

Chapter 1 Climatology

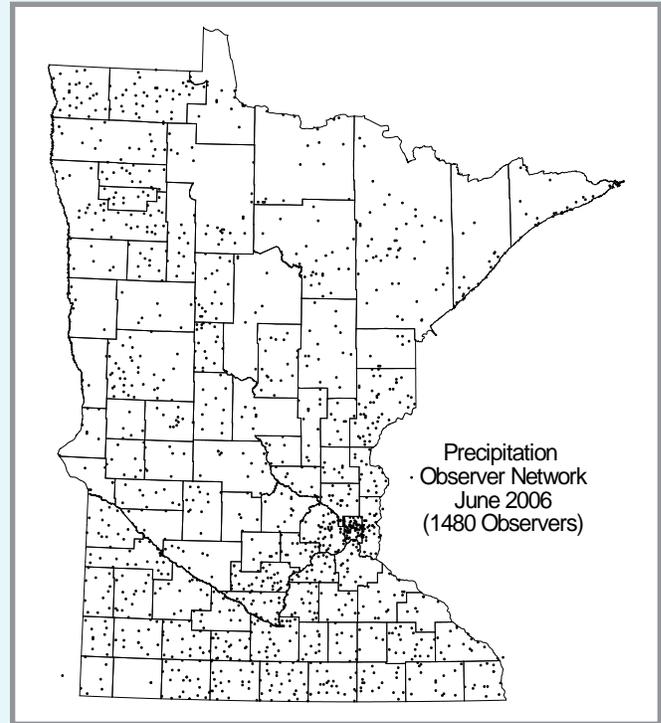


Peter Boulay

Introduction

The DNR Waters State Climatology Office exists to gather and analyze climate data for the benefit of the State of Minnesota and its citizens. A variety of organizations provide climate data. These organizations rely primarily on the efforts of volunteer observers. The data are consolidated into a unified database and climate information is distributed to many users.

A review of climate information can assist in explaining a prior event or condition. Climate information aids long-range planning efforts by characterizing what is typical or extreme, likely or unlikely. Users of climate information include government agencies (local, state, federal), academic institutions, media, private sector professionals and the general public. Specifically, engineers use temperature and precipitation data to design roads and storm sewers. Wildlife managers use temperature and snow depth information to research animal health and mortality. Agricultural specialists use temperature and precipitation data to determine the types of crops that will grow in Minnesota. Others who rely on climate information include hydrologists, foresters, meteorologists, attorneys, insurance adjusters, journalists and recreation managers.



"Normal"

The word "normal" in this chapter refers to a 30-year mathematical average of measurements made over the period 1971-2000. Many individuals tend to (erroneously) perceive "normal" weather as what they should expect. Dr. Helmut E. Landsberg, former Director of Climatology for the U.S. Weather Bureau, summarized this misconception as follows: "The layman is often misled by the word. In his every-day language, the word 'normal' means something ordinary or frequent...When (the meteorologist) talks about 'normal' it has nothing to do with a common event. For the meteorologist, the 'normal' is simply a point of departure or index which is convenient for keeping track of weather statistics."



photo by Deb Rose

Climate Data Sources:

Soil and Water Conservation Districts

National Weather Service

University of Minnesota

Department of Natural Resources

- Ecological Resources

- Division of Forestry

- Division of Parks

- Division of Trails and Waterways

- Division of Waters

**State Climatology Office Back Yard
Network**

Metropolitan Mosquito Control District

**Minnesota Association of Watershed
Districts**

Metropolitan Waste Control Commission

Minnesota Power and Light Company

Emergency Management Offices

The 2007 Water Year

October 2006-September 2007

Highlights

- *Snow Drought 2006-07*
 - *Snowy February*
 - *Damp Spring*
 - *Summer Drought*
- *Historic August 18-20, 2007 Flood, Southeast*
- *Wet Autumn 2007*

One positive aspect of this storm is that it brought copious amounts of water to the landscape over south central and southeast Minnesota. Since the ground was not frozen yet, much of the melting snow percolated into the ground. One-half to three-quarters of an inch of liquid fell from this storm at its heaviest. [Heavy Snow over Southeast Minnesota: November 10, 2006](#)

Despite the snowstorm, November was a warmer than normal month, delaying ice formation on lakes in the state. As of November 30, many larger lakes were free of ice, enabling some fairly uncommon “lake effect snow”. [November 30 Lake Effect Snow](#)

Autumn 2006

The previous water year (2006) ended with a lingering drought in northern and central Minnesota. Parts of Minnesota did receive significant rain in September 2006, most notably in west central Minnesota.

October

The drought that began in June 2006 continued into October – another in a series of dry months. The unusually dry late autumn weather raised concerns about topsoil moisture in the southern half of the state. The Twin Cities had the tenth driest October on record. [Cool and Dry October 2006 in the Twin Cities](#). October was also much cooler than normal across the state and was the coolest month, relative to normal, since May 2005.

November

November was another dry month with one major exception: a classic late fall storm moved from Oklahoma to Illinois on November 10th, resulting in a narrow band of heavy snow over southeast Minnesota, northern Iowa and Wisconsin. The heaviest snow fell in a swath from 10 to 13 inches from Austin to Rochester. The heaviest amount in Minnesota (reported to the National Weather Service) was 13 inches near Byron in Olmstead County.

Lake-effect snow is produced in the winter when cold winds move across long expanses of warmer lake water, providing energy and picking up water vapor which freezes and is deposited on the lee shores.

Winter 2006-07

December

Thoughts of a normal winter melted away with a statewide December temperature average that was a whopping ten degrees above normal. In the Twin Cities it was the sixth warmest December in the modern record.

December 2006 precipitation totals were above average in most Minnesota locations, but that doesn't mean it was a snowy month -- the bulk of the precipitation fell as rain. Much of Minnesota experienced a “brown” Christmas (it was the first time in Duluth's climate record that no snow was reported on the ground on the morning of December 25).

“Panhandle Hooker”

This is a storm that develops in the lee of the Rockies, near the Texas and Oklahoma panhandles, then moves to the northeast. This type of storm can draw in ample Gulf moisture and may bring heavy snow to Minnesota depending on which path the storm takes.

January

January 2007 followed December as another warm month with mean temperatures ranging from five to eight degrees above normal. The first part of January was exceptionally warm with the mercury 15 to 30 degrees above normal. High-temperature records and warm low-temperature records were tied or set on January 3, 4, and 5. Temperatures returned to typical January readings by mid-month and remained near, to below, normal for the remainder of the month.

January 2007 precipitation totals were below average across most of Minnesota. Precipitation was short of the historical normal by more than one-half inch in many places (a few locations in the southern one quarter of the state reported near normal, to above normal, precipitation for the month). A “snow drought” continued for much of Minnesota. The lack of snowfall was most acute in central and northern Minnesota with landscape so bare that grass and cattail fires occurred in the middle of the month. [Snow Drought in Minnesota 2006-07](#)

February

An arctic blast during the first week of February was the pinnacle of the frigid month. There were 63 hours of continuous below zero temperature readings in the Twin Cities. The statewide average temperature was only 8.5 degrees, making this the coldest month in Minnesota since January 2005. [Extended Period of Below Zero in the Twin Cities](#)

“Old Man” winter also staged a comeback with a double whammy of snowstorms for the final days of February into March. The first occurred from February 23 to February 26, dumping a foot of snow or more across parts of central and southern Minnesota. La Crosse, Wisconsin reported its largest snowstorm total ever with 21 inches of snow. Winona had one of the highest totals with 29.5 inches. [Snowfall of February 23-26, 2007](#)

The second storm at the end of the month was also formidable. This one began as a classic “Texas Panhandle Hooker” type of storm on February 28. This storm dumped a foot or more of snow across central and southern Minnesota and along the north shore of Lake Superior before it wrapped up on March 2. The University of Minnesota in the Twin Cities closed during the afternoon on March 1st marking the first time since January 18, 1994 that the University closed due to a weather event. Another memorable aspect of this storm was the blizzard conditions in the Duluth area, which caused 10 to 15 foot high snowdrifts on Minnesota Point along the shore of Lake Superior. There were also blizzard warnings in the Red River Valley and in southern Minnesota. [Snowstorm and Blizzard: February 28 to March 2, 2007](#)

Despite the snowy February finish, seasonal snow totals for 2006-07 were generally below average, with the exceptions of Rochester and La Crosse (which happened to be at the epicenter of the largest snowstorms of the year). Duluth finished near average while International Falls, St. Cloud and the Twin Cities were all below average.

Spring 2007

March

March 2007 was the second consecutive month of above-average snowfall. Precipitation totals ranged from two to four inches statewide, topping the historical average by one or more inches in many communities. Most of the precipitation came from the blizzard at the start of the month, and a soggy system at the end of the month (which brought heavy rains over much of the state).

Mean temperatures for March 2007 ranged from three to six degrees above the historical average. Cool conditions in early March were more than offset by very warm readings during the last ten days of the month. Numerous records were set on March 25 and March 26 when the temperature soared into the 70's and low 80's in central and southern Minnesota. [Record Warmth: March 26, 2007](#)

The warm temperatures in mid-March produced rapid snow melt in many southern and western Minnesota watersheds. In addition to the hasty melt, unusually thick ice created jams in constricted locations along stream courses. The combined result led to isolated moderate-to-major flooding, the worst of which affected Browns Valley.

April

April 2007 was the third consecutive month of above-average precipitation except in south central and southeastern Minnesota. Monthly precipitation totals ranged from one to four inches statewide. West central Minnesota received the greatest amount with many locations reporting over four inches of liquid (melted snow plus rainfall), - double the historical average.

One of the more notable weather events of April 2007 was an early spring snowstorm that dropped six or more inches of snow across central and northeastern Minnesota on April 2 and 3. Brainerd reported 11 inches of snow and Duluth set a



local record (12.1 inches) for the greatest single-day snowfall total during the month of April. Another event on April 10 and 11 dropped three or more inches upon most of the southern one half of Minnesota. Fairmont reported a record 8 inches of snowfall.

Monthly mean temperatures for April 2007 were near average across much of the state. However, temperatures were two to four degrees below the historical average in west central Minnesota. Across the state, very cold temperatures in early April were balanced by warmer-than-average temperatures during the later half of the month. It was the coldest start to an April in over 30 years. During the first eleven days of the month daytime highs struggled to top the freezing mark in many locations. [Cold First Week of April 2007](#)

May

Early May brought weather conditions that were highly conducive to an explosive wildfire situation. The rapid spread of the "Ham Lake" fire in Cook County was the result of the very dry conditions. As the month began, the area was deemed to be in a "Severe" to "Extreme" drought. Light and heavy fuels were very dry and spring green-up was just underway. Daytime temperatures on May 8 and 9 reached well into the 80's while the relative humidity was below 30 percent. In addition, strong winds of variable direction impacted the firefighting effort. Smoke from the Ham Lake fire was seen as far south as the Twin Cities. [Smoky Skies: May 11, 2007](#)

The “Ham Lake Fire” started on May 5, 2007 and was the largest and most destructive fire in Minnesota in recent history. It burned slightly more acreage in Canada (39,000 acres) than in the US (36,000 acres). One hundred and forty structures were lost in the fire.

May rainfall was spotty across the state. For west central Minnesota, it was the fourth month in a row of above normal precipitation. Welcome showers fell in west central, northwest, and north central parts of the state, bringing monthly totals above average in these locations. The rest of northern Minnesota fell short of normal, but the rains were ample enough to ease wildlife concerns and improve drought conditions somewhat. Rainfall was below average in central and parts of southwestern Minnesota.

Monthly mean temperatures for May 2007 were mild across all of the state. Temperatures were generally two to four degrees above the historical average. On the other hand, frost was reported on the morning of May 17 in northern Minnesota and in southeastern Minnesota, but little crop damage was reported.

Summer 2007

June

The same area that saw heavy rains in May also saw some of the heaviest rain in June. In some communities in west central Minnesota, rainfall totals topped six inches for the month. Elsewhere in Minnesota, June rainfall totals were very light. Some central, east central, south central, and southwestern Minnesota locations reported monthly rainfall totals of less than two inches. This is two or more inches less than the historical average for the month. In many of these areas, the dry weather marked the second consecutive month of below-average rainfall. The dryness raised concerns about deteriorating soil moisture supplies and lower than average surface water levels.

West-central Minnesotans were wondering what all the fuss was about regarding dry weather. Falling upon an already saturated landscape, torrential rains in early June in west central and northwestern Minnesota, led to rural flooding. Some roadways were inundated and crop re-planting was necessary in some spots. The heavy rain also led to flooding along the Red River and some of its tributaries throughout the month of June.

The heaviest rain event of the month occurred June 13 and 14 in eastern Polk and northern Clearwater counties. A sequence of thunderstorms dropped a narrow band of over six inches of rain in a 36-hour period in this area. [Tornadoes and Heavy Rains in Northwest Minnesota: June 13-14, 2007](#)

Monthly mean temperatures for June 2007 were warm across Minnesota. Temperatures for the month were generally two to four degrees above the historical average.

July

July 2007 was one of the driest Julys on record in some cities. Many locations reported less than two inches of rain for the month, with totals only half of what falls on average in July. [Monthly Summary for July 2007](#) Most locations in west central, central, and southwestern Minnesota received less than one inch of rain in July. Hutchinson reported their 2nd driest July in history with 0.50 inch of rainfall for the month. A 0.30-inch July rainfall total in Pipestone was also the second driest on record. The monthly rainfall total for Redwood Falls was 0.16 inch, the driest July in their historical record. [Dry and Warm July 2007](#)

Monthly mean temperatures for July 2007 were near, to somewhat above, historical averages across Minnesota. A warm finish to the month counterbalanced a spell of seasonally cool weather during the middle of the month.

August

August 2007 was dry in the north, and exceedingly wet in the south. While rainfall amounts fell short of average by one to three inches in northern Minnesota, many southern locations set all-time August rainfall records. Rainfall totals in the southern three to four tiers of Minnesota counties topped eight inches for the month, doubling the historical monthly average. Numerous south central and southeastern Minnesota communities reported rainfall totals in excess of ten inches in August. Many locations set all-time August

monthly rainfall records. Some examples include the Twin Cities (9.32 inches) and Rochester (14.07 inches). The National Weather Service site one mile south of Hokah received 23.86 inches of precipitation in August 2007, breaking the old August record of 16.52 inches in Alexandria in August 1900. The 23.86 inches was also the most precipitation ever recorded in a month in Minnesota. The old record was July 1987 at the Twin Cities International Airport with 17.90 inches.

Monthly mean temperatures for August 2007 were within two degrees either side of the historical average.

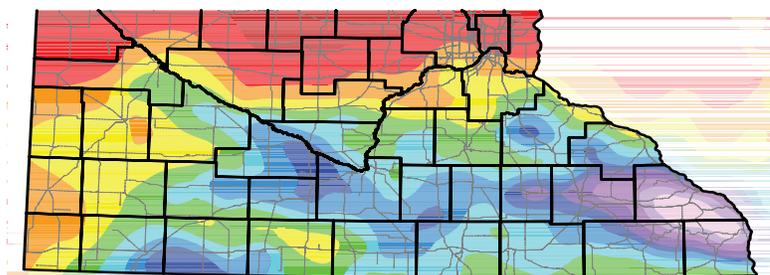
The Historic August 18-20, 2007 Flood

The most memorable singular event of the 2006-07 Water Year is the southeast Minnesota flood of August 18-20, 2007. A series of thunderstorms moving along a stalled frontal boundary dropped extremely heavy rain on much of southern Minnesota beginning August 18. The most intense precipitation rates occurred during the afternoon and evening hours of Saturday, August 18, and the early morning hours of Sunday, August 19. Over the course of the event, all or portions of 28 counties received at least four inches of rain. Six-inch totals were common across the region, and portions of southeastern Minnesota reported astounding rainfall amounts ranging from 8 to 18 inches. The heaviest rainfall reports came from Winona, Fillmore, and Houston counties, where 36-hour totals exceeded 14 inches. The largest multi-day rainfall total reported was 18.17 inches observed west of La Crescent in northern Houston County. An official National Weather Service climate observer near Hokah in Houston County reported a storm total of 16.27 inches. Of the 16.27 inches, 15.10 inches fell within the observer's 24-hour observation cycle ending at 8:00 AM on Sunday, August 19. This is the largest 24-hour rainfall total ever recorded by an official National Weather Service reporting location in Minnesota. The previous Minnesota record was 10.84 inches, measured at the city of Fort Ripley in Crow Wing County on July 22, 1972.

The deluge produced flooding tied to seven fatalities. Major flood damage occurred in many southeastern Minnesota communities. Hundreds of homes and businesses were impacted. Reports of stream flooding, urban flooding, mud slides, and road closures were numerous throughout southern Minnesota. The combination of huge rainfall totals and a very large geographic extent, make this episode one of the most significant rainfall events in Minnesota's climate history. A six-inch rainfall total for a given location in this region over a 24-hour period is said to be a "100-year" (1% probability) storm. The area receiving six or more inches during a 24-hour period in the midst of this torrent encompassed thousands of square miles. Other heavy rainfall events during this decade of comparable magnitude and spatial coverage include extraordinary rainfalls in northwestern Minnesota on June 9-10, 2002, and in [southern Minnesota on September 14-15, 2004](#).

Rainfall Totals for Southern Minnesota August 18 through August 20 (8:00 AM CDT), 2007

State Climatology Office
DNR Waters



0 1 2 3 4 5 6 7 8 10 12 14 inches

Autumn 2007

September

September 2007 rainfall totals were well above historical averages in many Minnesota counties. Drought-stricken regions of central and northern parts of the state received beneficial rains, improving the situation considerably. Monthly rainfall totals in excess of four inches were common in these areas, as well as in sections of southeastern Minnesota. In some counties, rainfall totals topped six inches for the month. For a few locations in Minnesota's Arrowhead region, monthly rainfall totals set new September records by exceeding ten inches. This is more than triple the historical average for the month. By contrast, September rainfall in some northwestern and southwestern counties fell short of the historical average by nearly two inches.

On September 6, a strong weather system moving through the Midwest dropped over six inches of rain on portions of St. Louis, Lake, and Cook counties. Rainfall totals surpassed eight inches in central St. Louis County. The deluge led to overtopped and washed out sections of roads and highways. The situation was greatly tempered by the long-term drought conditions that existed prior to the rain event. A storm of this magnitude and intensity would have certainly had a greater

impact had the landscape not been so dry. Another heavy rain event also affected portions of the Iron Range on September 18 when intense precipitation flooded Highway 169 near Grand Rapids. [Heavy Rains Drench Iron Range: September 6, 2007](#)

Intense rains doused west central and central Minnesota on September 20 and 21. Three to five inches fell along an arc that bisected Minnesota from near Ortonville to Hinckley. The rain drenched portions of Stevens, Pope, Douglas, Todd, Stearns, and Morrison counties; an area that was suffering most intensely from the 2007 drought. [Heavy Rains: September 20-21, 2007](#)

Monthly mean temperatures for September 2007 were two to four degrees above the historical average in most locations. Extreme values for September ranged from a high of 97 degrees at Breckenridge (Wilkin County) on the 3rd, to a low of 18 degrees at Embarrass (St. Louis County) on September 15. Three mid-month frosts effectively ended the growing season in most parts of the state. The most notable cold-snap occurred on September 15 when many Minnesota locations reported temperatures in the 20s. Some all-time low temperature records were set that morning. [Chilly September 15, 2007](#)



Dale Homuth



Southeast MN Flood

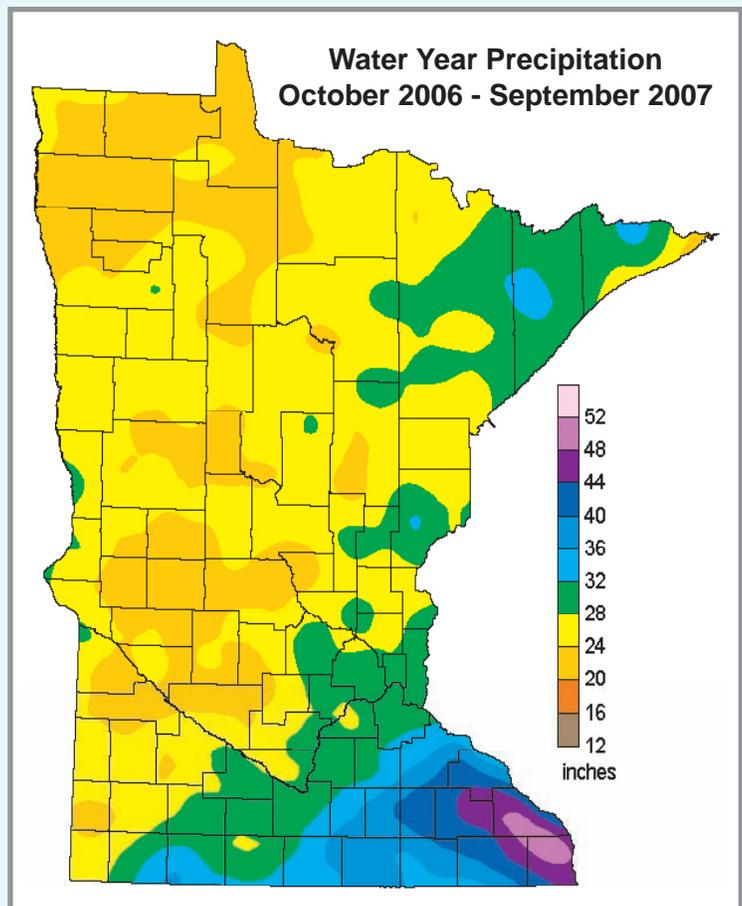
Peter Leete

Drought of Summer 2007

For the second summer in a row, there was a widespread drought in Minnesota. The main focus of the drought during the summer of 2007 was across northern and central Minnesota. September rains significantly improved the situation in many areas. However, rainfall for the sixteen-week period from June 5 through September 24 totaled less than eight inches for some locations in west central and central Minnesota. In these areas, rainfall totals for the period were five or more inches short of the historical average. When compared with historical rainfall totals for the same sixteen-week time frame, 2007 values ranked at or below the 5th percentile (one year in twenty occurrence) in some counties. The period from May through September is historically the wettest time of the year in Minnesota. Long-term average rainfall rates during the heart of the summer are around one inch per week. Very dry weather, occurring during a time of year when ample rain is typical, leads to the rapid intensification of drought. The lack of precipitation, along with very high evaporation rates, produced deteriorating crop conditions, lower stream flows and lake levels, and increased wildfire danger. [Drought Situation Report: September 27, 2007](#)

Water Year 2007 Summary

The heavy rain event of August 18-20, 2007 dominated the 2007 Water Year totals for southeast Minnesota. Southeastern Minnesota finished from four to an amazing sixteen inches above normal. For the rest of the state, the drought of summer 2007 impacted totals significantly over much of central and northern Minnesota. Deficits were eased somewhat with substantial September rains. Many areas across a wide swath of Minnesota wound up plus or minus two inches of normal. Some notable drier pockets were in Carlton County and in central Minnesota where deficits were four inches below average. The Red River Valley had a surplus of moisture for the water year with areas four to six inches above normal. This was the first year in Minnesota in which both a flood and a drought federal disaster was declared.



The 2008 Water Year

October 2007-September 2008

Highlights

- *Wet and Warm October 2007*
 - *Snowy December 2007*
- *2007-08 Coldest Winter since 2000-01*
 - *Cold and Snowy April 2008*
 - *Late Ice Out*
 - *Another Drought Begins in June*
- *Some Relief to Drought August & Sept*

November

The end of the autumn season was a dry one across the state. Precipitation totals for November 2007 ranged from near zero in west central Minnesota, to just over a half an inch in the northeast. Precipitation in general for the month fell short of normal by one to two inches for most places. Interestingly, after having the wettest October on record, the Twin Cities had the 4th driest November on record. [Dry November 2007](#)

November was a somewhat warm month, finishing one to four degrees above historical averages.

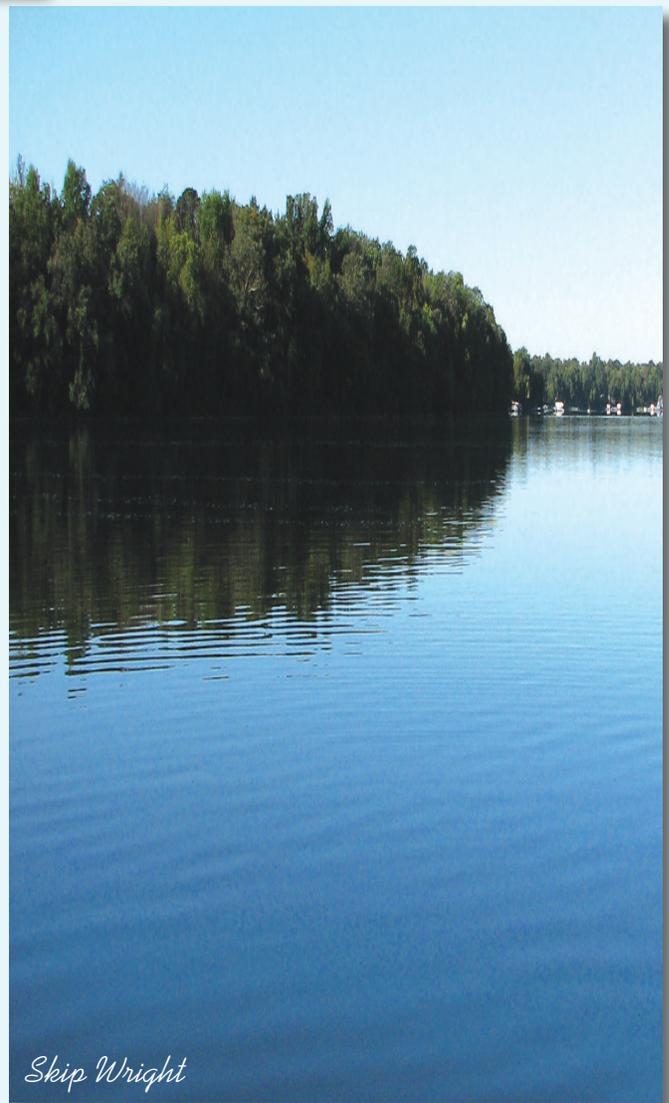
Autumn 2007

October

October 2007 rainfall totals were well above historical averages in nearly all Minnesota counties. As was the case in September, drought-stricken regions of central and northern Minnesota received welcome rains, further improving the situation. October monthly rainfall totals in excess of four inches were common, approximately doubling the October normal.

On a statewide basis, it was the third wettest October in the modern record. For many northeastern Minnesota communities, it was the wettest October ever, with precipitation totals topping eight inches in a few places. Many of these same locations had set all-time high precipitation records in September as well. The Twin Cities had its wettest October on record. [Top Ten Wettest August-October Periods in the Twin Cities](#)

October 2007 was a very warm month. Average temperatures were four to six degrees above the historical average throughout Minnesota. Numerous high maximum and high minimum temperature records were set on the 6th and 7th.



Skip Wright

Winter 2007-08

December

Winter returned with a vengeance bringing the snowiest December since 2000. Monthly precipitation totals topped normal by roughly one half inch in most communities. Monthly snowfall totals exceeded one foot in nearly all locations. Some spots in northeastern Minnesota received two to three feet of snow in December.

Mother Nature conjured up a number of winter storms. On December 1, nearly every county in Minnesota received at least three inches of snow. Some locations in northeastern parts of the state reported over 12 inches of snow during this event. Another snowstorm followed shortly behind, dropping three to nine inches of snow across much of central and northern Minnesota on December 4. A strong winter storm moved through the Midwest on December 22 and 23, assuring a white Christmas, but creating significant hardships for holiday travelers. An early and enduring snow cover has been rare in Minnesota in recent years.

[Heavy Snow: December 1, 2007](#)

[More Snow: December 4, 2007](#)

[Still More Snow: December 22-23, 2007](#)

Colder than normal Decembers have been unusual in recent years, but December 2007 bucked that trend. Monthly mean temperatures were generally one to three degrees below the historical average. Cold weather early in the month was counterbalanced by seasonal to above-normal temperatures in the second half of the month.

January

The snowy conditions from December did not continue into January 2008 and, as a result, precipitation finished below average for the month. There were few storms of note, one of which was a blizzard that struck southern Minnesota on January 29. [Blizzard: January 29, 2008](#)



The statewide temperature for January finished near average for the month, but that doesn't mean that the actual daily air temperatures were average. There was a classic January thaw from January 5-7. ["January Thaw" of January 5-7, 2008](#). On the other extreme, there was an extraordinary temperature plunge on the 29th. [Rapid Temperature Change: January 29, 2008](#)

February

February 2008 had fairly meager snowfall totals across the state. The only exception was in far southeast Minnesota where, in some places, better than a foot of snow fell for the month. What little snow fell over the rest of the state didn't go anywhere fast with average temperatures ranging five to seven degrees below normal. The cool February was the icing on the cake bringing the first colder-than-average winter statewide since the winter of 2000-2001.

Spring 2008

March

Chalk up March 2008 as another dry month. Monthly precipitation totals ranged from one half inch to one inch below average. The snow pack across much of the state began to erode with an occasional flirt of some mild temperatures. The landscape was nearly snow-free across southern Minnesota by the end of the month. As the month came to a close however, it was clear that winter was not done yet with Minnesota. A classic late winter storm took aim on central and southern parts of the state on March 31. [Snowstorm of March 31-April 1, 2008](#) Despite some mild weather, March finished cooler than normal.

April

Any worries of a dry spring (or not seeing any more snow for the season) were quickly put to rest in April. With the exception of far northwestern Minnesota, most communities reported significant rain or snowfall totals in April. Precipitation totals in most northeast, east central, and southeastern Minnesota counties topped five inches for the month. Total April precipitation in some southeastern Minnesota locales exceeded seven inches. In a few cases, the monthly precipitation totals were record setting. Many commu-

nities in west central, north central, and northeastern areas received over 30 inches of snow for the month, shattering April monthly total snowfall records in many places. There were four major snow events during the month (including the event that began on March 31 mentioned above).

[Very Heavy Snow: April 5-7, 2008](#)

[Blizzard: April 10-11, 2008](#)

[Snowstorm and Blizzard: April 25-26, 2008](#)

April temperatures kept to the winter-like theme and continued the trend of below normal temperatures. Average temperatures ranged from two to four degrees below normal across Minnesota.

May

May started out on the wet side, but became dry by the second half of the month. The state-wide average precipitation wound up nearly normal for the month.

And it was yet another cold month -- the fourth month in a row that the average monthly state-wide temperature was below normal. With the cold winter and early spring, there was worry that the ice would not be off some of the larger lakes in time for fishing opener. Indeed, for the first time since 1996, there was still some ice on far northern lakes on the opener. [Lake Ice Out 2008](#)



Cliff Bentley

Summer 2008

June

June precipitation was hit or miss across the state, with numerous rounds of severe weather and heavy rainfall. Two notable flash flood events occurred in southeast Minnesota, one on June 7-9, and another on June 11-12.

[Southeast Minnesota Flooding: June 7-9, 2008](#)
[More Southeast Minnesota Flooding: June 11-12, 2008](#)

After these two events, much of the state settled into a dry spell for the rest of June. The driest parts of the state were south central and east central parts of the state, finishing about a half to three-quarters of an inch behind normal for the month.

Once again, the monthly mean temperatures for the state were below normal with average June temperatures ranging from one to three degrees below.

July

For the third year in a row, Minnesota saw itself in the midst of a summer drought. The rainfall deficits for July 2008 fell short of normal by two or more inches. There were a few isolated spots of heavy rainfall, but in general a pattern of dryness prevailed. There was one flood event of note despite the overall dry month. On July 16-17 a small, but intense area of thunderstorms produced torrential downpours over extreme southeastern Minnesota in Winona and Houston County. [Heavy Rain: July 16-17, 2008](#)

The drought of summer, 2008 was not as intense of the drought of 2007 because there was a lack of hot temperatures. Monthly mean temperatures for July 2008 were very near historical averages keeping evaporation near seasonal norms and mitigating the situation somewhat. [St. Paul Campus Climatological Observatory Monthly Pan Evaporation](#)

August

The drought that began in June persisted in August as precipitation totals fell short of average by two or more inches in most counties. There were some exceptions. A line of heavy thunderstorms hit a few areas of west central Minnesota on August 11-12, causing some localized street flooding. [Heavy Rain in West Central Minnesota: August 11-12, 2008](#). And beneficial rains fell over eastern Minnesota on August 27-28, helping to alleviate the drought conditions. [Beneficial Rains: August 27-28, 2008](#). But while the showers were welcome, more rain was needed to eliminate the drought.

As with June and July, there weren't too many hot days. The highest temperature found in the state for August (and the summer) was 99 degrees at Redwood Falls. The Twin Cities did not reach 90 in August. The statewide average temperature for August wound up near normal.



Molly Shodeen

Autumn 2008

September

September 2008 precipitation totals fell short of average by one to three inches in the southern one-third of Minnesota. By contrast, heavy rainfalls in some sections of the northern one-half of the state caused monthly rainfall totals to exceed the long-term average by two or more inches. Unfortunately, the bulk of the rainfall missed many of the drought-stricken areas. One exception was the four or more inches of September rainfall reported in northwestern Crow Wing, eastern Cass, and southwestern Itasca counties where drought conditions were among the worst found in Minnesota. [Dry 2008 Growing Season](#)

Monthly mean temperatures for September 2008 were one to three degrees above historical averages. As was the case throughout the summer, maximum temperatures above 90 degrees were not common. Frosts occurred in several northern counties during September, but the remainder of the state escaped the month without frost, a factor that helped crops reach maturity.



Drought of Summer 2008

For the third summer in a row, there was a prolonged summertime dry spell in Minnesota. For the ten-week period during the last two weeks of June and into late August, many Minnesota communities received less than four inches of rainfall. This came at a time of year when rainfall rates average roughly one inch per week. Thus, rainfall deficits over the ten-week dry spell topped four inches in many areas. Described another way, ten-week rainfall totals were less than 50 percent of normal for the period. When compared with the same ten-week time span in previous years, 2008 growing season rainfall ranked below the 5th percentile (one year in twenty) in many locales.

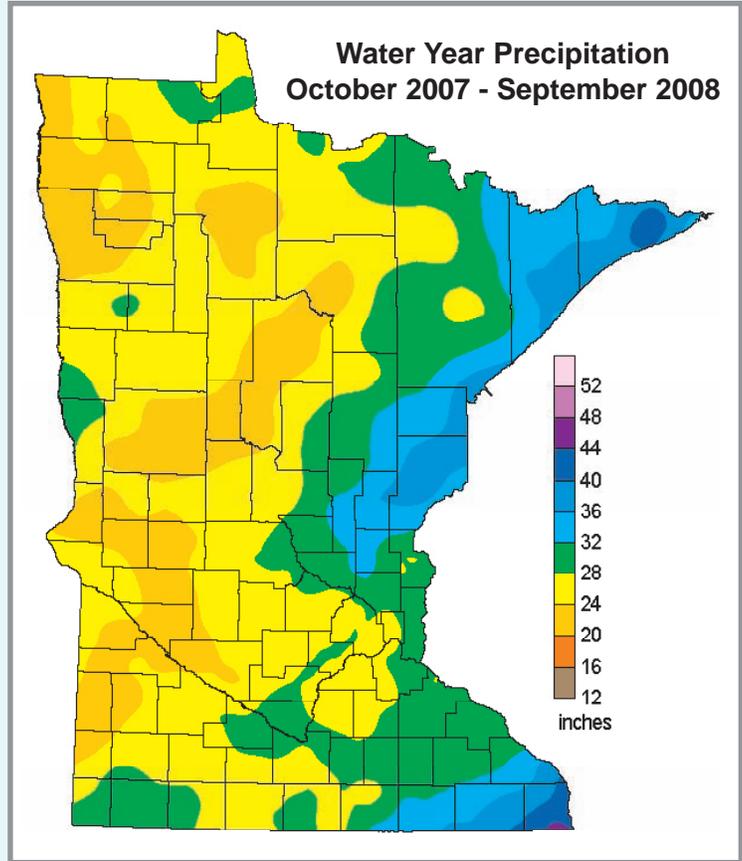
There were some beneficial rains in late August that took the edge off the drought over eastern Minnesota. Nonetheless, through the end of the 2008 Water Year, a large swath of southern Minnesota was in a moderate drought, as well as the Mississippi headwaters and parts of northeast Minnesota.

The drought would have been worse if it was a warm summer with many 90-degree temperatures. This was not the case. Maximum temperatures above 90 were not common. This held evaporation rates close to normal. The drought persisted into the next water year season.

Water Year 2008 Summary

For the 2008 Water Year, precipitation totals tended to be above normal along the edges of the state with the dry areas in the middle. Some of the areas that had above-normal precipitation include: the Red River Valley, east central Minnesota north of the Twin Cities, the extreme southeast tip of the state, the North Shore of Lake Superior and along the Canadian Border. Some of the wettest areas of the state were spots around Grand Marais in Cook County, and in Houston County near the Iowa Border. Some of these locations were six to ten inches above normal.

The summer drought of 2008 dominated the 2008 Water Year in a large swath though the center of the state. The water year finished drier from the Mississippi Headwaters, southwestward though Pope County, through the Twin Cities and then south along Interstate 35 to Albert Lea. There were locations in this arc of dryness that were four to six inches below normal.



Molly Shodeen