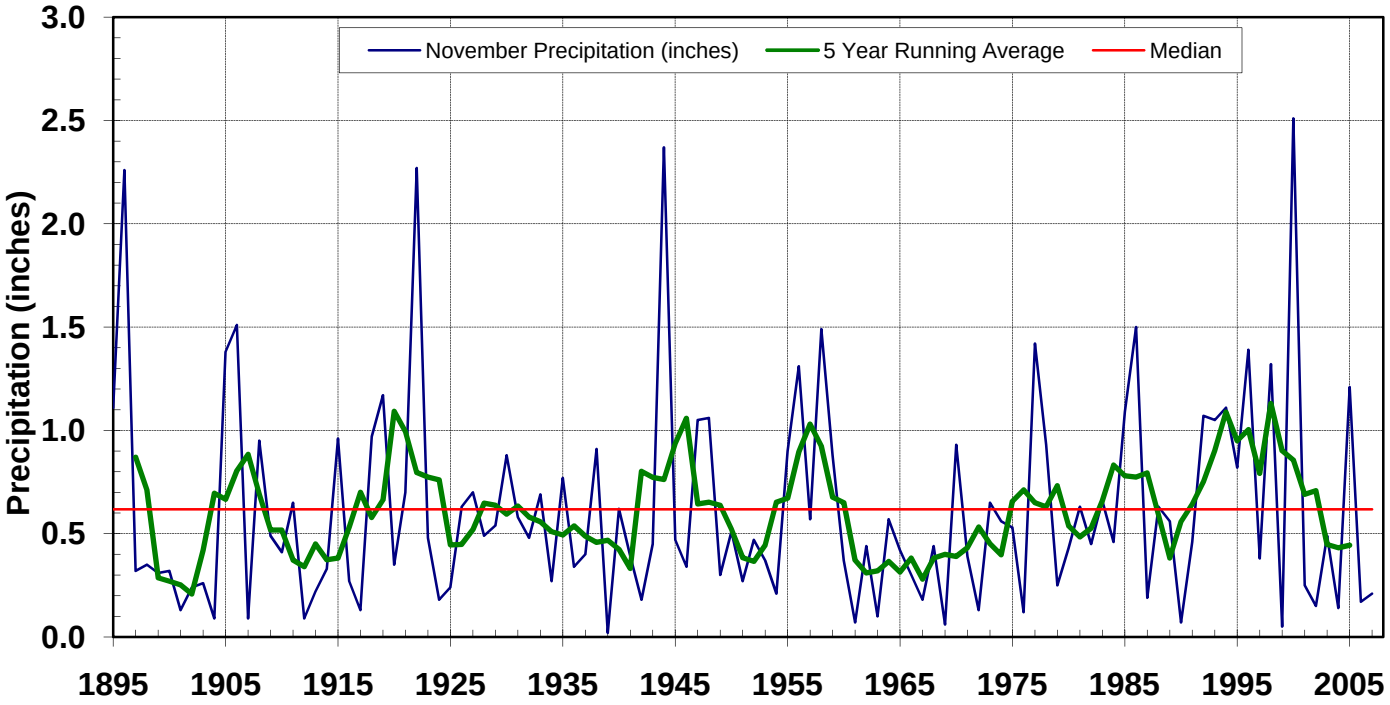


October Precipitation Statistics

2007 Amount: 1.13 inches
Maximum: 4.71 inches in 1982
State Normal: 1.41" (1971-2000)

Monthly Ranking: 42nd Wettest in 113 years
Minimum: 0.10 inches in 1952
Years in Record: 113

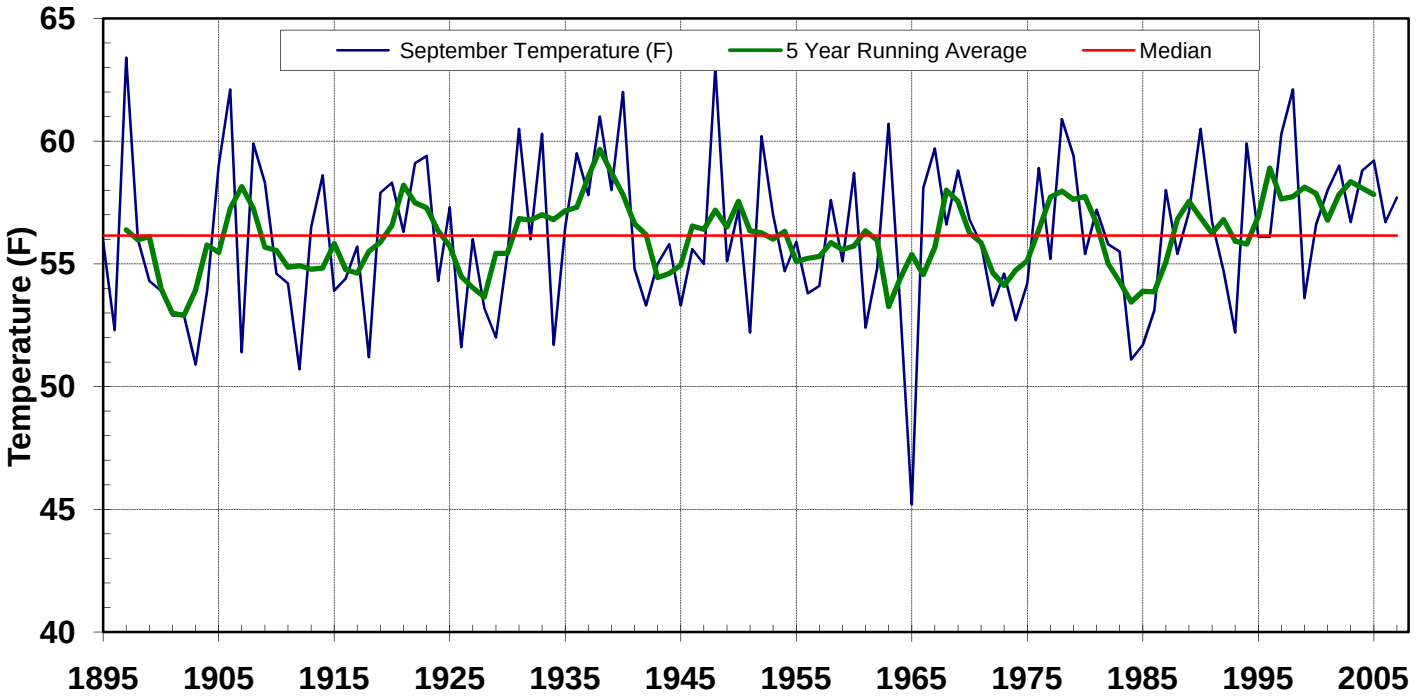
Historical November Precipitation for North Dakota



November Precipitation Statistics

2007 Amount:	0.23 **inches**	Monthly Ranking:	23rd Driest in 113 years
Maximum:	2.51 inches in 2000	Minimum:	0.02 inches in 1939
State Normal:	0.73” (1971-2000)	Years in Record:	113

Historical September Temperature for North Dakota

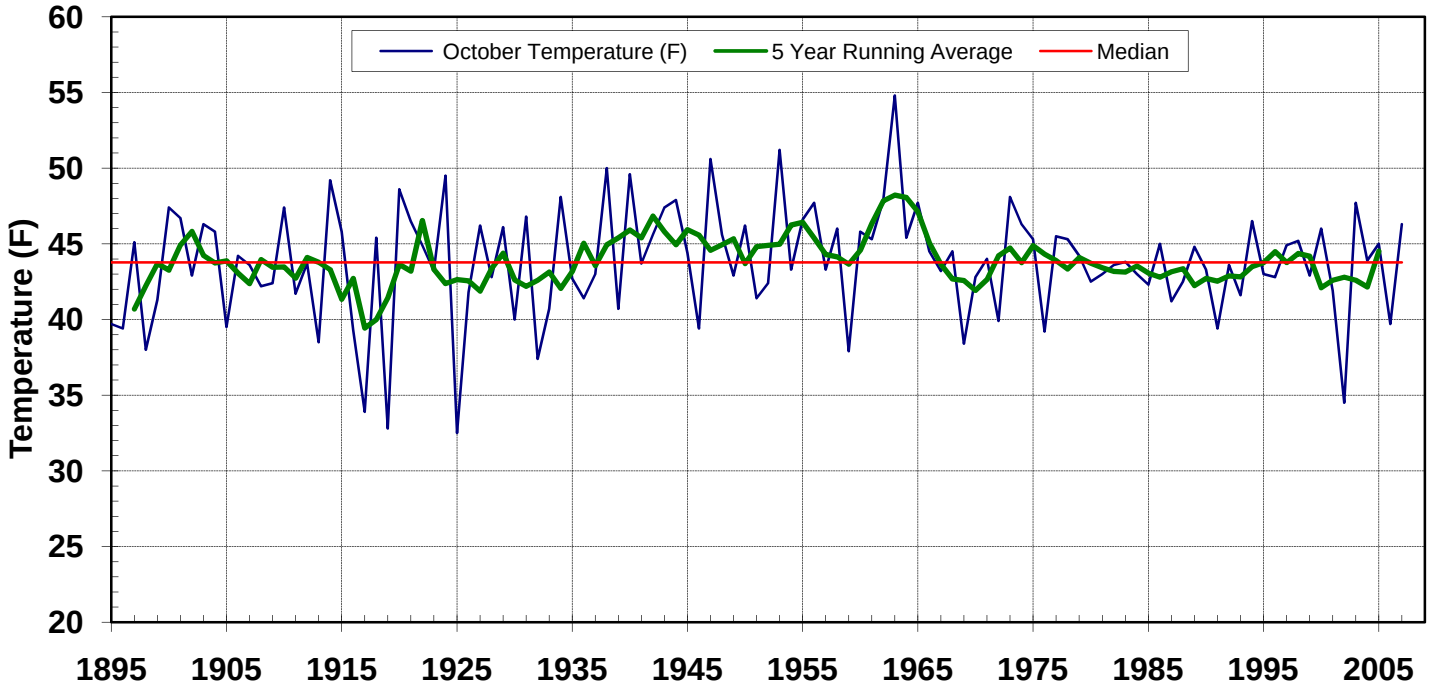


September Temperature Statistics

2007 Average: 57.7 °**F**
Maximum: 63.4° F in 1897
State Normal: 56.14° F (1971-2000)

Monthly Ranking: 37th Warmest in 113 years
Minimum: 45.2° F in 1965
Years in Record: 113

Historical October Temperature for North Dakota

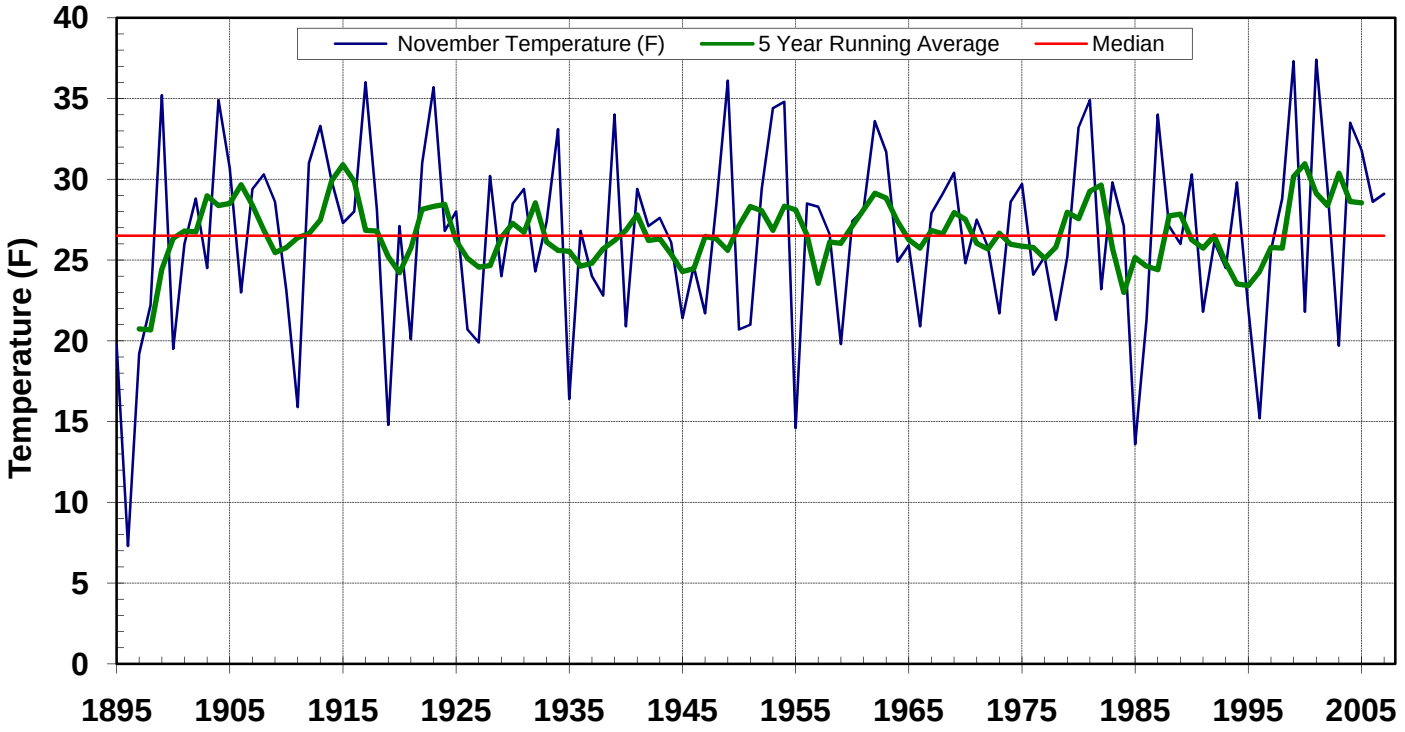


October Temperature Statistics

2007 Average: 46.3 °F
Maximum: 54.8 °F in 1963
State Normal: 43.62 °F (1971-2000)

Monthly Ranking: 24th Warmest in 113 years
Minimum: 32.5 °F in 1925
Years in Record: 113

Historical November Temperature for North Dakota



November Temperature Statistics

2007 Average: **29.3 °F**
Maximum: 37.4 °F in 2001
State Normal: 26.1 °F (1971-2000)

Monthly Ranking: 37th Warmest in 113 years
Minimum: 7.3 °F in 1896
Years in Record: 113

Storms & Record Events

State Tornado, Hail, and Wind Reports for Fall 2007

by B. A. Mullins

North Dakota Counties	Tornado 0	Hail 9	Wind 3
Reports by Month			
Month	**Wind**	**Hail**	**Tornado**
Total September	3	5	0
Total October	0	4	0
Total November	0	0	0

North Dakota Record Event Reports for Fall 2007

1. 11/13/07 Bismarck maximum morning temperature of 42 ° F breaking the old record of 40 ° F set on this date in 1923.
2. 11/13/07 Grand Forks Univ. (NWS) high temperature of 59 ° F tied the 1953 record.
3. 11/13/07 Grand Forks International Airport high temperature of 60 ° F tied the 2001 record.
4. 11/13/07 Grand Forks International Airport had a record high minimum temperature of 43 ° F.
5. 10/18/07 Grand Forks Univ. (NWS) had a record 1.11 inches of rainfall.
6. 10/18/07 Grand Forks International Airport had a record 0.93 inches of rainfall.
7. 09/29/07 Bismarck had a record high temperature of 90 ° F.
8. 09/29/07 Minot had a record high temperature of 88 ° F.
9. 09/23/07 Grand Forks NWS had a record high temperature of 91 ° F.
10. 09/23/07 Grand Forks International Airport had a record high temperature of 93 ° F.
11. 09/23/07 Fargo Hector Airport had a record high temperature of 93 ° F.
12. 09/23/07 Bismarck had a record high minimum temperature of 61 ° F.
13. 09/12/07 Grand Forks International Airport had a record low temperature of 33 ° F.
14. 09/08/07 Bismarck had a record rainfall of 1.38 inches.
15. 09/03/07 Dickinson had a record high temperature of 99 ° F.
16. 09/08/07 Fargo Hector Airport had a record rainfall of 1.16 inches.

Spring Outlook

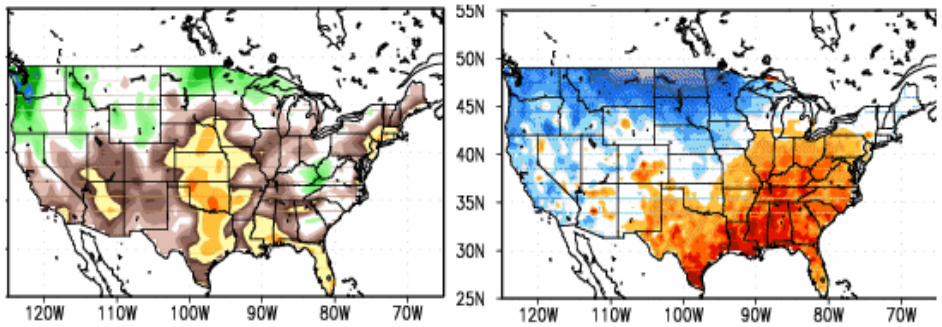
Seasonal Climate Outlooks

by M. Ewens

During the fall of 2007, and winter season of 2007/2008, a moderate La Nina developed in the equatorial Pacific Ocean. A La Nina occurs when cold water below the surface moves upward to the surface, causing a widespread, significant cooling from the Argentinean coast to the International Dateline. La Nina affects the climate across a large part of the northern hemisphere by displacing the jet stream north of its usual winter position. This in turn typically brings colder and somewhat snowier weather to the northern plains.

During the spring, the La Nina normally weakens, allowing weather patterns to return to a more normal state. However, the affects of the La Nina can take up to several months to be removed from the atmosphere. In other words, the cooler than normal "signal" often persists into the March and April time frame.

The official outlook for the spring months of March – May 2008 presented by the Climate Prediction Center (CPC) indicates there are equal chances for normal, above or below normal temperatures and precipitation over the northern plains. These outlooks are updated on the third Thursday of each month, with a final monthly outlook issued at the end of each month. Most updated local 3-month temperature outlooks for your region can be accessed from the state climate office web site: http://www.soilsci.ndsu.nodak.edu/ndawn/Outlook/L3MTO.html



La Nina affected precipitation (left) and temperature (right) patterns across the United States for the spring months of March, April and May. The northern plains are typically wetter (green shading) and colder (blue shading) in La Nina spring seasons.

However, local research suggests a more definitive outlook. On average, when there is a moderate La Nina during the winter, the following springs are usually colder and wetter than normal over a large part of the northern plains.

Hydro-Talk

Flooding in the West and Central North Dakota

by Charlene Prindiville

A 100 year review

Flooding in North Dakota is usually caused by snowmelt in the spring which can be worsened by such factors as above normal fall precipitation, high moisture levels in the snow at the time of freeze up, above average winter and/or spring snowfall, a late spring thaw, above normal precipitation during the thaw, and ice jams. Heavy rainfall of short duration can also cause urban and small stream flooding. The following are some notable floods:

April 1917 – Missouri River ice was 3 feet thick when it broke up and as a result Mandan flooded. Five men drowned while trying to cross the river between Bismarck and Mandan. Their boat flipped and was submerged.

March-April 1943 – Heavy snowfall with high water content and drifts up to 15 feet deep occurred in March. Snowmelt was rapid at the end of the month, but the ground was still frozen with a layer of ice on it. Flooding encompassed the Cannonball, Heart, Knife, Missouri, and James River watersheds. Mandan flooded when the Heart River dikes broke, leaving most of the city inundated. An estimated 2000 residents were left homeless. Five hundred families in Mott were evacuated when the Cannonball River flooded.

Mandan, Railroad Bridge over the flooded Heart River in 1943. (Submitted by Russel Kruger)

The Knife River at Beulah also forced about 500 people from their homes. The greatest damage to homes on the Missouri River occurred between Bismarck and Sanger. Heavy damage was also reported at Jamestown due to flooding along the James River. Six people drowned in western North Dakota during this flooding episode. Damages exceeded two million dollars.

Northern Pacific Railroad Bridge, Cannonball River at Breien, April 1950 (Courtesy of USGS)

April-May 1950 – Also due to rapid snowmelt, Beulah, Center, Stanton, and Hazen were seriously flooded along with southeast Mandan. Almont and Mott were inundated. Two separate peak flows on the James River of almost the same level caused serious flooding in Jamestown where 500 homes were evacuated. Heavy flooding also occurred at Napoleon and Strasburg from slow draining sloughs, while two houses were carried away at Solen.

March-April 1952 – Deep winter snows melted rapidly after a cold, moist autumn created frozen soils. Medora and Marmarth were partially flooded while Beulah and Hazen were once again inundated. An ice jam above Bismarck broke April 6th while a large jam situated about 5 miles downstream of the city caused a rapid rise of the Missouri River. Approximately 200 homes in southwest Bismarck were flooded. Mott, Breien, and Cannonball also received flood damage. Fifteen families had to abandon their flooded homes in Linton. A man attempted to swim across the Cannonball River near Breien and drowned.

April 1969 – Minot was the hardest hit during this flood with 3000 residences and 250 businesses under water. Two flood crests on the Souris River caused the evacuation of about 12,000 people. Burlington experienced flooding, as well as Linton on Beaver Creek. Ten homes in Zap were inundated. A flooding Pipestem Creek caused extensive damage in Jamestown where nearly one-third of the city was under water.

July 1993 – Rainfall was much above normal for July statewide. Monthly amounts ranged from 5 to 15 inches over most of the state. Bismarck recorded 13.75 inches. Major urban flooding was the result in Bismarck, Mandan, and Jamestown. Other towns such as Fessenden and Glen Ullin also flooded. Most of the damage however, was to crops, with many fields too saturated to plant.

March 1997 – Record seasonal snowfall, over 100 inches in many places, was followed by rapid melting and ice jams. Thawing occurred first in the headwaters of the Missouri, Cannonball, Knife, and Heart Rivers, forcing water into the unthawed parts of the basin. Soils were saturated from above normal winter and early spring precipitation. Flash flood conditions occurred at Williston, Mott, Beulah, and Hazen. More than 200 families were evacuated in Hettinger, Morton, Mercer, and Sioux counties. Due to heavy snowpack in the Northern Rockies combined with late spring warm-up, high discharges within the Missouri River watershed continued through mid-summer.

What's in store for the spring of 2008? So far, fall moisture and winter snowfall are minimal which would trend toward little or no flooding but, this is North Dakota and as most local residents can attest to, our weather variability can bring many changes in a short amount of time.

Merry Christmas All!

Science Bits

Nitrogen Recommendations and ND Agroclimate Zones

by Dr. Dave Franzen

Who would have thought that climate might influence crop response to nitrogen fertilizer? However, within the last few years several studies involving different crops and nitrogen rates have resulted in a move towards different recommendations depending on what part of North Dakota the farm is located in. Climate, both rainfall and growing season temperature, affect the activity of microorganisms and the release of nitrogen from the soil from the biological breakdown of soil organic matter and fresh residues. Organic matter tends to be higher in the east than west, and also higher north than south, due to climate differences that have been present in the state since the glaciers receded thousands of years ago. Also, it tends to be moister in the east, especially the southeast, and warmer in the southwest. All of these differences in heat and moisture influence the rate and amounts of nitrogen that are naturally added into the available nitrogen pools for crops to tap each season.

New recommendations with climate included in the recommendation are barley (NDSU Extension Circular SF-723, revised 2007) and canola (NDSU Extension Circular SF-1122 revised, 2007). In these recommendations, nitrogen recommendations are generally greater in the east, due to increased yield potential of these crops in the east; however, the amount of nitrogen required per bushel is probably lower in the east than the west. In a current study on spring wheat, results to date suggest that nitrogen rates should be lower in the east, particularly the northeast per bushel of expected production, with higher per bushel nitrogen rates in the west. Work will continue on the wheat project so that additional site years from different parts of the state will increase the confidence level of any new recommendation.

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CONTACTING THE NORTH DAKOTA STATE CLIMATE OFFICE

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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